

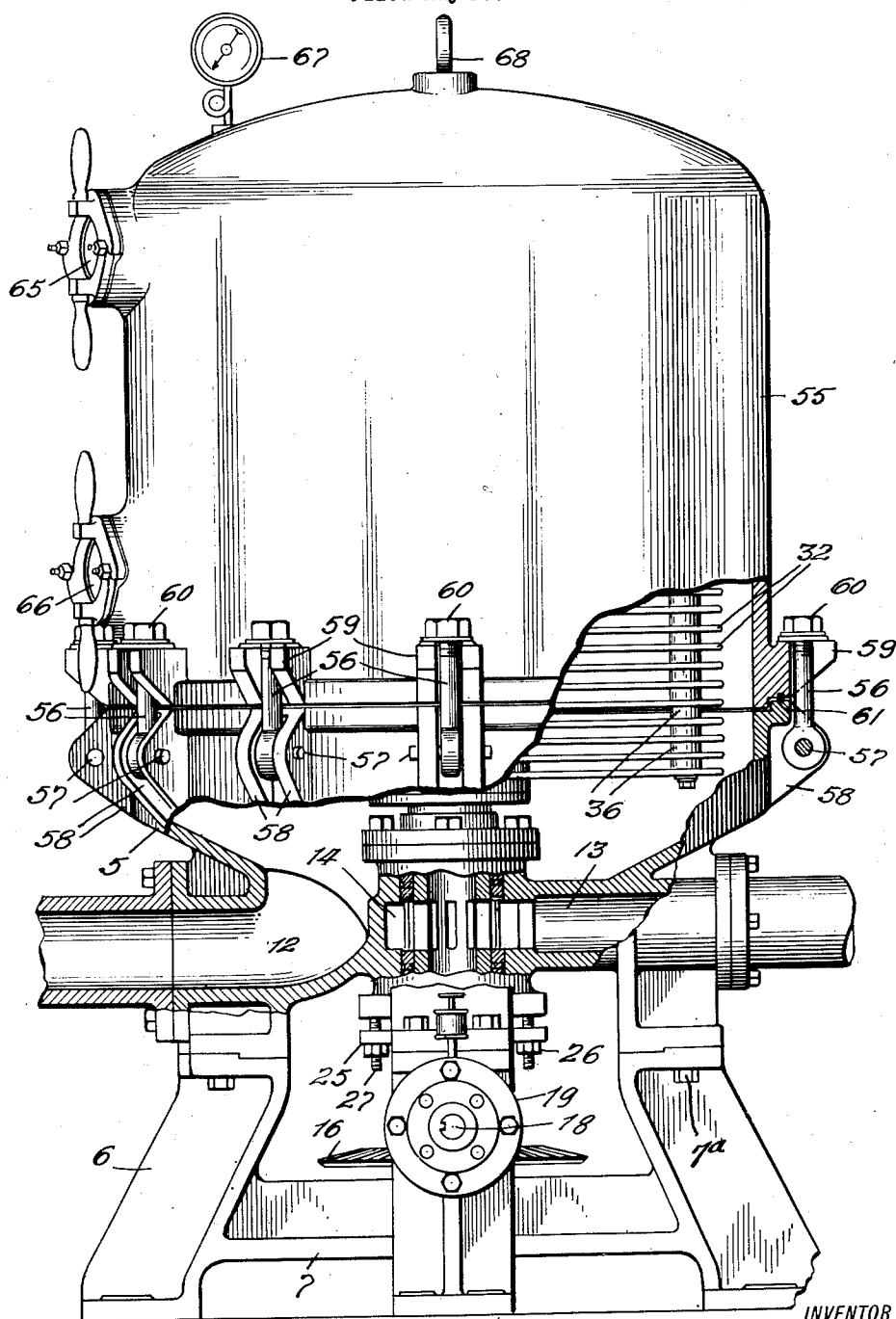
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E. J. SWEETLAND
APPARATUS FOR FILTERING

Filed May 10, 1922

3 Sheets-Sheet 1



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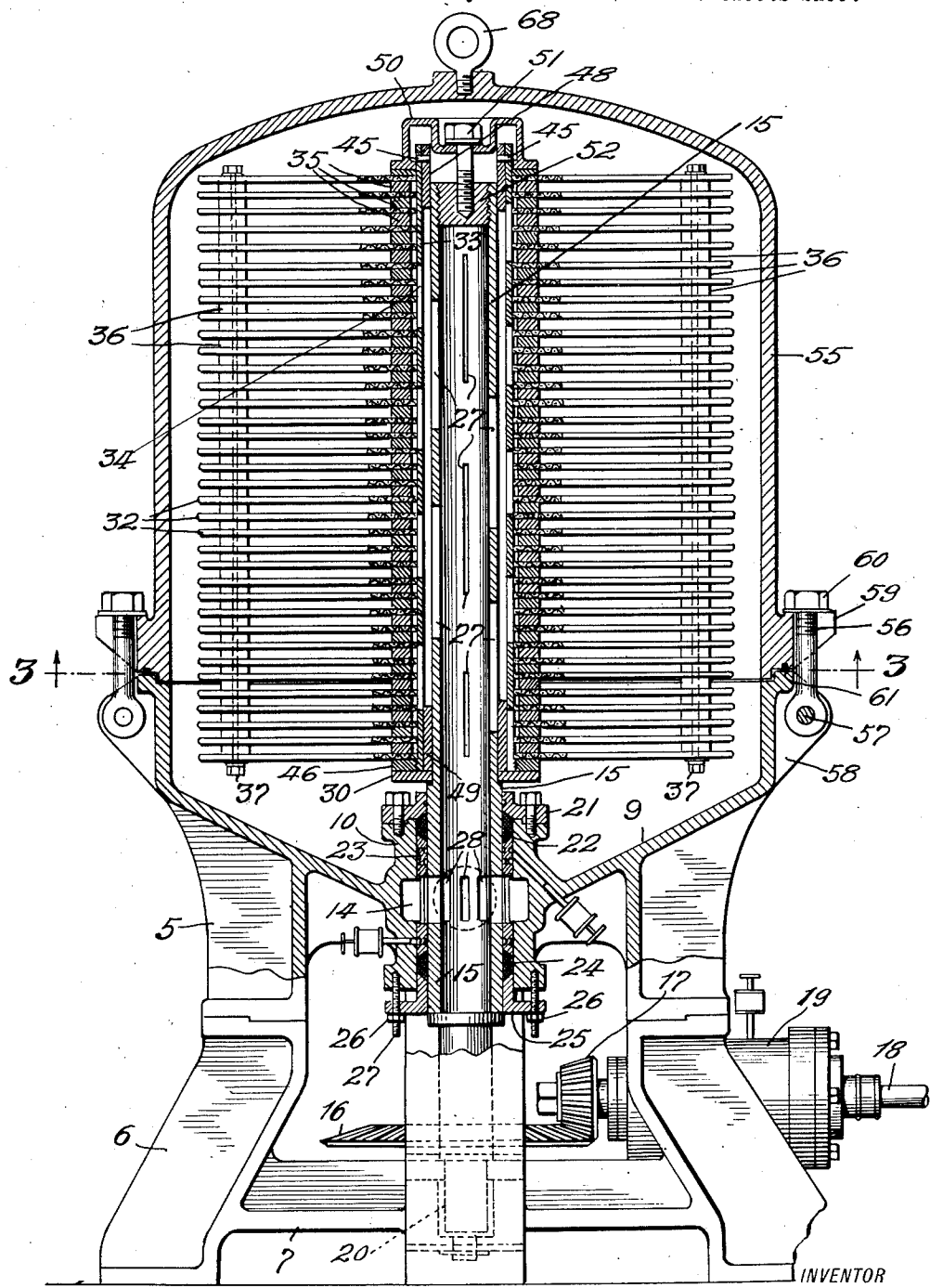
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3 Sheets-Sheet 3

Fig. 3.

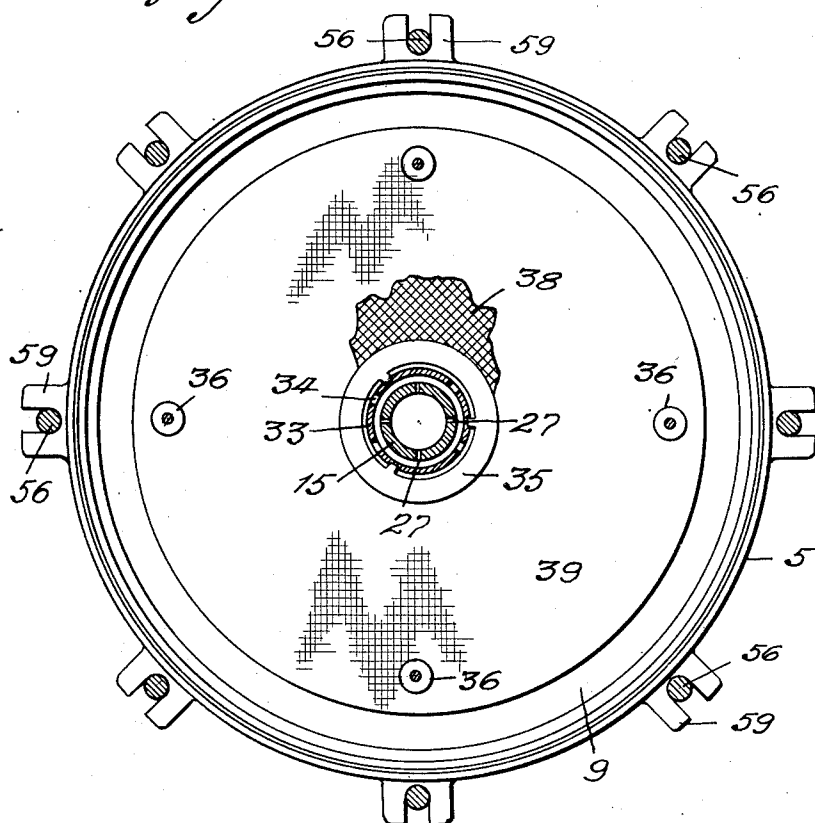
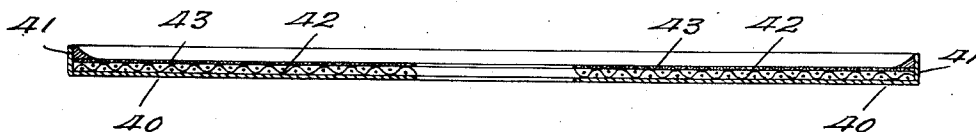


Fig. 4.



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APPARATUS FOR FILTERING.

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This invention relates to certain new and useful improvements in apparatus for filtering, and is particularly, although not exclusively useful in connection with the filtration of sugar syrups.

The invention will be understood from the following description taken in connection with the accompanying drawings in which Figure 1 is an elevation, partly in section, of a filter embodying the invention; Figure 2, is a sectional elevation taken at right angles to Figure 1; and Figure 3 is a plan view, partly in section on the line III—III of Figure 2, and Figure 4 is a sectional view of a new form of filter leaf for use with the invention.

Referring to the drawings, the filter is shown as provided with a base 5 and a frame 6 which have machined cooperating faces and are connected by bolts 7. As will be obvious from Figures 1 and 2, the frame 6 is provided with four leg portions which are joined by horizontal connection portions 7 which serve to support a vertical shaft, as hereinafter described. The base 5 is provided with a top in the form of a conical bowl 9, at the center of which is a cylindrical portion 10 through which passes the shaft above mentioned. Cored in the base 5 is a passage 12 which communicates with the conical bowl 9, and a passage 13 communicating with an annular cavity 14 on the inside of the cylindrical portion 10. The vertically arranged shaft 15, which has been hereinbefore mentioned, is revolubly supported in the frame and base and projects above the top of the latter. Fixed to said shaft is a bevel gear 16 which meshes with a bevel pinion 17 secured to a shaft 18 journaled in a suitable bearing 19 in one of the legs of the panel 6. As shown, the lower end of the shaft 15 is journaled in a step bearing 20 which may be of any suitable form and is located in the horizontal portions 7 of the frame 6; and said shaft is rotatably held in its vertical position by a bearing within the cylindrical portion 10 of the base 5, at the top and bottom of which are stuffing boxes. As best shown in Figure 2, the cylindrical portion 10 has bolted to its top a flange 21, which surrounds the

shaft 15. Below the flange 21 packing material 22 may be inserted, and this material is engaged by a sleeve 23 which may be grooved as shown for lubricating purposes; and below this sleeve 23 is inserted packing material 24, which is engaged by a gland 25 adapted to be forced upwardly by the nuts 26 threaded upon pins 27 screwed into the bottom of the cylindrical portion 10 of the base 5 and passing thru holes in the gland 25. When the gland 25 is forced upwardly, the packing 24 is compressed and an upward pressure is exerted on the sleeve 23 which puts the packing 22 under compression, thus forming stuffing boxes at the top and bottom of the cylindrical base portion 10.

The upper portion of the shaft 15 is hollow and provided with perforations 27, and with perforations 28 at the point adjacent the annular cavity 14 in the cylindrical base portion 10 which communicates with the passage 13. At a point above the cylindrical portion 10 on base 5, the shaft 15 is provided with a shoulder adapted to receive a collar 30, which supports the filter element which will now be described. The filter element comprises a plurality of filter leaves 32 which are mounted on a sleeve 33 provided with perforations 34 with which the edge of the leaves communicate. The leaves are assembled on the sleeve 33 with spacing rings 35 between the leaves near their inner edges; and near their outer edges, the leaves are held spaced from one another by means of washers 36 held in place by bolts 37 which pass thru the washers and thru holes in the filter leaves. Any suitable number of sets of bolts 37 and washers 36 may be used, but in practice it will be found that four are ordinarily sufficient.

The filter leaves 32 may be of any suitable and well-known form, for example, of the kind which are composed of wire screen the faces of which are covered with filter cloth 39 in a well known manner. But for use when it is desired to wash the deposited material before it is removed from the filter leaves, I prefer to use the new form of filter leaf shown in Figure 4. In this form of leaf the bottom is made of a disc 40 of sheet

iron, having an upturned outer edge 41, and on the top of this disc is laid wire screen 42 which supports filter fabric 43. With this structure, the bottom of the filter leaf is
 5 impervious, and the sludge which is deposited on the upper side is prevented by the upturned edge from being eroded at the edges of the leaves during the washing operation.

10 The filter leaves may be assembled on the perforated sleeve 33 before the latter is mounted on the shaft 15; and after the assembling of the leaves has been completed, the sleeve 33 with the leaves thereon may be
 15 lifted by inserting hooks in the holes 45 and lowered over the shaft 15 until the bottom of the sleeve engages the disc 30. As will be understood from Figure 2, the bottom of the sleeve 33 is provided with a ring 46, preferably threaded on the sleeve and serving as
 20 a flange upon which the assemblage of filter leaves and spacing rings rests. It will also be noted from Figure 2, that the sleeve 33 is provided near its top and bottom with
 25 internally located rings 48 and 49, which serve to space the sleeve 33 from the shaft 15, thereby permitting the filtered liquid to pass from the edges of the filter leaves thru the perforations 34 in the sleeve 33, into the
 30 space between the sleeve 33 and the shaft 15, and thru the perforations 27 in the shaft 15 into the latter. From the inside of the shaft 15 the liquid flows thru the openings 28 into the annular cavity 14 and thence thru the
 35 cored opening 13 in the base 5. After the sleeve 33 carrying the filter elements has been lowered on to the shaft 15, the inner edges of the filter leaves may be put under compression by means of a cap 50 of the
 40 form shown in Figure 2, adapted to be forced downwardly by a screw bolt 51, which threads into a plug 52 in the top of the hollow shaft 15. Besides compressing the inner
 45 edges of the filter elements, the cap 50 also increases the driving friction between the shaft 15 and the sleeve 33, thereby insuring that the sleeve and the filter elements assembled on it will rotate with the shaft.

The conical bowl 9 at the top of the base
 50 5, is provided at its upper edge with a machined seat which receives the machined edge of a casing 55, adapted to cover the filter leaves and the tops of the shaft 15 and the sleeves 33. The casing 55 may be
 55 secured to the upper base portion 5 in any suitable manner, for example, by means of the bolts 56 pivoted on pins 57 extending thru ears 58, extending from the base 5, said bolts being arranged to swing in between pairs of lugs 59 extending from the
 60 lower edge of the casing 55 and being provided with nuts 60 which co-operate with the tops of said lugs. A gasket 61 is preferably interposed between the edge of the casing 55 and the edge of the conical bowl

9, in order to make a tight joint. As shown in Figure 1, the casing 55 may be provided with a plurality of sight openings 65 and 66 of any well known form, with a pressure gauge 67, and with a ring 68 by which the
 70 casing 55 may be raised and lowered.

My filter may be used in many ways for filtering many kinds of solutions, but the preferred new method of filtering with this apparatus is as follows: The solution to the
 75 filter is fed under pressure thru the intake opening 12, and surrounds the filter leaves within the space between the conical bowl 9 and the casing 55. The filtered liquid passes into the filter leaves and, escaping thru the
 80 inner edges thereof, flows thru the perforations 34 in the sleeve 33, thru the space between that sleeve and the shaft 15, thru the perforations 27 in the latter, downwardly thru the shaft, outwardly thru the perforations 28 into the cavity 14 and thence
 85 thru the outlet 13. While the filtering operation is taking place, the shaft 15 and the filter element carried thereby are preferably left at rest. As the filtering continues, sludge or cake accumulates upon the surface of the
 90 filter leaves, and when this accumulation has reached a certain thickness, the supply of solution to be filtered is preferably cut off in order to permit the sludge or cake to be
 95 removed. This may be accomplished by draining out the unfiltered solution within the conical bowl 9 and the casing 55, and then rotating the shaft 15 and the filter element carried thereby thru the medium of
 100 the driving means hereinbefore described. This causes the sludge to be removed from the leaves by centrifugal action, which may, if desired, be assisted by causing water or steam to pass thru the filter leaves from
 105 their insides out. In case it is desired to wash the sludge or cake before it is removed from the filter leaves, the form of leaf shown in Figure 4 is preferably used, and with this form of leaf sloughing off of
 110 the cake during the washing operation is prevented. The sludge or cake which is removed from the leaves in the manner above described, flows down the insides of the casing 55 and conical bowl 9 and out thru the
 115 passage 12 into a suitable receptacle; and the device is then ready for another filtering operation.

While I have described one form in which my invention may be embodied, it is to be understood that this may be modified in many respects without departing from the spirit of the invention as covered by the appended claims.

What I claim is:

1. In a filter, the combination of a hollow perforated shaft, a perforated sleeve adapted to be removably mounted on said shaft, filter leaves mounted on said sleeve and having their edges communicating with
 125 130

perforations in said sleeve and means to retain the filter leaves in assembled position on said sleeve.

2. In a filter, the combination of a hollow
5 perforated shaft, a perforated sleeve adapted to be removably mounted thereon and spaced therefrom, filter leaves mounted on said sleeve and having their edges communicating with the perforations in said sleeve and means to retain said filter leaves in assembled position on said sleeve, whereby the filter leaves and sleeve may be assembled and mounted or dismounted as a unit on said shaft.

3. In a filter, the combination of a vertically arranged hollow perforated shaft, a perforated sleeve adapted to be removably mounted on said shaft and spaced therefrom, filter leaves mounted on said sleeve and having their edges communicating with the perforations in said sleeve, means to support said filter leaves in assembled position on said sleeve and means to retain said filter leaves in assembled position.

4. In a filter, the combination of a vertically arranged hollow perforated shaft having means thereon, to support a filter unit, a perforated sleeve adapted to be removably mounted on said shaft and spaced therefrom with the bottom end of said sleeve resting on said supporting means, filter leaves mounted on said sleeve and having their edges communicating with the perforations in said sleeve, means to hold said leaves in spaced relation as a unit on said sleeve, and means adapted to cooperate with the upper end of said shaft and with the filter leaves for holding the latter and the sleeve immovable with reference to the shaft.

5. In a filter, the combination of a base, a vertically arranged hollow shaft supported thereby, said base having passages communicating with the inside of said hollow shaft and with the top of said base, a perforated sleeve adapted to be removably mounted on said shaft, filter leaves mounted on said sleeve and adapted to be secured thereto and to be removable therewith, and a casing adapted to cover said filter leaves and to be secured to the top of said base.

6. In a filter, the combination of a base, a vertically arranged perforated hollow shaft supported thereby, said base having passages communicating with the inside of said hollow shaft and with the top of said base, a perforated sleeve adapted to be removably mounted on said shaft and spaced therefrom, filter leaves mounted on said sleeve and having their edges communicating with the perforations in the latter, and a casing adapted to cover said filter leaves and to be secured to the top of said base.

7. In a filter, the combination of a base, a vertically arranged perforated hollow shaft revolvably supported in said base and

projecting above the top of the latter, means for rotating said shaft, a perforated sleeve adapted to be removably mounted on said shaft and to revolve therewith, filter leaves mounted on said sleeve and having their edges communicating with the perforations in said sleeve, a casing adapted to cover said filter leaves and the top of said shaft and sleeve and to be secured to the top of said base, an outlet passage from the inside of said hollow shaft, an inlet to the filtering space formed by said base and casing, and means to rotate said hollow shaft.

8. In a filter, the combination of a base, a vertically arranged hollow shaft revolvably supported in said base and projecting above the top of the latter, said shaft having perforations both in the portion above the base and in the portion within the latter, said base having a passage communicating with the last mentioned perforations, filter leaves mounted on said shaft above the base and having their edges communicating with the perforations in the portions of said shaft above said base, a casing adapted to cover said filter leaves and the top of said shaft and to be secured to the top of said base and an inlet passage into said filter.

9. In a filter, the combination of a base, a vertically arranged hollow shaft revolvably supported in said base and projecting above the top of the latter, said base having a cylindrical portion provided with an annular cavity and a passage communicating with said cavity, said shaft having perforations communicating with said cavity, said shaft being also provided with perforations in its portion above the cylindrical portion of the base, filter leaves carried by said shaft and having their edges communicating with the perforations in the latter, a casing adapted to cover said filter leaves and the top of said shaft and to be secured to the top of said base, and gearing whereby said shaft may be rotated.

10. A filter element comprising a plurality of filter leaves having openings thru their centers, hollow perforated supporting means upon which said leaves may be assembled and with which the edges of said leaves communicate, and spacing means near the edges of said leaves for holding them in proper relation to one another.

11. A filter element comprising a plurality of filter leaves each having an opening thru its center and a plurality of openings near its edge, hollow perforated supporting means adapted to pass thru the center openings in said leaves and supporting the latter with their edges in communication with the interior of said means, means for securing said leaves in assembled relation on said supporting means, washers adapted to be arranged between the outer edges of said leaves, and bolts adapted to pass thru the

holes near the outer edges of said leaves and thru said washers whereby the outer edges of said leaves are maintained in proper spaced relation with reference to one another. 5

12. In a filter, a pressure-tight casing enclosing a plurality of filter discs, a vertical drainage shaft extending upwardly within said casing, a plurality of filter discs re-

movably mounted upon said shaft, and 10 means independent of the center shaft to hold said disks together in proper position when being mounted upon or removed from said shaft.

In testimony whereof I have affixed my 15 signature to this specification.

ERNEST J. SWEETLAND.