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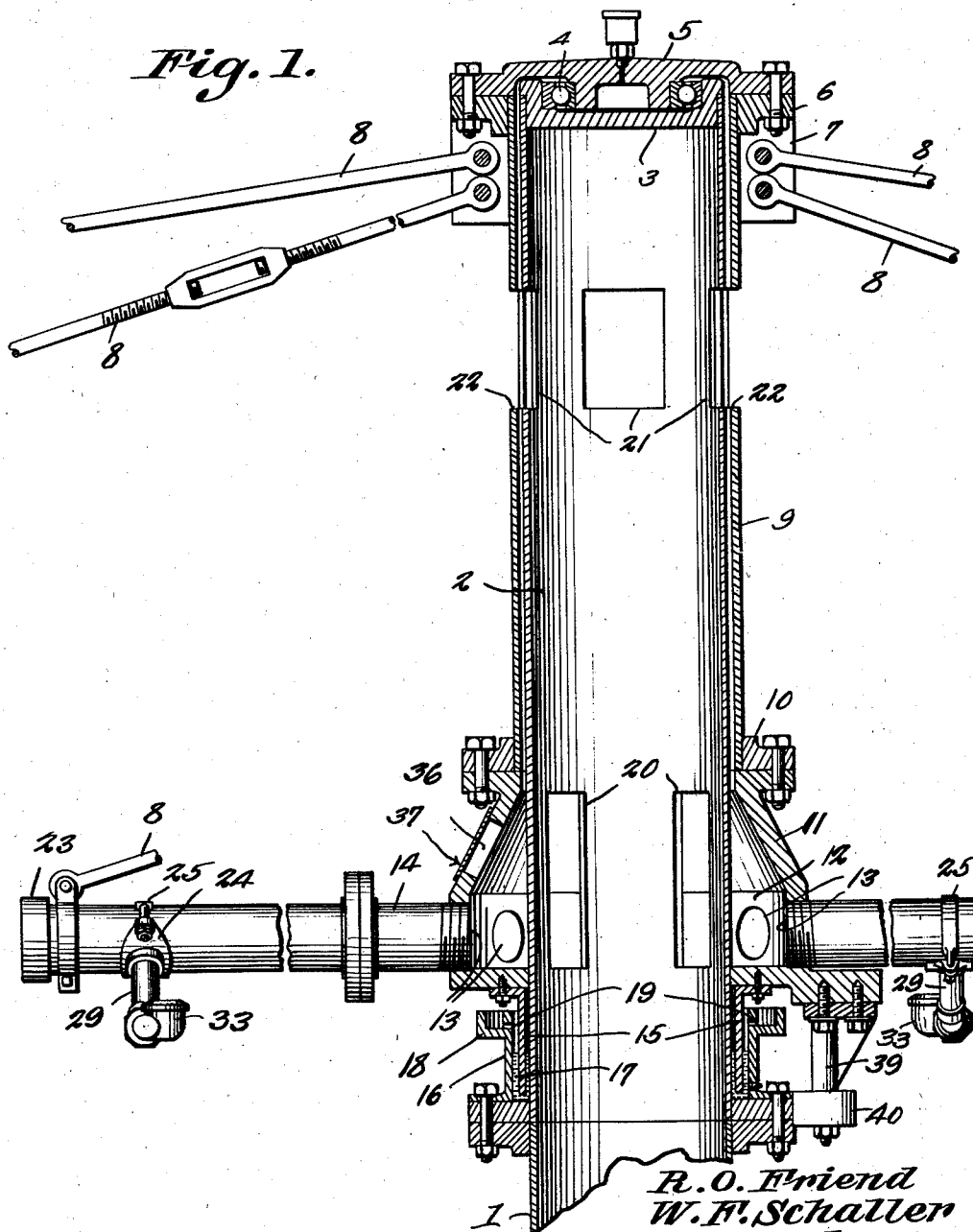
2,263,125

ROTARY DISTRIBUTOR

Filed April 2, 1940

3 Sheets-Sheet 1

*Fig. 1.*



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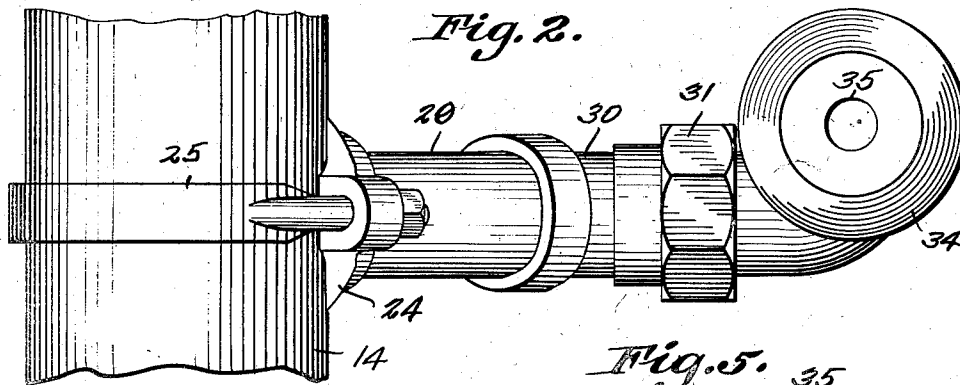
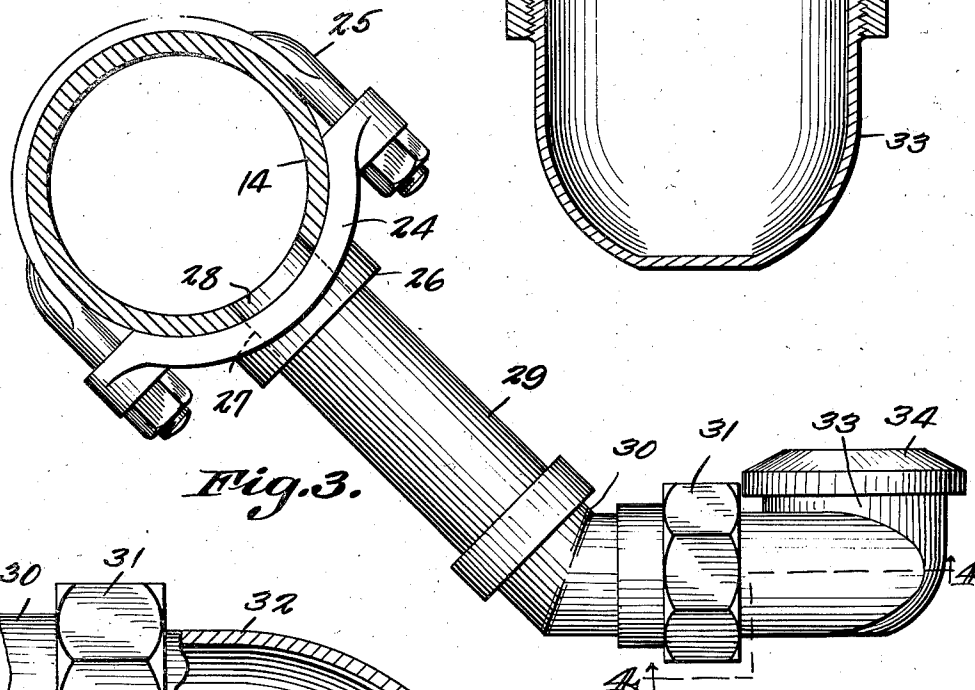
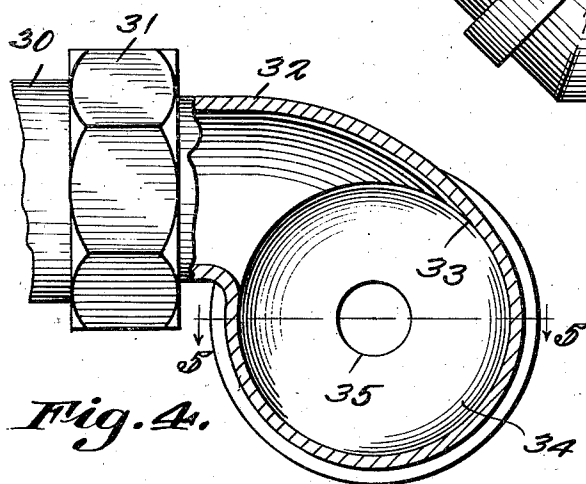
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*Fig. 6.*

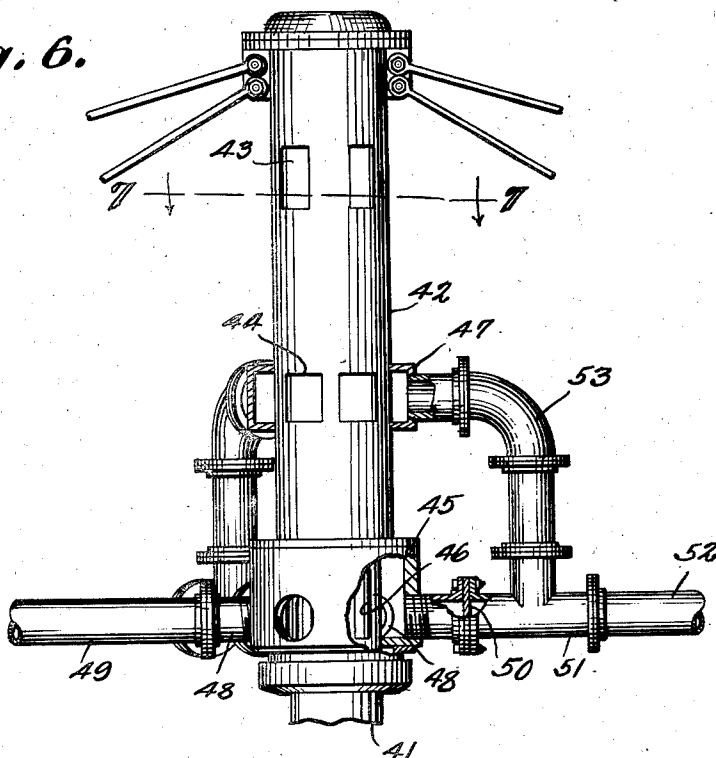
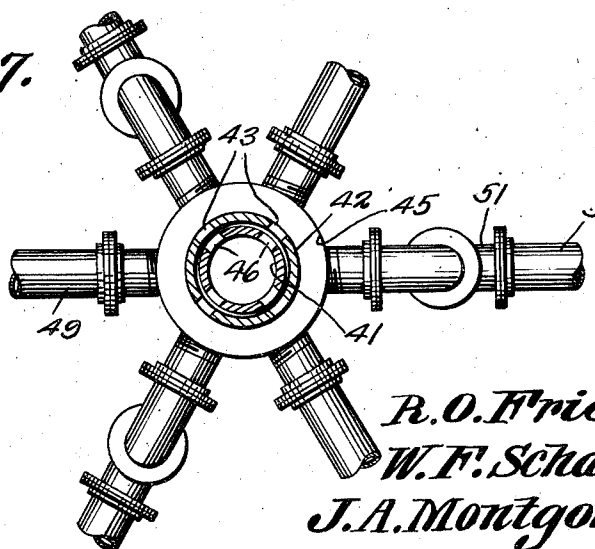


*Fig. 7.*



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## UNITED STATES PATENT OFFICE

2,263,125

## ROTARY DISTRIBUTOR

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Application April 2, 1940, Serial No. 327,510

4 Claims. (Cl. 299—69)

This invention relates to rotary distributors for trickling filters used in connection with water purifying systems, sewage disposal systems, etc. It is designed more especially as an improvement upon the structure disclosed in our co-pending application filed October 14, 1938, Serial No. 235,036.

An object of the invention is to provide nozzles of new and novel construction so assembled with a supply or stand-pipe that liquid supplied thereto under as little as a one and one-half foot head, will be delivered in a rain-like spray over the filter bed.

Another object is to provide an apparatus so constructed that, under certain conditions, it can operate under comparatively low flows while at other times it can be operated at higher rates, this change being effected without necessitating any change in the nozzles forming a part of the apparatus.

A further object is to so proportion and assemble the nozzles with a stand-pipe that a correct working head to the nozzle can be maintained without danger of blowing out the mercury seal used for preventing leakage between the working parts.

A still further object is to utilize a means by which an excessive head due to retardation of flow to the nozzle or stoppage of any of the nozzles will be prevented and resultant blowing out of the mercury seal likewise avoided.

Another object is to provide nozzles each of which is so constructed that it can be cleaned out without in any way changing the distribution adjustment of the nozzle.

A further object is to provide nozzles any one of which can be adjusted to deliver liquid at a desired elevation and in any direction relative to the axis of rotation of the distributor, thereby to permit field adjustment to insure uniform distribution of liquid over the entire filter bed and also control the speed of rotation.

With the foregoing and other objects in view which will appear as the description proceeds, the invention consists of certain novel details of construction and combinations of parts hereinafter more fully described and pointed out in the claims, it being understood that changes may be made in the construction and arrangement of parts without departing from the spirit of the invention as claimed.

In the accompanying drawings the preferred form of the invention has been shown.

In said drawings:

Figure 1 is a central vertical section through

a portion of the rotary distributor, illustrating the working parts.

Figure 2 is an enlarged plan view of one of the nozzles and its mounting.

5 Figure 3 is a front elevation of the structure shown in Figure 2, the tubular distributing arm being shown in section.

Figure 4 is an enlarged section on line 4—4, Figure 3.

10 Figure 5 is a section on line 5—5, Figure 4.

Figure 6 is a view partly in section and partly in elevation showing the central portion of a modified form of the apparatus.

Figure 7 is a section on line 7—7, Figure 6.

15 Referring to the figures by characters of reference, 1 designates a supply or stand-pipe to the flanged upper end of which is bolted or otherwise joined the flanged lower end of a distributor column 2. The upper end of the column is closed by a recessed head 3 containing an anti-friction bearing 4 which is interposed between said head and a cap 5 mounted for rotation relative to the distributor column. To the marginal portion of the cap is bolted or otherwise attached a ring 6 having wings or webs 7 to which are attached the upper ends of downwardly diverging guys 8 adapted to be attached at their lower ends to distributing arms as hereinafter explained.

20 Ring 6 is joined to and rotates with the upper end of a rotating column or sleeve 9 which extends around the stationary column 2 and is annularly spaced therefrom. The flanged lower end 10 of this outer rotatable column is bolted or otherwise joined to the flanged upper end of a manifold 11 extending around the stationary column 2 and providing a distributing chamber 12 having annularly spaced outlets 13 from each of which is extended a distributing arm 14 adapted to receive liquid from the manifold.

40 Depending from the manifold 11 is a circular apron 15 constituting the rotatable member of a fluid seal. The stationary or container portion of this seal is in the form of a sleeve 16 mounted on the bottom flange of the stationary column 2 and serving to retain a suitable sealing fluid, such as mercury indicated at 17. A gutter 18 surrounds the upper open end of the seal and has drain openings 19 for maintaining communication between the bottom of the gutter and the interior of the sleeve 16.

That portion of the stationary column 2 which is surrounded by the chamber 12 is provided with a desired number of outlet slots 20 through which liquid can flow freely from the column 2

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into manifold 11 and thence through the outlets 13 to the tubular distributing arms 14.

Overflow or release openings 21 are formed in column 2 at predetermined points above the level of the outlets 20 and additional openings 22 are provided in the outer or rotating column at points where they will successively move into register with the openings 21.

Each of the distributing arms 14, which is closed at its outer end, as shown at 23, is supported by one or more of the guys 8. These arms can be straight from end to end or can be Y-shaped as shown in my co-pending application herein referred to. However the size and shape of each arm constitute no part of the present invention as these may be varied to meet the requirements.

Each of the distributing arms 14 is equipped with one or more nozzles shown in detail in Figures 2 to 5 inclusive, and each nozzle includes a coupling plate 24 adapted to straddle arm 14 and be held thereto by a screw-threaded yoke 25 also embracing the arm. The coupling plate 24 has a circular flange 26 projecting therefrom and around an opening 27 extending through the plate. As shown in Figure 3 this opening is adapted to register with a terminal opening 28 formed within the arm 14 and when the plate 24 is fastened firmly to arm 14, liquid will be free to flow directly from said arm into the opening 27. Flange 26 is adapted to receive one end of a tubular nipple 29 to the other end of which is joined an elbow 30 carrying a union 31. This union provides a connection between elbow 30 and the tubular stem 32 of the nozzle head 33. As shown particularly in Figure 4, the stem 32 discharges along substantially tangential lines into the head 33 so that liquid being delivered into the nozzle under a suitable head will be caused to swirl therein. The head of the nozzle is bowl-shaped as shown in Figure 5 and is closed at the top by a screw-threaded cap 34 having a central circular orifice 35 constituting the outlet of the nozzle. Thus when a swirling action of the fluid is set up within the bowl-like nozzle, the upper portion of the liquid in the nozzle will be thrown outwardly through the aperture 35 and distributed in the form of a rain-like spray over a surface beneath the nozzle.

Obviously by loosening the union 31 the stem 32 can be adjusted angularly about its longitudinal center so as to vary the pitch of the cap 34 relative to the plane in which said cap is adapted to move about the column 2. By positioning the nozzle so that its outlet is not in a horizontal plane, the reaction of the outflowing liquid will cause the apparatus to revolve about the column 2 at a speed which will be determined by the angle at which the nozzle is placed and by the head of the liquid.

Obviously cap 34 can be removed and the interior of the nozzle cleaned without necessitating any change in the adjustment previously made. Therefore following adjustment of the parts in the field for the purpose of obtaining the desired speed of rotation and distribution of liquid, this being permissible by reason of the use of coupling or union 31, cleaning of the nozzle can be effected without disturbing the adjustment.

The number of nozzles used in connection with the apparatus will depend upon the size of the filter bed (not shown) located beneath the arms 14 and to which the liquid is to be distributed in the form of a rain-like spray. It is designed,

however, to provide a head of liquid within column 2 sufficient to keep all of the nozzles constantly supplied with liquid. It is further designed, however, to prevent the creation of a head in the column 2 sufficient to blow out the mercury seal should one or more of the nozzles become clogged. It is for this reason that the openings 21 and 22 have been provided. These openings are so located that liquid within the column will escape therethrough before the head is sufficient to blow out the mercury. Normally, however, these openings are located above the level of the liquid in the column. Thus it will be noted that these openings 21 and 22 and the column 2 together with the revolving column 9, cooperate to maintain within the apparatus a head sufficient to insure a constant flow of liquid to all of the nozzles under a predetermined head and also to maintain that head or substantially the same head to all operating nozzles should one or more of the nozzles become clogged.

To facilitate cleaning out the manifold 11, an opening 36 having a suitable closure 37 may be provided.

A suitable number of stub shafts 38 can be extended downwardly from the manifold 10 and each of these may have a wheel 40 thereon for rolling contact with the periphery of the bottom flange on column 2. Only one of these shafts and rollers has been shown. These have been provided for the purpose of holding the lower portions of the columns properly centered during the operation of the apparatus.

The structure thus far described is of a type wherein operation under high flows or low flows cannot be effected without changes in the sizes of the nozzle orifices. Under certain conditions it is desirable to operate rotary distributors on comparatively low flows while at other times it is necessary that they be rotated at much higher rates. Naturally, during periods of low flow, there would not be sufficient liquor to give proper nozzle reaction and driving force if all of the nozzles were in operation simultaneously. During periods of high flow, unless more nozzles should be available, the nozzles which are used during low flow would not have orifices large enough to take care of the peak flows. The foregoing applies to the structure shown in Figures 1 to 5 inclusive.

To meet the objections noted and allow for operation under different conditions mentioned, the apparatus illustrated in Figures 6 and 7 has been designed. In this modified form the column 41, which corresponds with the column 2 and the rotating column or sleeve 42, which corresponds with the rotating column or sleeve 9 are both not only provided with upper slots 43 but they are also provided with intermediate slots 44. A manifold 45 is joined to the bottom of the revolving column 42 and opens therein and this manifold surrounds that portion of the stationary column 41 in which are formed the lower slots 46. An intermediate manifold 47 is extended around and joined to the revolving column 42 and is located where the slots 44 will open into it.

Tubular arms 48 are extended radially from the lower manifold 45 and open therein. In the illustrated structure distributing arms 49, which can be similar to the arms 14, are connected to alternate arms 48. The remaining arms 48 are closed by plates 50 which are bolted between said inner arms and the flanged inner ends of T-shaped fittings 51 from the outer ends

of which are extended radially disposed distributing arms 52. These fittings 51 are joined to the upper manifold 47 by pipe connections 53. The arms 49 and 52 are all provided with nozzles but, when the apparatus is to operate under a low flow only, the liquid provided in the columns is supplied at such a rate as to reach a level in the columns below the slots 44. Thus the liquid will flow outwardly only through the slots 46 into the lower manifold 45 and thence to those distributing arms 49 which are in direct communication with manifold 45. When the apparatus is to be operated under a high rate of flow, the level of the liquid is raised above the slots 44 so that the liquid will thus flow not only into the arms 49 but also will flow outwardly into manifold 47 and thence downwardly through the pipe connections into the arms 52.

Obviously by providing an arrangement such as described it is possible to utilize two rates of flow without changing the nozzles and under all conditions the nozzle reaction will be ample to insure proper actuation of the apparatus.

While relief outlets have been shown in the upper end portions of the columns in both forms of apparatus, it is to be understood that these outlets can be dispensed with under certain conditions.

What is claimed is:

1. A rotary distributor including fixed and rotatable columns, means for directing liquid thereinto, separate distributing arms extending from and in communication with the columns at different levels respectively, nozzles carried by the arms and proportioned to deliver liquid at a rate sufficient normally to maintain liquid in the columns at a predetermined head, and means for releasing surplus liquid from the columns when the predetermined head is exceeded.

2. In a rotary distributor the combination with an apertured distributing arm mounted for rotation, of a nozzle connected to the arm and including an apertured plate registering with the aperture in the arm, means for binding the plate to the arm, a nipple extended from the plate, an elbow joined thereto, a bowl-like nozzle body

having a tubular stem opening thereinto along tangential lines, a union constituting means for coupling the stem to the elbow for annular adjustment and a removable cap on the body having a central outlet proportioned to deliver fluid in a rain-like spray at a low head and with a low reactive force for rotating the arm at low speed.

3. A rotary distributor including fixed and rotatable columns, means for directing liquid thereinto, said columns having overflow openings proportioned and positioned for the passage of liquid when brought above a predetermined level in the two columns, there being liquid outlets at two different levels in the columns, distributing arms extending from and in communication solely with the outlets at the lower level, distributing arms between the other arms and in communication solely with the outlets at the upper level, all of said arms being positioned in the same plane of rotation and being movable with the rotatable columns, and outlet nozzles carried by all of the arms.

4. A rotary distributor including a rotatable column having upper and lower manifolds, means for directing liquid into the manifolds, distributing arms radiating from and in communication with the lower manifold, distributing arms between the other arms and in communication with the upper manifold, all of the arms being rotatable with the manifolds and in the same plane, and nozzles carried by all of the arms, the nozzles carried by the arms of one manifold being proportioned to deliver a liquid at a rate sufficient normally to maintain liquid in the column at a predetermined head and the nozzles on all of the arms cooperating and being proportioned to deliver liquid at a rate sufficient normally to maintain liquid in the column above the level of the upper manifold, there being an overflow opening in the column for the relief of excess liquid when normal delivery through the nozzles is interfered with.

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