

No. 631,929.

Patented Aug. 29, 1899.

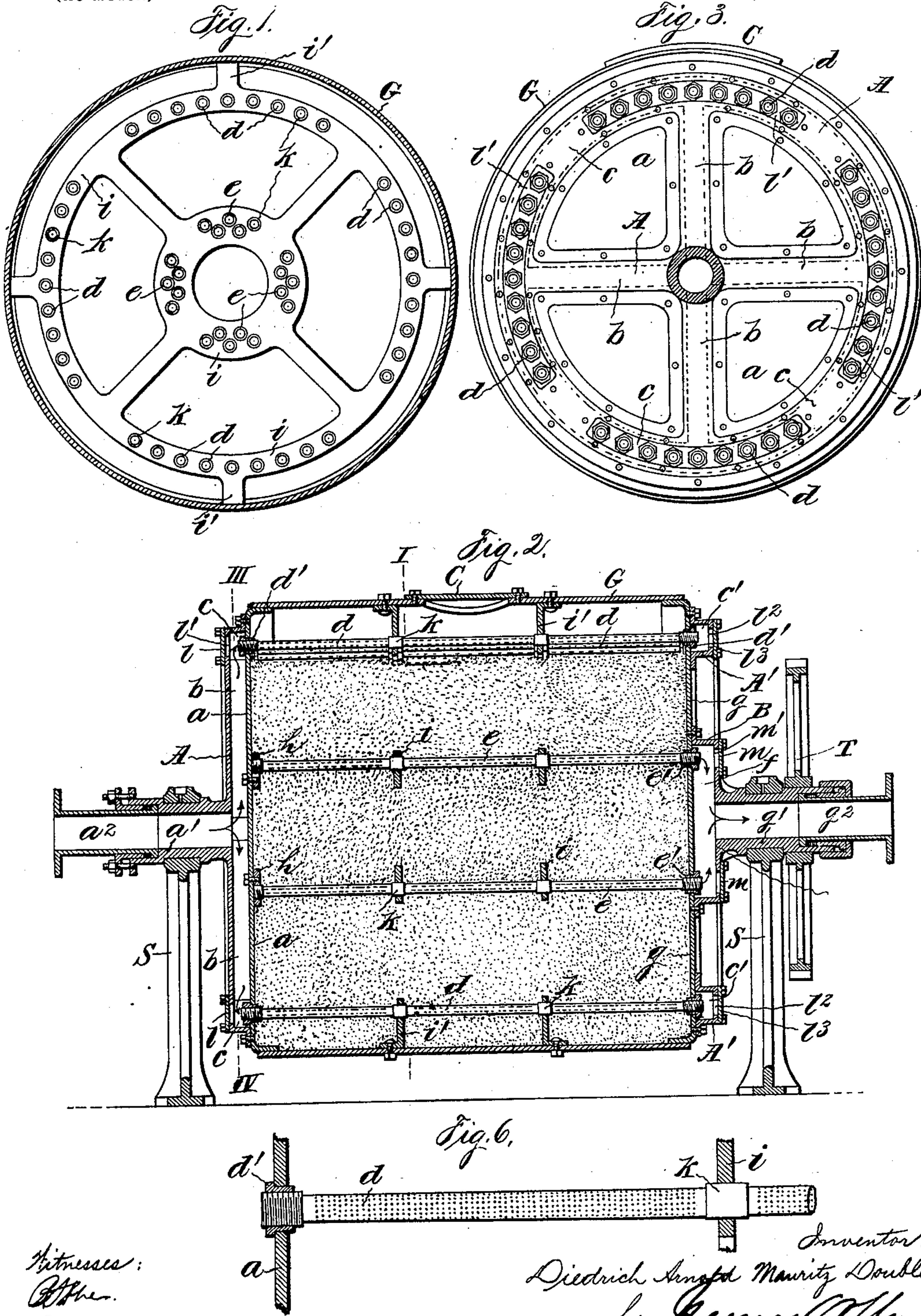
D. A. M. DOUBLET.

FILTER.

(Application filed Mar. 21, 1899.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:  
Attest.

B. H. Sommers

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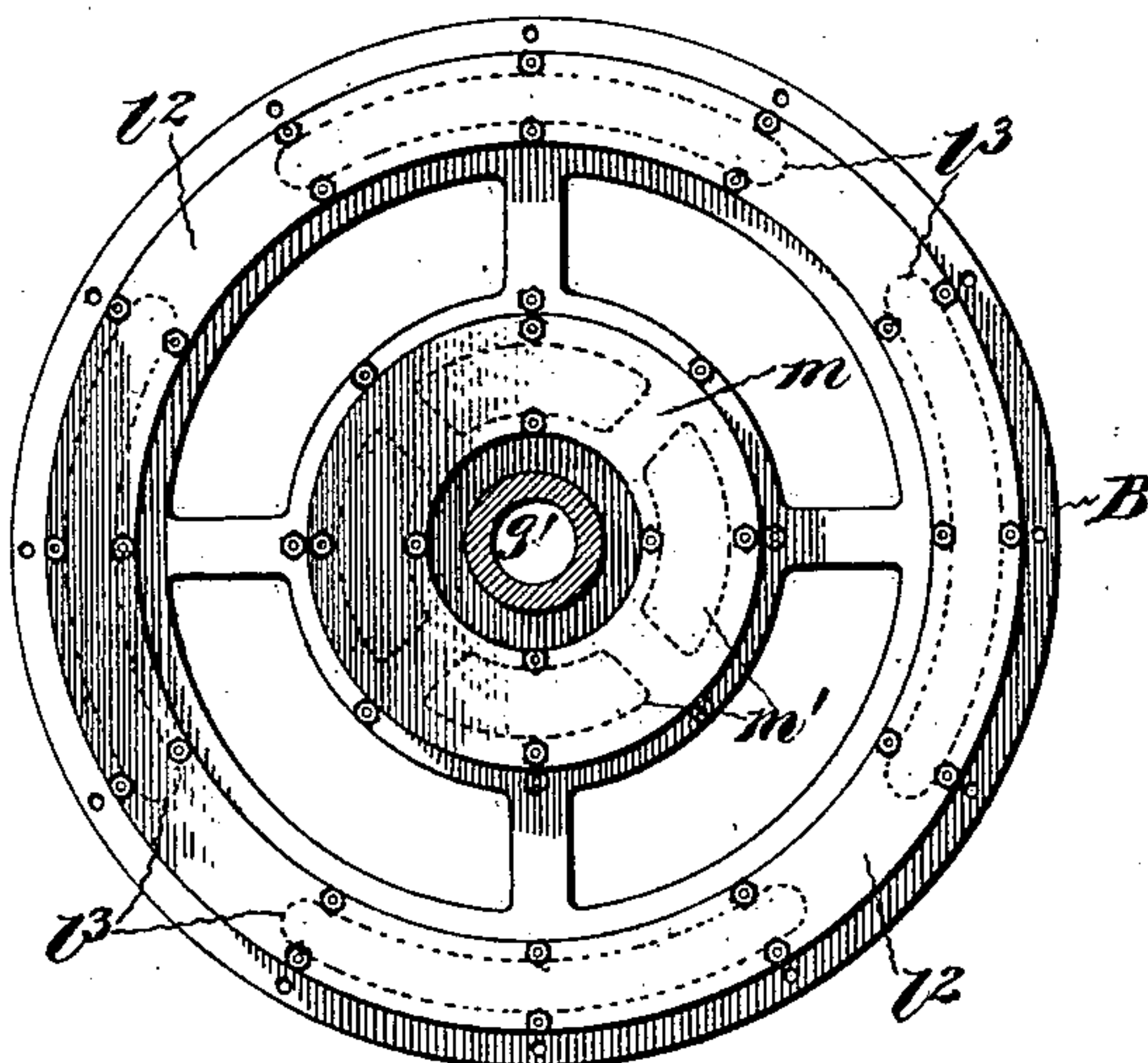
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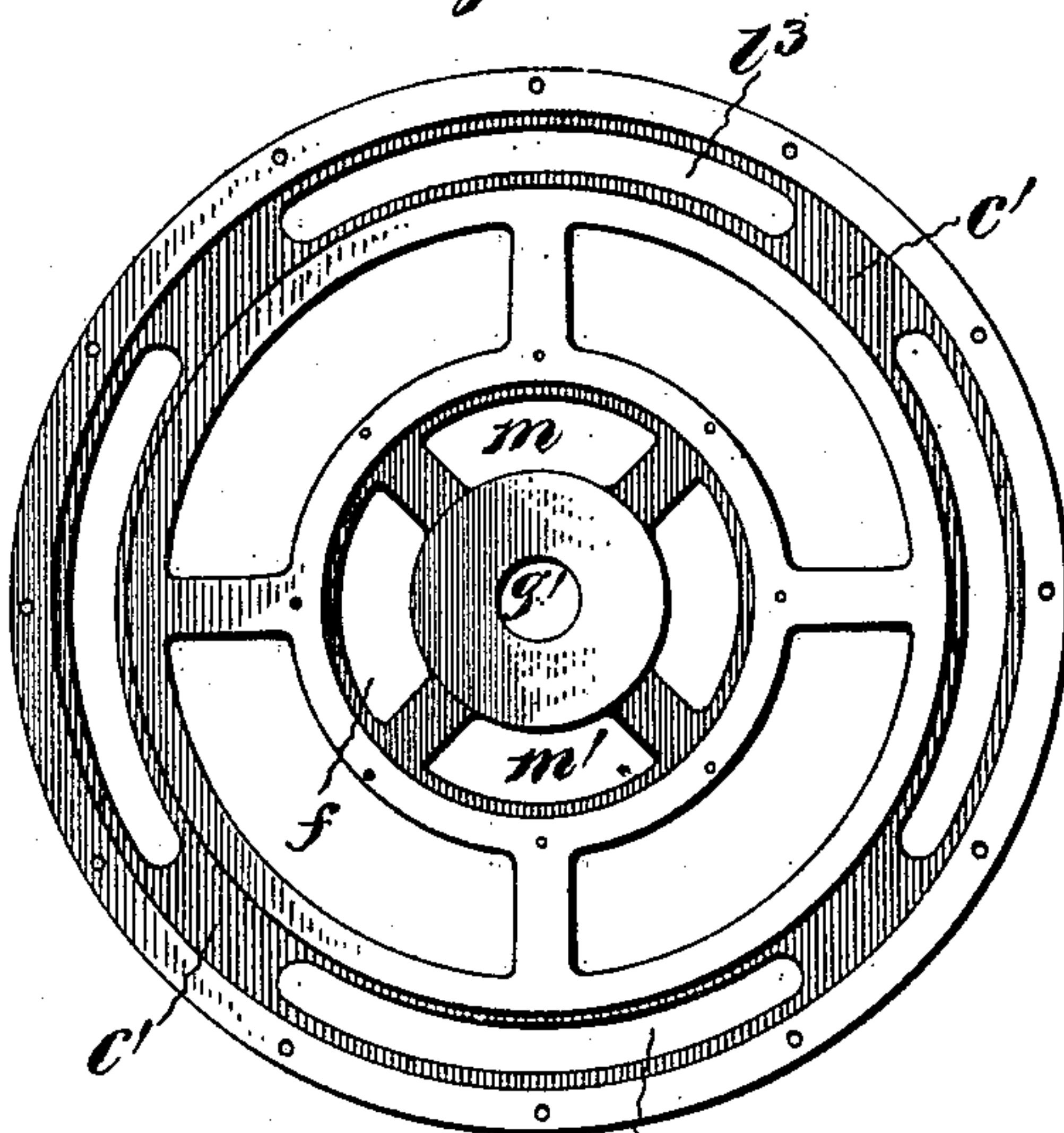
(No Model.)

2 Sheets—Sheet 2.

*Fig. 4.*



*Fig. 5.*



Witnesses:  
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# UNITED STATES PATENT OFFICE.

DIEDERICH ARNOLD MAURITZ DOUBLET, OF ALTONA-OTTENSEN, GERMANY

## FILTER.

SPECIFICATION forming part of Letters Patent No. 631,929, dated August 29, 1899.

Application filed March 21, 1899. Serial No. 709,920. (No model.)

*To all whom it may concern:*

Be it known that I, DIEDERICH ARNOLD MAURITZ DOUBLET, a subject of the Queen of the Netherlands, and a resident of Altona-Ottensen, in the German Empire, have invented certain new and useful Improvements in Filters, of which the following is a specification.

The invention has relation to filtering apparatus, its objects being to simplify the construction, increase the capacity and efficiency of the apparatus, and provide means whereby ready access is had to the internal distributing and delivery tubes for the purpose of cleansing or for the removal of and replacing of any one or more or all of the tubes, as will now be fully described, reference being had to the accompanying drawings, in which—

Figure 1 is a section of a filter embodying my invention, taken on line I II of Fig. 2, which latter shows the filter by a vertical longitudinal section. Fig. 3 is a section taken on line III IV, the cover-ring *l* being removed. Fig. 4 is an outside elevation of the head of the filter-casing at the right or discharge end, showing the cover-rings in position. Fig. 5 is an inside elevation thereof, and Fig. 6 is a detail sectional view illustrating the manner of securing the distributing-tubes to the tube-sheets.

Referring more particularly to Figs. 1, 2, and 3, *G* indicates the filter-casing, provided with an aperture for the introduction and discharge of the filtering material, which aperture may in large filters serve as a manhole and is normally closed fluid-tight by a cover *C*, Fig. 2. To each end of the filter-casing is secured a tube-sheet *a* and *g*, respectively, in which are removably seated open-ended perforated distributing-tubes *d*, arranged about and near the inner face of the cylindrical casing *G*. In order that any one of these tubes may be readily removed, they are screwed into flanged or headed sleeves *d'*, which have their bearings in suitable openings in the flue-sheets *a* and *g*, with their flanges abutting against the outer faces of the sheets, as more clearly shown in Fig. 6, so that by screwing up the sleeves on the tubes the latter can be readily secured fluid-tight to their respective flue-sheets and as readily removed.

As shown in Figs. 1, 2, and 3, the distributing-tubes *d* are arranged in segmental rows or groups, so that, as hereinafter described, access may be had to the open ends of said tubes. About the axis of the casing *G* are arranged open-ended perforated delivery-tubes *e*, also in segmental groups, so that ready access may be had to the discharge end thereof, as hereinafter explained. One end of these tubes *e* is screwed into a tube-ring *h*, secured to the inner face of the flue-sheet *a*, so as to close said end and prevent entrance therethrough of unfiltered liquid, while the discharge end of said tubes is secured in the tube-sheet *g* in the same manner as the tubes *d*—namely, by means of flanged or headed internally-threaded sleeves *e'*, seating in openings in said flue-sheet *g*, so that by screwing up the sleeves on tubes *e* a fluid-tight joint is likewise formed at the point of connection with the flue-sheet *g*, while said tubes can be readily removed.

To avoid sagging of the tubes *d* and *e* when the filter-casing is of great internal area and especially of great internal longitudinal area, I use supporting-rings *i*, Fig. 1, connected by radial arms and provided with peripheral radial angle or flanged lugs *i'*, whose flanges are bolted to the filter-casing *G*, Fig. 2.

In practice I have found it advantageous to use distributing and delivery tubes *d* and *e*, whose perforated walls are made as thin as possible not only for the sake of lightness but to lessen the liability of the perforations becoming choked up by solid matter, and to prevent injury to the tubes at the points where they are seated in the supporting-rings *i*, I mount on said tubes a reinforcing-sleeve *k*. (More clearly shown in Fig. 6.)

The head *A* at the fluid end of the filter-casing *G* has cast thereto a tubular journal *a'*, to which is connected the feed-pipe *a''* in such manner as to allow the filter to revolve. The journal *a'* is in communication with the radial passages *b*, formed in said head and opening into a peripheral circular chamber *c*, formed between said head and the flue-sheet *a* and communicating with the inlet or feed end of the segmental rows of tubes *d*, and in said head *A* are formed segmental openings *l'*, facing said segmental rows or groups of tubes *d*, which openings *l'* are normally closed



fluid-tight by a ring  $l$ , bolted to the head A. It will readily be seen that by removing the ring  $l$  ready access is had to the tubes  $d$  at the feed end thereof. The head B at the discharge end of the filter is also constructed to form a circular chamber  $c'$ , in communication with the open ends of the tubes  $d$ , said head having likewise segmental openings  $l^2$ , facing said tube ends, normally closed fluid-tight by a cover-ring  $l^3$ , so that ready access may be had to said tube ends by removing ring  $l^3$ . The said head B is also constructed to form between it and the tube-sheet  $g$  a central or axial chamber  $f$ , into which the delivery-tubes  $e$  open, and said central chamber has likewise segmental openings  $m'$ , facing the open ends of said tubes  $e$ , which openings are normally closed fluid-tight by a cover-ring  $m$ , bolted to the chamber  $f$ . The said chamber  $f$  has a tubular journal  $g'$ , to which is connected the discharge-pipe  $g^2$ , so as to allow the filter to revolve, and to said journal is secured a driving-gear T, the journals  $a' g'$  on heads A B being mounted to revolve in bearings on suitable standards S.

Any suitable granular filtering material may be used—as, for instance, sand—and in practice I prefer to fill the filter-casing G but partially with the filtering material or to such an extent as to leave a space between the casing and the tubes  $d$  when the filter is at rest, as shown in Fig. 2, for purposes which will presently be explained.

During the filtration the apparatus remains stationary, the liquid to be filtered being fed under a head or pressure to the feed-pipe  $a^2$ , and thence flowing through the distributing-channels  $b$  into the distributing-chamber  $c$  and tubes  $d$ , which perform the function of strainers, and is by said tubes distributed in numerous jets into the filtering material, the liquid percolating gradually through said material from practically all points at or near the periphery toward the center, where the liquid, freed from solids held in suspension therein, passes through the numerous perforations in the tubes  $e$  and flows from said tubes into the delivery-chamber  $f$  and from thence through the discharge-pipe  $g^2$ .

It will readily be seen that the described mode of causing the liquid to be filtered to flow from innumerable points at the surface of a filter-bed to the center thereof causes the solid impurities to be retained on the surface of the bed, or, at least, they will not be carried to any great extent into the filtering material, so that the latter does not become fouled as rapidly as would be the case otherwise. Furthermore, the surface of the filter-bed is very extensive as compared with its cross-sectional area, so that the formation thereon of a deposit of impurities of sufficient depth to materially interfere with the filtration will take a much longer time than would be the case if the cylinder were an upright one and the liquid fed thereto at its upper end and the filtrate drawn off at its lower end,

and since the interior portion of the filter-bed does not become fouled to a great extent the speed of percolation of the liquid through the filtering material is not materially retarded.

When it becomes necessary to cleanse the filtering material and the tubes  $d$ , the cleansing liquid is caused to flow under pressure from the discharging-pipe  $g^2$  to and through the feed-pipe coupling  $a^2$ , and during this operation the filter is revolved, and as it is not completely filled with filtering material the latter is also set in motion and can therefore be thoroughly cleansed.

Should access to the tubes  $d$  or  $e$  become imperative from any cause, it will simply be necessary to remove either one or both of the cover-rings  $l$  or  $l^3$  or the cover-ring  $m$ , as the case may be.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. A filter comprising a casing, a series of perforated tubes arranged about and near the inner face of the walls of said casing and extending the full length thereof, a chamber at the feed end of the casing in communication with one end of said tubes, means for feeding liquid to be filtered to said chamber, a series of perforated tubes arranged about the axis of the casing and extending the full length thereof, a chamber at the discharge end of the casing in communication with the ends of said axially-disposed tubes, said chamber provided with a discharge-passage, and a filtering material contained in the casing, for the purpose set forth.

2. A filter comprising a cylindrical revolvable casing, a series of perforated tubes arranged about and near the inner periphery of said casing and extending the full length thereof, a chamber at the feed end of the casing in communication with one of said tubes, means for feeding liquid to be filtered to said chamber, a series of perforated tubes arranged about the axis of the casing and extending the full length thereof, a chamber at the discharge end of the casing in communication with the ends of said axially-disposed tubes, said chamber provided with a discharge-passage and a filtering material contained in the casing, for the purposes set forth.

3. A filter comprising a casing containing filtering material, a series of open-ended perforated tubes arranged about and near the inner face of the casing-walls and extending the full length thereof, and a series of perforated tubes open at one end and arranged about the axis of the casing and extending the full length thereof, a chamber at each end of the casing in communication with the open ends of the first-named series of tubes, means at the feed end of the casing for feeding liquid to be filtered to the chamber at said end, a chamber at the discharge end of the casing in communication with the open end of the axially-disposed tubes, said three chambers having openings facing the tube ends in com-



munication therewith, and covers for said openings, substantially as and for the purpose set forth,

5 4. In a filter, the combination with a casing for a filtering material, thin-walled perforated distributing and delivery tubes *d* and *e* arranged in said casing as described and removably secured to tube-sheets at the opposite ends thereof, stay-rings *i* secured to  
10 said casing and having openings for the passage of said tubes, and reinforcing-sleeves *k* on said tubes having their bearings in the openings in said rings, means at one end of the casing for feeding liquid to be filtered to  
15 one end of tubes *d*, and means at the oppo-

site end of the casing for educting the filtrate discharged from tubes *e*; of means whereby access is afforded to tubes *d* at both ends, and means whereby access is afforded to tubes *e* at the discharge end of said tubes, substantially as and for the purpose set forth.

5. In a filter such as described, the combination with the heads A and B provided with segmental openings *l'* *l*<sup>3</sup> and *m'*, of the cover-rings *l* *l*<sup>2</sup> and *m*, substantially as and for the  
25 purposes set forth.

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Witnesses:

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