

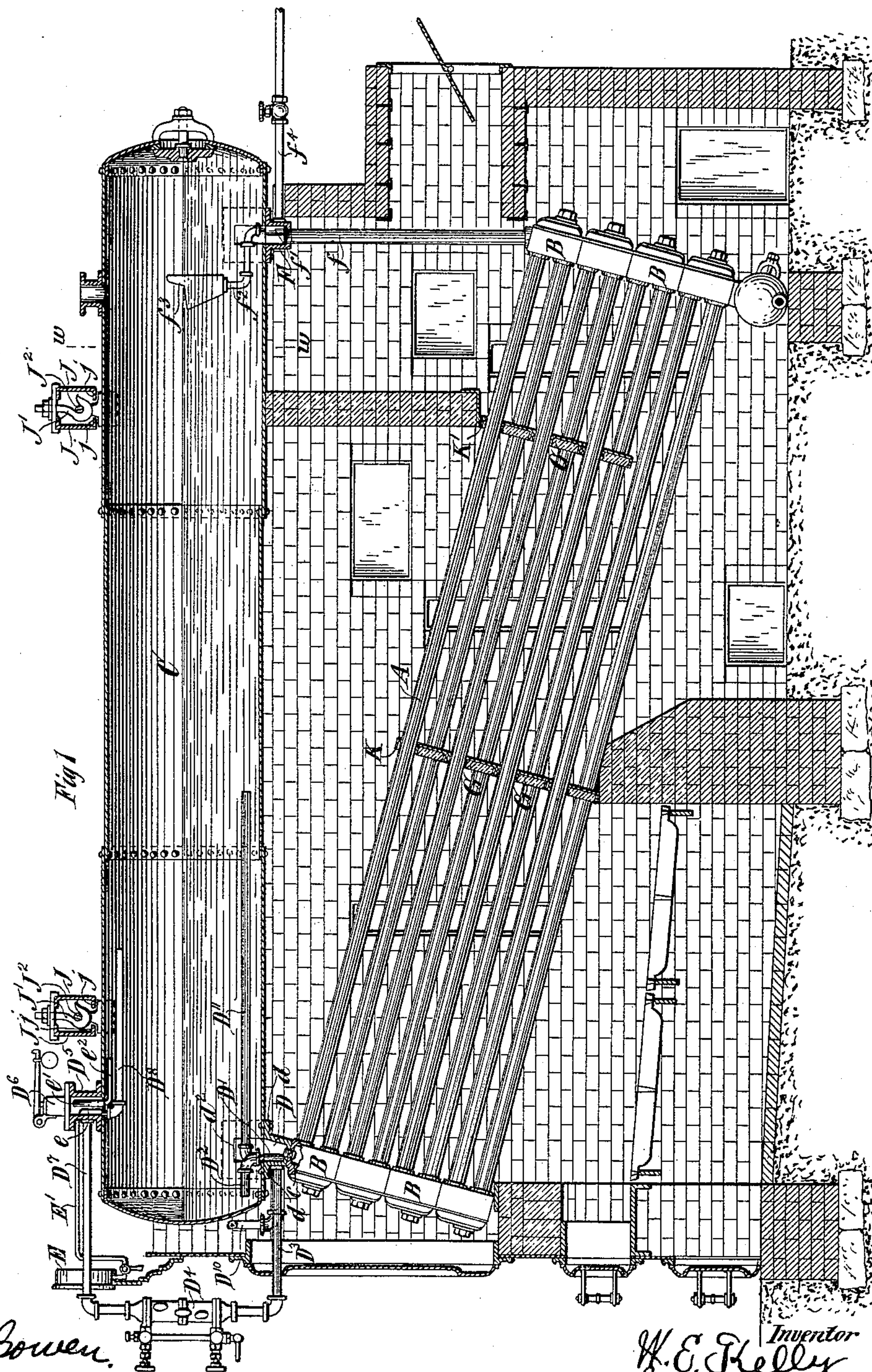
(No Model.)

4 Sheets—Sheet 1.

W. E. KELLY.
STEAM GENERATOR.

No. 350,202.

Patented Oct. 5, 1886.



Witnesses
Jas. R. Bowen.
Chas. F. Ward.

W. E. Kelly
by his attys,
Gifford & Brown.

(No Model.)

4 Sheets—Sheet 2.

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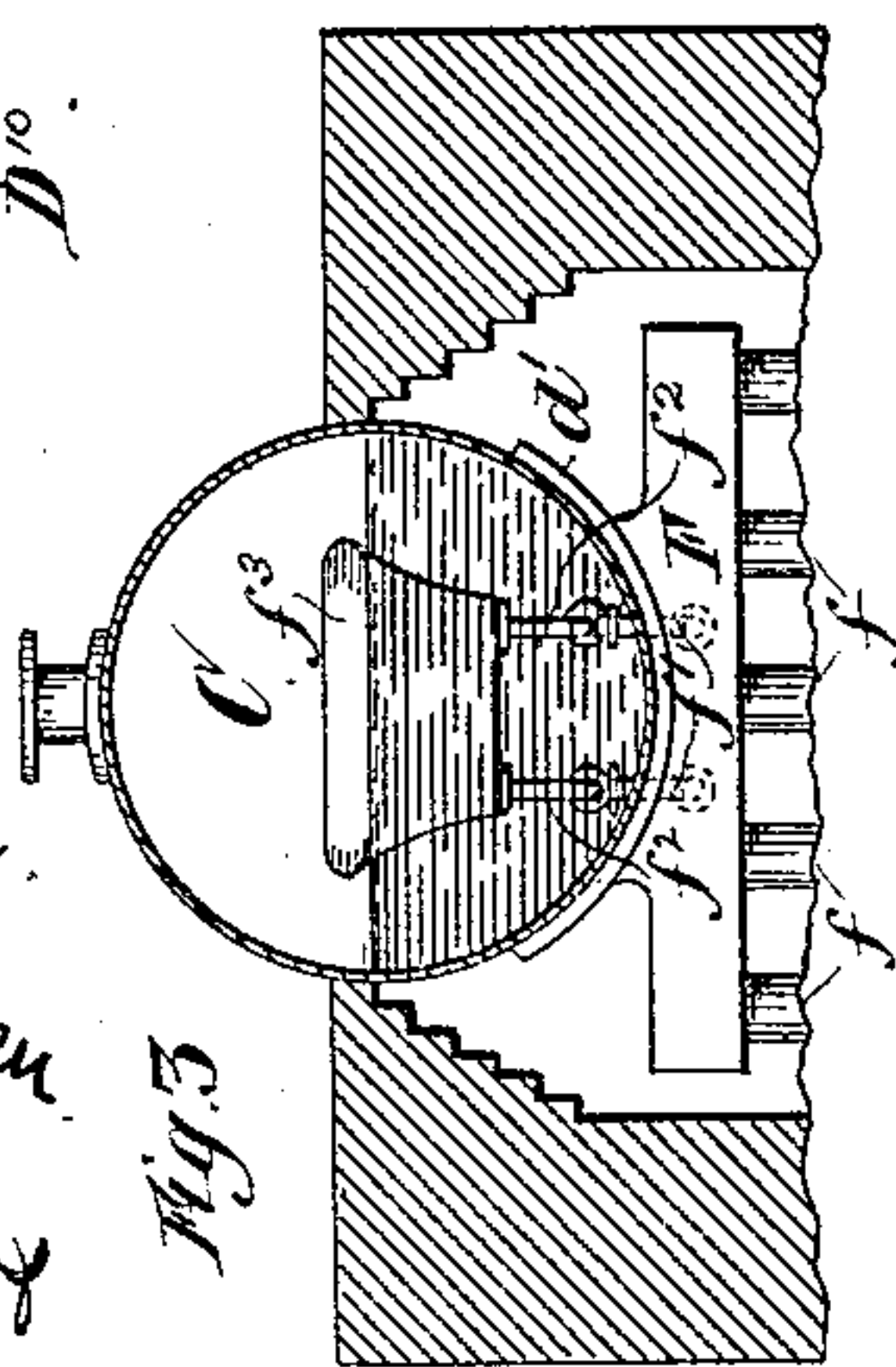
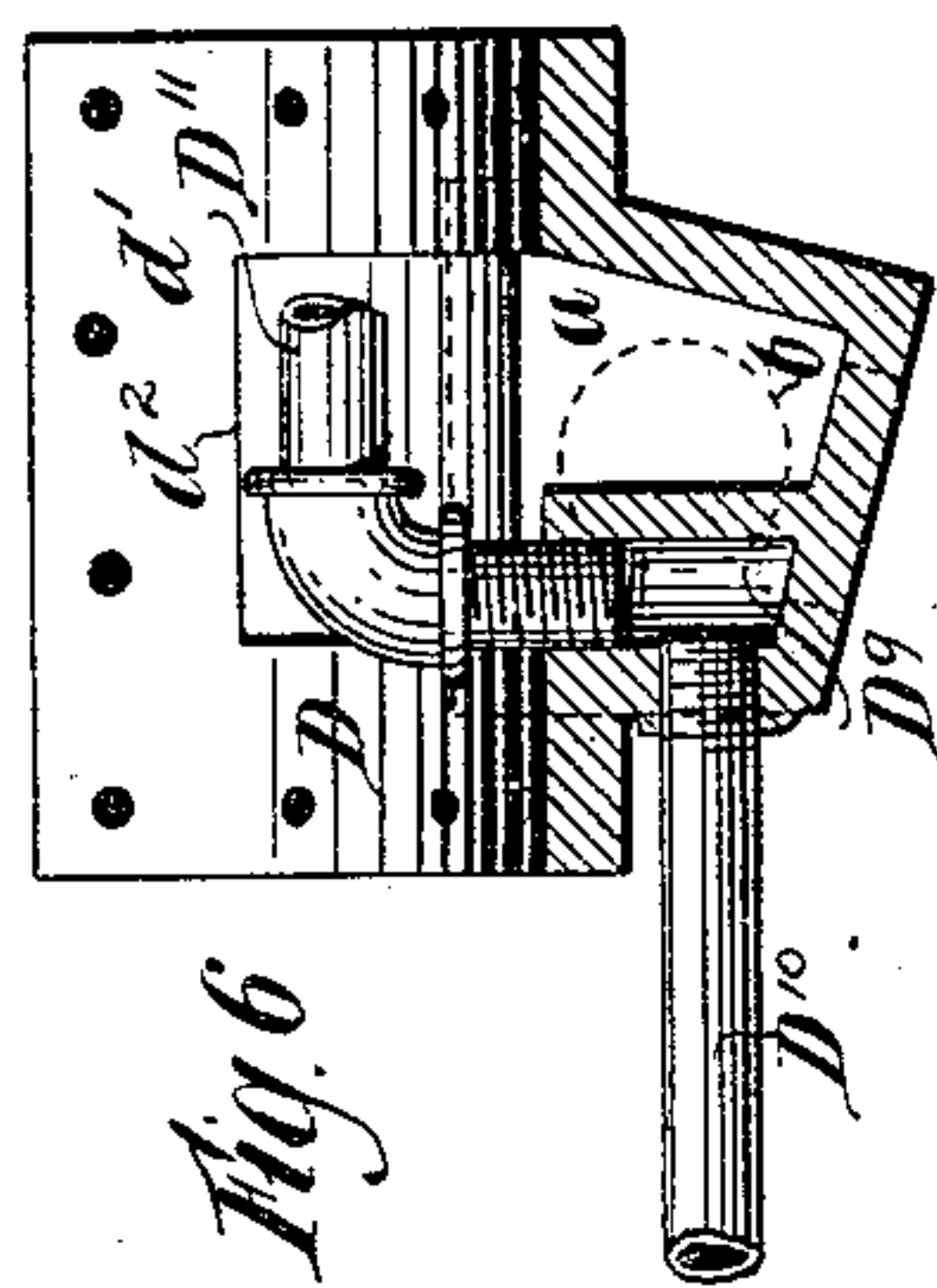
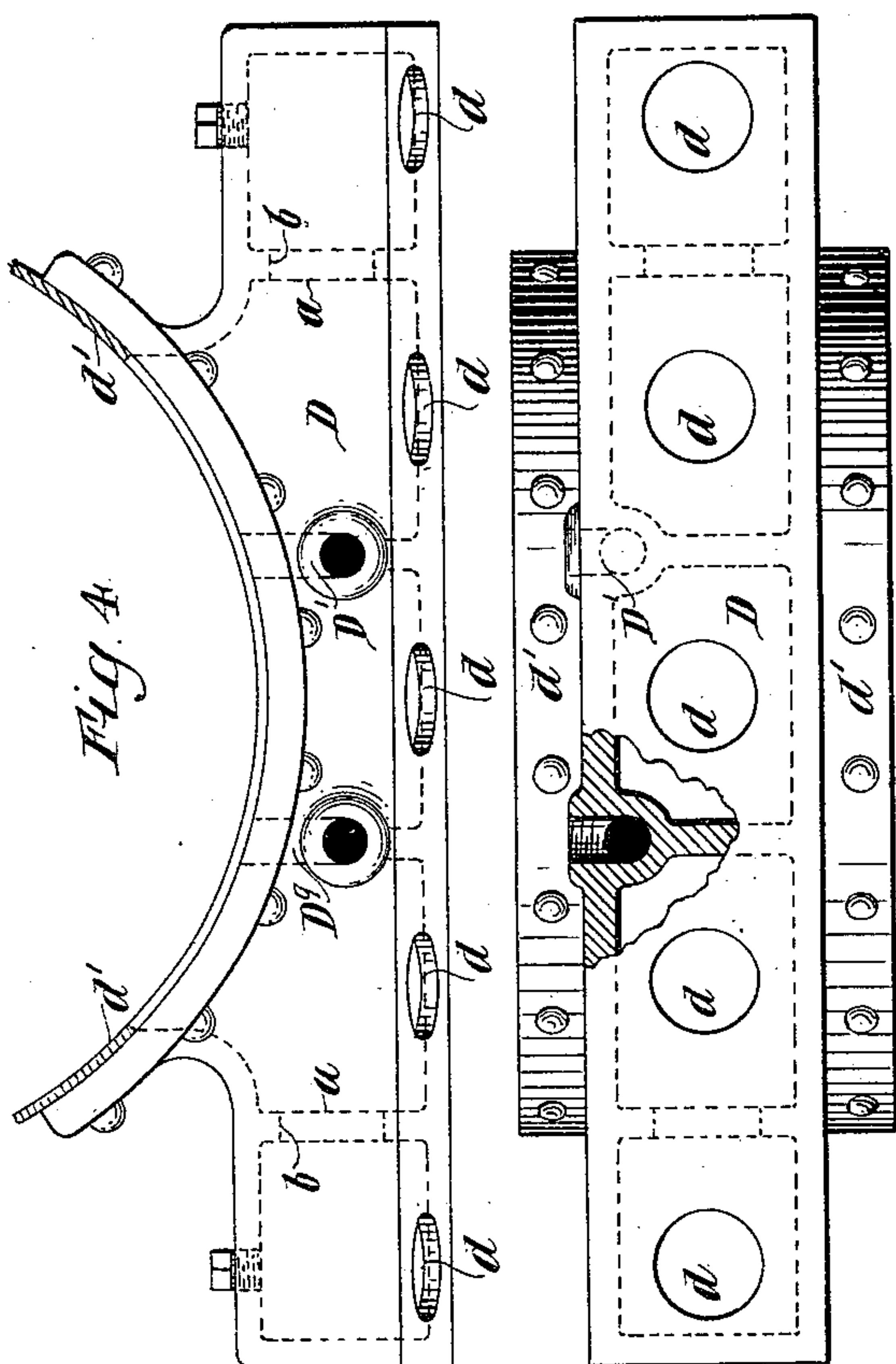


Fig. 2

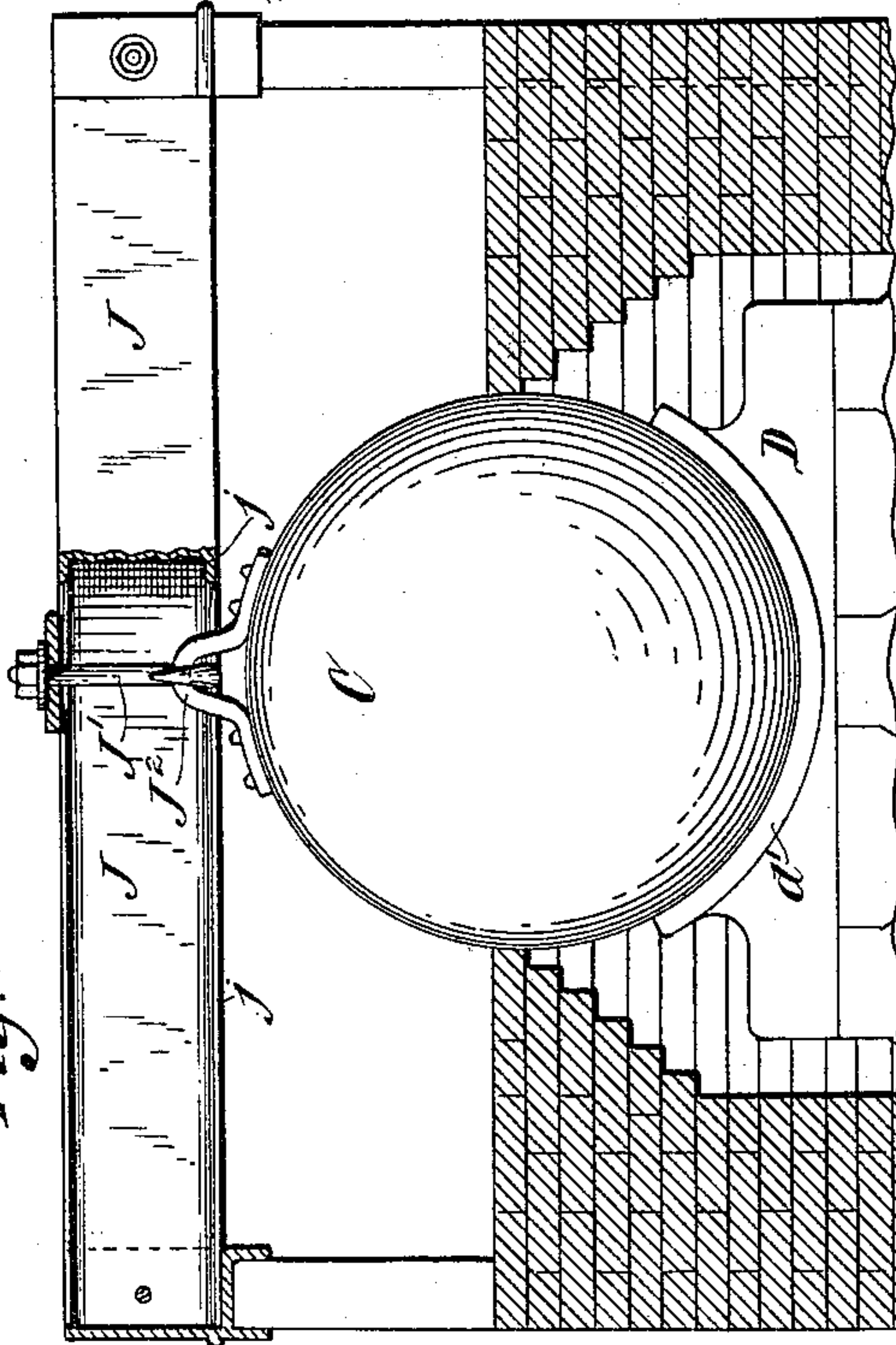


Fig. 15

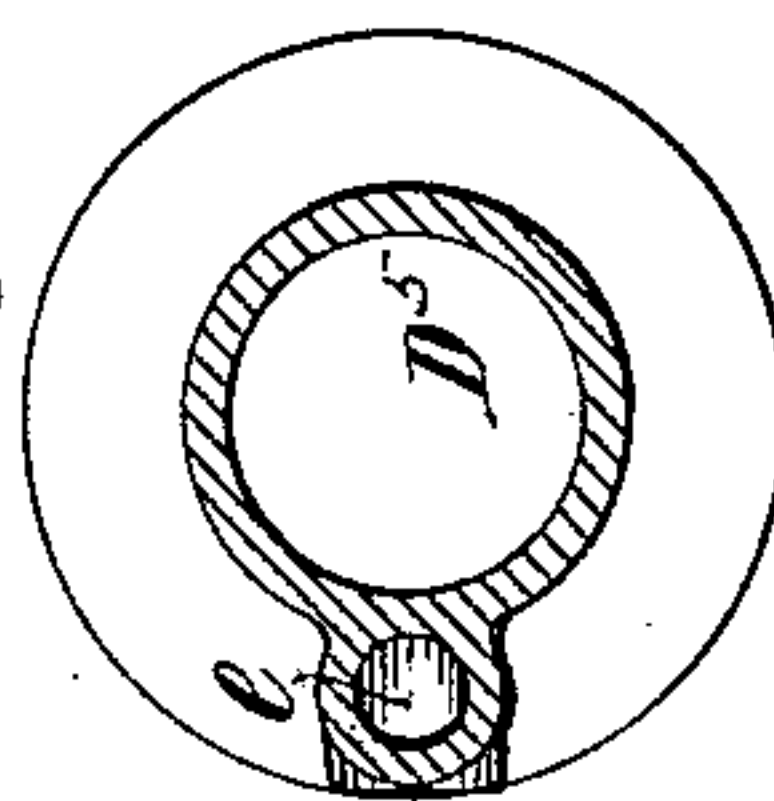


Fig. 10

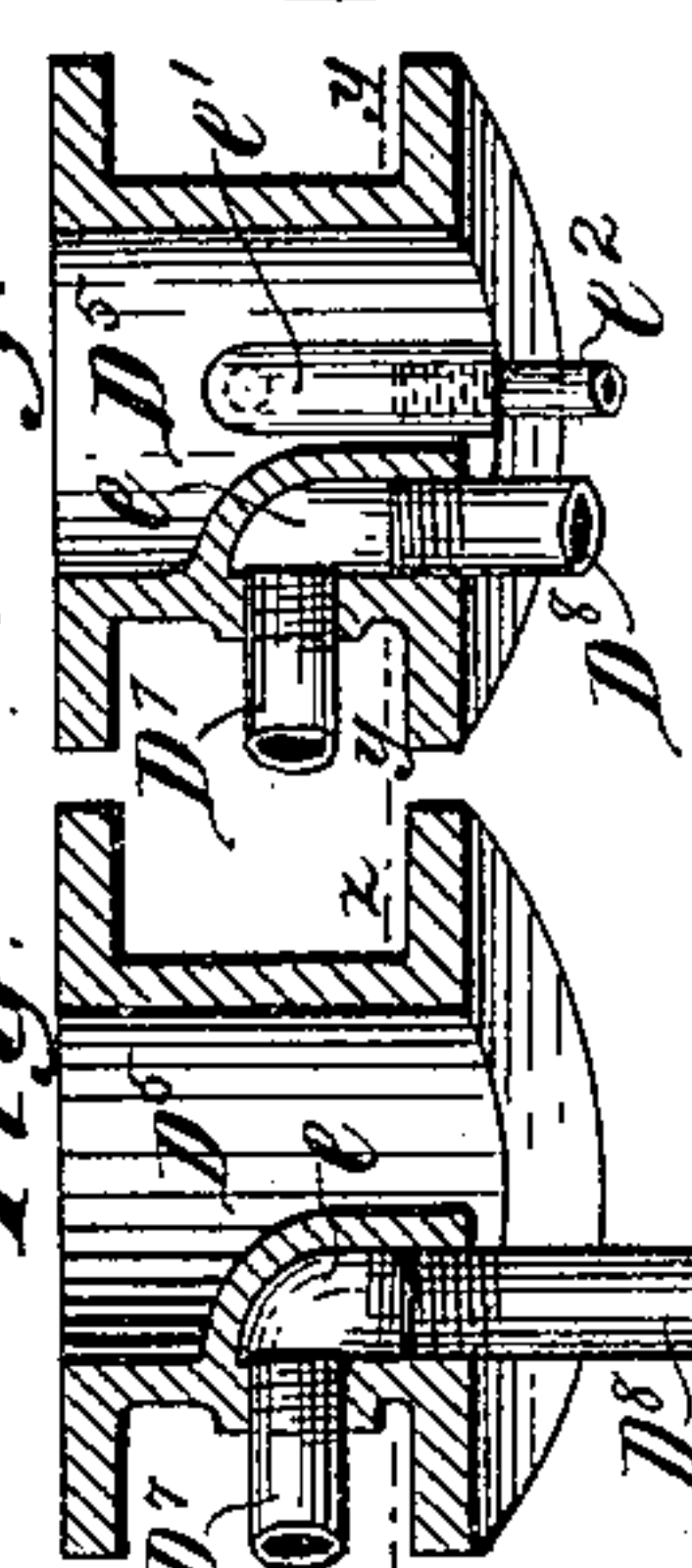


Fig. 12

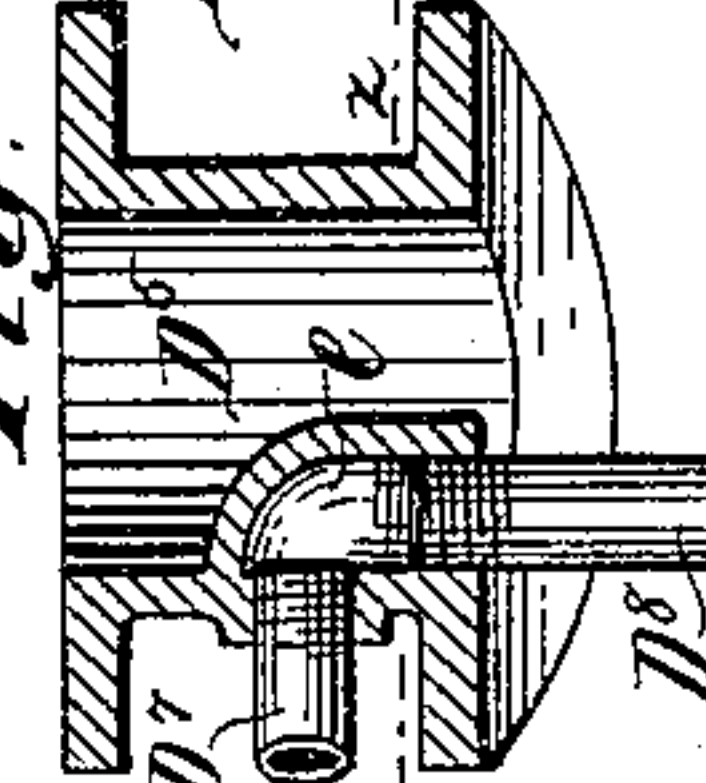


Fig. 11

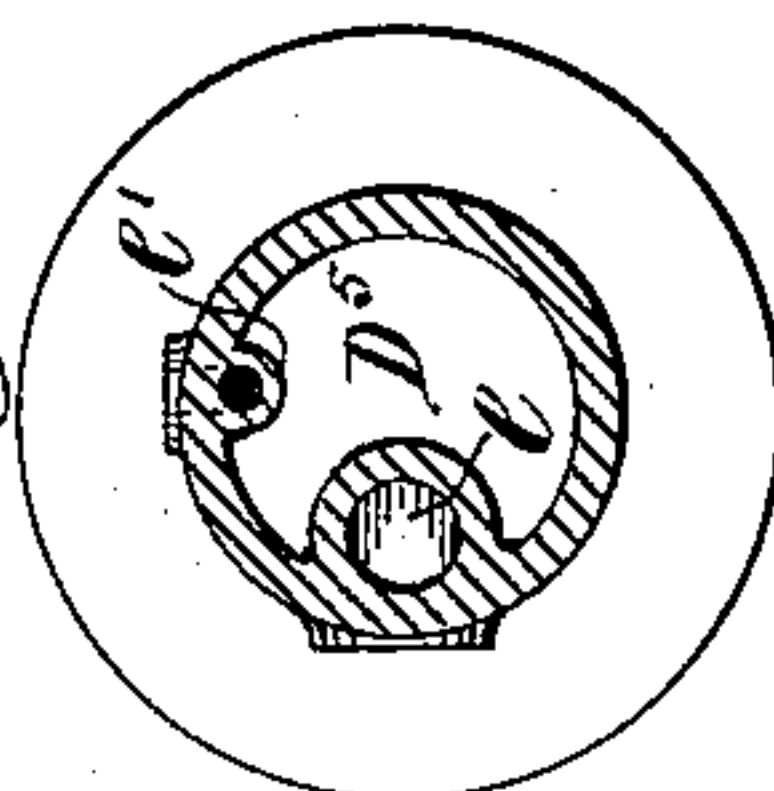


Fig. 14

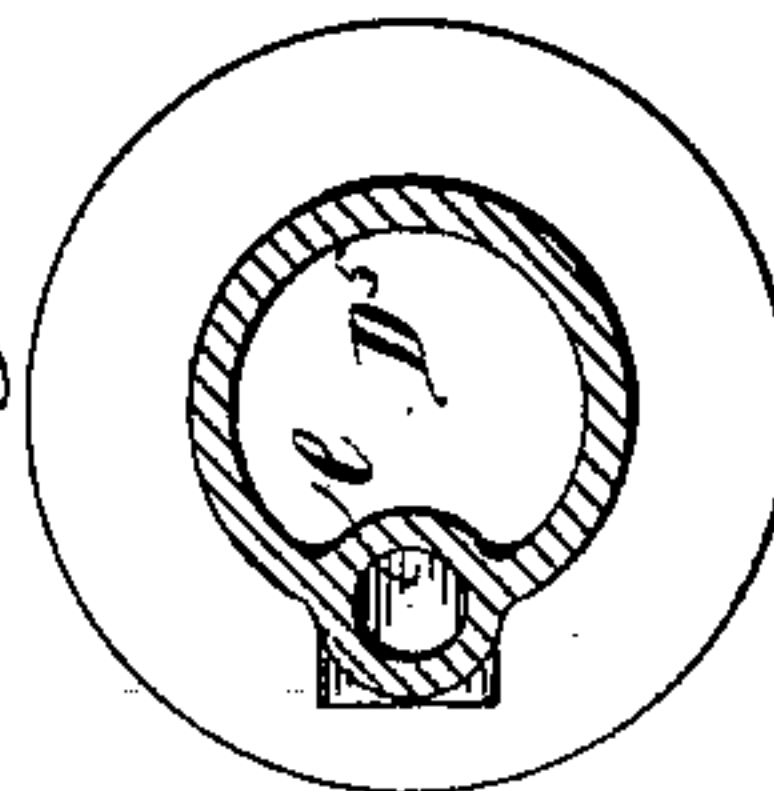
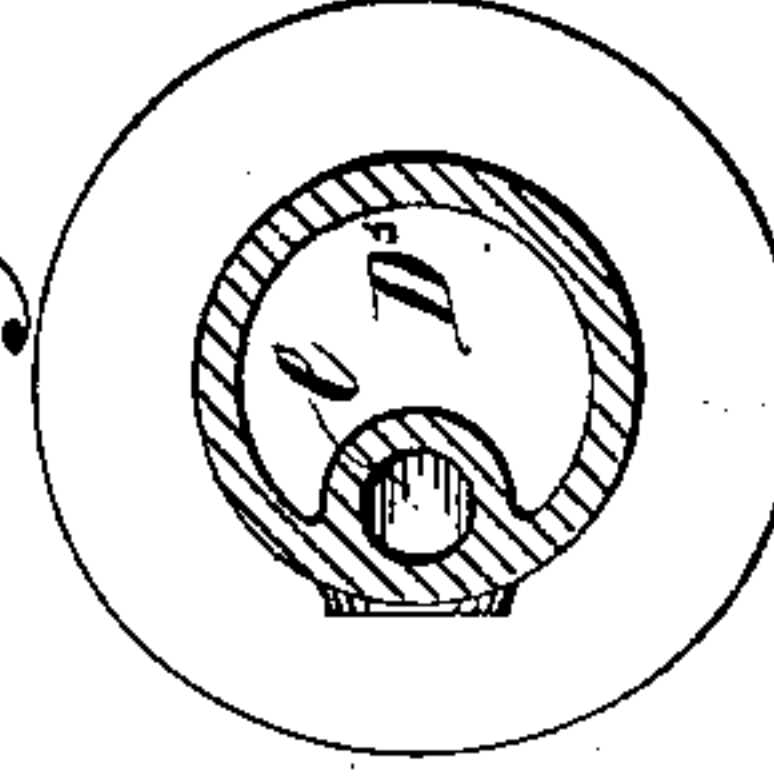


Fig. 13



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Fig. 3

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Fig. 6*

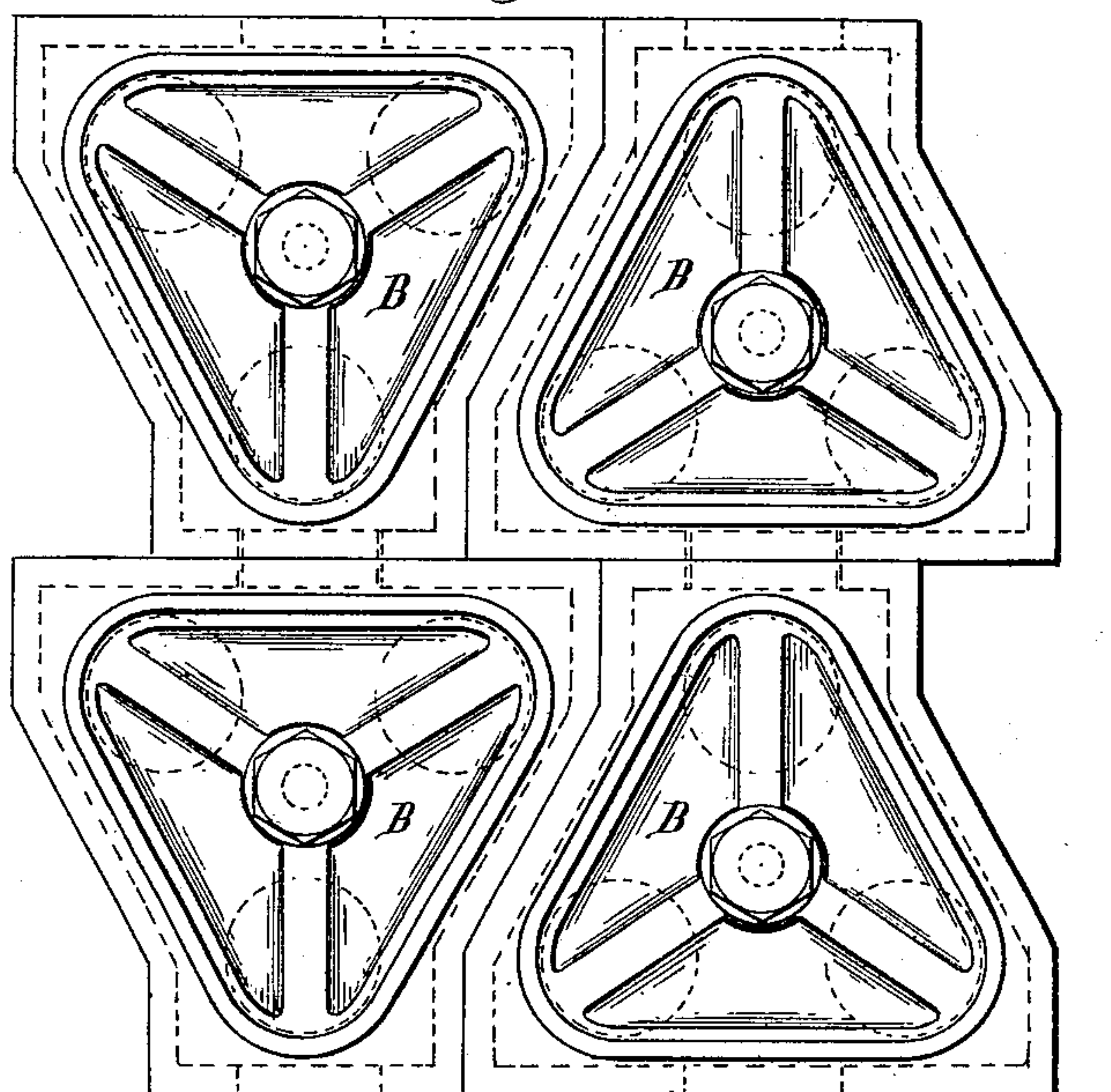
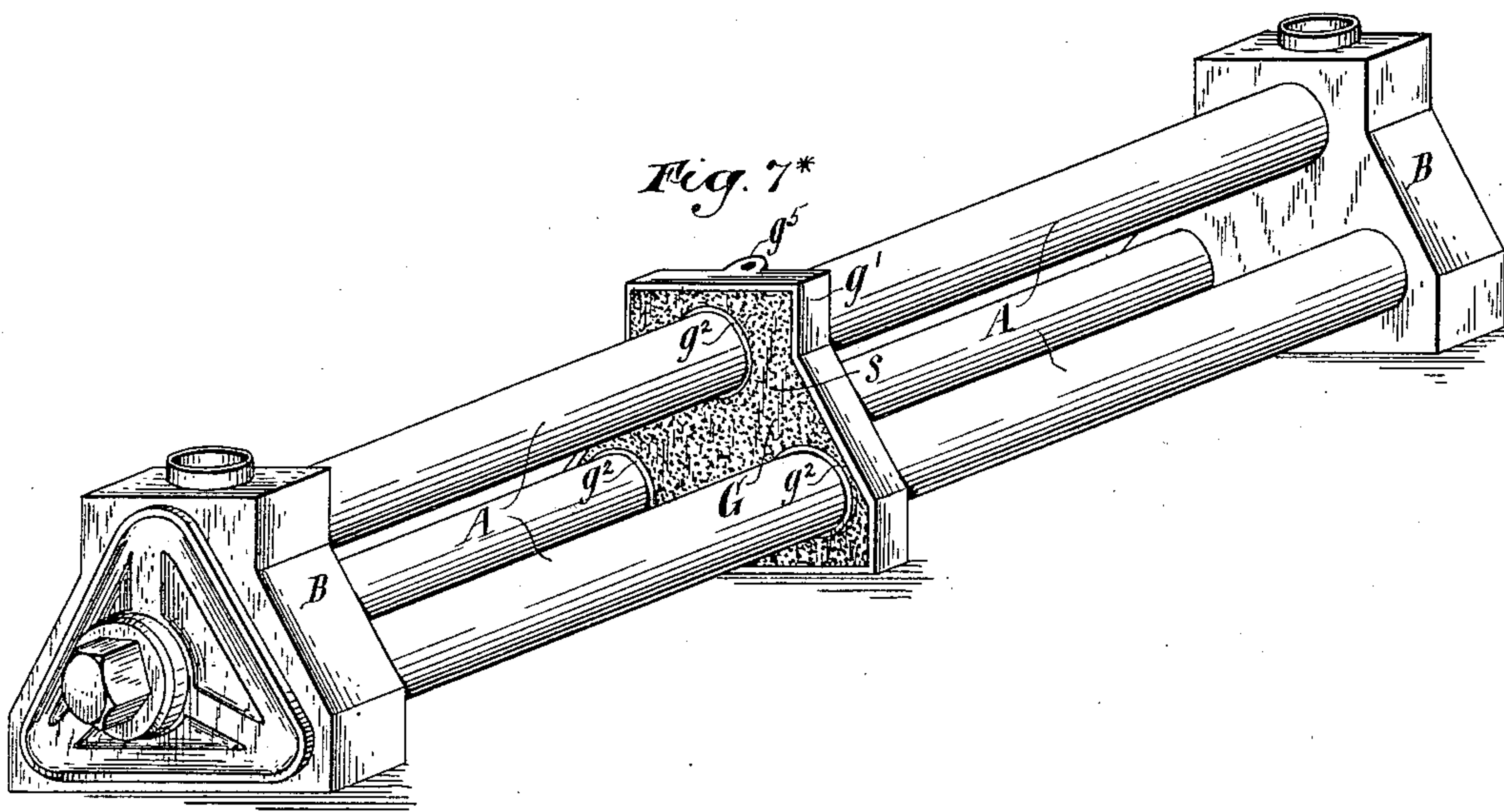


Fig. 7*



Witnesses

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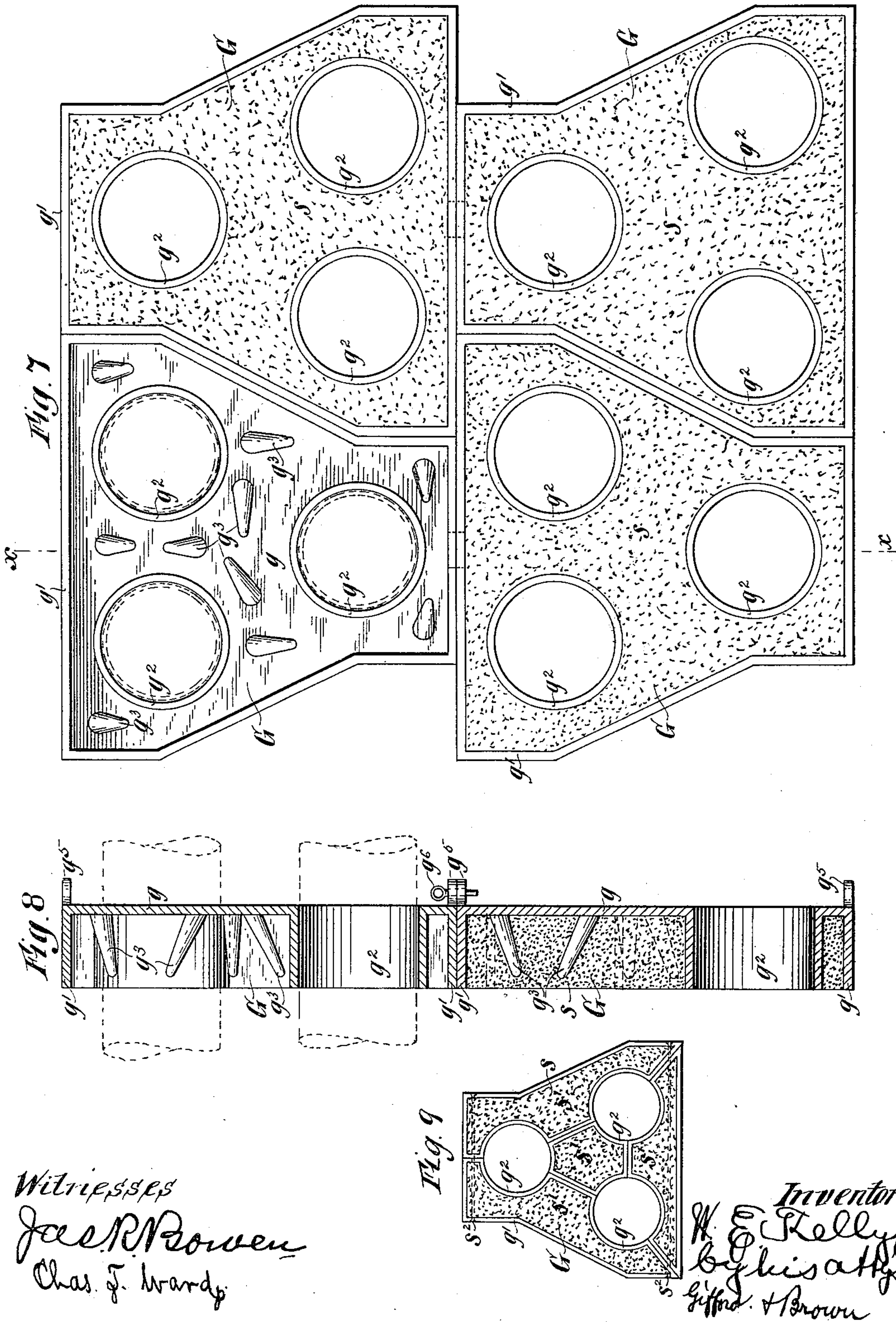
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UNITED STATES PATENT OFFICE.

WILLIAM E. KELLY, OF NEW BRUNSWICK, NEW JERSEY.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 350,202, dated October 5, 1886.

Application filed April 20, 1886. Serial No. 199,455. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. KELLY, of New Brunswick, in the county of Middlesex and State of New Jersey, have invented a certain new and useful Improvement in Steam-Generators, of which the following is a specification.

I will describe a steam-generator embodying my improvement, and then point out the various features of the improvement in claims.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of a steam-generator embodying my improvement. Fig. 2 is a transverse vertical section of a portion of the generator, the section being taken close to the front end. Fig. 3 is a transverse section of certain parts, the section being taken as indicated by the dotted line *ww*, Fig. 1. Fig. 4 is a front view of a combined header and saddle upon which the front end of the steam and water drum of the generator rests, the latter part being shown in section. Fig. 5 is an inverted plan of this combined header and saddle, a portion being shown in section. Fig. 6 is a transverse vertical section of this combined header and saddle. Fig. 6* is a front view of a group of headers. Fig. 7 is an elevation of a group of sections of a flame-plate. Fig. 7* is a perspective view of the boiler-tubes, showing the form of the headers and mode of connecting up the pipes, together with the form and arrangement of the flame-plates. Fig. 8 is a vertical section of certain sections of this flame-plate, the section being taken as indicated by the dotted line *xx*, Fig. 7. Fig. 9 is an elevation of a modified section of a flame-plate. Fig. 10 is a vertical section of a nozzle or nipple upon which a safety-valve is fitted, and by which water-gage pipes are coupled together and steam-pressure gage-pipes are united. Fig. 11 is a horizontal section of the said nozzle or nipple, taken at the dotted line *yy*, Fig. 10, and showing the same as it appears when looking upward. Fig. 12 is a vertical section of the same nozzle or nipple modified so as not to serve as a coupling for the steam-pressure gage-pipes, but merely as a coupling for the water-gage pipes. Fig. 13 is a horizontal section of this modified nozzle or nipple, taken on the plane of the dotted line *zz*, Fig. 12, and showing the same as it appears when looked at from below. Figs.

14 and 15 are similar horizontal sections of other modified forms of the nozzle or nipple.

Similar letters of reference designate corresponding parts in all the figures.

I will first describe generally the steam-generator which I have shown in Fig. 1 to illustrate the various features of my improvement, premising, however, that said improvements are not confined in their application to steam-generators of this style.

A designates a number of tubes, which are arranged upon an incline and subjected to the influence of the heat of the products of combustion from a furnace. These tubes are connected at their ends to headers B, and the headers B are united one above another and connected with a steam and water drum, C, so that water, when sufficiently heated, and steam may ascend through the inclined tubes, and rise through the headers B, to which the upper ends of the inclined tubes are connected, into the drum C, and so that the cooler water will descend from the drum C into and through the headers to which the lower ends of the inclined tubes are connected, and pass from these headers into the inclined tubes.

D designates a combined header and saddle placed under the forward end of the steam and water drums C, and affording a means of communication between the inclined tubes and the drum. This saddle will be cast hollow, and preferably provided, for the purpose of increasing its strength, with vertical partitions *a*, dividing it into compartments, communication between the compartments being afforded by means of openings *b* in the partitions. The upper row of headers B communicates with the saddle D by means of nipples *c*, expanded or screwed into openings *d* in the lower side of the saddle D and into corresponding openings in the upper sides of the headers. The saddle is provided with a curved flanged portion, *d'*, upon which the drum rests, and which is riveted to the drum. An opening, *d''*, in the drum affords communication between the drum and the saddle. The saddle is provided with a conduit, D', which is closed against the admission of steam or water from the saddle. This conduit may be cast in the saddle. A pipe, D², secured near one end in a suitable opening in the conduit D', affords communication between the conduit and the interior of

the drum. A pipe, D^3 , secured at one end in a suitable opening in the conduit D' below the drum, extends outwardly, and connects near its outer end to the lower end of a water-gage column, D^4 . The upper end of the water-gage column D^4 communicates with a nozzle or nipple, D^5 , for a safety-valve, D^6 , by means of a pipe, D^7 . Within the nozzle D^5 is formed a conduit, e , (shown more clearly in Figs. 10, 11, 12, 13, 14, 15,) with which the pipe D^7 communicates, and with which there is also connected a pipe, D^8 , extending into the steam-space of the drum. Water is supplied to the water-gage column from the pipe D^2 , which latter, it will be observed, extends well away from the point where the saddle communicates with the drum, and hence to a point where the water is less agitated than near the opening.

D^9 designates a conduit similar to the conduit D' , and likewise arranged in the saddle D . Feed-water pipes D^{10} D^{11} communicate with this conduit, whereby water may be fed to the drum. It is an important feature of this arrangement that I am not obliged to cut holes in the shell of the drum C in order to introduce any of the pipes for the water-gage or the feed-water pipe. The cutting of such holes is very difficult of execution, and can seldom be done with a desired degree of accuracy, and also has a tendency to weaken the shell of the drum. By providing the saddle D and nozzle D^5 , therefore, with closed conduits, with which the pipes of the water-gage and feed-water pipe communicate, much time and labor are saved, because the conduits may be cast in the saddle and nozzle, and the holes for the reception of the pipes may be tapped before the saddle and nozzle are secured to the drum.

I do not wish to be understood as limiting myself to the precise shape of the conduits D' and e , nor to the particular manner of connecting the several pipes thereto, as these may of course be varied. Figs. 13, 14, and 15 illustrate different methods of forming the conduits e in the nozzle D^5 , and like modifications of form or even different ones may be employed in the saddle.

In Figs. 1, 10, and 11 I have shown a means of affording communication between the interior of the drum and a steam-pressure gage, E , without cutting a hole through the shell of the drum, consisting in a pipe, E' , communicating at one end with the steam-gage, and at the other with a conduit, e' , in the nozzle D^5 , similar to the conduit e . A pipe, e^2 , extends from the conduit e' into the interior of the drum. F designates a saddle somewhat similar to the saddle D , located beneath and near the rear end of the drum and riveted to the drum. This saddle affords communication with the circulating-tubes A for the returning water, tubes f being connected to it and the headers B at the lower end of the inclined tubes A . This saddle is provided, as shown, with two

conduits, f' , similar to the conduits D' , with which pipes f^2 from a scum-collector and blow-off pan, f^3 , communicate. Pipes f^4 also connect with the conduits f' and extend outside the generator, through which scum may be blown off. Of course, feed-water pipes can be introduced into the saddle F , if desirable. By riveting the saddles D and F to the drum the latter is braced and strengthened.

Another important feature of my improvement consists in the flame-plates K K' , by which the flame and products of combustion are caused to follow a circuitous course through the circulating-tubes. These flame-plates are made up of sections G , which will preferably conform to the form of the headers B , each of which headers is shown in this example of my improvement as receiving three of the circulating-tubes. I have shown this arrangement more clearly in Figs. 6* and 7*; but I do not wish to be understood but that other forms of headers and flame-plates may be used than those shown. The sections G of the flame-plates are made of iron and are hollow. They will preferably be cast in such manner that they will each have a back, g , a rim, g' , extending about the edges, and thimbles g^2 formed in suitable positions in the back, and extending forward approximately coincident with the rim g' . Pins or projections g^3 extend from the back toward the front of the sections. As shown, they are arranged at inclines to each other. They may be cast with the sections or secured therein in any suitable manner. It is intended that the space within the sections shall be filled with fire-clay or similar material, s . Where such material is used the pins g^3 serve to retain it in position. I may, however, fill in the spaces with bricks of suitable form, which may be driven in or secured therein in any suitable manner. In such case the pins might be omitted. So far as the pins g' and their arrangement are concerned, the flame-plates might of course be of any desired form. The sections are provided upon their rear sides with lugs g^5 , through which pins or bolts g^6 may be passed to secure them together when in position about the pipes. The circulating-tubes extend through the thimbles g^2 , which latter protect the clay within the sections from the rubbing of the tubes. It will be advantageous to place the flame-plate sections in position on the tubes, as shown in Fig. 7*, before shipment, and fill them with the clay or other material when the generator is being erected. The heat of the furnace may then be depended on to bake the clay hard. The sections are superposed one upon the other, and do not overlap.

In Fig. 9 I have shown a flame-plate section of modified form, composed of a number of parts, s' , secured together and held in place by bolts s^2 . Although this flame-plate is made up of a number of parts, it is undivided, said parts being connected rigidly together, so as not to be capable of separating or dividing

when in use. Flame-plates made according to my improvement are cheap, desirable, will not warp, and are easily placed in position.

Another feature of my improvement consists in the channel-irons J above the drum, and the mode of arranging the hooks by which the drum is supported from the channel-irons. The channel-irons, it will be observed, have flanges *j* upon their lower sides, which extend inwardly or toward each other, whereby a considerable space is left between the channel-irons. By thus forming the channel-irons I am enabled to use but a single hook, *J'*, with each set of channel-irons, which hook is inclosed within the space between the channel-irons, thereby enabling the channel-irons to be brought much closer to the drum than has heretofore been possible when single hooks have been used. The hooks *J'* engage with iron loops *J²*, riveted to the drum. The height of the generator is therefore materially reduced, which is a desirable feature.

Instead of the conduits *e e'* being arranged in a safety-valve, they may be arranged in any other suitable outlet-nozzle.

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

1. The combination, with a steam-generator comprising circulating-tubes and a steam and water drum, of a saddle affording communication between the circulating-tubes and the drum, a conduit in said saddle, and pipes for a water-gage communicating with said conduit, substantially as specified.

2. The combination, with a steam-generator comprising circulating-tubes and a steam and water drum, of an outlet-nozzle, a conduit in said nozzle, and pipes for a water-gage communicating with said conduit, substantially as specified.

3. The combination, with a steam-generator comprising circulating-tubes and a steam and water drum, of a saddle affording communication between the circulating-tubes and the drum, a conduit in said saddle, an outlet-nozzle, a conduit in said nozzle, pipes connecting the conduit in the saddle with the conduit in the outlet-nozzle, and pipes connecting the conduits with the interior of the drum, substantially as specified.

4. The combination, with a steam-generator comprising circulating-tubes and a steam and water drum, of a saddle affording communication between the circulating-tubes and the drum, a conduit in said saddle, a feed-water pipe communicating with said conduit, and a communication between said conduit and the

interior of said drum, substantially as specified.

5. The combination, with a steam-generator comprising circulating-tubes and a steam and water drum, of an outlet-nozzle, a conduit in said nozzle, a pipe connecting said conduit with a steam-gage, and a communication between said conduit and the interior of the drum, substantially as specified.

6. The combination, with a steam-generator comprising circulating-tubes and a steam and water drum, of a saddle affording communication between the circulating-tubes and the drum, a conduit in said saddle, and a blow-off pipe or pipes communicating with said conduit, substantially as specified.

7. In a steam-generator, the combination, with circulating-tubes, of a flame-plate of shell-like construction provided with pins or projections arranged at inclines to each other and fire-resisting material within the flame-plate, substantially as specified.

8. In a steam-generator, the combination, with circulating-tubes, of a flame-plate composed of sections through which the tubes extend and superposed one upon the other, said sections being filled with fire-resisting material, substantially as specified.

9. In a steam-generator, the combination, with circulating-tubes, of headers to which the circulating-tubes are connected at their ends, and a section of a flame-plate between the headers, through which the circulating-tubes extend, the said flame-plate sections being of the same shape as the headers, each section being undivided and inclosing one or more tubes, substantially as specified.

10. In a steam-generator, the combination, with circulating-tubes, of a flame-plate, as K, composed of sections G, each provided with a back, *g*, rim *g'*, thimbles *g²*, and pins or projections *g³*, the sections being filled with fire-resisting material, substantially as specified.

11. In a steam-generator, the combination, with a steam and water drum, of channel-irons extending above the drum and provided upon their under sides with flanges turned inwardly or toward each other, so that a considerable space will be left between the channel-irons, and a hook inclosed within the space between the channel-irons and engaging a loop on the drum, substantially as specified.

WILLIAM E. KELLY.

Witnesses:

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JOS. R. BORDEN.