

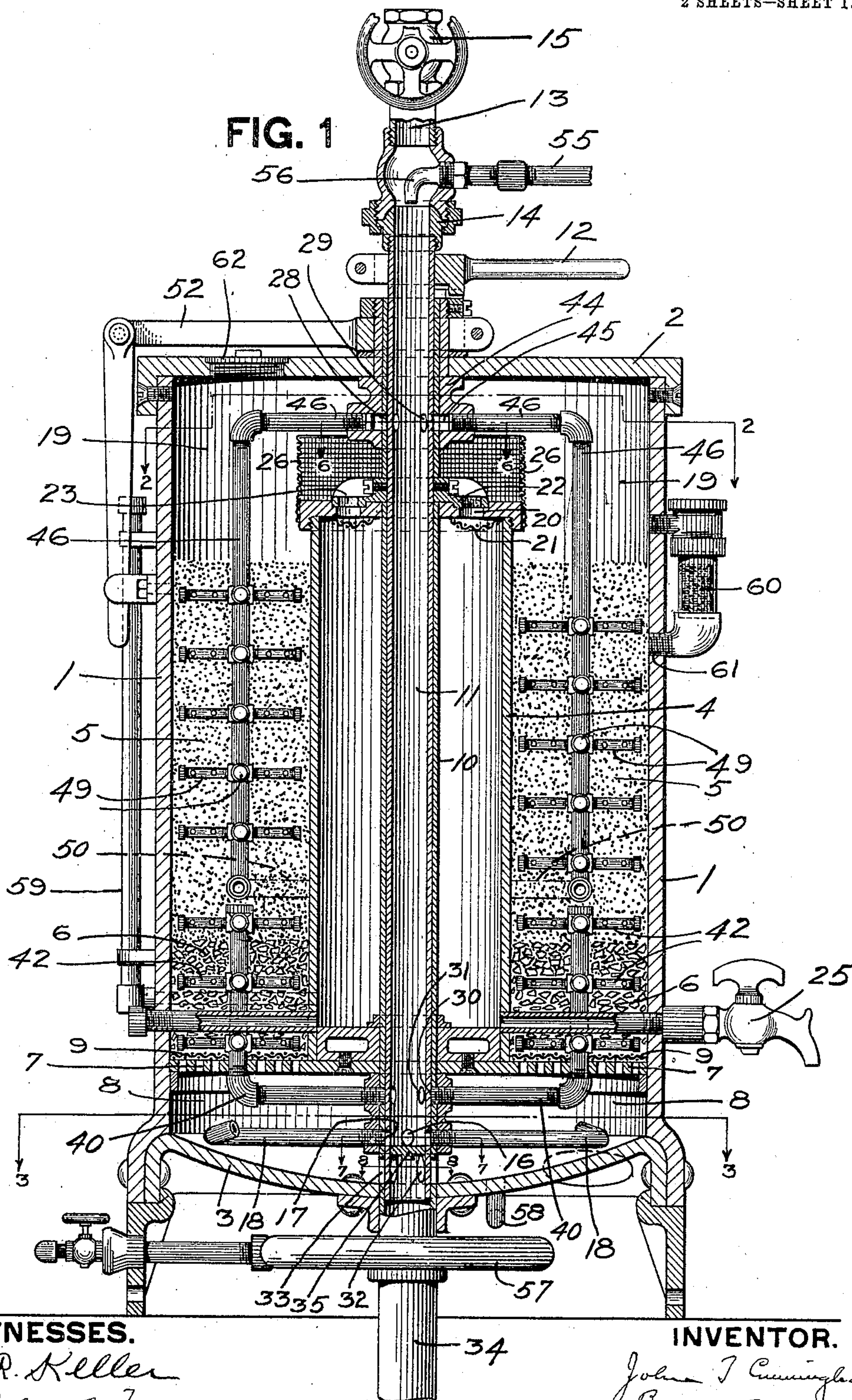
No. 810,846.

PATENTED JAN. 23, 1906.

J. T. CUNNINGHAM.
FILTER.

APPLICATION FILED APR. 26, 1905.

2 SHEETS—SHEET 1.



WITNESSES.

J. R. Keller
Robert C. Lott

INVENTOR.

John T Cunningham
R Kay Totten & Winters
Attorneys

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2 SHEETS—SHEET 2.

FIG. 2

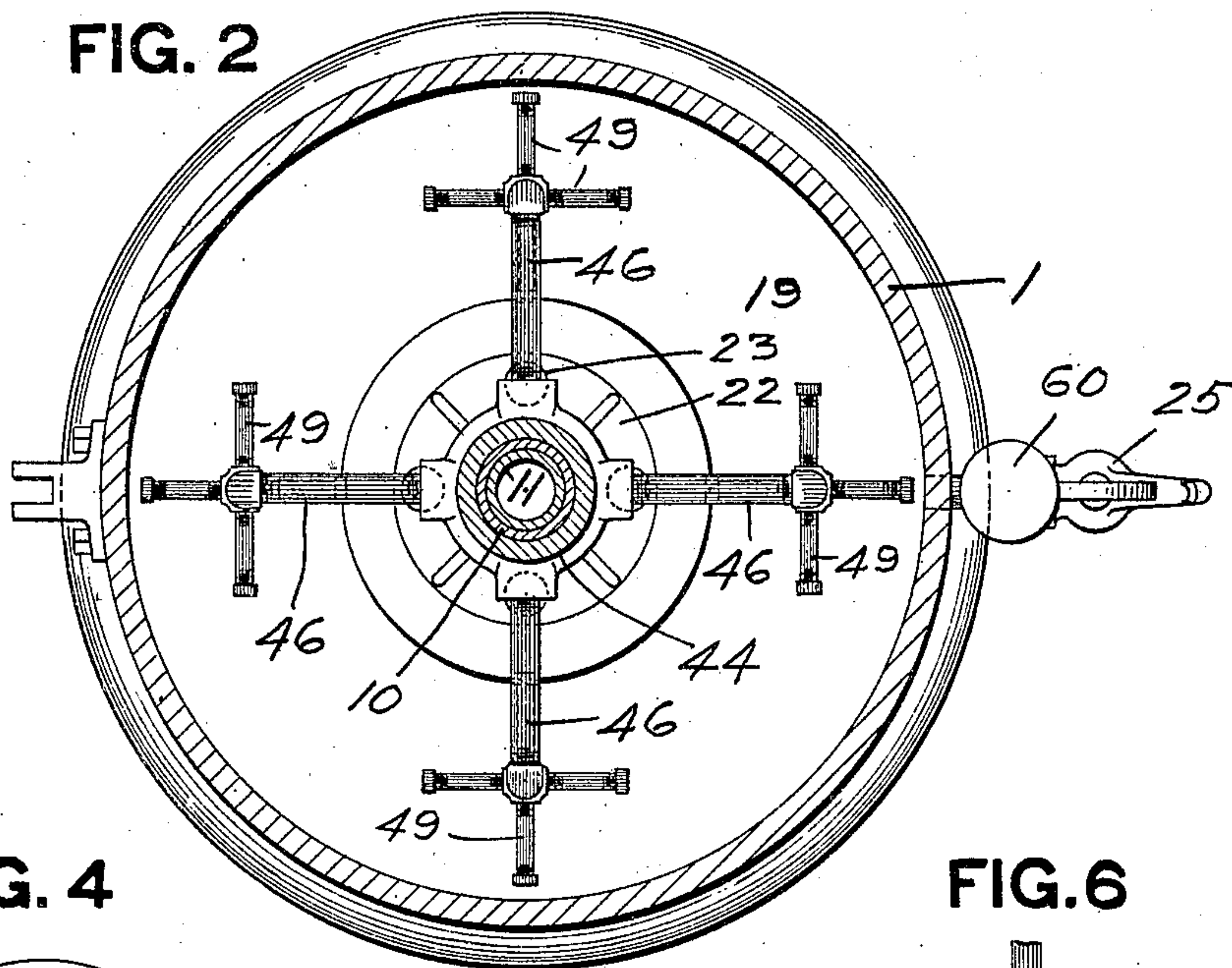


FIG. 4

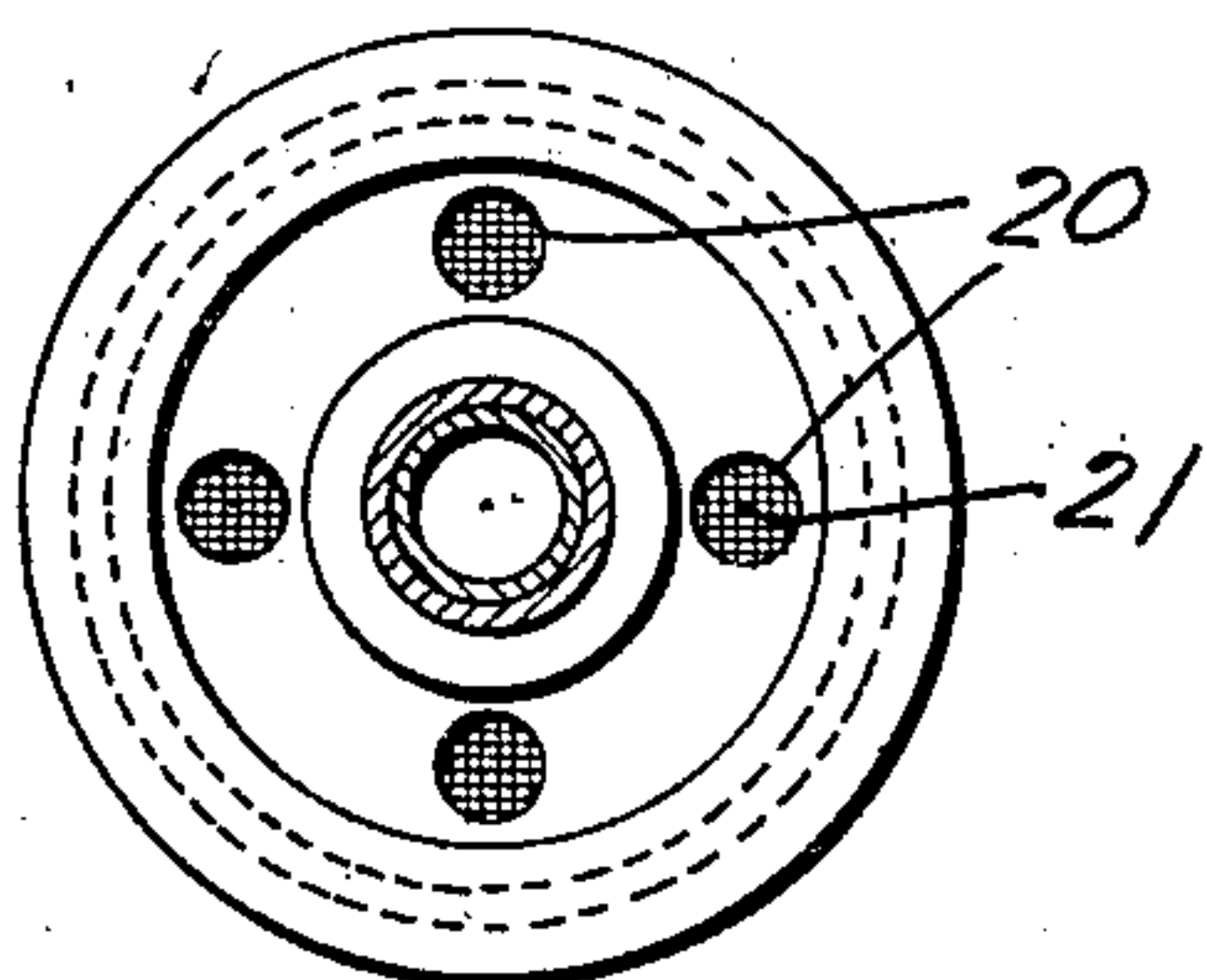


FIG. 5

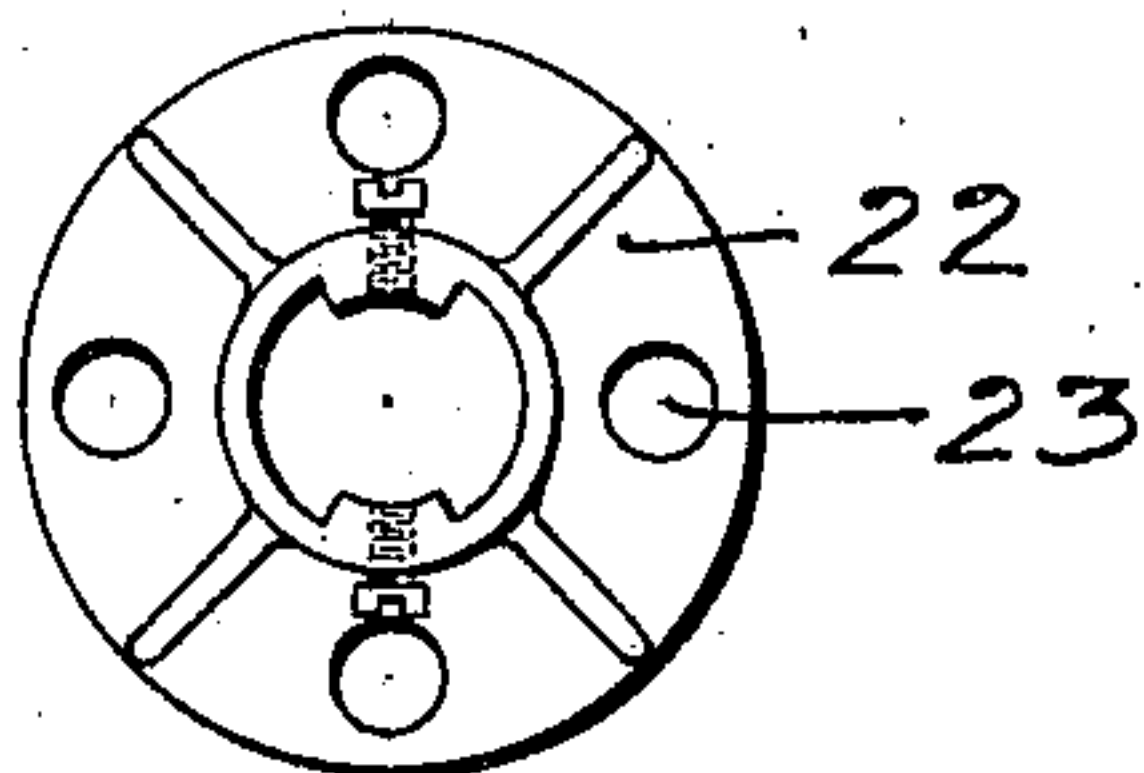


FIG. 6

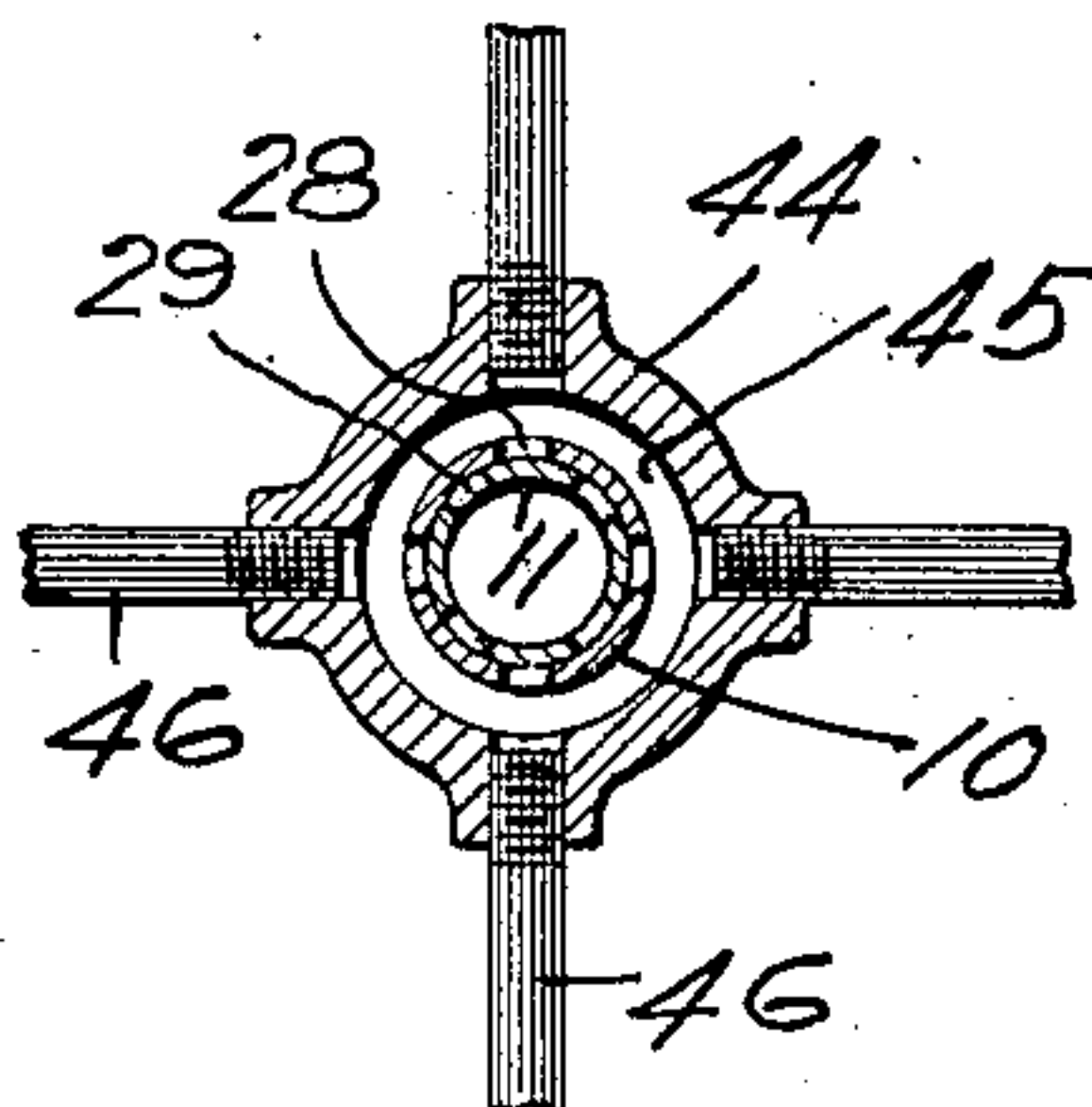


FIG. 8

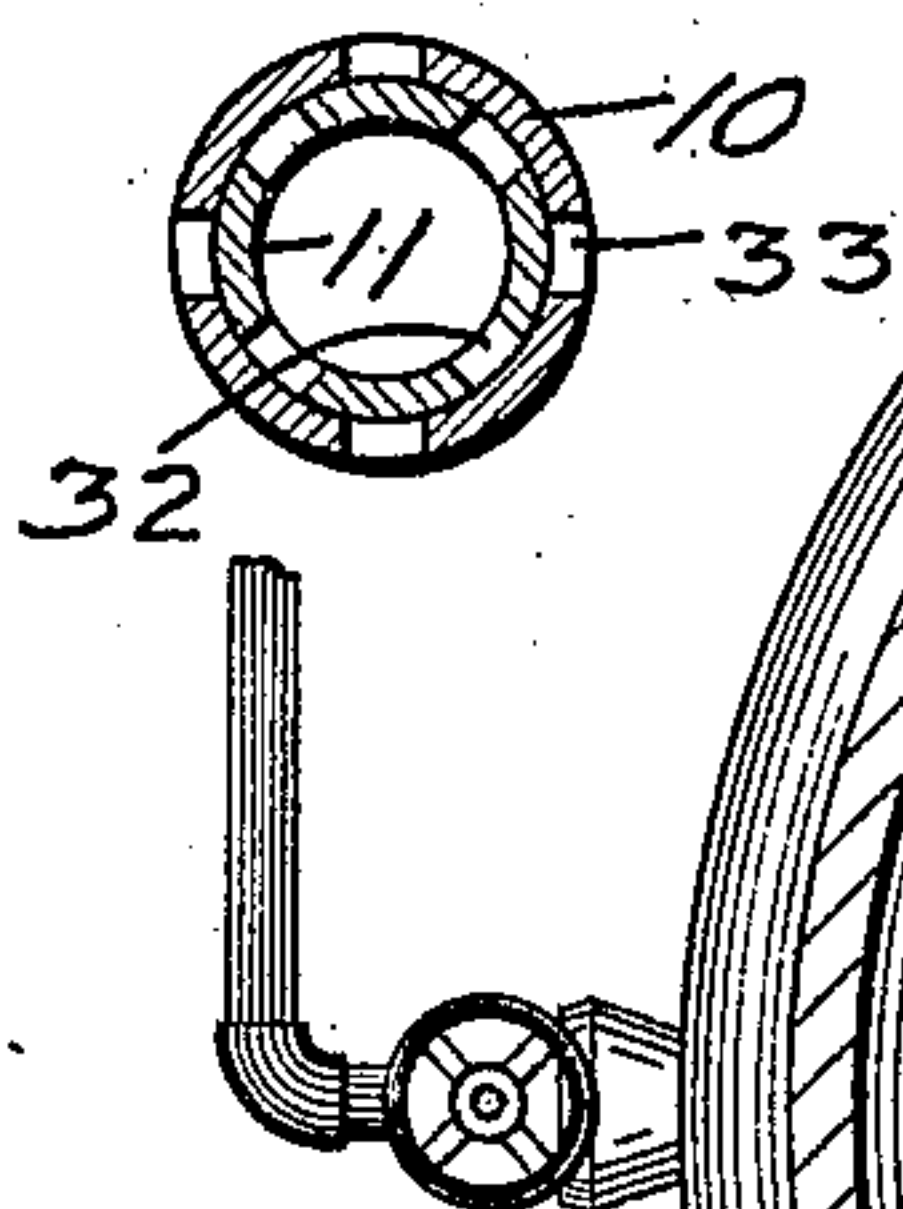


FIG. 3

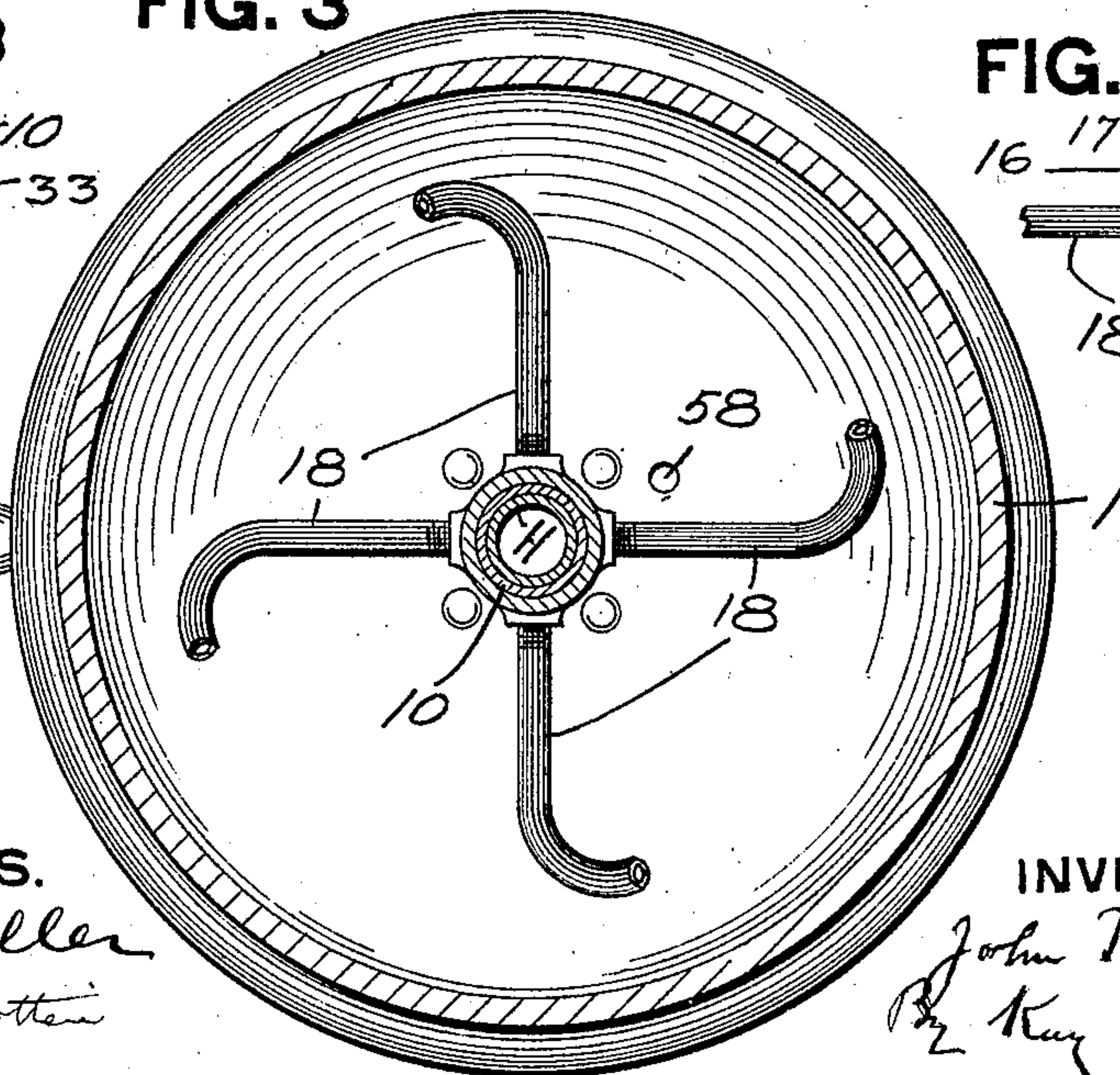
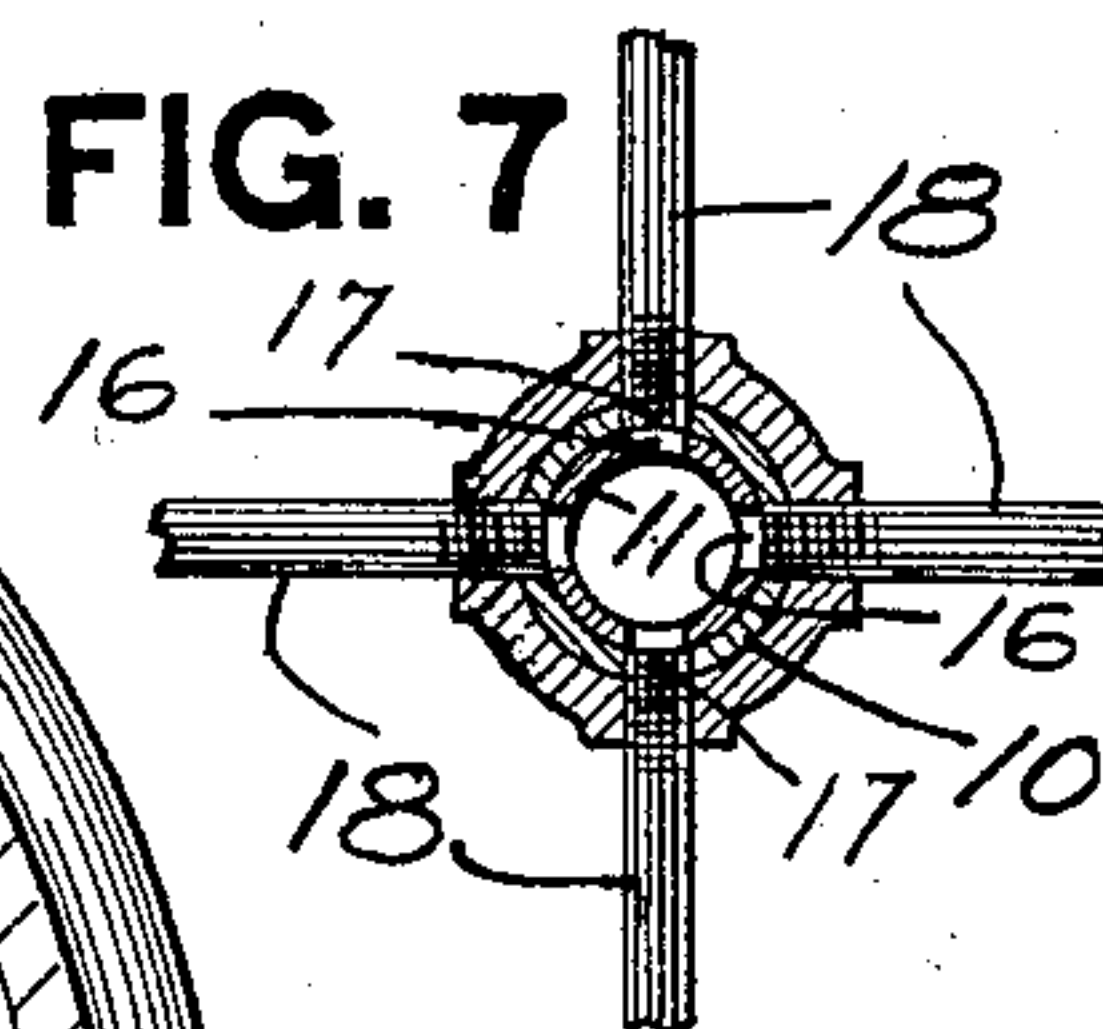


FIG. 7



WITNESSES.

J. R. Keller
Robt C. Lottin

INVENTOR.

John T. Cunningham
By Roy Lottin & Winter
Attorneys

UNITED STATES PATENT OFFICE.

JOHN T. CUNNINGHAM, OF ALLEGHENY, PENNSYLVANIA.

FILTER.

No. 810,846.

Specification of Letters Patent.

Patented Jan. 23, 1906.

Application filed April 26, 1905. Serial No. 257,504.

To all whom it may concern:

Be it known that I, JOHN T. CUNNINGHAM, a resident of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Filters; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to water-purifying apparatus, and more especially to apparatus for domestic and similar uses.

The object of my invention, generally stated, is to provide a simple apparatus convenient for domestic use, whereby the water may be not only filtered, but also sterilized, if desired.

My apparatus is of the type known as "sand or granular bed filters." As is well known, with all filters of this character the filtering material must be washed from time to time in order to remove therefrom the impurities collected during the filtering process. This generally is done by reversing the flow of water through the filtering material and carrying off the washing-water in a separate conduit. Before the washing-water is turned on it is necessary to close the pure-water outlet as well as the filtering-inlet and open the washing-outlet. There are therefore four separate openings which must be controlled. With devices of this kind having separately-operated valves controlling these different inlets and outlets it frequently happens that by reason of the carelessness or ignorance of the attendants the valves will be opened or closed in the wrong order. For instance, they frequently turn on the washing-water before closing the pure-water outlet, so that a quantity of impure washing-water will escape through the pure-water outlet.

One of the special features of my apparatus is an internal valve arrangement, whereby the several outlets and inlets are controlled simultaneously, so that by the movement of a single operating means or handle the proper control of the several inlets and outlets is insured and no attention need be given to the opening and closing of the valves in proper sequence, this being accomplished by an arrangement of valve mechanism which is automatic in operation from a single handle.

Another feature of my invention consists in a special arrangement of washing-tubes projecting into the filtering material and being movable therein, so as to thoroughly stir up the granular material and to cleanse the same during the same operation.

Another feature of the invention consists in means for sterilizing the water as it is being filtered or of the filtering material during the cleansing process, this being accomplished by heating the water prior to its passage through the filtering material or by the admission of live steam through a proper inlet.

To the accomplishment of the foregoing ends my invention consists in the arrangement of parts hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a vertical section through my apparatus. Fig. 2 is a horizontal section on the line 2 2, Fig. 1. Fig. 3 is a similar section on the line 3 3, Fig. 1. Fig. 4 is a view of the top or head of the pure-water reservoir with the valve removed. Fig. 5 is a plan view of the valve; and Figs. 6, 7, and 8 are horizontal detail sections taken, respectively, on the lines 6 6, 7 7, and 8 8 of Fig. 1, showing the valve arrangements.

My filter comprises a suitable external casing 1, preferably cylindrical and preferably constructed of metal. This is closed at the top by a suitable head 2 and at the bottom by a suitable head 3, the latter being of metal in order to permit the sterilizing of the water by heating, as hereinafter described. Arranged preferably centrally in this filter-chamber is an interior chamber 4, which serves as a reservoir for the pure or filtered liquid. The filtering material 5 is placed in the annular chamber surrounding the interior chamber 4 and consists of any suitable granular material, preferably sand, resting on a base of coarse sand, gravel, broken stone, marble, or washed coke 6, as is customary. This filtering material rests upon a perforated floor or diaphragm 7, located some distance above the lower head 3 of the exterior casing, so as to leave underneath said perforated floor a chamber 8. Suitable gauze or straining material 9 will be placed on the perforated floor 7.

Extending down centrally through the casing is a tube or cylinder 10, and inside the same and having a close fit therein is another tube 11. These two tubes are provided with suitable openings constituting inlet and outlet openings for the various operations hereinafter described and are relatively rotary, so that said openings can be brought into and out of register in order to change the flow of water through the apparatus, as hereinafter described. Preferably the inner tube 11 will be the rotating one, and the outer one 10 will

be stationary. Consequently said inner tube is shown as provided with a handle 12, by means of which it may be turned, and said inner tube in effect constitutes a tubular valve rotating in the valve-casing 10. The water-supply 13 is connected to the upper end of the tube 11 by a suitable connection 14, which will permit rotation of said tube 11. This water-supply will be provided with a cut-off valve 15 of any suitable form.

My filter is so arranged that the flow of water during filtering is upwardly through the granular material, and the filtering-inlet is into the chamber 8 at the bottom of the filter. Consequently the tube 11 is provided near its lower end with an opening or openings 16, preferably four, arranged ninety degrees from each other, which are adapted to register with corresponding openings 17 in the outer tube 10, in which latter openings are secured pipes 18, projecting radially into the chamber 8 and having their outer ends bent, as shown in Figs. 1 and 3, so as to give to the water as it enters the chamber 8 a swirling motion upwardly against the perforated floor 7, so as to prevent the screen 9 from becoming clogged with dirt.

From the chamber 8 the water rises up through the perforated floor 7 and through the granular material resting upon the same into the chamber 19 at the upper end of the filter. The head of the filtered-water reservoir 4 is provided with one or more openings 20, provided with strainers 21, and which openings are controlled by a valve 22, secured to the tube 11 and rotatable therewith. This valve 22 is provided with openings 23, which are so arranged that they register with the openings 20 when the openings 16 in the lower end of the tube 11 register with the pipes 18. When in this position, water is admitted into the lower chamber 8 and the upper end of the chamber-filter is in communication with the pure-water chamber 4, so that the water which rises through the granular material will pass down into the reservoir 4, from which it can be drawn by a suitable spigot 25. A screen 26 rises vertically from the head of the pure-water chamber and prevents any sand which may rise with the water from getting on top of the valve 22 or from entering the filtered-water reservoir 4.

The outer tube 10 near its upper end is provided with an opening or openings 28, which are adapted to register with openings 29 in the interior tube 11 and near its bottom with similar openings 30, adapted to register with openings 31 in the interior tube 11. These openings are the washing-inlets of the apparatus. The washing-outlets are at the lower ends of the tubes, being indicated by 32 and 33, respectively, and lead to an outlet-pipe 34. A plug or diaphragm 35 is placed in the interior tube 11 just above the outlet-openings 32. The several openings 28 and 29, 30

and 31, and 32 and 33 are similarly arranged, so that all three sets will either be open or closed, and they are arranged oppositely with reference to the inlet-openings 16 and 17, so that when the filtering-inlets 16 and 17 are open the washing inlets and outlets will be closed, and vice versa. Preferably there are four openings in each of these groups arranged at angles of ninety degrees, so that by merely giving the inner tube 11 an eighth-turn these openings will be opened or closed.

Connected to the openings 30 are stationary pipes 40, which extend out radially and then project upwardly through the floor 7 and into the lower portion of the filtering material, said upwardly-projecting portions being provided with several series of radially-arranged perforated pipes 42. Surrounding the upper end of the tube 10 and projecting up through the head 2 of the filter and having a water-tight fit therein is a rotatable sleeve 44, which is provided with an annular groove 45, registering with the openings 29. Connected to this sleeve and communicating with the groove 45 are pipes 46, which extend out radially and then downwardly into the filtering material. The downwardly-projecting portions are provided with a series of radially-arranged perforated pipes 49. The lower ends of the vertical pipes are connected by a suitable ring 50, preferably a pipe, so as to strengthen the downwardly-projecting arms. Connected to the upper end of the sleeve 44 is a suitable handle 52, which serves as a means for rotating said sleeve, and thus carrying the pipes 46 around in the filtering material, so as to thoroughly stir up and agitate the same.

During the operation of filtering the ports 28 and 29, 30 and 31, and 32 and 33 will be out of register, while the ports 16 and 17 and 20 and 23 will register, and therefore be open. The water enters through the inner tube 11 and passes to its lower end and out through the radial pipes 18 into the chamber 8. Thence it rises through the granular material and above the latter, and then down into the reservoir through the openings in the head of said reservoir, from which it can be drawn as necessary. When it is desired to wash the filter, the attendant will take hold of the handle 12 and give an eighth-turn thereto. This will rotate the inner tube 11, thus cutting off communication between the ports 16 and 17 and also closing the valve 22 on the head of the reservoir 4. Simultaneously therewith the washing-inlets 28 and 29, 30 and 31 will be brought into register, and the washing-outlets 32 and 33 will also be brought into register. The water will then pass from the pipe 11 through the several washing-pipes projecting upwardly and downwardly into the granular material and out through the several washing-pipes projecting upwardly and downwardly into the granular material

and out through the perforated radial pipes carried thereby. This will admit a large quantity of water into the material and will soften and agitate the same and wash out the impurities, which will pass down into the chamber 8 and out from the bottom thereof. After the sand has become softened and somewhat mushy the attendant will take hold of the lever 52 and slowly rotate the sleeve 44, thereby carrying the pipes 46 around in the granular material, so that the latter will be thoroughly agitated and all portions thereof washed. The annular chamber 45 in the sleeve 44 insures the constant flow of washing-water during the rotation of these pipes. When the washing is completed, the handle 12 will be moved in the opposite direction, thus cutting off the washing inlets and outlets and opening the filtering inlet and outlet. It will thus be seen that by the movement of a single handle all of the valves are simultaneously controlled, so that even an ignorant attendant can be trusted with the apparatus and without any danger of any of the impure washing-water passing into the pure-water reservoir. In order to sterilize the entire apparatus, I connect to the inlet 13 a pipe 55, having a nozzle 56 projecting downwardly in the pipe 11. The pipe 55 may be connected to any suitable source of steam or boiling water, and by means of it the steam or boiling water can be caused to circulate through the entire apparatus both when in its filtering and when in its washing position, so as to thoroughly sterilize the apparatus. While this is being done, the water will be shut off at the cut-off valve 15. In order to sterilize the water as it is being filtered, I place underneath the bottom head 3 a suitable burner 57, (shown as a circular gas-burner,) by means of which the water in the chamber 8 can be heated to the boiling-point, if necessary, prior to its passage through the filtering material. A suitable flushing-pipe 58 projects through the bottom head 3 of the apparatus, so as to permit of the drawing off of muddy water from the chamber 8 at intervals between washings. A suitable gage 59 may be provided for indicating the height of filtered water in the reservoir 4. So, too, a gage 60 is provided for indicating roughly the height of the sand in the apparatus. If the level of the sand should fall below the lower opening 61 of this gage, all of the sand in said gage will run out, thus indicating that further sand will have to be added, which can be supplied through the opening 62 in the head of the apparatus.

My apparatus is comparatively simple and is so arranged that absolutely pure water can be obtained. The washing of the apparatus especially is simple, and the valve arrangement is such that all of the inlets and outlets are controlled in the proper sequence by the movement of a single operating-handle, thus

obviating all danger of getting a flow of water through the apparatus in the wrong direction.

What I claim is—

1. In a filter, the combination of a filtering-chamber, valve mechanism therefor comprising an outer tube or cylinder provided with a plurality of openings, one being the filtering-water inlet, another being the washing-water inlet, an interior tubular valve having a supply-inlet thereto and having openings coöperating with those of the outer tube or cylinder, and arranged to connect the supply-inlet to the filtering-inlet and also to the washing-inlet, a filtered-fluid valve operatively connected to said inner tube, said outer and inner tubes being capable of relative rotary movement and the openings therein being so arranged that when the filtering inlet and outlet are open the washing-inlet is closed, and vice versa, and a valve-controlled washing-outlet from said filtering-chamber.

2. In a filter, the combination of a filtering-chamber, valve mechanism therefor comprising an outer tube or cylinder provided with a plurality of openings, one being the filtering-water inlet, another being the washing-water inlet, and a third being the washing-water outlet, an interior tubular valve having a water-supply connection thereto and having openings coöperating with those of the exterior tube, and arranged to connect the supply-inlet to the filtering-inlet and also to the washing-inlet, and a filtered-fluid valve operatively connected to said interior tube, said outer and inner tubes being arranged for relative rotary movement and the openings therein and valve thereon being so arranged that when the filtering inlet and outlet are open the washing inlet and outlet are closed, and vice versa.

3. In a filter, the combination of a pure-water reservoir and a filtering-chamber arranged concentrically, a central tube provided with openings communicating with the filtering side of the filtering-chamber and with other openings communicating with the washing side of said filtering-chamber, openings establishing communication between the filtered-liquid reservoir and the filtering-chamber, and an inner tube having connection with the water-supply and provided with openings coöperating with those in the outer tube and arranged to connect the water-supply to the filtering-opening and also to the washing-opening, said inner tube also carrying a valve controlling the communication from the filtering-chamber to the filtered-liquid reservoir, said tubes being capable of relative rotary movement and the arrangement being such that when the filtering inlets and outlets are open the washing-inlet is closed, and vice versa.

4. In a filter, the combination of a filtered-liquid reservoir and a filtering-chamber ar-

ranged concentrically, a central tube provided with openings communicating with the filtering side of the filtering-chamber, other openings communicating with the washing side of the filtering-chamber, and other openings leading to a washing-outlet, openings establishing communication between the filtered-liquid reservoir and the filtering-chamber, and an interior tube having connection with the water-supply and provided with openings cooperating with the three series of openings in the outer tube and carrying the valve controlling the communication between the filtering-chamber and the filtered-liquid reservoir, said inner and outer tubes being capable of relative movement and the arrangement being such that when the filtering inlets and outlet are open the washing inlet and outlet are closed, and vice versa.

5. In a filter, the combination of an exterior casing, a perforated bottom located above the lower end of said casing, a reservoir located centrally in said casing and provided with openings in its top, filtering material on said perforated bottom in the annular space surrounding the central reservoir, a pipe projecting centrally through said chamber and provided near its lower end with openings communicating with the inlet-chamber, and with other openings communicating with the outlet-pipe, a pipe arranged inside of said central pipe and rotatable with reference thereto, said central pipe being provided at its lower end with openings adapted to register with the washing-outlet of the outer pipe and with other openings adapted to register with the openings communicating with an inlet-chamber, and having a diaphragm between said two sets of openings, a valve carried by said inner pipe and controlling the openings in the upper end of the central reservoir, and a water-supply connection to said inner pipe.

6. In a filter, the combination of a filtering-chamber, granular filtering material therein, perforated washing-pipes extending into said granular material, a supply-inlet to said chamber, a filtered-fluid outlet therefrom, a washing-outlet therefrom, an inlet from the supply to the washing-pipes, valves controlling said inlets, outlets and washing-pipes, said valves being so arranged that when the supply-inlet and filtered-fluid outlet are open the inlet to the washing-pipes and the washing-outlet are closed, and vice versa, and connected operating means for said several valves whereby they are operated in unison.

7. In a filter, the combination of a filtering-chamber, granular filtering material in said chamber, perforated washing-pipes extending into said granular material, means for moving said pipes in said material, a supply-inlet to said chamber, a filtered-fluid outlet therefrom, a washing-outlet therefrom, an inlet from the supply to the washing-pipes,

valves controlling said inlets, outlets and washing-pipes, said valves being so arranged that when the supply-inlet and filtered-fluid outlet are open the inlet to the washing-pipes and the washing-outlet are closed, and vice versa, and connected operating means for said several valves whereby they are operated in unison.

8. In a filter, the combination of a filtering-chamber circular in cross-section, granular filtering material therein, perforated washing-pipes extending down into said granular material and rotatably mounted concentrically in said chamber, means for rotating said pipes, a supply-inlet to said chamber, a filtered-fluid outlet therefrom, a washing-outlet therefrom, an inlet from the supply to the washing-pipes, valves controlling said inlets, outlets and washing-pipes, said valves being so arranged that when the supply-inlet and filtered-fluid outlet are open the inlet to the washing-pipes and the washing-outlet are closed, and vice versa, and connected operating means for said several valves whereby they are operated in unison.

9. In a filter, the combination of a filtering-chamber, granular filtering material therein, a water-inlet pipe through the head of said chamber, pipes connected to said inlet-pipe and extending radially and thence downwardly into the granular material and being perforated, means for rotating said pipes around the inlet-pipe, and valve mechanism for the inlet-pipe arranged to direct the water either into the filtering-chamber or into the perforated pipes.

10. In a filter, the combination of a filtering-chamber, a water-supply connection thereto, granular filtering material in said chamber, perforated washing-pipes extending downwardly into said material, means for moving said pipes through said material, stationary perforated washing-pipes extending upwardly in the granular material, and valve mechanism for the water-supply connection arranged to direct the water either into the filtering-chamber or into the washing-pipes.

11. In a filter, the combination of a filtering-chamber, granular filtering material therein, a water-inlet pipe, perforated washing-pipes connected to said inlet-pipe and extending upwardly in the lower portion of said granular material, movable perforated pipes also connected to said inlet-pipe and extending radially and thence downwardly into the granular material, means for rotating said last-named pipes, and valve mechanism for the inlet-pipe arranged to direct the water either into the filtering-chamber or into the perforated pipes.

12. In a filter, the combination of a filtering-chamber and a filtered-water reservoir arranged concentrically, a central tube therefor, an inner tube in said central tube, a sup-

ply connection to said inner tube, said tubes being provided with openings adapted to register and being relatively rotary so as to change the course of water from the supply-inlet through the filter, and a steam or hot-water connection to said inner tube.

13. In a filter, the combination of a filtering-chamber, an inlet-chamber underneath said filtering-chamber, an outlet from the upper end of said chamber, a central inlet-pipe projecting into said inlet-chamber, and pipes connected to said inlet-pipe and projecting radially in said inlet-chamber and provided with bent ends whereby the water in said inlet-chamber will be given a continuous swirling movement.

14. In a filter, the combination of an exterior casing, a perforated bottom located above the lower end of said casing, a reservoir located centrally in said casing and provided with openings in its top, filtering material on said perforated bottom in the annular space surrounding the central reservoir, a pipe projecting centrally through said chamber and provided near its lower end with openings communicating with the inlet-chamber, and

with other openings communicating with an outlet-pipe, and near its upper end with openings having connected thereto pipes projecting down into the filtering material, a pipe arranged inside of said central pipe and rotatable with reference thereto, said central pipe being provided at its lower end with openings adapted to register with the washing-outlet of the outer pipe and with other openings adapted to register with the openings communicating with the inlet-chamber and having a plug or diaphragm between said two sets of openings, said inner tube at its upper end having openings adapted to register with the openings in the outer tube to which the washing-pipes are connected, a valve carried by said inner pipe and controlling the openings in the upper end of the central reservoir, and a water-supply connected to said inner pipe.

In testimony whereof I, the said JOHN T. CUNNINGHAM, have hereunto set my hand.
JOHN T. CUNNINGHAM.

Witnesses:

F. W. WINTER,
ROBERT C. TOTTEN.