No. 717,385.

Patented Dec. 30, 1902.

E. GATHMANN.

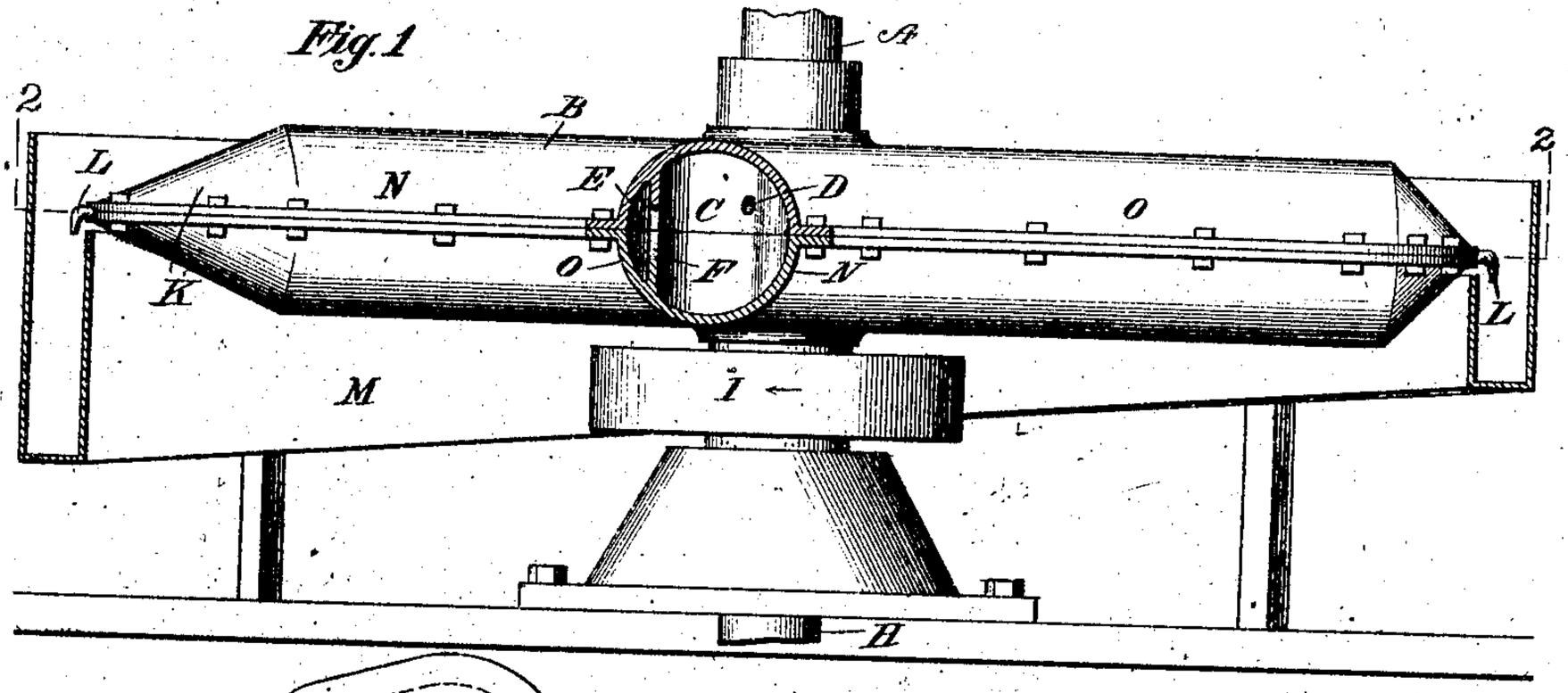
LIQUID PURIFIER.

(Application filed Oct. 12, 1901.)

(No Model.)

4 Sheets—Sheet 1.

Fig. 1



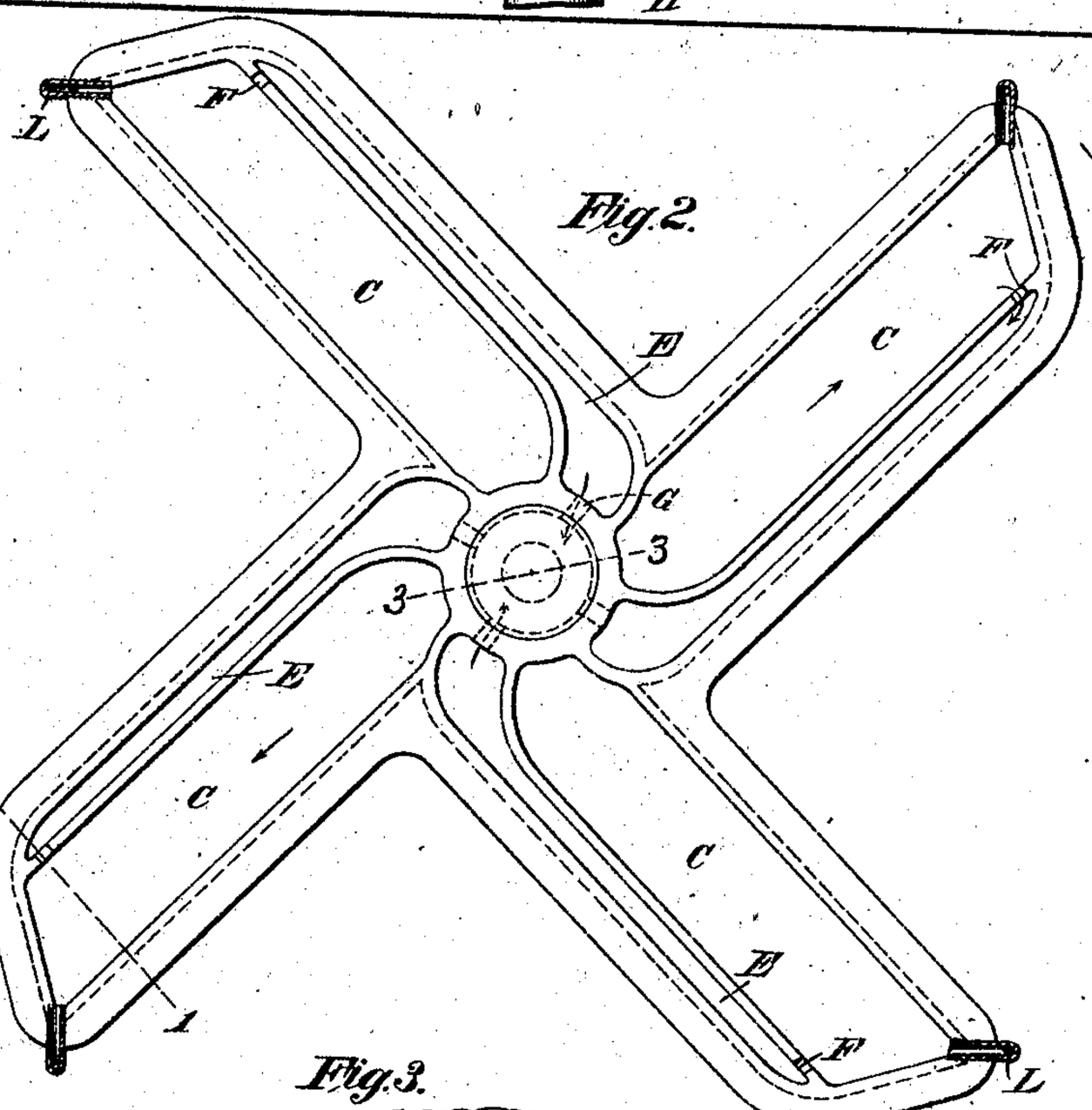
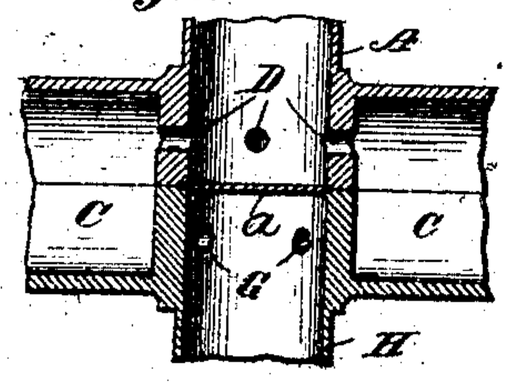


Fig. 2.

Fig. 3.



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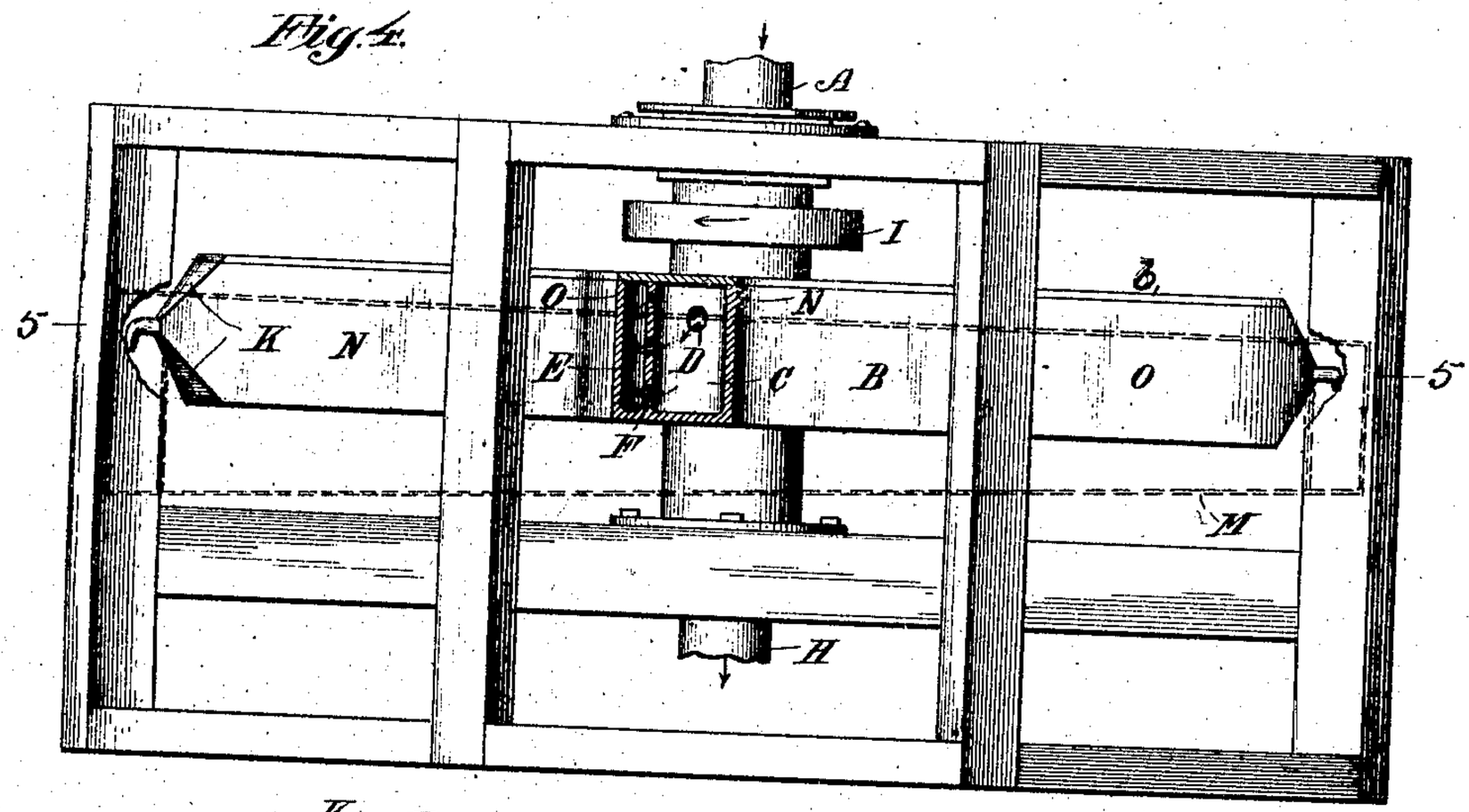
4 Sheets—Sheet 2.

Fig. 4.



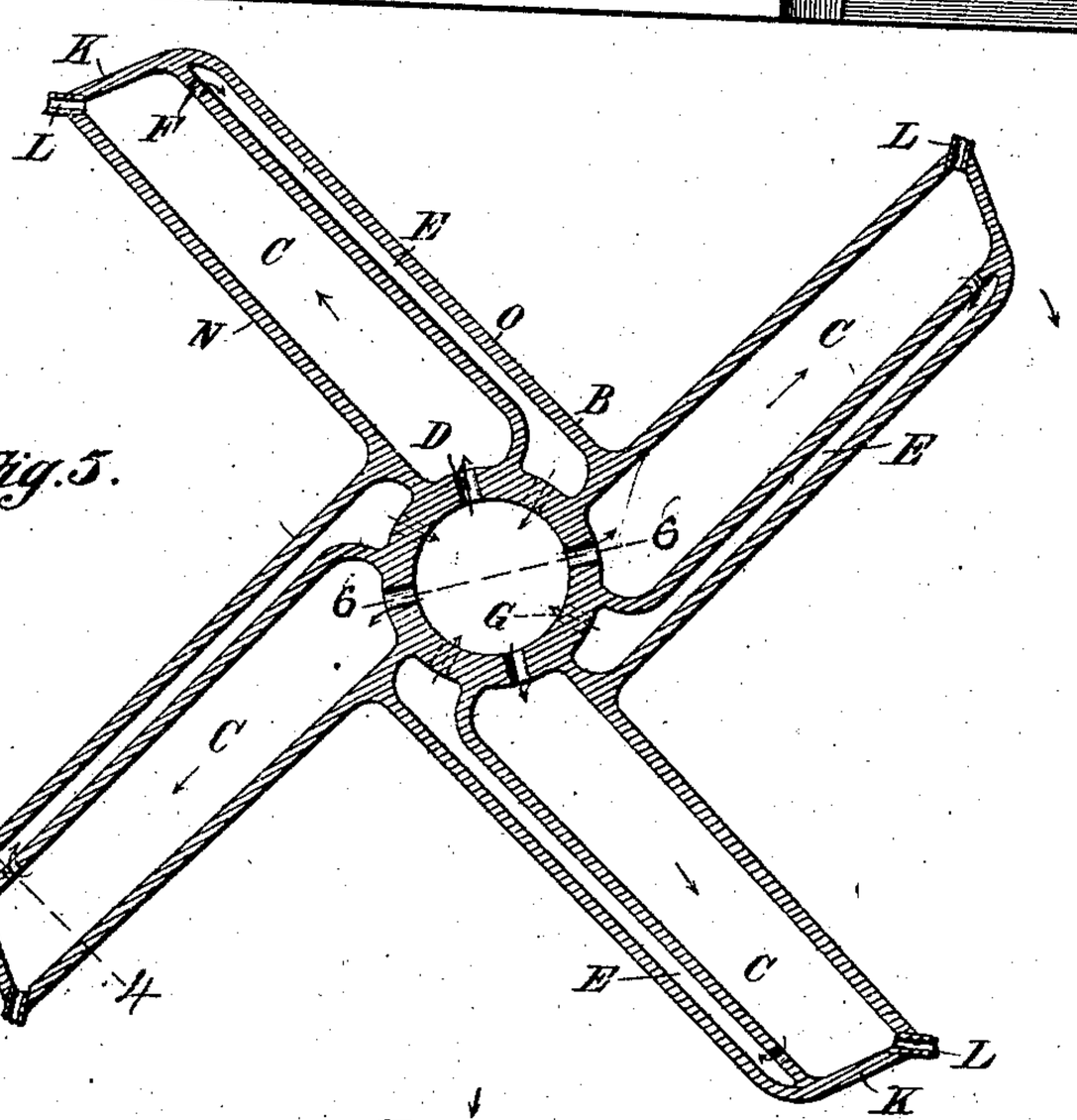


Fig. 5.

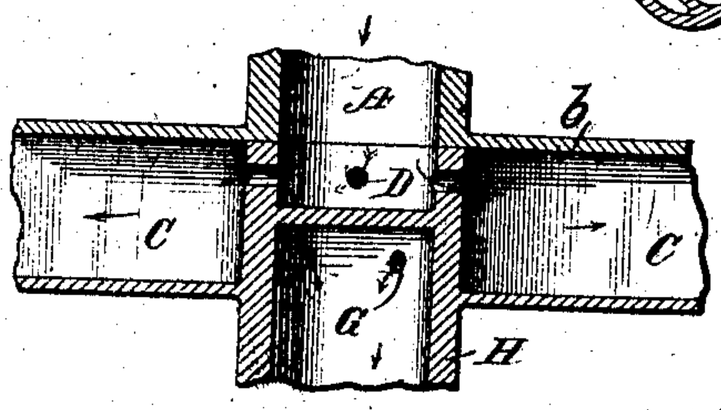


Fig. 6.

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(No Model.)

4 Sheets—Sheet 3.

Fig. 7.

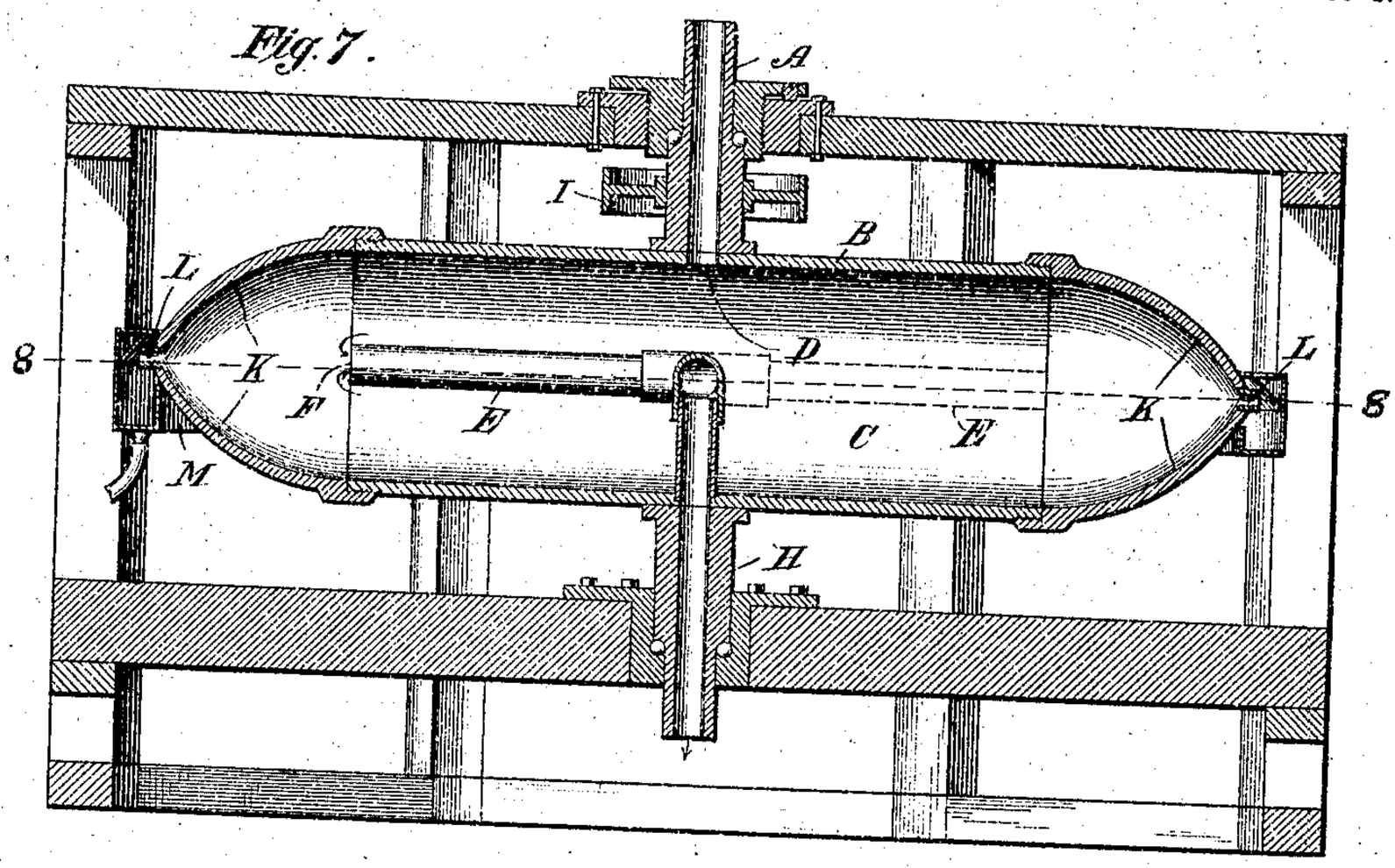


Fig. 8.

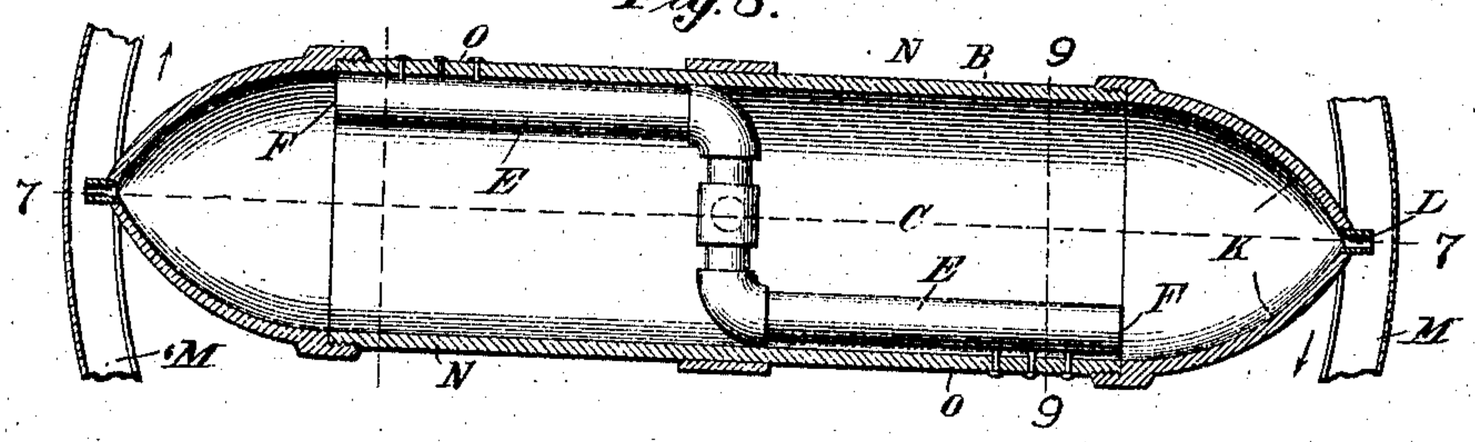
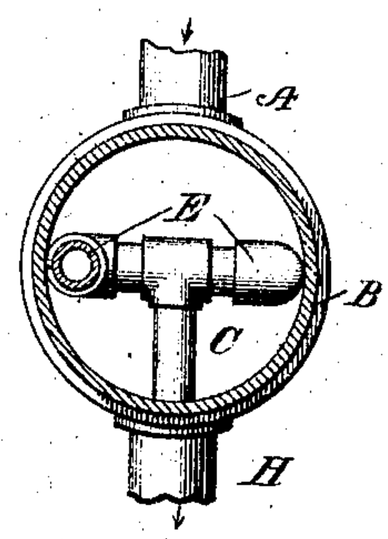


Fig. 9.



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LIQUID PURIFIER.

(Application filed Oct. 12, 1901.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 10.

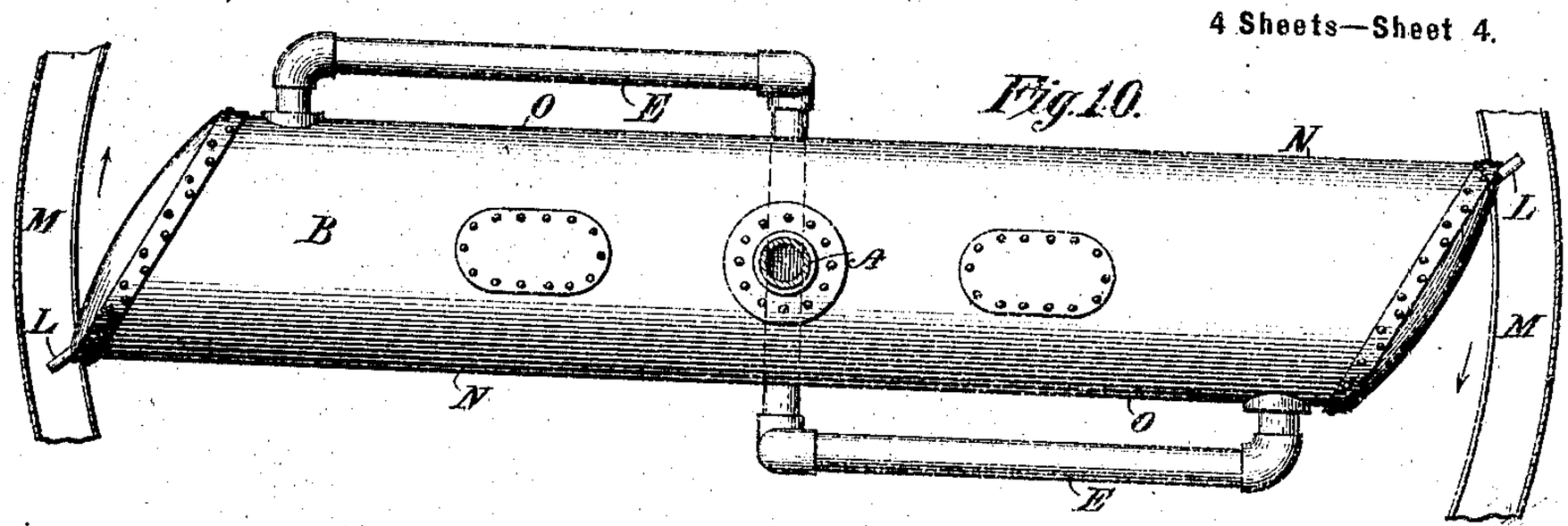


Fig. 11.

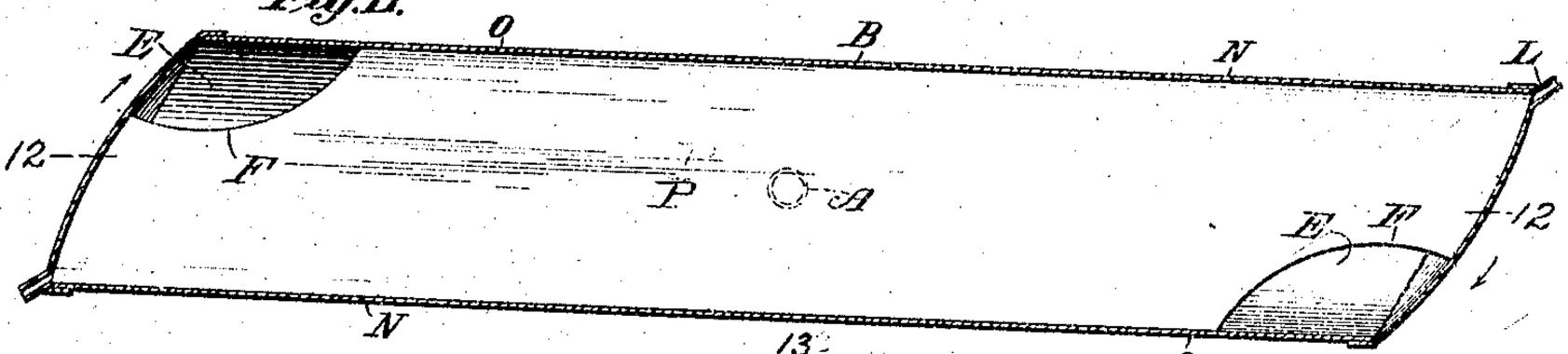


Fig. 12.

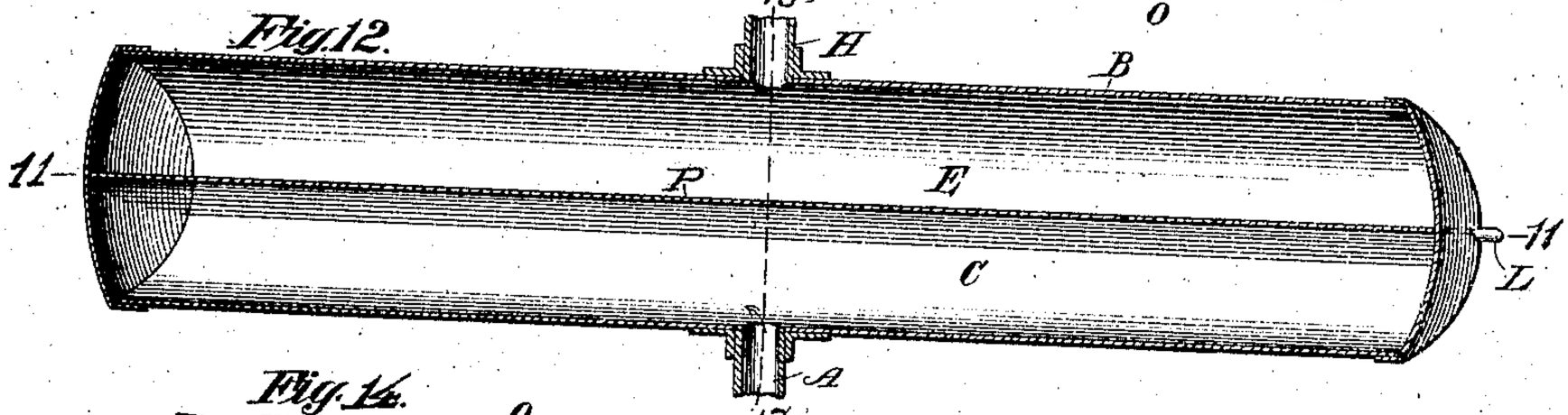


Fig. 14.

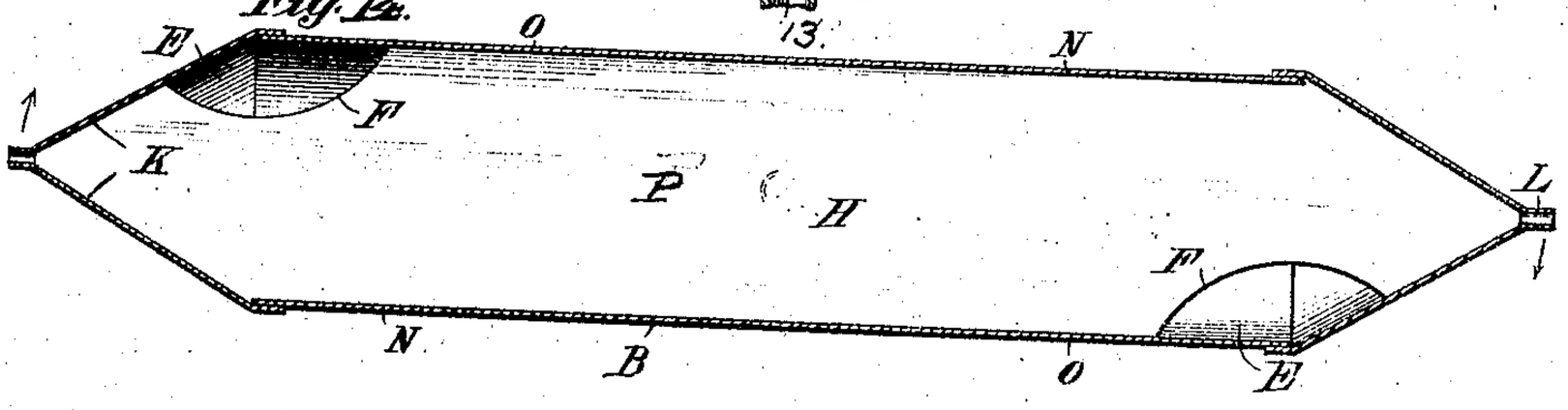


Fig. 13.

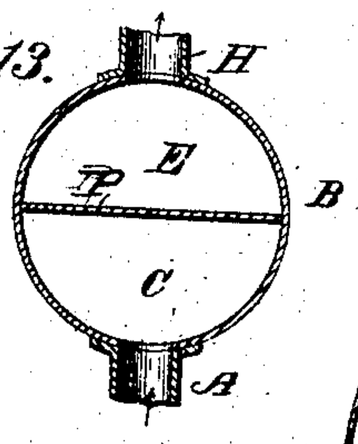
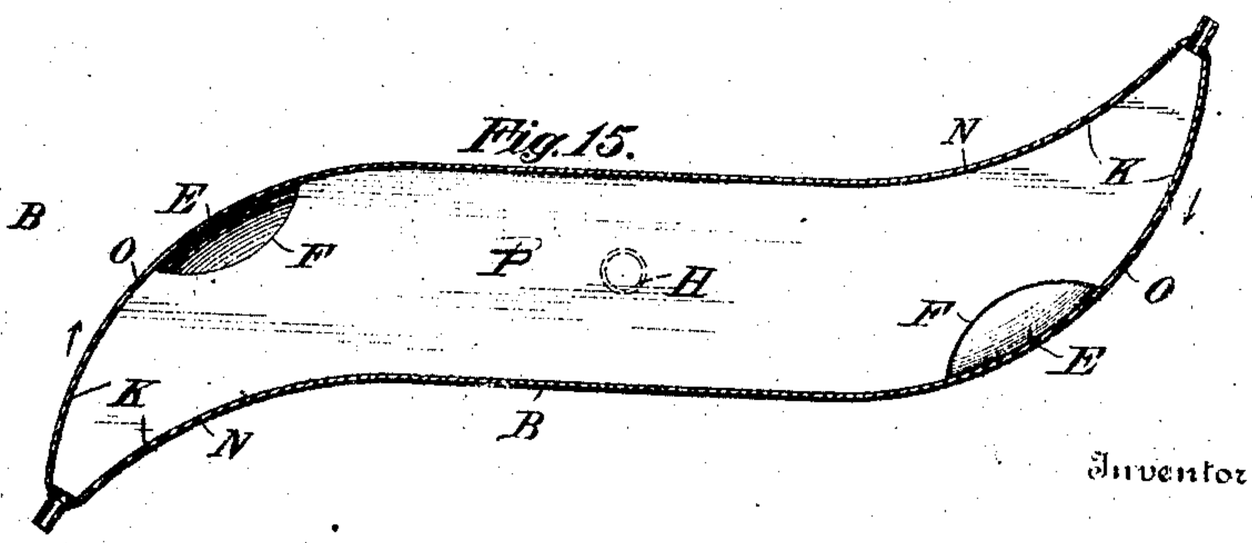


Fig. 15.



Witnesses
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Inventor
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UNITED STATES PATENT OFFICE.

EMIL GATHMANN, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR OF ONE-HALF TO LOUIS GATHMANN, OF WASHINGTON, DISTRICT OF COLUMBIA.

LIQUID-PURIFIER.

SPECIFICATION forming part of Letters Patent No. 717,385, dated December 30, 1902.

Application filed October 12, 1901. Serial No. 78,464. (No model.)

To all whom it may concern:

Be it known that I, EMIL GATHMANN, a citizen of the United States, residing at Washington, in the District of Columbia, have invented a new and Improved Purifier for Water and other Liquids, of which the following is a specification.

The object of my invention is to provide a simple and efficient apparatus for clarifying water and other liquids, and it is intended principally for freeing water from sedimentary and other foreign material (usually contained therein) to a degree which will fit it for human consumption and for uses in the arts.

The invention consists, broadly, in a chamber to be supplied with the liquid to be clarified and mounted suitably for continuous rapid movement, whereby in such movement of the chamber and of the body of liquid contained therein the inertia of the solids contained in the liquid will cause them to have a less rapid movement than the liquid body and to therefore accumulate in the rear portion of the chamber, while the clarified portion of the water occupies the front portion of said chamber, said chamber being provided with an outlet in its front portion for the withdrawal of the clarified liquid and with an outlet leading from its rear portion for the discharge of liquid containing the solids.

The invention consists, further, in the provision of continuously-open inlet and outlet passages to and from the clarifying-chamber above described, whereby the operation of clarification may be carried on continuously by connection of the apparatus with a continuous source of supply.

The invention further consists in features of construction substantially as hereinafter set forth.

In the accompanying drawings, forming a part of this specification, I have shown several constructions of the apparatus, these various forms being merely illustrative and simply intended to show available plans for the embodiment of my invention.

In all of the illustrated forms the apparatus embraces a revolving chamber or a series of revolving chambers, each having an induction and an eduction port at or near its axis of revolution, an eduction-passage for the impurities at or near the outer end of the chamber or the end remote from the axis of revolution, and a passage leading from the outer end of the chamber to the first-mentioned eduction-passage for the delivery of the purified liquid.

In the drawings, Figure 1 is a sectional elevation of one form of my apparatus, taken on line 1 1 of Fig. 2. Fig. 2 is a section on line 2 2 of Fig. 1; and Fig. 3 is a sectional detail on line 3 3 of Fig. 2, showing a partition between the induction and eduction passages or ports formed in a pipe which constitutes the axle of rotation of the separator. Fig. 4 is a sectional elevation of a somewhat different form of the apparatus, taken on line 4 4 of Fig. 5. Fig. 5 is a section on the lines 5 5 of Fig. 4; and Fig. 6 is a sectional detail on lines 6 6 of Fig. 5, showing the partition between the induction and eduction passages or ports. Fig. 7 is a vertical longitudinal sectional elevation of still another form of the apparatus, taken on lines 7 7 of Fig. 8. Fig. 8 is a section on lines 8 8 of Fig. 7, and Fig. 9 is a vertical cross-section taken on lines 9 9 of Fig. 8 looking in the direction of the arrow. Fig. 10 is a top view of still another form of the separator. Fig. 11 is a horizontal longitudinal sectional view of another form of separator, taken on lines 11 11 of Fig. 12. Fig. 12 is a longitudinal section taken on lines 12 12 of Fig. 11. Fig. 13 is a section on lines 13 13 of Fig. 12. Fig. 14 is a longitudinal sectional view of another modification of the separator proper, the section plane being parallel to a longitudinal diaphragm in the chamber. Fig. 15 is a longitudinal sectional view of still another form of the separator.

Similar letters refer to similar parts throughout the drawings.

First giving a general description of the particular and similar constructions shown in Figs. 1 to 7, B B are a series of oblong separating chambers or casings arranged radially end to end and connected together to form a sort of rimless wheel. At their converging point this wheel is revolubly mounted on hollow trunnions A H, having support in any suitable frame, the trunnion A serving as an

induction-pipe for the water or liquid to be clarified and the opposite trunnion H serving as an eduction-pipe for the discharge of the purified liquid. Each arm or casing B of the wheel constitutes a complete separator and is divided longitudinally into two passages or compartments C and E. The former of these, C, connects at its inner end with the induction-pipe A by the port D and is provided with a small outlet L at its outer end for the discharge of water containing the impurities into the trough or other receptacle M. The compartment C also connects at or near its outer end with the compartment E by the passage F, and the compartment E communicates at its inner end with the eduction-pipe H through the opening G. Finally, the arrangement of the compartments and ports and the direction of rotation (shown by the arrow in Figs. 2 and 5) are such that the compartment C is behind the compartment E when the apparatus is in motion and the outlet L is in line with the rear wall N of the compartment C. The induction and eduction ports D and G of the chambers C and E, respectively, being formed in a continuous pipe, a cross-partition *a* is provided in said pipe between D and G to cause the liquid to pass through the compartments C and E in its progress from A to H.

The inlet A may be connected with any desired source of supply and the outlet H with any point of delivery, and revolution of the separators B may be effected by any suitable means—as, for example, by a belt applied to a pulley I, attached to one of the hollow trunnions. The plane of revolution may be either horizontal or vertical, but if horizontal the speed of revolution may be somewhat less than if vertical.

The mode of operation is as follows: A stream of water being made to pass through the apparatus from A to H while the separators are rapidly revolving upon the trunnions the solid impurities in the outwardly-moving body of water in each compartment C will by their greater inertia move relatively toward the rear wall N of said chamber C, while at the same time they are carried outward by the current and by centrifugal action. In this continual outward movement of the contents of the chamber C each part thereof has an accelerated advancing motion, due to its increasing distance from the center of revolution, and this condition favors the continuous and more rapid relative movement of the suspended solids backwardly toward the rear wall of the chamber, along and near which they are concentrated as they proceed outwardly. These impurities find egress, along with a small stream of water carrying them, through the discharge-opening L, while the clarified portion of the water in the front part of the compartment C passes out through the opening F into the compartment E and thence through the opening G into the eduction-passage through the hollow trunnion H. In this manner the operation of clarification may be carried on continuously and as trial shows very effectively.

The apparatus is of course capable of various modifications in form and details of construction, while preserving the essential characteristics and mode of operation of my invention as above pointed out.

The difference between the apparatus shown in Figs. 1, 2, and 3 and that shown in Figs. 4, 5, and 6 is slight and structural only, the former having its separators B and their central connection cast in halves, which are flanged and bolted together, as clearly seen in Fig. 1. In Figs. 4, 5, and 6 the casting is likewise in two parts; but the chambers are shown wholly in one part, and the other part is merely a cap or cover, as seen at *b*, Fig. 4.

In the modification shown in Figs. 7, 8, and 9 a single and interiorly-continuous shell B, having tapered end caps K, forms the radially-outward passages or compartments C for the water, while the inward passages or compartments E E for the clarified water are formed by pipes leading to the hollow trunnions or eduction-pipe H and having their ends open at F F to receive the water. In this form of the apparatus the induction-pipe or hollow trunnion A of course opens interiorly into the general interior of the shell at its middle, and but two opposite arms of the previously-described "wheel" are present, giving what may be called a "double separator."

In Fig. 10 is shown a double separator to be centrally mounted on hollow trunnions, as in Fig. 7, one of the trunnions being seen at A. The delivery-pipes E E are in this construction mainly exterior to the shell B, their receiving ends connecting with the interior of the shell on its front side and at the delivery ends being directed inwardly to the hollow exit-trunnion, as in Figs. 7, 8, and 9.

In the construction shown in Figs. 11, 12, and 13 a cylindric shell for a double separator is divided longitudinally by a median plate partition P, arranged in the plane of revolution and having its outer front corners cut away, as particularly shown in Fig. 11, to form the passages F, connecting the compartments C and E. In this construction the compartments C and E are side by side or one above the other, (according to the direction of the plane of revolution,) and the withdrawal of clarified liquid through the compartment E is insured by the position of the passage E at the front or advanced side of the partition P.

Fig. 14 differs from Figs. 11, 12, and 13 in having its outer ends conically tapered. The outlet L for the impurities is situated at the apex of the cone of each separator, and the rear wall of the conical cap or end K forms a continuation of the rear wall N of the chamber C, along which the solid impurities are free to pass to said outlet.

Fig. 15 has the partition P of Figs. 11 to 14, but differs from the preceding forms in hav-

ing the outer end of each separator deflected backwardly with reference to the direction of revolution and corresponds with Fig. 14 in having its extremity sharply tapered at K.

In all forms of the apparatus shown it will be observed that the outlet L for the impure stream of liquid leads from the compartment C of the separator. Desirably said outlet L is radially beyond the passage F and leads from the outer extremitity of a sort of pocket, into which the impurities tend to gather under the various forces brought into action in the operation of the apparatus.

I wish it to be understood that my invention is not restricted to the particular forms of apparatus which I have shown or to either of them, such described forms of the apparatus being merely illustrative of the distinctive principle of my invention, and of what I now regard as the best forms of its embodiment. This principle may be defined as being, primarily, the concentration of solids within a liquid by giving motion to the liquid and a lesser motion to the solids, whereby a portion of the liquid body is carried beyond or away from the solids, which are by their lesser motion gathered in another portion of the liquid body. The motion here referred to is that produced by the advancing movement of the chamber C, containing the impure liquid. The liquid advances at the same rate as the chamber which carries it; but the solids within the liquid advance with a less speed, because of their inertia and of the yielding nature of the liquid which carries them. In other words, the solids fall back by their inertia in the progress of the separator precisely as such solids would settle to the bottom of the chamber by their gravity if the chamber were at rest, only much more rapidly. In such retardation of the solids they are concentrated on and near the rear wall of the rapidly-traveling chamber C of the apparatus, while at the same time they are moved outward toward the outlet L by the current flowing in that direction and in a revolutionary advance of the chamber by centrifugal action. Such centrifugal action is, however, not vital to the operation of the principle above set forth, because, as will be seen from Fig. 15, a proper rearward direction of the rear wall of the advancing chamber C will permit the inertia of the solids to alone carry them to the outlet L, inertia being of course aided by the current toward the outlet L when said outlet is open, as when the apparatus is being continuously supplied and discharged.

It is thus obvious that the fundamental principle of separation in the invention is distinct from and independent of that of centrifugal action, although in the desirable rotary form of the apparatus about an axis, as shown, centrifugal action is advantageously brought into play, not necessarily for the separation, but for the more rapid deposition and for the expulsion of the solids. In a continuous operation of the apparatus the essential action is that of a forced and artificial "settling" of the solids by utilization of its inertia through unequal motion of the liquid and solids, accompanied by a withdrawal of clarified liquid from the clear portion of the liquid body and a withdrawal of the solids, together with a portion of the liquid body containing such solids.

The sizes of the various passages may be fixed and originally constructed to suit particular situations and requirements, or, manifestly, they may be provided with familiar means—such as valves, gates, or cocks—for their adjustment or regulation.

I claim as my invention—

1. A separator for the removal of solids from a liquid, consisting of a chamber for the liquid to be clarified mounted suitably for rapid bodily-advancing movement, said chamber being provided with an outlet leading from its forward portion for the discharge of the clarified liquid and an outlet arranged to take liquid and its contained solids exclusively from the rear portion of the chamber.

2. A separator for the removal of solids from a liquid, consisting of a chamber mounted suitably for rapid bodily-advancing movement, said chamber being provided with an inlet for the continuous supply of liquid to be clarified to said chamber, with an outlet for clarified liquid leading from the forward portion of the chamber and with an outlet taking liquid and its contained solids from the rear portion only of said chamber, whereby the operation of clarification may be continuously performed in a continuous bodily-advancing movement of the chamber.

3. A separator for the removal of solids from a liquid consisting of a chamber suitably mounted for continuous bodily-advancing movement, said chamber being provided with an inlet at one end, an outlet taking liquid and its contained solids from the rear portion only of the chamber and an outlet leading from the forward portion of the chamber at or near its end remote from the inlet for the discharge of clarified liquid.

4. A separator for the removal of solids from a liquid consisting of an oblong chamber pivoted at one end upon hollow trunnions suitably for continuous revolution in one direction, said chamber being provided with an inlet leading from one of the trunnions for liquid to be clarified, an outlet at its outer end arranged to take liquid and its contained solids from the rear portion only of the chamber, an outlet at the front side of its outer end for the delivery of clarified liquid, and a passage connecting said last-mentioned outlet with the hollow trunnion opposite that connected with the inlet referred to.

5. A separator for the removal of solids from a liquid consisting of a casing revolubly mounted by being pivoted at one end upon hollow trunnions, said casing embracing two longitudinal chambers which communicate

severally with the interior of the several trunnions, and which communicate with each other by a passage leading from the front part of the receiving-chamber near its outer end, and said receiving-chamber being provided with an outlet at its outer end adapted to discharge from the rear portion only of the receiving-chamber.

6. A separator for the removal of solids from a liquid, consisting of a chamber suitably mounted for rapid bodily-advancing movement, said chamber having an inlet for liquid to be clarified, an outlet leading from its forward portion for the discharge of clarified liquid and an outlet for liquid and solids leading from the rear portion, the rear wall of said chamber being inclined rearwardly toward said last-mentioned outlet.

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

EMIL GATHMANN.

Witnesses:
A. C. SPALDING,
LOUIS GATHMANN.