Jan. 23, 1945. W. KASTEN 2,367,873

FILTER

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FIG. 1.

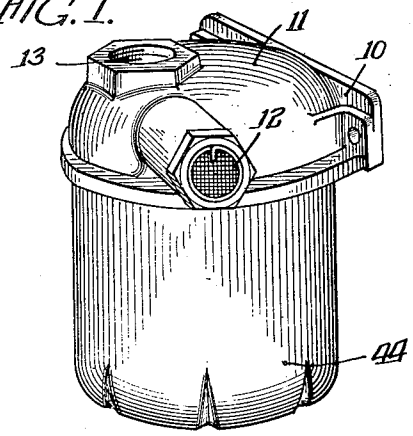



FIG. 2.

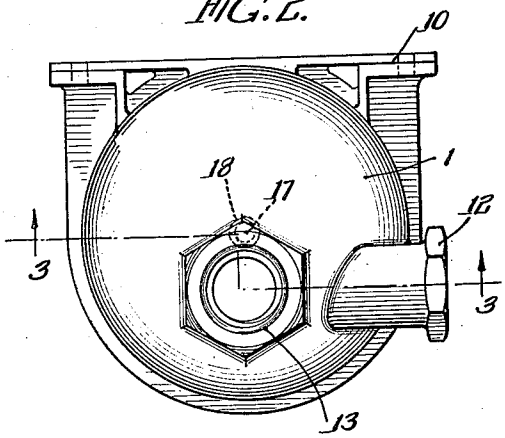
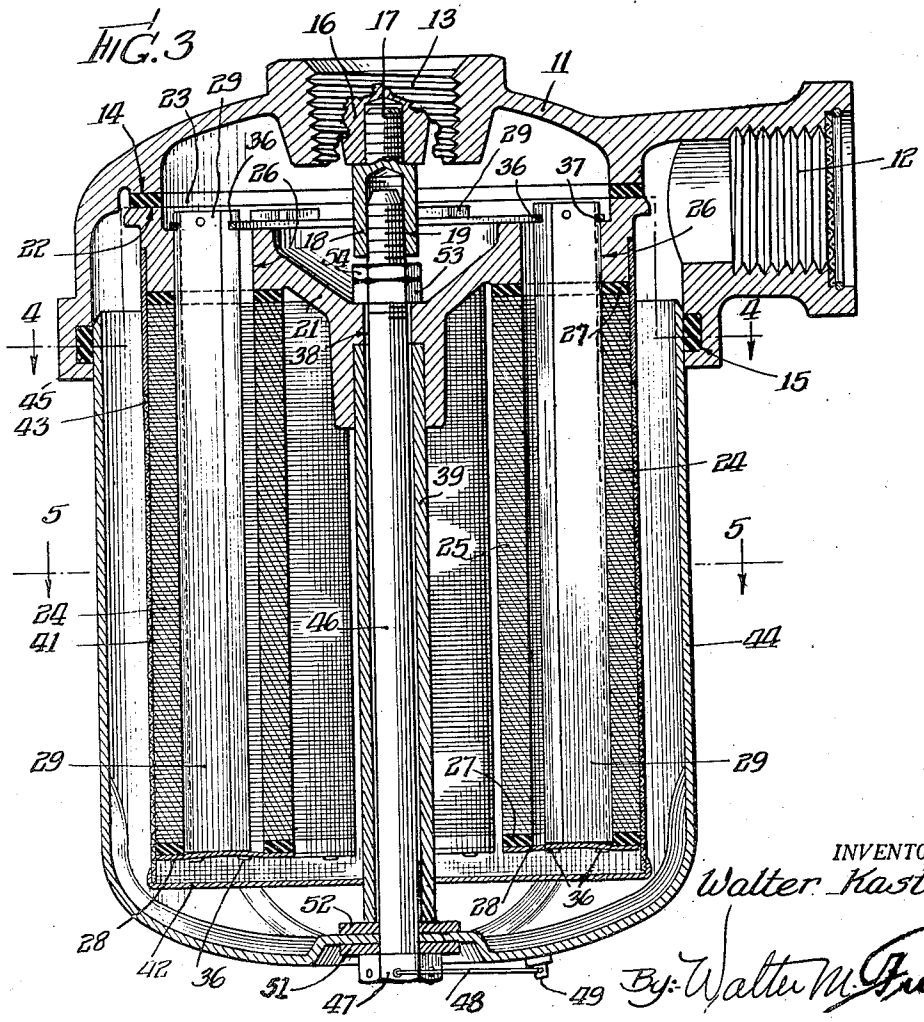



FIG. 3




INVENTOR.

Walter Kasten

By: Walter M. Fuller Atty.

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FIG. 4.

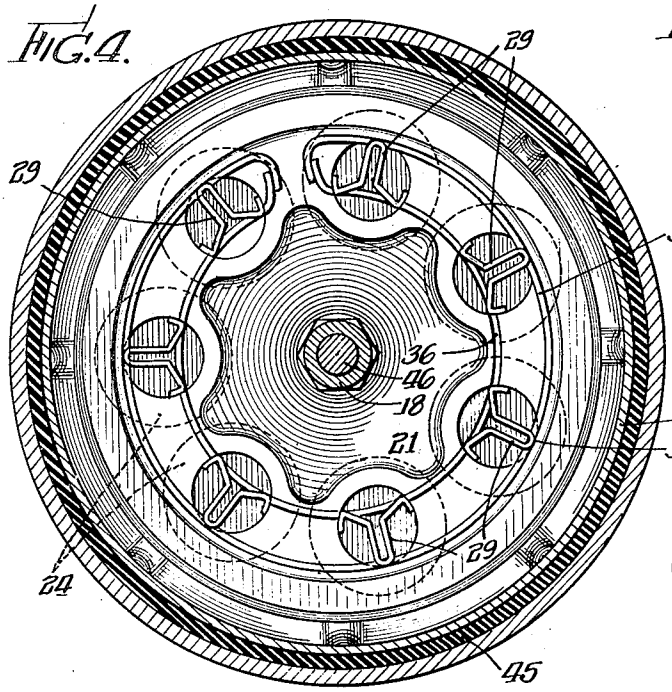



FIG. 6.

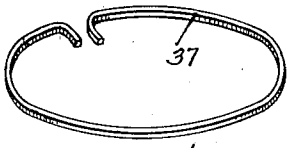



FIG. 7.

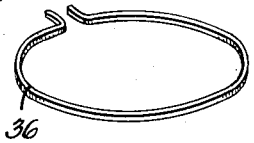



FIG. 8.

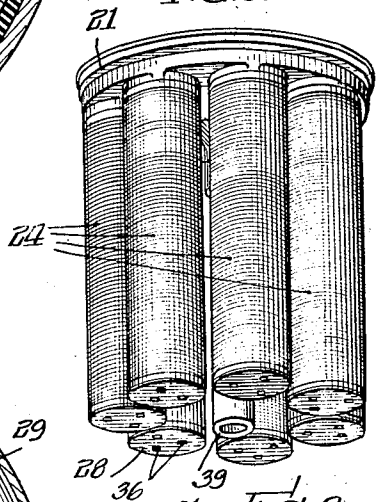



FIG. 5.

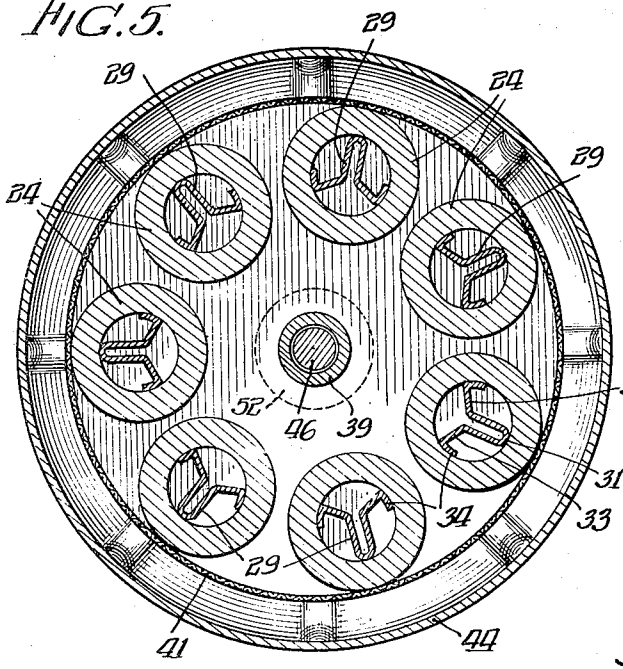
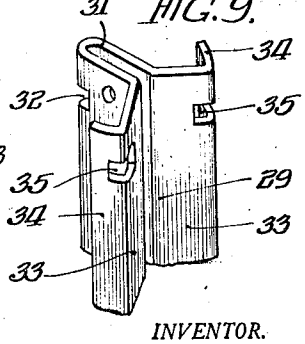



FIG. 9.




INVENTOR.

Walter Kasten

By: Walter M. Fuller
Atty.

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# UNITED STATES PATENT OFFICE

2,367,873

## FILTER

Walter Kasten, Franklin, Mich., assignor to Skinner Purifiers, Inc., Detroit, Mich., a corporation of Delaware

Application April 22, 1942, Serial No. 440,055

16 Claims. (Cl. 210—184)

The current invention concerns certain novel structural features in filters resulting in improved operating and cleaning properties of the appliance, an outstanding and prominent aim of the invention being to provide a construction of this type which is relatively simple, which is of comparatively small cost, which functions efficiently, which is unlikely to become damaged or injured during ordinary service, which can be assembled or taken apart with ease and facility, which does not require undue servicing, which is relatively-easily cleaned, etc.

To enable those acquainted with this art to fully understand the invention, both from structural and functional standpoints, a present preferred embodiment thereof has been illustrated in the accompanying drawings and, for simplicity, like reference characters have been used to designate the same parts throughout the several views.

In these drawings:

Figure 1 is a perspective view of the complete filter;

Figure 2 is a plan view of the same;

Figure 3 is a vertical section through the filter on the offset line 3—3 of Figure 2 on an enlarged scale and with a portion of the wall of the outlet broken away to show a part of the boss back of it in section;

Figure 4 is a horizontal section on line 4—4 of Figure 3;

Figure 5 is a horizontal section on line 5—5 of Figure 3;

Figure 6 is a perspective view of the outer locking-ring;

Figure 7 is a similar view of the inner locking-ring;

Figure 8 is a perspective view of the filter-pack assembly; and

Figure 9 is a fragmentary perspective view of the top portion only of one of the center bars or rods of one of the filter-packs.

Referring to these several views of the drawings, it will be noted that the appliance includes a top, downwardly-open casting 11 having a side screened-inlet 12 and a top outlet 13 both of which are adapted to be connected to suitable admission and discharge conduits, respectively, not shown, such casting being adapted to be attached by the part 10 to any suitable support.

Internally such member 11 has a flat, smooth, horizontal, ring-shaped seat 14 surrounding, and spaced away from, the outlet 13, and an internal, ring-shaped channel or groove 15 around the inside of the lower, round mouth or opening of the casting and below the inlet 12.

Additionally, such metal member 11 has a central, internal, downwardly-directed boss 16 with a screw-threaded cavity or socket permanently and non-detachably accommodating the threaded stem 17 of a depending stud 18 having a downwardly-opening, screw-threaded aperture 19.

The filter portion of the appliance, which may be used for the filtration of air, or other fluid, either gas or liquid, includes a round member or casting 21, of the cross-sectional shape clearly presented in Figure 3, and having at its top a smooth, flat, ring-shaped seat 22 bearing against the bottom face of a rubber, or other appropriate, ring-gasket 23 whose top face bears against the surface 14 of the top casting 11, thus sealing the joint between the two parts 11 and 21.

Mounted on and depending from, such supporting-member 21 are a plurality, in the present instance seven, of filter-packs, each characterized as a whole 24, and each comprising a stack of registered, centrally-apertured, paper, or other appropriate discs 25 impregnated or charged with a suitable material rendering them impervious to, or unaffected by, the medium undergoing filtering and its contaminating elements, such medium, during the filtering operation, passing inwardly through the very shallow spaces between the discs and not through the material of the discs themselves.

Member 21 has seven, upright, circularly-arranged holes 26 therethrough each of which is in register with, and in direct communication with, the vertical passage through the corresponding filter-pack 24 formed by the registered apertures through the many discs 25 forming the stack.

As to each pack, a rubber, or other equivalent, elastic or resilient, disc or gasket 27 is interposed between the top disc of the pack and the under surface of the member 21, and a like disc 27 is employed between the lower end disc of the stack and a terminal metal disc 28 of the same size as the paper discs.

In order to maintain the discs 25 and the associated terminal gaskets 27, 27 in their correct registered relation, and, at the same time, to allow the filtered medium, after flowing inwardly between the discs 25, to pass up through the central passage of the pack and the companion aperture 26 and to leave the filter through the outlet 13, a longitudinally-bent, three-armed, sheet-metal rod or bar 29, of the same diameter as the caliber of such passage and aperture occupies such aligned openings (Figure 3), one arm 31 of

such member 29 (Figure 9) being double and externally recessed near its upper end at 32, each of the other two arms 33 of such member having a bent rib at 34, the two parts 33 and 34 in each instance being externally recessed at 35, all three recesses being in the same transverse plane just above the top face of the member 21, as is clearly portrayed in Figure 3.

At their lower ends, these three, integral, radiating ribs or arms are supplied with three tongues 36, forming parts thereof, extended through holes in the metal end-disc 28 and bent over below the latter to firmly unite such disc 28 with the part 29.

As is illustrated more clearly in Fig. 4, an inner, split locking-ring 36, which normally tends to expand, and which bears on the upper face of casting 21, occupies all of the recesses 35 of the several packs, and another, companion, outer, split-locking ring 37, also bearing on casting 21 and normally tending to contract, fits in all of the recesses 32 of the several elements 29, these two rings holding all of the filter-packs 24 on the casting 21 and with the resilient discs or gaskets 27, 27 under compression, so that all of the intermediate filtering-discs 25 are held firmly pressed together face-to-face under sufficient force to assure an efficient filtering action.

Casting 21 has a central hole 38 therethrough in register with a downwardly-directed tube 39 fitted in a larger-diameter section of such hole and fixed to the casting in any approved manner ing 21, occupies all of the recesses 35 of the sevas by welding, or by a tight fit, or otherwise.

Fitted around such member 21 is the upper portion of a very fine, cylindrical, metallic screen 41 whose lower end is covered with, and closed by, a metal-disc 42 secured around its circular margin to the lower edge of the screen, such closure having a central aperture which receives the tube 39, the latter extending downwardly below the part 42 as is fully shown in Figure 3.

Such screen 41 at its upper end snugly fits around casting 21 so that there is no space between them, although the screen can be readily removed from the casing, by pulling apart longitudinally, when required for cleaning.

In order that the air, or other fluid, to be filtered, entering the filter through the inlet 12, may not impinge directly through the tiny apertures of the screen on to the upper portion of the encased filter-packs, the minute openings through the upper part of the foraminous or reticulated screen 41 are sealed closed by any suitable means, such as by the rubber or other cement, from its top end down, to a point 43 well below such intake 12.

A sheet-metal cup-shaped shell or casing 44, ribbed about its lower end for strengthening purposes, at its upper end fits inside of the mouth of the casting 11 and the joint between the two is sealed by a rubber or other gasket ring 45 occupying the channel 15, the center of the bottom wall of such shell 44 having an aperture therethrough receiving the shank of a long bolt 46 whose laterally-perforated head 47, below the shell, may be held against unintentional turning by a locking-wire 48 extended through one of the bolt-head holes and an opening through a projection 49 on the underside of the shell.

Between such bolt-head 47 and the bottom surface of the shell is a fibre or comparable washer 51, and between the opposite surface of the shell and the adjacent end of the tube 39 is a similar or like washer 52, both washers desirably being cemented to the shell or casing the upper threaded end of the bolt fitting in the screw-threaded cavity 19 in the lower end of the depending, stationary stud 18, whereby the single, manually-removable bolt normally holds all of the demountable elements of the filter in proper assembled relation.

In the central, upper depression of the part 21, such bolt 46 is provided with a nut 53 which is held in adjusted position on the bolt just above such casting 21 by a lock-pin 54.

The parts of the novel structure are assembled in this manner:

Assuming that the groups of associated discs 25 and 27 have been assembled on their bars 29, which have been already mounted on, and clinched to, their terminal discs 28, the end portions of such bars are extended through the apertures 26, and, while pressure is placed against the opposite ends of the filter-packs to hold their discs in proper pressure relation with one another, such condition is permanently maintained by applying the two rings 36 and 37 to the recesses or notches of such bars, thus securely mounting the plurality of filter-packs on the underside of the casting 21 with all of the discs of each pack adequately pressed together face-to-face by reason of the elasticity of the resilient discs 27, 27.

Then the screen 41 is applied over the filter-packs with its upper end portion firmly frictionally engaging the casting 21 over which it fits.

Thereupon, the shell 44 with its two washers or gaskets 51 and 52, which are desirably adhered to the shell as by cement or the like, is mounted on the bolt, upon the accomplishment of which, support 21 and its group of filter-packs are placed in the shell, through its then open mouth, with the bolt 46 occupying the interior of tube 39 and the aperture 38.

Then nut 53 is screwed on to the upper end portion of the bolt and locked in proper adjusted position by the pin 54 or its equivalent.

Assuming that the two rubber or similar gaskets 23 and 27 have been put in place, the foregoing assembly is mounted on the under side of the top casting or head 11 by screwing the bolt 46 into the cavity 19 by turning the bolt-head 47, and then the locking-wire 48 may be employed to preclude the loosening of the bolt as by jarring or otherwise.

Thus the bolt 46 maintains the shell or casing 44 in place and the latter, through the tubular-extension 39, holds the filter-pack support 21 in position.

The air, or other fluid, to be filtered may be caused to flow through the filter by reason of a partial vacuum applied to the outlet 13 or air or fluid under pressure may be forced through the filter by introducing it through the inlet 12.

In either instance, the air circulating around the space outside of the upper closed portion of the dispersing or diffusing screen passes downwardly substantially uniformly around the outside of the screen and then through the multitudinous minute apertures thereof so that it is practically uniformly fed to the exteriors of the enclosed filter-packs, between the discs of which it flows leaving its contaminating dust or like on the outsides of the packs from which most of it falls down into the bottom part of the filter, the thus cleaned air or other fluid traveling upwardly through the inner passages of the packs into the

top chamber of the filter and out through the discharge-opening 13.

The distributing screen executes its main or paramount function not only of directing the air to the filter-packs with practical uniformity or homogeneity, whereby the packs act with efficiency and effectiveness, but the screen also performs the work of a preliminary filter in that a material part of the contaminating material may not reach the filter-packs in that the screen itself extracts it.

By the time the filter needs cleaning, it may be that the gasket 23 has become adhered to the casting 11 and also to the part 21 and that the gasket 45 has in similar manner cleaved to member 11 and is held tight to the shell 44, either of which prior occurrences might render the removal of the shell and filter-packs a matter of some difficulty without injury to them.

It is to overcome such trouble without inconvenience that the nut 53 is employed.

When the bolt 46 is turned, after releasing it from wire 48, to free its upper threaded end from the socket 19, the nut 53, before the screw-threaded end of the bolt leaves the internally-threaded socket 19 of stud 18, by engagement with the casting 21 pushes down the latter and its filter-packs and screen, and the thus forced descent of the tube 39 with such member 21 initially compels the downward travel of the shell 44 which necessarily breaks any adhesion between it and its surrounding gasket 45, the turning of the bolt having also pushed casting 21 from gasket 23, further turning of the bolt freeing it from socket 19.

The parts of the filter having been thus forcefully and easily removed from the top casting 11, the screen may be separated from part 21 and the contained extracted dirt in the filter may be readily disposed of as by first applying compressed-air into the open ends of the tubular filter-elements, which reverses the normal air flow thus loosening any external surface deposits, whereupon the latter may be blown off by directing the compressed-air longitudinally along the packs from each end, care being exercised not to apply the air-jet at a right-angle to the pack as this would have a tendency to wedge impurities between the filter-discs. Any remaining dust can be wiped off the filter-packs, bowl and diffusing-screen.

Upon completion of such cleaning or reconditioning procedure, the removed parts can be reassembled in their original relation.

Those acquainted with this art will readily understand that this invention, as defined by the appended claims, is not necessarily limited or restricted to the precise and exact structural details illustrated and described and that reasonable modifications may be resorted to without departure from the invention and without the loss or sacrifice of any of its material benefits and advantages.

I claim:

1. In a filter of known general type including a hollow head having a downwardly-opening mouth, an inlet for the unfiltered fluid, and an outlet for the filtered fluid surrounded by a downwardly-facing seat, a demountable casing forming an enclosure with said head, a support in and removable from said head, filter-means in said enclosure and operative between said inlet and outlet, and means mounting said filter-means on, depending from, and communicating with said outlet through, said support, a gasket bearing on said head-seat and surrounding said outlet, a seat on said support bearing on the opposite face of said gasket and surrounding said outlet, the novel combination of externally-operative fastening-means in major part inside of said enclosure and having a screw-threaded connection with said head to hold said support normally pressed against said gasket, and means actuated by said fastening-means to force said support from said gasket while said support and filter-means are undergoing release from said head by operation of said screw-threaded connection by said fastening-means.

2. The novel combination set forth in claim 1 including the additional novel feature that said fastening-means normally holds said casing in association with said head.

3. In a filter of known general type including a hollow head having an inlet for the unfiltered fluid, an outlet for the filtered fluid, and a downwardly-open mouth lower than said inlet and outlet, a casing normally extending part-way in the mouth of said head, and thereby forming an enclosure with said head, a support in and removable from said head, filter-means in said enclosure and operative between said inlet and outlet, means mounting said filter-means on, and depending from, said support, a gasket in a seat in the mouth of said head surrounding and engaging the exterior of said casing, the novel combination of externally-operative fastening-means having screw-threaded connection with said head and normally maintaining the casing in the specified relation, and means coacting with said fastening-means forcibly extracting the casing from said gasket when said screw-threaded connection is turned by said fastening means to demount the casing.

4. In a filter of known general type having a hollow head with an inlet for the unfiltered fluid, an outlet for the filtered fluid, a downwardly-facing seat in the head surrounding said outlet, and a downwardly-open mouth lower than said inlet and outlet, a casing closing the mouth of, and thereby forming an enclosure with, said head, a casing-gasket between said casing and head, a support in and removable from said head, filter-means mounted on, depending from, and communicating with said outlet through, said support, a support-gasket surrounding said outlet and having one side bearing on said head-seat, said support having a seat surrounding said outlet and bearing on the opposite side of said support-gasket, the novel combination of externally-operative fastening-means having screw-threaded connection with said head and normally maintaining said casing in place, intermediate means between said casing and support normally maintaining said support in place pressed against said support-gasket by said fastening-means acting through said casing, and means actuated by said fastening-means upon turning of its screw-threaded connection and before freeing said support from said head to force said support from said support-gasket and through said intermediate-means to force said casing from said casing-gasket.

5. In a filter of known general type having a head with an inlet for the unfiltered fluid, an outlet for the filtered fluid, a downwardly-open mouth, and a downwardly-facing seat surrounding said outlet, a demountable casing forming an enclosure with said head and in part occupying said mouth, a support in and removable from said head, and filter-means mounted on, depend-

ing from, and communicating with said outlet through, said support, a support-gasket bearing on said head-seat and surrounding said outlet, said support having an upwardly-facing seat bearing on the under face of said support-gasket and surrounding said outlet, a casing-gasket in the mouth of said head, engaging the outer surface of said casing, and sealing the latter with said head, a screen mounted on and detachable from said support and encasing said filter-means, the novel combination of a single externally-operative fastening-means having screw-threaded connection with said head and detachably fastening said support, filter-means, screen and casing in said head, and means cooperating with said fastening-means initially forcing said support from said support-gasket and initially forcing said casing from said casing-gasket when said fastening-means is turned to actuate said screw-threaded connection to dismantle the filter for cleaning purposes or replacement of the filter-means.

6. The novel combination set forth in claim 5, in which the openings through the upper portion of said screen are closed to preclude the unfiltered fluid entering the filter through said inlet from impinging directly on said filter-means.

7. The novel combination set forth in claim 4 in which said fastening-means is a bolt, in which said support-forcing means is a nut on said bolt adapted to engage said support, and in which said casing-forcing means includes a tube between said support and the lower portion of said casing, and accommodating said bolt.

8. The novel combination set forth in claim 5 in which said fastening-means is a bolt, in which said support-forcing means is a nut on said bolt adapted to engage the top of said support, in which said casing-forcing means includes a tube depending from said support, engaging the lower portion of said casing, and accommodating said bolt, and in which the lower end of said screen has an aperture through which said tube extends.

9. The novel combination set forth in claim 5 in which said screen has a friction fit only with said support.

10. In a filter of known general type having a plurality of filter-elements arranged in a circle, each such filter element including a series of registered face-to-face contacting layers of a rough-surface material surrounding a central passage therethrough, an end-member overlying and closing one end of the element, and a rod in said passage attached to said end-member, the filter including an apertured support with its apertures arranged in a circle in register with said passages of said filter-elements and with the open ends of said filter-elements bearing against a face of said support, said rods extending through and beyond said support apertures, the novel improvement being that the portions of said rods protruding beyond the side of said support opposite said elements have side recesses, in combination with a split, resilient locking-ring bearing on said support, having a normal tendency to change its size, and occupying the recesses of said rods thereby securing said filter-elements to said support, such tendency automatically holding said ring in said recesses.

11. The novel combination of features in filters set forth in claim 10 in which said rod-recesses are in the outer portions of said rods, and in which said locking-ring occupying said recesses tends to contract, thereby holding it in said recesses.

12. The novel combination of features in filters set forth in claim 10 in which said rod-recesses are in the inner portions of said rods, and in which said locking-ring occupying said recesses tends to expand, thereby holding it in said recesses.

13. In a filter having a plurality of filter-elements arranged in a circle, each such filter-element including a series of registered face-to-face contacting layers of a rough-surface material surrounding a central passage therethrough, an end-member overlying and closing one end of the filter-element, and a rod in said passage attached to said end-member, the filter including an apertured support with its apertures arranged in a circle and in register with said passages of said filter-elements and with the open ends of said elements bearing against a surface of said support, said rods extending through and beyond said support apertures, the novel improvement being that the portion of each of said rods protruding beyond the surface of said support opposite said elements has inner and outer side recesses, in combination with inner and outer split, resilient locking-rings bearing on said support and occupying the corresponding recesses of said rods thereby securing said filter-elements to said support, said inner ring tending to expand into its rod recesses and said outer locking-ring tending to contract into its rod recesses.

14. The novel combination of features in filters set forth in claim 10 in which each said rod comprises a longitudinally-bent sheet-metal member having in cross-section at least three radiating arms.

15. The novel combination of features in filters set forth in claim 10 in which each said rod comprises a longitudinally-bent sheet-metal member having in cross-section at least three radiating arms, one of said arms being formed of two thicknesses of the metal-sheet, each of the remaining arms being formed of a single-thickness of the metal-sheet.

16. The novel combination of features in filters set forth in claim 10 in which each filter-element has at least a disc of resilient material held under compression by said locking-ring, thereby maintaining all of the layers of the rough-surface material of each element under pressure.

WALTER KASTEN.