

No. 618,964.

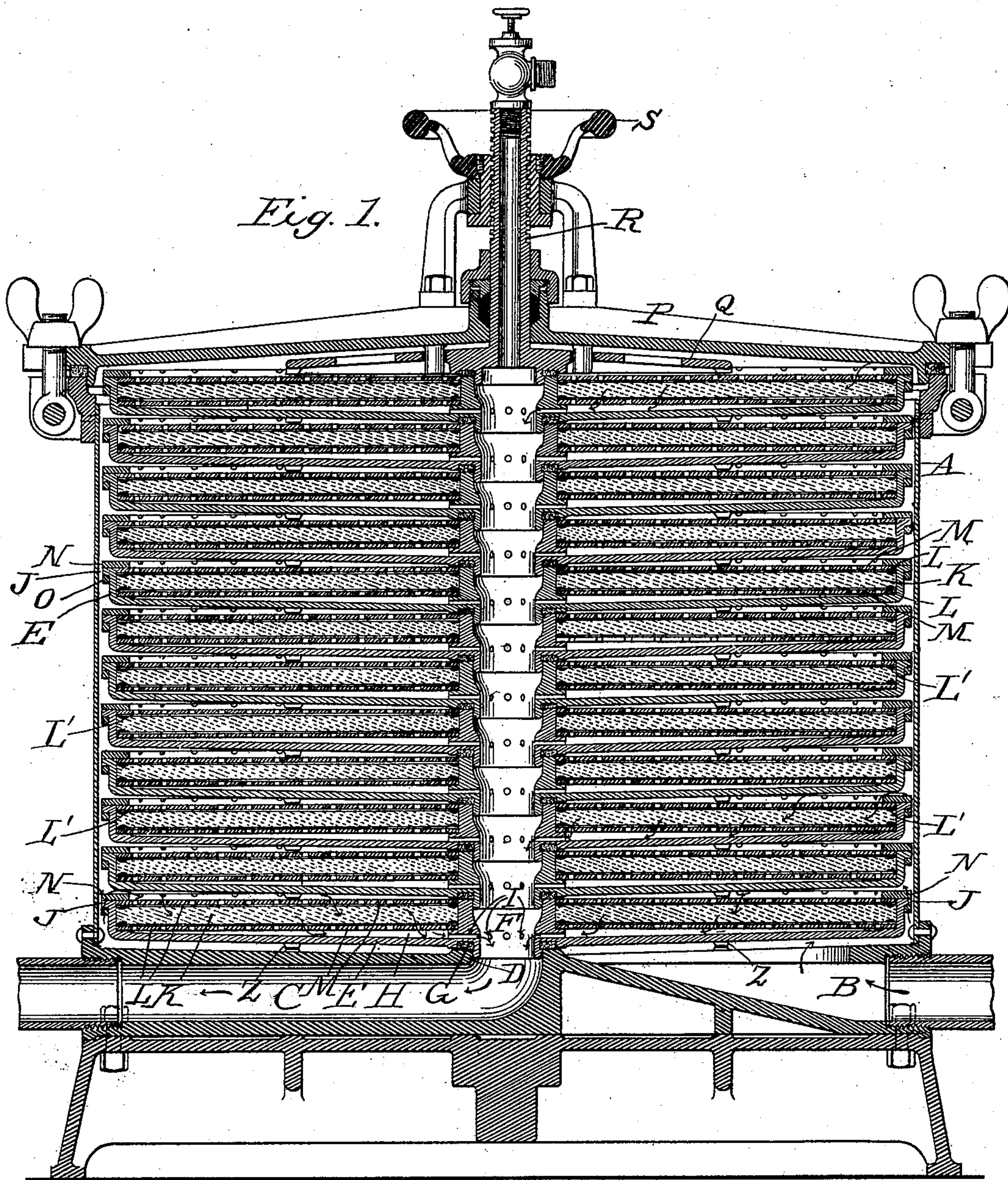
Patented Feb. 7, 1899.

J. F. THEURER.  
FILTER.

(Application filed June 9, 1897.)

(No Model.)

5 Sheets—Sheet 1.



*Attest:*  
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*D. E. Burdine*

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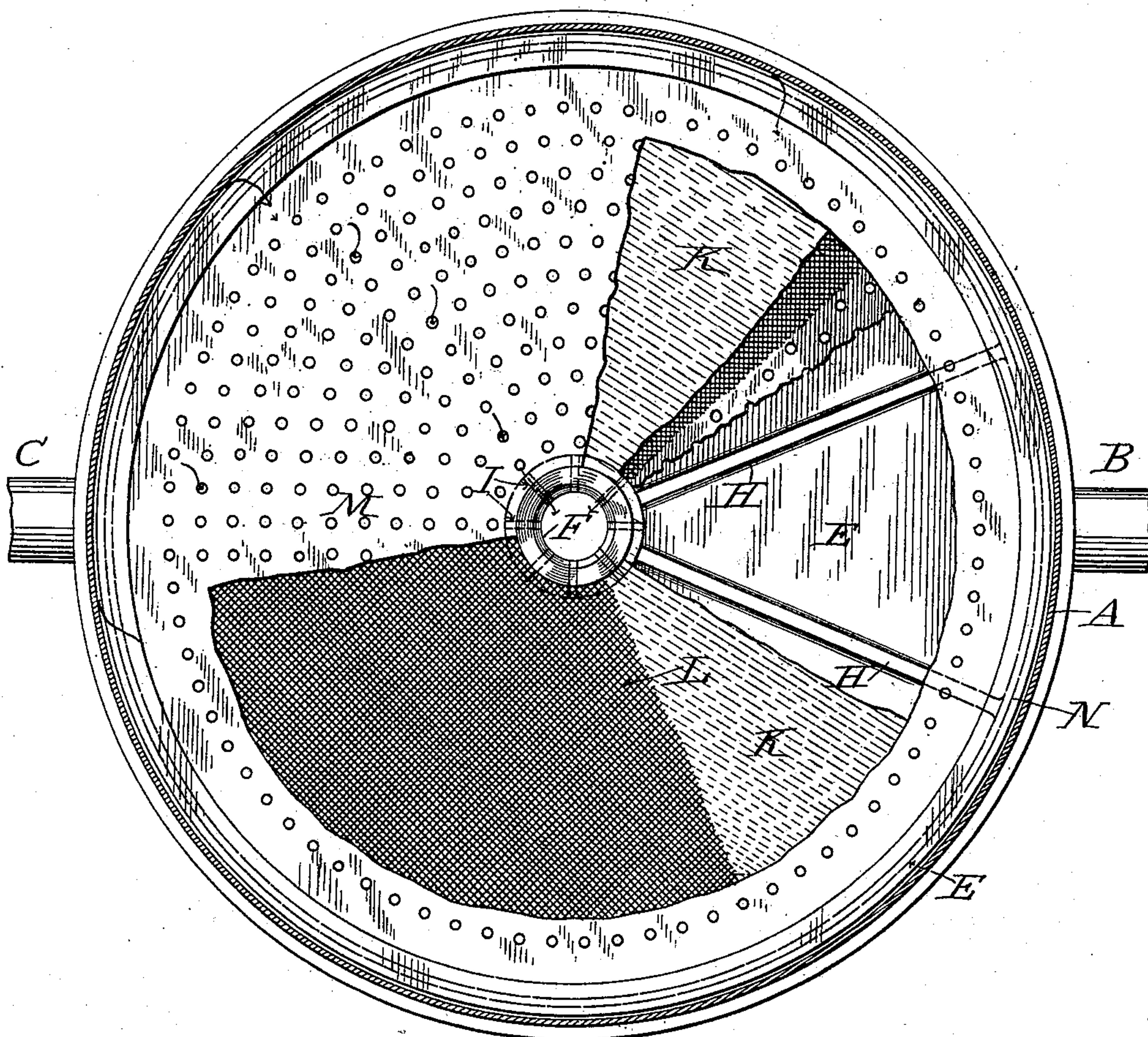
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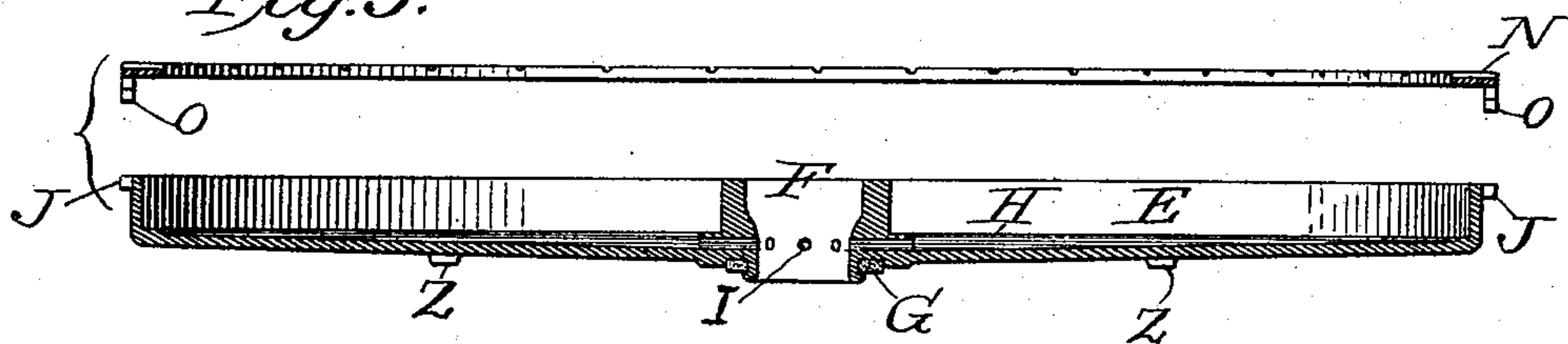
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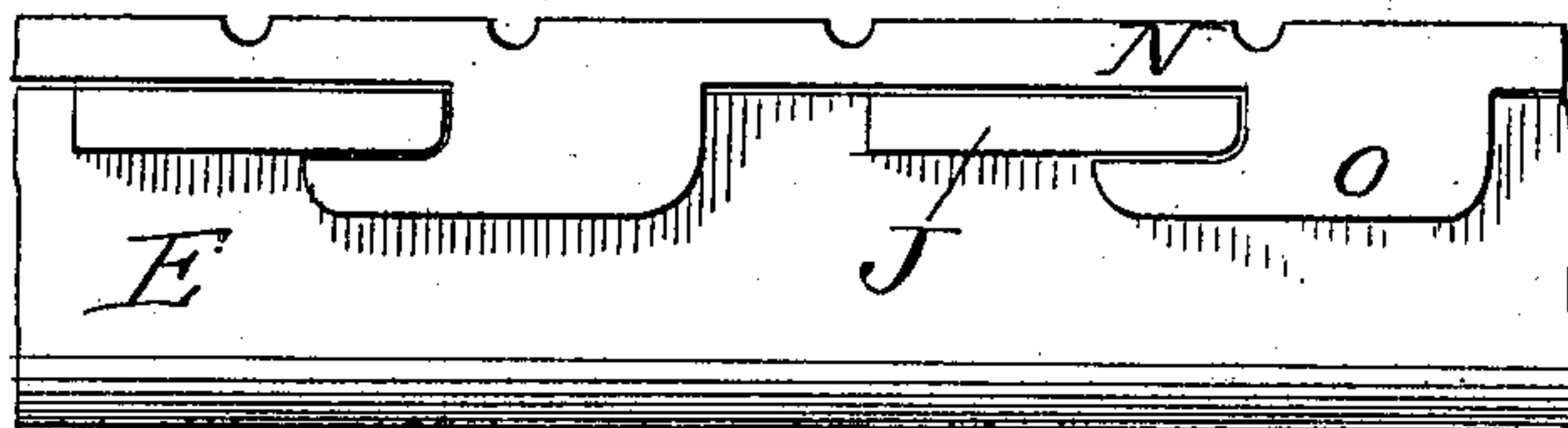
*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



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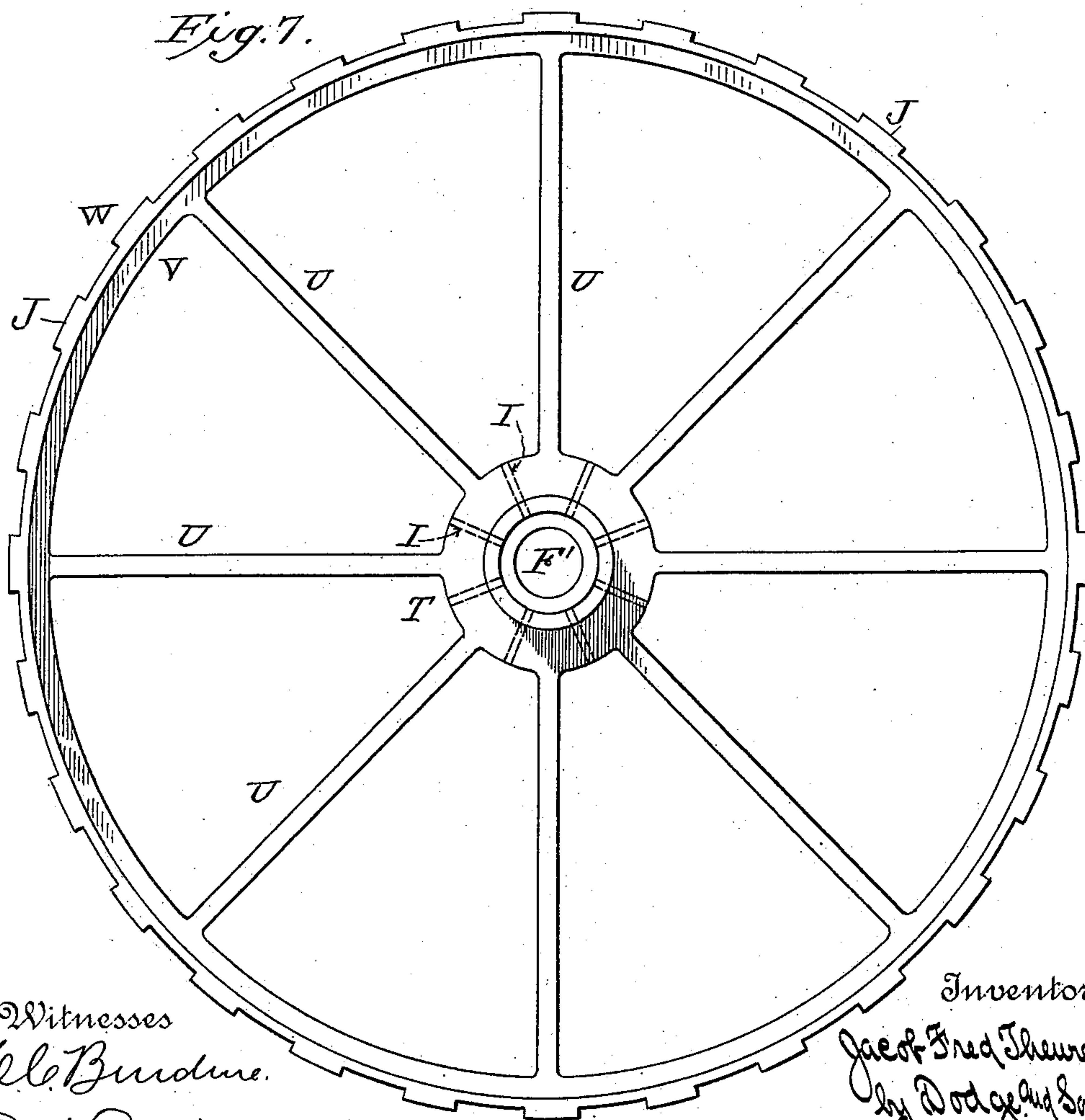
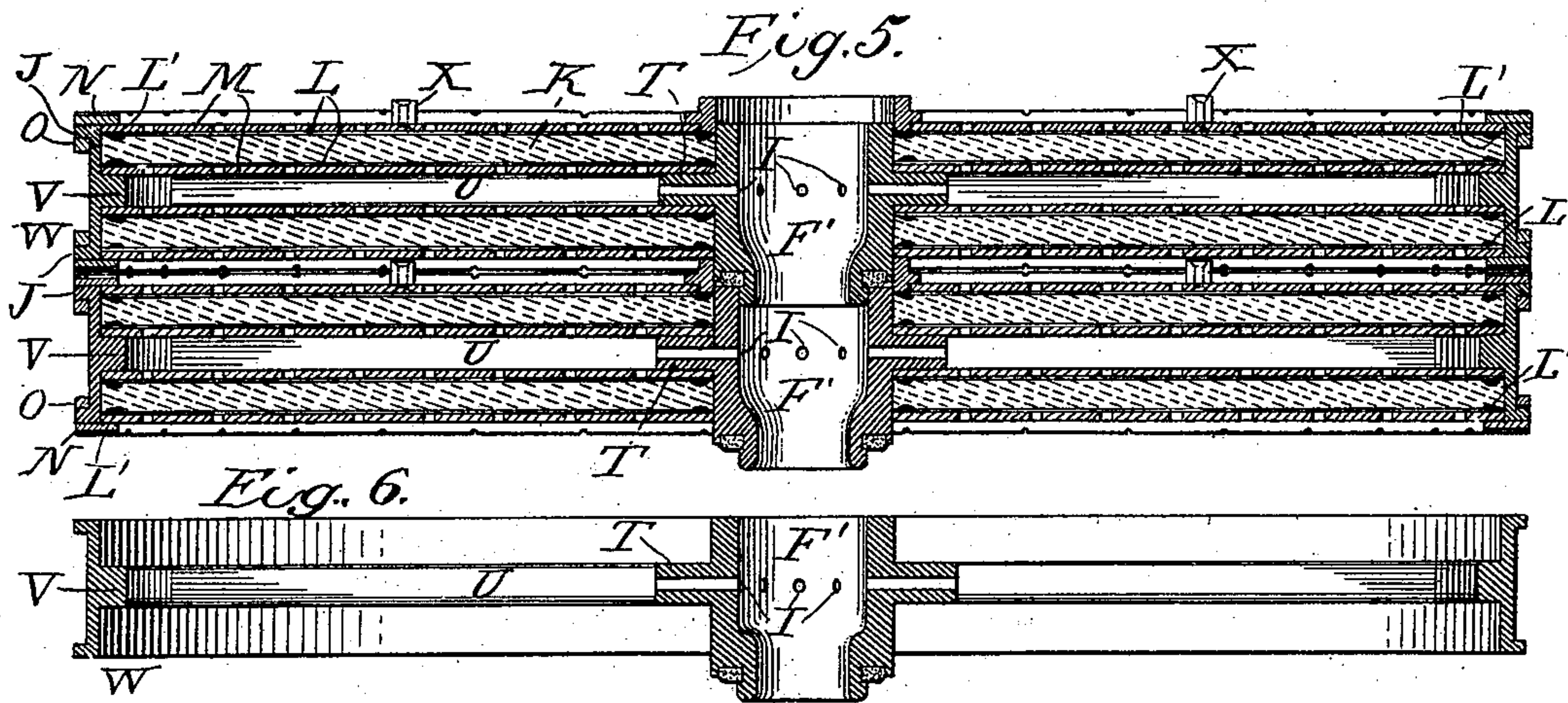
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(Application filed June 9, 1897.)

(No Model.)

**5 Sheets—Sheet 3.**



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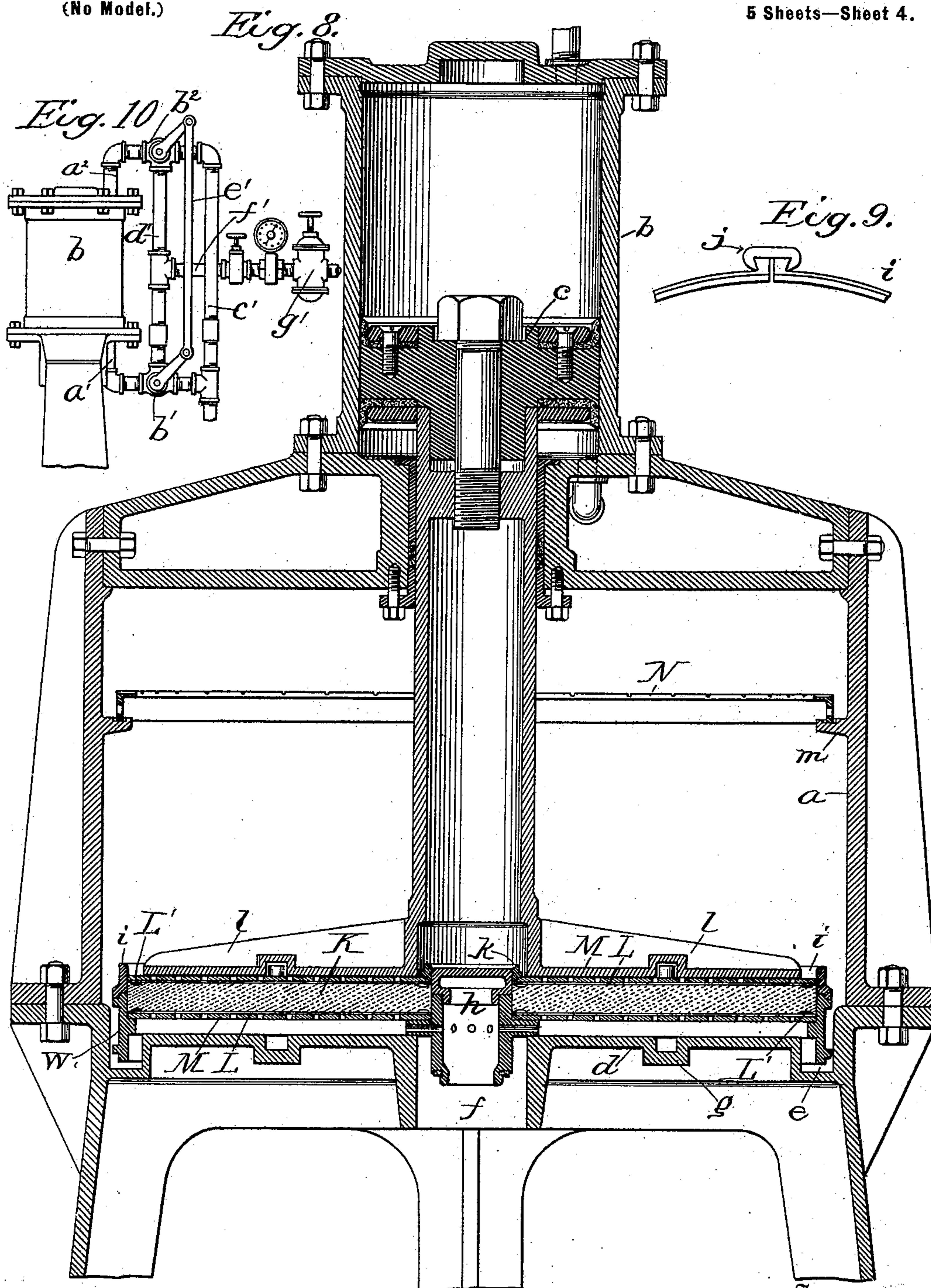
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(No Model.)

5 Sheets—Sheet 4.



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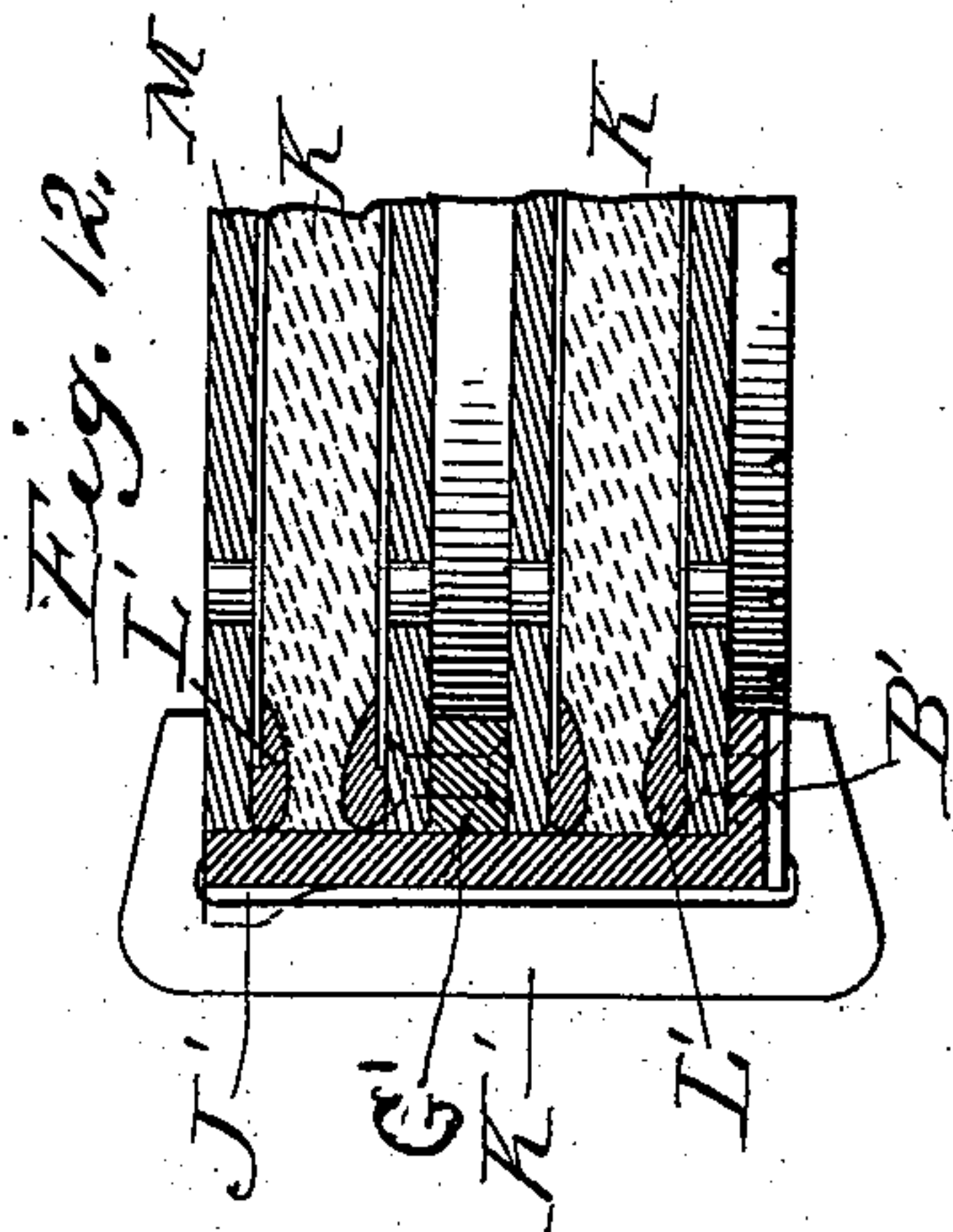
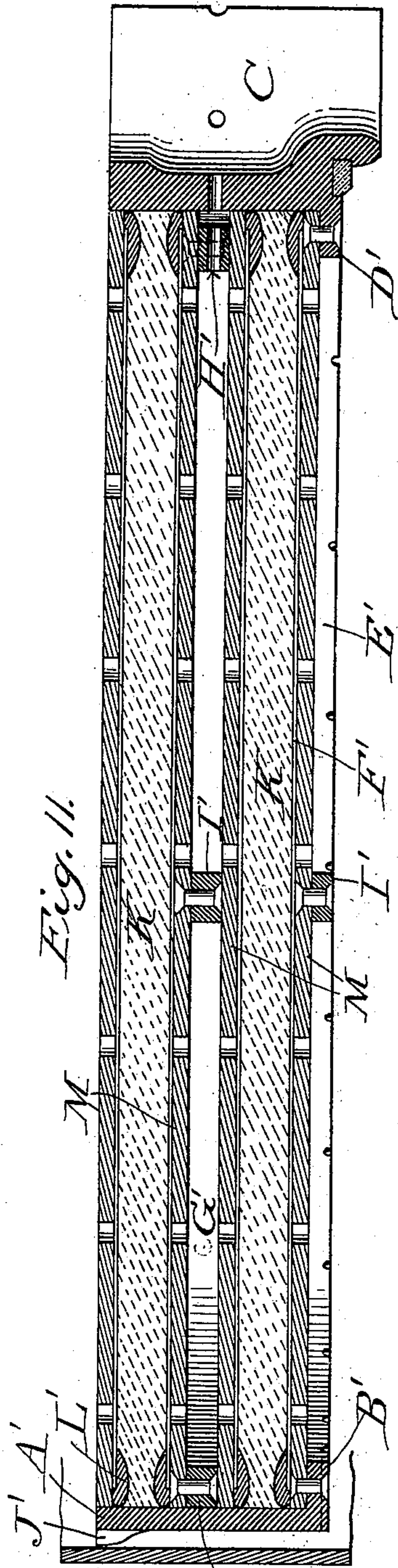
J. F. THEURER.  
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Patented Feb. 7, 1899.

(Application filed June 9, 1897.)

(No Model.)

5 Sheets—Sheet 5.



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# UNITED STATES PATENT OFFICE.

JACOB FRED THEURER, OF MILWAUKEE, WISCONSIN.

## FILTER.

SPECIFICATION forming part of Letters Patent No. 618,964, dated February 7, 1899.

Application filed June 9, 1897. Serial No. 640,030. (No model.)

*To all whom it may concern:*

Be it known that I, JACOB FRED THEURER, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Filters, of which the following is a specification.

My present invention pertains to filters, the objects, construction, and advantages of which will be hereinafter set forth, reference being had to the annexed drawings, in which—

Figure 1 is a vertical sectional view of the filter; Fig. 2, a horizontal sectional view, the parts being broken away to disclose the structure; Fig. 3, a sectional view of one of the pans and the retaining-ring; Fig. 4, an enlarged detail view of the same; Fig. 5, a vertical sectional view of a modified form; Fig. 6, a similar view of one of the independent retaining-frames; Fig. 7, a top plan view of the same; Fig. 8, a horizontal sectional view of a hydraulic press designed to hold the pans or retaining-frames while the filtering medium is being compressed therein; Figs. 9 and 10, detail views; Fig. 11, a sectional view of a second modified form of one of the elements, and Fig. 12 a detail view.

The object of my invention is to produce a cheap and at the same time a highly-efficient filter designed, primarily, for the treatment of beer, though equally as applicable to be used to secure the proper filtration of other liquids or fluids.

The construction set forth is of the general type known as "battery-filters;" and one of the main objects of the present invention is to produce finished elements or sections loaded with a certain weight or quantity of pulp containing a determinate degree of moisture and pressed with a certain predetermined intensity to a certain uniform thickness. The finished elements may be used and replaced, when desired, with but slight labor, as each element is complete in itself and independent of the others.

A still further object of my invention is to produce filtering elements of equal and like porosity throughout, so that no matter how many elements may be used the resultant filtered liquid will be of the same quality.

Again, it is my aim to design and employ such a construction of the elements and cas-

ing that but little of the liquid is wasted and that the strained impurities or residuum can be washed out by the counterflow of the liquid when so desired.

Referring to Figs. 1 and 2, A represents the outer shell or inclosing casing, B the inlet, and C the discharge-opening, said discharge-opening extending from the outside of the casing and terminating in an annular central collar D. Mounted within the casing and superimposed one upon another is a series of filtering elements which are independent of the casing except as the lower one engages collar D, and the uppermost one is held in place by clamping means to be hereinafter referred to. In the form shown in the figures just alluded to these filtering elements each comprise an annular pan E, formed with a central boss or hub F, the lower end of which extends below the lower face of pan E, where it is undercut and provided with a packing gasket or ring G of any suitable material. From the periphery the bottom of the pan inclines downwardly toward the central boss, and said bottom is also provided with radiating ribs or flanges H, extending from the periphery to the center, the upper faces of which lie in a horizontal plane. Openings I are formed in the boss in line with the bottom of the pan intermediate the ribs H, while lugs J are cast upon the outer upper face of the pan, for a purpose which will presently appear.

The filtering medium which I propose to use is mounted within the pan just described, and, broadly stated, consists of a body of compressed pulp K. To retain said pulp in place and to give it proper support, I employ disks L of fine-mesh wire, which are next to compressed pulp K. Upon each side and next to these wire disks are placed disks or plates of foraminous metal M. Disks L are provided at their outer and inner edges with reinforcing-rings L' of half-round metal, the purpose of which will be hereinafter referred to.

After the parts are assembled in the pan and the pulp compressed to the required degree, as will be presently explained, a binding-ring N, having depending hooks O, is placed upon the pan and given a slight turn, the hooks engaging the lugs J securely holding the parts of the filtering medium in place.



The binding-rings are notched upon their upper face to permit free access of the liquid. When the desired or requisite number of pans with the filtering-bodies therein are placed in the casing one upon the other, a cover P is secured down upon the casing. A compression-plate Q, formed with a central collar designed to fit over the upper end of boss F of the upper pan and with a threaded stem R, bears upon the upper pan. The stem passes through a suitably-packed opening in the cover and is engaged by a hand-wheel S, mounted upon the cover, by means of which the plate Q may be forced downwardly, thereby causing the gaskets G to fit closely down upon the upper face of the boss F immediately below it, the lowermost gasket bearing upon the collar D.

Stem R is hollow, and its upper end is threaded internally, a cock with hose connection being screwed therein when it is necessary that it should be closed, or it may be connected with a water-supply when desired to assist in washing out the filter.

Upon reference to Figs. 1 and 3 it will be noted that the pans are provided with lugs Z, extending downwardly from their bottom face and designed to bear upon the disks M, and thus assist in holding the filtering-bodies K in their proper position when they are wet and inclined to swell or bulge, especially when the pressure is reversed for cleaning the filter.

In Figs. 5, 6, and 7 is illustrated a modified construction wherein frames are used in place of the pans above described. Fig. 6 shows a cross-section of one of the frames, and Fig. 7 a top plan view of the same. These spider-frames comprise a central hub or boss F', similar to the boss of the pans in all particulars except that it is longer and provided with an annular flange or collar T, through which the openings I extend. Radiating from this collar is a series of spokes U, connected at their outer ends by a ring V, formed integral with a rim W. Rim W is provided with integral lugs J at the upper and lower sides, and rings N are secured upon the upper and lower edges of the rim, as is done where the pan-support is employed. The filtering medium in this modification is exactly like that employed with the construction set forth above, with the exception that two bodies are secured within the one frame, as indicated in Fig. 5. With this construction lugs X are secured upon the uppermost foraminous disks M, the lug being of such height that it bears against the disk of the lower filtering-body held in the section just above it, the spokes U maintaining the proper relation of the disks upon their inner faces.

In Fig. 8 I have shown a press designed to compress the pulp in place in the pans or spider-frame, whichever may be used, the spider-frame being represented in the drawings. The press comprises a frame a, a cylinder b, piston c, working therein, and a bed-plate d, formed with an annular groove or

channel e, central opening f, and pockets g. Suitable means, such as shown in Fig. 10, are employed, whereby a determinate hydraulic pressure may be exerted upon or applied to the piston. It comprises pipes a' a<sup>2</sup>, leading, respectively, into the lower and upper part of the cylinder, each pipe being connected to a three-way valve b' b<sup>2</sup>. A common exhaust-pipe c' and a common pressure-pipe d' are also connected to the valves, and a hand-lever e' is employed for working the valves in unison and admitting water to one end of the cylinder and opening the exhaust at the other. A lateral f' extends from the source of pressure and is connected to the pressure-pipe d'. Said lateral is preferably provided with a pressure-gage and a reducing-valve g', so that the exact pressure determined upon may be exerted upon each charge of pulp.

When it is desired to charge one of the frames, it is placed upon the bed and a perforate disk M and wire disk L placed therein. A stopper or plug h is placed in the upper end of the hub and a section-ring i, held together by clamps j, Fig. 9, is placed around and rests upon the periphery of the rim W. The operator having mixed the pulp to the required and determinate consistency, pours it in upon the wire disk, where it spreads out evenly. The upper wire disk and perforate plate are then put in place, a ring k being screwed down into the central opening of the upper foraminous plate to stiffen the same and to keep the plates in place. The piston is then caused to descend and a presser-plate l, carried at the lower end of the piston-stem, bears upon the upper plate M and compresses the pulp evenly over its entire surface, the pressure being equal throughout. Being confined it gradually sinks down within the frame, the water passing out through the opening and discharging at the central outlet of the bed-plate. By using the reinforcing-rings L' around the edges of the disks L the pulp as it is compressed moves sideways between the upper and lower rings and is condensed between them and the outer edge of the pan and the central boss to such an extent that no liquid can pass around the edges of the compressed mass. No packing around the edges is therefore required. As before stated, the pressure exerted by the piston is determinate and is so regulated that the pulp will be compressed just to the exact point in every instance. Each frame or pan being of equal depth and the same quantity of pulp of like consistency being placed therein at each charge there cannot be any variation in the density or porosity of the different elements. After the pulp is compressed the sectional or molding ring i is removed and the ring N, which had previously been placed upon brackets M, formed upon the frame, is lowered and secured upon the rim as before described. The presser-plate l is then elevated, the frame turned over, and the other side charged in a like manner. So long as



the hubs or bosses are properly placed one upon another and the plate Q and its collar brought down upon the upper one there can be no leakage. The tendency of the compressed pulp is to swell when wet, and this renders the joints between the pans or frames and the body of the pulp all the tighter.

In Fig. 11 there is shown a second modified form of an element. A ring A' is used, having an inwardly-projecting flange B' around its lower edge, the ring, as shown, being of a depth capable of holding two layers of compressed pulp. A central hub or boss C' is employed, having a projecting lip D' near its lower end and provided with perforations midway its length. To the flange B' and the lip D' is riveted a foraminous plate E', and upon this is laid a wire disk F' similar to the disks described in the other forms. The required amount of pulp is then put in place, a second wire disk and foraminous plate inserted, and the pulp compressed to the requisite and determined degree. After this is accomplished another foraminous plate, having secured to it at its outer periphery a spacing-ring G' and at its inner edge a perforated ring H', is placed in the frame. The usual wire disks, charge of pulp, and upper foraminous plate are then put in place and compressed to secure the requisite density, which will bring the upper plate and the upper edge of rim A' in line. Lugs I' are secured to the under faces of the lower foraminous disks to properly space and support said disks, and the lower side of flange B' is notched or cut away to permit free access of the liquid. Around the periphery of rim A' are formed lugs J', which act as guides when the elements are being placed within the casing. After the upper layer has been compressed the piston is elevated and ring i removed. Clamps K', of U shape in form, as shown in Fig. 12, are then slipped on the ring A' at intervals, securely retaining the parts within the ring until they are desired for use. With this construction a larger compression-plate Q is employed than with the other forms heretofore described, and, furthermore, the ring need not be removed from the press and turned over to be fully charged, as is necessary with the construction illustrated in Figs. 5, 6, 7, and 8.

The bed-plate of the press will of course be modified as necessary for the reception of the different forms of holders or frames.

In operation the liquid enters the inlet B, passes up around and between the pans, passing through the upper foraminous plates and wire disks, through the compressed pulp K, through the lower wire disk and foraminous plate, running down the inclined bottom of the pans, through the openings I, and finally down and out through the discharge-opening C.

Any element of the filter may be removed

when found necessary, and as they may be prepared and set aside until needed there is no loss of time in stopping to compress one. The filter is readily cleansed, as the dirt is strained mostly by the surface, enabling users to wash it off from time to time by reversing the flow of the liquid for a short period. The dirt-laden liquid obtained by washing back the dirt or yeast particles, as in the case of beer, is drawn into a vessel for settling, and the partly-clarified liquid is made available by refiltration.

By using pulp of determinate consistency and subjecting it to a certain degree of pressure in each instance the elements will of necessity be of the same thickness and density throughout and the resultant liquid which passes through any portion of them will be clarified to the same degree.

While I have described the use of a hydraulic press, I do not desire to limit myself to that particular form, as it is well understood that the press may be actuated by steam, air, or water.

Having thus described my invention, what I claim is—

1. A filtering medium comprising a pan having a hollow central boss or hub; openings extending from the interior of the pan through the hub; a body of compressed pulp having a wire net upon each side; and foraminous disks bearing against the wire net.

2. A pan for receiving a filtering-body, having its bottom inclining toward its center; a central hollow boss or hub; ribs formed upon the bottom and extending radially from the periphery to the boss; and openings extending through the boss.

3. A pan for receiving a filtering-body having its bottom inclining toward its center; a central hollow boss provided with openings extending therethrough; and lugs extending downwardly from the bottom of the pan, substantially as and for the purpose described.

4. A filter comprising a series of pans superposed one upon another; a filtering medium of compressed pulp contained in each pan; and lugs extending from the bottom of the pans and bearing against the upper face of the filtering medium, substantially as and for the purpose described.

5. A pan for receiving a filtering-body having its bottom inclining toward its center; a central hollow boss provided with openings communicating with the interior of the pan; ribs formed upon the upper face of the pan; and a gasket, G, secured around the boss.

6. In a filter, the combination of a frame or casing; an inlet; a central discharge-opening; a series of filtering-bodies of a diameter less than that of the casing whereby a space is formed between the casing and bodies, said bodies being superimposed upon each other and upon the discharge-opening, and each provided with a hollow central boss or hub;



and means for closing the uppermost boss and for forcing the bosses down upon each other and upon the central discharge-opening.

7. In a filter, the combination of a frame  
5 or casing; an inlet; a central discharge-opening; a series of filtering-bodies of a diameter less than that of the casing superimposed upon each other, and upon the discharge-opening, and each provided with a central  
10 hollow boss; a plate, Q, having a collar designed to fit within the uppermost boss; a stem, R, extending from the plate, Q, up through the cover; and means for raising and lowering the stem.

15 S. In combination with an annular frame or holder; a filtering-body mounted therein;

and a ring as N designed to fit down over the edge of said frame and to be connected thereto, substantially as described.

9. In combination with an annular frame 20 or holder; a filtering-body mounted therein; and a ring as N, notched upon its upper face, designed to fit down over the edge of said frame and to be connected thereto, substantially as described. 25

In witness whereof I hereunto set my hand in the presence of two witnesses.

JACOB FRED THEURER.

Witnesses:

RICHARD BIRKHOLZ,  
C. W. HENNING.