

No. 696,241.

Patented Mar. 25. 1902.

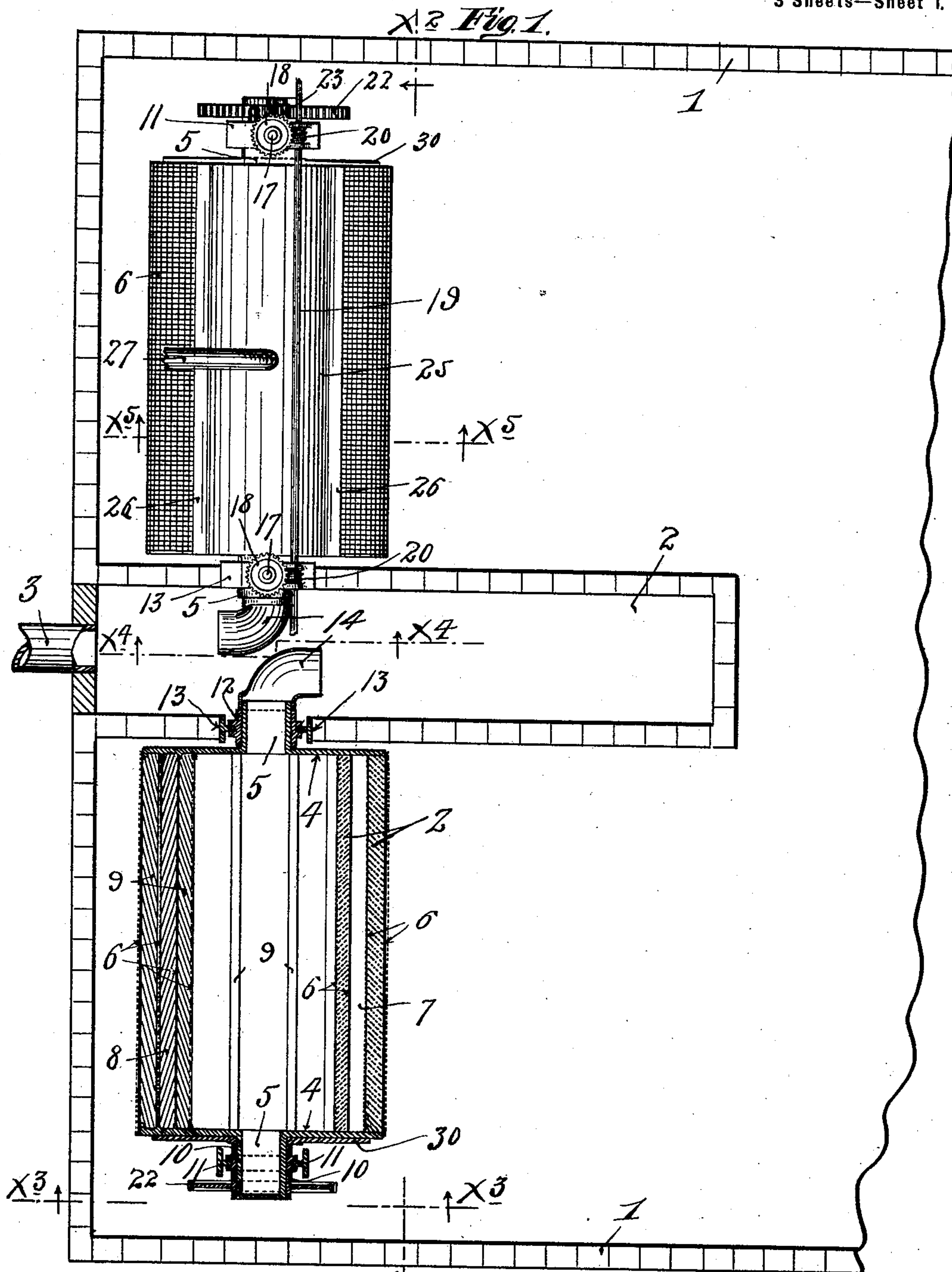
A. JOHNSON.

FILTER.

(Application filed June 24, 1901.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses  
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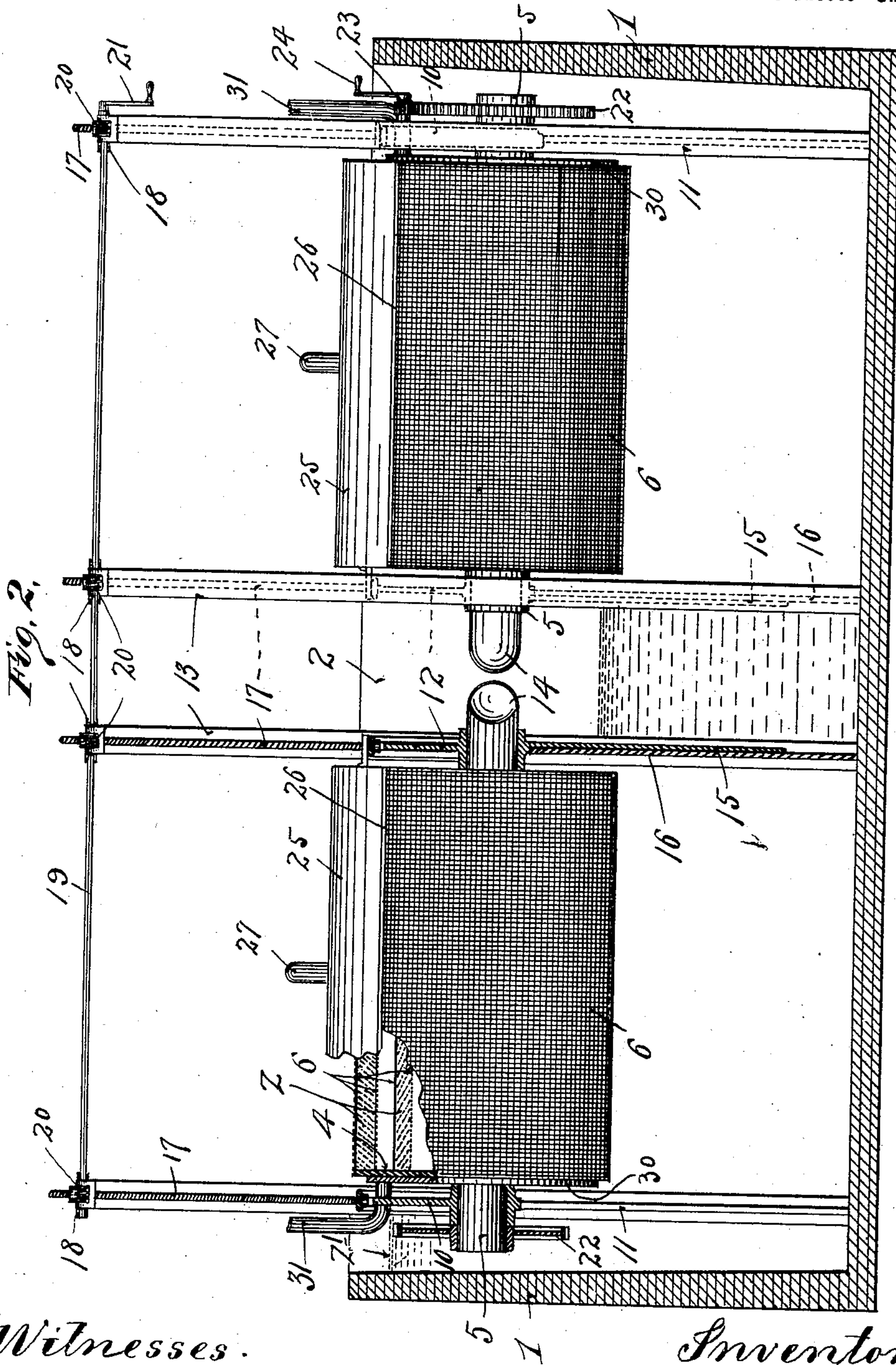
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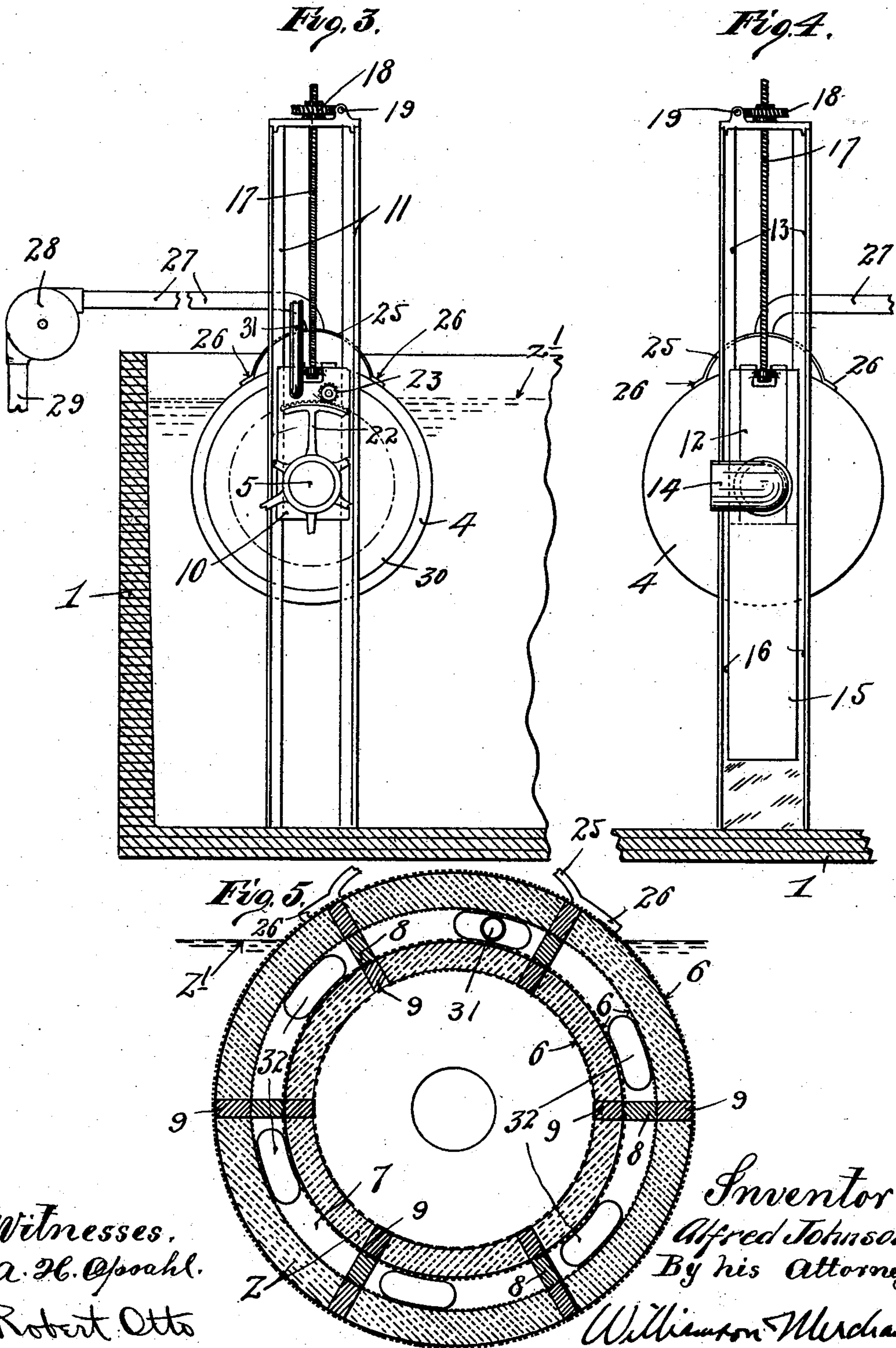
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# UNITED STATES PATENT OFFICE.

ALFRED JOHNSON, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR OF THREE-FIFTHS TO ALEXANDER SWANSON AND JOHN NELSON, OF MINNEAPOLIS, MINNESOTA.

## FILTER.

SPECIFICATION forming part of Letters Patent No. 696,241, dated March 25, 1902.

Application filed June 24, 1901. Serial No. 65,748. (No model.)

*To all whom it may concern:*

Be it known that I, ALFRED JOHNSON, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Filters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates especially to large filtering plants, such as required for use in connection with city waterworks, and has for its objects to improve the same in the several particulars hereinafter noted.

The invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

The invention is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Figure 1 is a view principally in plan, but with some parts sectioned and others broken away, showing several of my improved filters applied in working position within a large water-reservoir, such as used in connection with the city waterworks. Fig. 2 is a transverse vertical section approximately on the line  $x^2 x^2$  of Fig. 1, but with some parts broken away and others sectioned in vertical line with the axes of the filters. Fig. 3 is a vertical section approximately on the line  $x^3 x^3$  of Fig. 1, some parts being broken away. Fig. 4 is a vertical section approximately on the line  $x^4 x^4$  of Fig. 1, some parts being broken away and the wall portions of the reservoir being removed; and Fig. 5 is an enlarged vertical section through one of the filtering-drums on the line  $x^5 x^5$  of Fig. 1.

The numeral 1 indicates a large water-reservoir of any suitable construction built, preferably, of masonry and provided with a draw-off sluice 2, from which, as shown, a main supply-pipe 3 leads to any suitable point.

In practice I preferably employ a plurality of rotary filtering-drums and in the drawings I have shown two such filters. These filtering-drums are each constructed as follows:

The numeral 4 indicates a pair of flanged heads of disk-like form provided with trun-

nions 5, which are axially alined and one of which is closed at its end, while the other is open. By the concentric flanges of the heads 4 four concentric filtering-cylinders 6, preferably of finely-woven wire-gauze, are suitably supported. A suitable filtering material, such as finely-pulverized silicon, (indicated at  $z$ ), is placed between the two inner and the two outer cylinders 6, so as to leave a cylindrical chamber 7 between the two intermediate cylinders 6, as best shown in Fig. 5. The annular chamber 7 is divided into segmental compartments running from end to end of the drum by means of imperforate spacing-strips 8, placed between the intermediate cylindrical screen 6. Other spacing or dividing strips 9 are placed between the two outer screens and the two inner screens in radial lines with the spacing-strips 8. The strips 8 and 9 divide the entire separating-surface of the drum into segmental compartments or sections, as best shown in Fig. 5.

Each rotary filtering-drum is mounted as follows: The closed trunnion 5 thereof is loosely mounted in a suitable bearing afforded by a bearing-plate 10, which in turn is vertically adjustable on the inwardly-projecting flanges of a vertically-extended rectangular guide-frame 11. The inner and open trunnion 5 of said filtering-drum is loosely journaled in the sleeve-bearing of a bearing-plate 12, which is grooved to closely fit and to move vertically on the vertical inturned flanges of a rectangular guide-frame 13, which guide-frame is built into the walls of the draw-off sluice 2, but extends high above the same. The sleeve-like bearing of each bearing-plate 12 is provided with a non-rotary discharge-elbow 14.

The filtering-drums are adapted to be raised vertically in suitable slots cut in the guide-frame 13, upward from the bearing-hubs of the bearing-plates 12, and to keep these slots closed when said drums are raised the said bearing-plates 12 are provided with depending plate portions 15, which serve as valves or gates. Said gate portions 15 fit closely against the inturned flanges and against the lower web portions 16 of the said guide-frame 13.

The filtering-drums may be raised and lowered by various devices, but are preferably



given such movement by the following-described means: The lower ends of vertical screw-rods 17 are secured to the upper ends of the bearing-plates 10 and 12. The upper ends of these screw-rods 17 work loosely through suitable seats formed in the upper transverse portions of the frame 11 and 13, and working with screw-threaded engagement thereon above said brackets are worm-gears 18, which act as nuts. A shaft 19, mounted in suitable bearings in the upper ends of the brackets 11 and 13, extends horizontally in line with the several worm-gears 18 and is provided with worm-sections 20, which engage one with each of the said worm-gears. At one end the shaft 19 is shown as provided with an operating-crank 21. As is evident, by manipulating the hand-crank 21 both of the filtering-drums will, through the connections described, be simultaneously raised or lowered. Of course the shaft 19 might be sectioned, so that the filtering-drums could be raised and lowered independently.

The closed trunnions 5 of the drum-heads 4 are shown as provided at their outer ends with rigidly-secured gears 22. A pinion 23, suitably mounted on the adjacent bearing-plate 10 and provided with an operating-crank 24, meshes with each gear 22, as best shown in Figs. 2 and 3. As is evident, by turning the crank 24 the filtering-drum may be rotated.

A so-called "collecting-head" 25, which is of inverted-trough-like form and has closed ends, rests with its longitudinal flanges 26 on the outer surface of the outer cylindrical screen 6 of each rotary filtering-drum. These collecting-heads 25 extend substantially from end to end of the filtering-drums, and their longitudinal flanges 26 are so spaced that but one segmental section of said drums may be completely exposed to the said head at one time. (See particularly Fig. 5.) A draft-pipe 27 extends from the top of the collecting-head 25 to a fan 28. The fan 28 delivers through a pipe 29 to any suitable point.

To each bearing-plate 10 is rigidly secured a disk 30, through which opens the lower end of an air-supply pipe 31. The outer heads 4 of the filtering-drums are provided each with a series of elongated perforations 32, which open into the annular air-space 7. One of the perforations 32 opens into each segmental section of said annular air-space 7. When one of the segmental sections of the drum is turned into registration with the cavity of the collecting-head 25, the perforation 32 of that section will register with the inner end of the air-supply pipe 31, as best shown in Fig. 5. All of the other of said perforations 32 will be closed by the disk 30.

The operation of the device will be substantially as follows: Suitable provision is made whereby the level of the water in the reservoir 1 with respect to the filtering drum or drums will remain substantially as indicated by the lines  $z'$  in Figs. 2, 3, and 5, so

that there will always be one section of the drum which is out of use or through which the water is not permitted to percolate. This adjustment may be maintained in various ways—as, for instance, by an overflow in the said reservoir or by adjusting the drum as an entirety, so as to maintain the said relations. This, as is evident, always leaves one section of the drum inoperative, so that it may be cleaned while the other sections are all operative. A very large per cent. of the sediment taken from the water by the filter will be deposited on the outer surface of the outer screen 6. When the fan 28 is running, a strong draft of air will be drawn in through the air-supply pipe 31 into the inoperative section of the annular air-space 7, and from thence it will be drawn outward through the two outer screens 6 and the interposed filtering material and into the collecting-head 25. From the collecting-head 25 the air will of course be drawn out through the pipe 27 and discharged from the pipe 29. This passage of air will rapidly dry the deposited sediment or impurities left by the water, and will then carry them from the screen and discharge the same with the blast.

By successively moving the sections of the filtering-drum to its inoperative or cleaning position the entire collecting-surface of the filter may be kept clean without interrupting the action of the filter. When it is necessary or desirable to repair the filters or to gain more complete access thereto, they may, as already indicated, be raised into inoperative positions above the water.

The water which passes from the reservoir 1 into the interior of the drums will run out through the open trunnions 5 thereof and elbows 14 into the draw-off sluice 2. The water in the draw-off sluice should be kept lower than the water in the reservoir 1.

The device above described is, as has been stated, especially adapted for use in very large filtering plants. Many of the features thereof may, however, be used to good advantage in small plants, such as required for private or family use. It is also evident that the device above described is capable of many modifications within the scope of my invention.

The expression "draft device" as herein used to designate the means for cleaning the filter is used in a broad sense. Instead of a draft of air a stream of water might be circulated through the exposed or inoperative section of the filter, and this would be within the scope of my invention.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. The combination with a filter, of a draft device for cleaning the same, having a receiving-head engageable in succession with different sections of the filter, substantially as described.

2. The combination with a rotary filtering-drum, of a draft device for cleaning the same,



having a receiving-head which is engageable in succession with different sections of said filtering-drum, substantially as described.

3. The combination with a rotary filtering-drum, having longitudinally-extended peripheral compartments, of a relatively fixed collecting-pocket engaging the outer filtering-surface of said drum, and means for producing a draft through said collecting-pocket and the engaged filtering-surface of said drum, to clean the said filtering-surface, substantially as described.

4. The combination with a reservoir, of a rotary filter mounted therein with a portion thereof always above the water-level thereof, and a draft device arranged to operate upon the exposed and inoperative surface of said filter, substantially as described.

5. The combination with a reservoir, of a rotary filtering-drum having longitudinally-extended compartments, which drum is

mounted in said reservoir with one section thereof always movable into a position to expose its outer filtering-surface above the water-level, and a draft device operative on the exposed and inoperative section of said drum, to clean the same, substantially as described.

6. A filtering-drum made up of the concentric filtering-screens 6 divided into compartments by the strips 8 and 9, and filtering material placed between the two outer screens and between the two inner screens, a divided annular air-space 7 being left between the intermediate screens, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ALFRED JOHNSON.

Witnesses:

ELIZABETH KELIHER,  
F. D. MERCHANT.