Oct. 16, 1945. J. D. WALKER 2,387,101

UNDERDRAIN FOR FILTERS AND THE LIKE

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Fig. 1

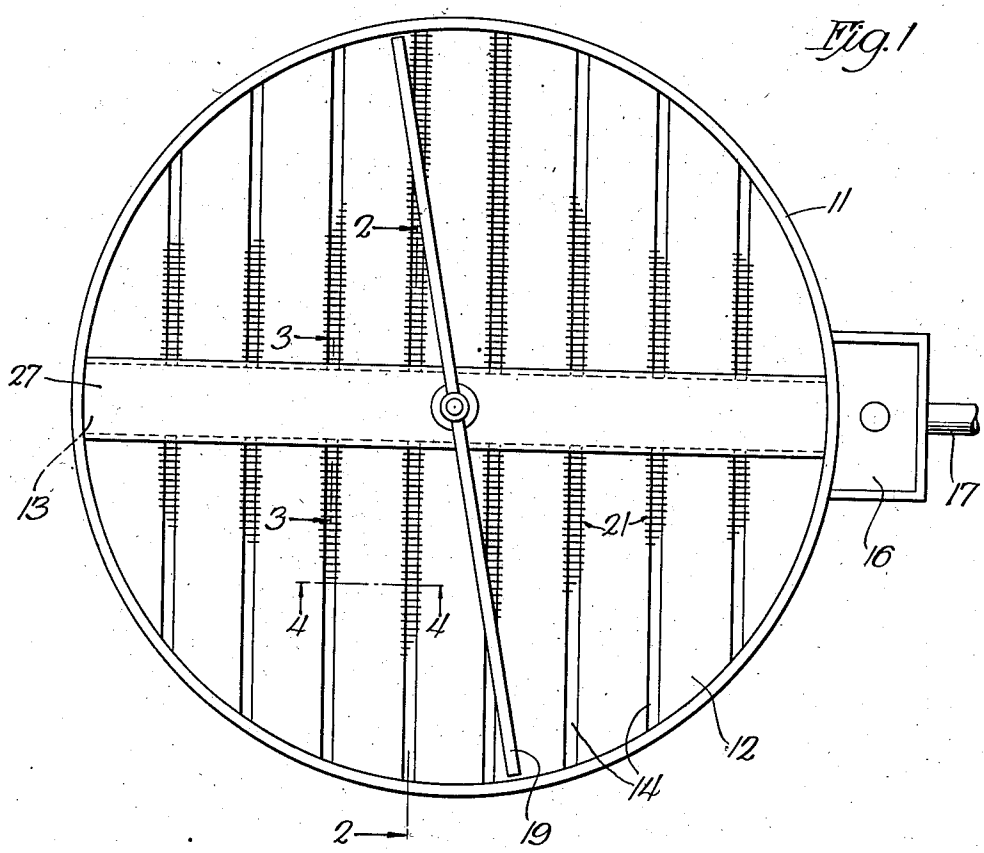

Fig. 2

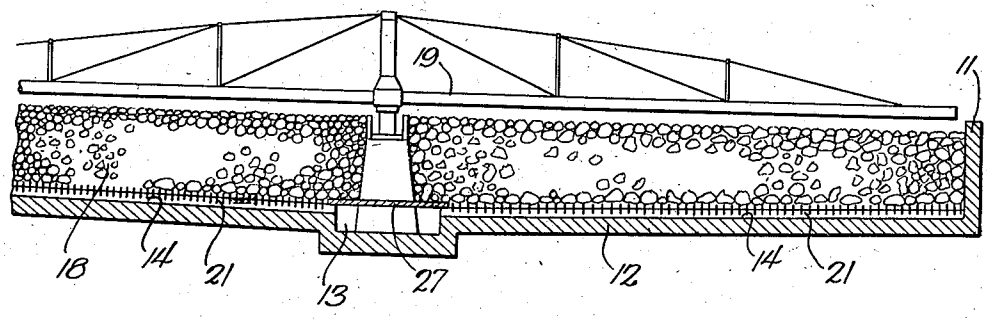

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Fig. 3

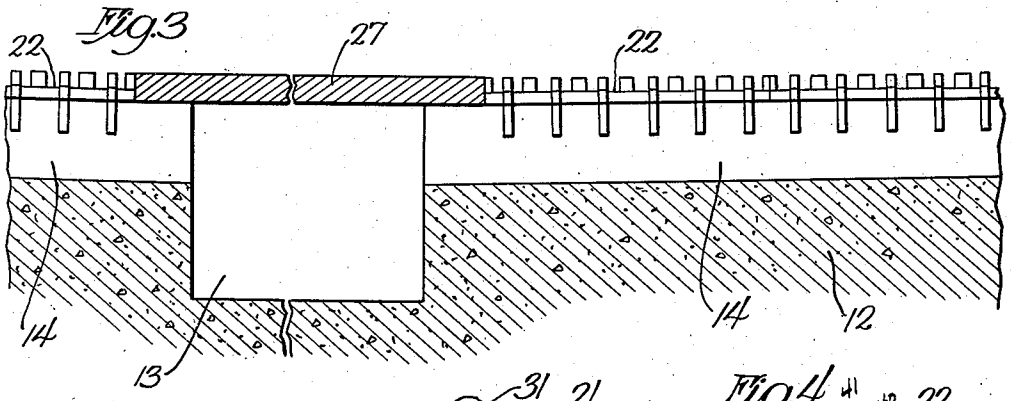


Fig. 4

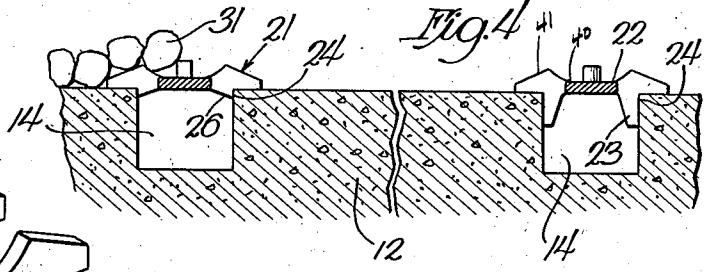


Fig. 5

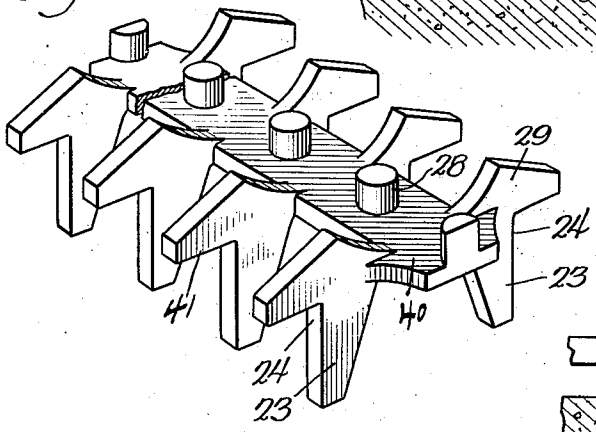


Fig. 7

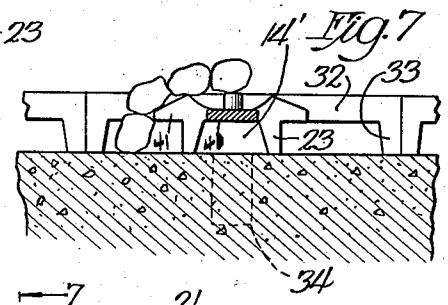
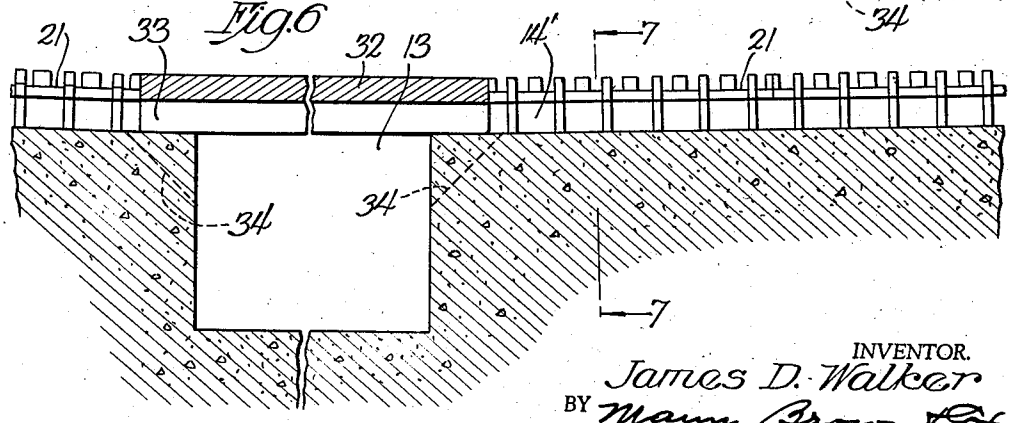


Fig. 6



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2,387,101

UNDERDRAIN FOR FILTERS AND THE LIKE

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10 Claims. (Cl. 210—148)

In filters, particularly the types used for trickling filters for sewage, there has been considerable difficulty in providing proper drainage and venting at the bottom of the filter bed. Of course, it is a simple matter to provide an adequate network of drain channels so that, once the liquor is drained out of the bed, it can be carried off. The difficulty arises in ensuring free flow from the lower course of rock or the like in the bed into the channels. It has been the practice heretofore to cover the channels with gratings and to lay the bottom course of material or several of the lower courses very carefully by hand in an effort not to obstruct the drain. Due to careless workmanship, to subsequent shifting of the materials, or perhaps to the inadequacies of the structure even with care and without shifting, there has frequently been trouble due to improper drainage and resultant inadequate venting and aeration.

According to the present invention, this difficulty is overcome by providing a drain member which is so shaped at its upper side that the material may be laid thereon without special care or may even be dumped thereon without any danger of inadequate drainage. These drain members may be used as covers for the channels. In their preferred form they may alternatively be used on a flat surface, thus saving the cost of producing the channels.

Additional objects and advantages of the invention will be apparent from the following description and from the drawings, in which:

Fig. 1 is a somewhat diagrammatic plan view representing a trickling filter embodying one form of the present invention.

Fig. 2 is a view corresponding to Fig. 1 but showing a vertical section of the structure of Fig. 1, being taken approximately on the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary section on a larger scale, being taken approximately on the line 3—3 of Fig. 1.

Fig. 4 is a fragmentary sectional view taken approximately on the line 4—4 of Fig. 1, showing two different forms of drain members.

Fig. 5 is a perspective view of the preferred form of drain member.

Fig. 6 is a view corresponding to Fig. 3 but showing a simplified manner of using the drain members.

Fig. 7 is a fragmentary sectional view taken approximately on the line 7—7 of Fig. 6.

Two forms of the invention have been chosen for illustration and description, in compliance with Section 4888 of the Revised Statutes, but it is recognized that persons skilled in the art will readily perceive other means within the scope of the invention for accomplishing the same results.

Figs. 1 and 2 represent a concrete filter tank of conventional type for which the present invention is particularly designed. The filter tank includes the sides walls 11 and bottom wall 12, the latter being provided with a main drain channel 13 and a plurality of transverse drain channels 14 which slope gently downwardly toward the main channel 13. The main channel empties into a well 16, from which the liquor may flow out through a conduit 17. The tank is of course filled with a suitable filter media 18, omitted from Fig. 1 for the sake of clarity. This media may comprise blast furnace clinker, granite, or any other suitable material. The sewage or other liquor to be filtered is sprinkled evenly on the top of the filter media by any suitable means, such as a rotary distributor 19. It is evident that the liquor after flowing through the media 18 must flow into the channels 14 and from them into the main channel 13.

According to the present invention, adequate drainage of the filter media into the transverse channels 14 is ensured by the use of drain members 21 or 22, which may be identical except that drain member 22 is provided with legs 23 several inches in height to make them capable of use without channels as shown in Figs. 6 and 7. As shown in Fig. 4, either type of drain member 21 or 22 may be set in the channel 14 and will be maintained in position therein by shoulders 24 formed by the outer sides of legs 23 or the lugs 26 corresponding thereto. As seen in Fig. 3, these drain members may be laid end-to-end in the channels 14 to form a continuous line. As seen in Fig. 1, this line would extend substantially for the length of each transverse channel 14, although for the sake of simplicity they have not been shown in all of the channels in Fig. 1. The main channel 13 could be covered with like drain members of larger size but it has been found to be sufficient to cover it with a solid cover member such as a pre-formed concrete slab 27, a continuous line of such slabs extending along the entire length of the main channel 13.

Each of the drain members 21 and 22 comprises a central longitudinal member 40 substantially in the form of a rectangular plate having a plurality of wings 41 extending laterally outwardly from both sides of the central member. The drain members 21 and 22 are provided with upstanding lugs 28 and 29 on the central mem-

ber 40 and wings 41, respectively which hold the stones 31 comprising the filter media in a somewhat elevated position, the lugs 28 and 29 being spaced apart sufficiently so that, no matter how the filter media are applied, there will be plenty of flow space between the lower course thereof and the drain member 21 or 22, and through the drain member into the channel 14. Each wing 40 is substantially square in cross-section. The lugs 28 and likewise the lugs 29 are preferably each spaced with three-inch centers, it being the common practice to provide filter media, at least for the lower courses, carefully sized with a minimum size of at least three inches in diameter.

The shapes of the upper sides of the drain member are so satisfactory from the standpoint of holding the filter media in a free-flowing position that it has been found satisfactory to dispense with the relatively costly transverse channels 14. For this purpose the long-legged drain members 22 are used and are set end-to-end in lines just as if transverse drain channels were provided. With reasonable care in laying the bottom course of filter media there will not be any objectionable shifting of the drain members out of alinement, but, if desired, the concrete floor may be provided with very shallow grooves for receiving the bottom tips of legs 23. These grooves may be so shallow as not to require the provision of special forms therefor and the cost of forming them may be almost negligible. The legs 23 form an adequate channel 14' therebelow (Fig. 7), and, since the drain members are alined, this channel provides free flow to the main channel 13. In this instance special provision must be made for securing adequate flow from the channel 14' into the channel 13. This may be accomplished most simply by supporting the cover slabs for the channel 13 on ordinary building bricks. Of course, special cover slabs 32 may be formed with legs 33 thereon if desired. Also, if desired, notches 34 may be formed in the concrete in alinement with the channels 14' so as to increase the flow area at this point. In fact, it would be entirely possible to rest cover slabs 27 directly on the floor without legs if the notches 34 were deep enough.

From the foregoing it is seen that a drain member has been devised which ensures free draining of the bottom course of a filter bed and consequent venting and aeration thereof and which in its preferred form overcomes the necessity for the provision of transverse drain channels. They are of a form which can be cast from iron or steel quite inexpensively and hence reduce the total cost of a filter as well as greatly increasing its reliability and efficiency. In connection with increased efficiency it may be noted that the lower courses of the bed may be formed of three or four-inch material instead of six-inch material as has often been required heretofore in an effort to ensure adequate drainage. The three or four-inch material of course has a great deal more exposed surface in a given height of bed. It is preferred that the filter media be sized with a minimum size of three inches and a maximum size of four inches throughout.

Either form of drain member disclosed here may also be used in constructing false bottoms for filters and the like. An ideal construction is to provide channel members across the tank spaced apart the proper distance to receive the filter members here disclosed and to fill these spaces with rows of filter members. Likewise, the entire bottom could be filled with the form of drain member shown in Fig. 5, and, if necessary, as in large area filters, the legs could be even longer. The channel members should be positioned with their flanges extending downwardly, and of course concrete beams or other members which do not form a pocket on their upper sides could be used instead of channel members. False bottoms of this type are particularly advantageous where there is to be an upward flow as in back-flushing.

Although this invention has been discussed primarily with respect to sewage filters, the drain members disclosed herein have also proved exceptionally satisfactory for other filters, as for water treatment.

I claim:

1. An underdrain for filters and the like, including a central longitudinal member, a plurality of wings extending therefrom laterally in both directions with the principal dimensions of each wing being disposed in a plane extending transversely of the central member, the wings being spaced longitudinally along the central member, downwardly extending projections on at least some of said wings, and spaced upstanding lugs on said wings and on said central member, the spacing of the lugs being appropriate for supporting filter media or the like above the portions of the underdrain between said lugs to permit free drainage thereof between the lugs and through the underdrain.

2. An underdrain for filters and the like, including a central longitudinal member, a plurality of wings extending therefrom laterally in both directions and spaced apart longitudinally of the central member to form spaces therebetween, downwardly extending projections on at least some of said wings positioned inwardly from the ends of said wings to maintain the underdrain over a channel on the sides of which said wings are resting, and spaced upstanding lugs on said wings and on said central member, the spacing of the lugs being appropriate for supporting filter media or the like above the portions of the underdrain between said lugs to permit free drainage thereof between the lugs and through the underdrain.

3. An underdrain for filters and the like, including a central longitudinal member, a plurality of wings extending therefrom laterally in both directions and spaced apart longitudinally of the central member to form spaces therebetween, legs on at least some of said wings positioned inwardly from the ends of said wings to maintain the underdrain over a channel on the sides of which said wings are resting and of sufficient height and so spaced as to form a flow passage of substantial cross section beneath the underdrain and between the legs, and spaced upstanding lugs on said wings and on said central member, the spacing of the lugs being appropriate for supporting filter media or the like above the portions of the underdrain between said lugs to permit free drainage thereof between the lugs and through the underdrain.

4. An underdrain for filters and the like, including a central longitudinal member, a plurality of wings extending therefrom laterally in both directions and spaced apart longitudinally of the central member to form spaces therebetween, legs on at least some of said wings of sufficient height and so spaced as to form a flow passage of substantial cross section beneath the underdrain and between the legs, and spaced upstanding lugs on said wings and on said central

member, the spacing of the lugs being appropriate for supporting filter media or the like above the portions of the underdrain between said lugs to permit free drainage thereof between the lugs and through the underdrain.

5. An underdrain for filters and the like, including a central longitudinal member, a plurality of wings extending therefrom laterally in both directions, free of connections at their outer ends and separated in the direction of the longitudinal axis of the member by spaces each of which is greater in dimension longitudinally of the central member than the thickness of the wings, downwardly extending projections on at least some of said wings, and spaced upstanding lugs on said wings and on said central member, the spacing of the lugs being appropriate for supporting filter media or the like above the portions of the underdrain between said lugs to permit free drainage thereof between the lugs and through the underdrain.

6. An underdrain for filters and the like, including a central longitudinal member, a plurality of wings extending therefrom laterally in both directions, free of connections at their outer ends and separated in the direction of the longitudinal axis of the member by spaces each of which is greater in dimension longitudinally of the central member than the thickness of the wings and greater in dimension in a direction normal to the first dimension than the width of the longitudinal member, downwardly extending projections on at least some of said wings positioned inwardly from the ends of said wings to maintain the underdrain over a channel on the sides of which said wings are resting, and spaced upstanding lugs on said wings and on said central member, the spacing of the lugs being appropriate for supporting filter media or the like above the portions of the underdrain between said lugs to permit free drainage thereof between the lugs and through the underdrain.

7. An underdrain for filters and the like including a central longitudinal member and a plurality of wings extending therefrom laterally in both directions and being of relatively thin dimension longitudinally of the central member, the wings being spaced from each other in the direction of the longitudinal axis of the central member so as to provide openings between adjacent wings greater in dimension longitudinally of the central member than the thickness of each wing, downwardly extending projections on at least some of said wings positioned inwardly from the ends of said wings, and spaced upstanding lugs on the wings and the central member.

8. An underdrain for filters and the like including a central longitudinal member, a plurality of wings extending therefrom laterally in both directions and being of relatively thin dimension longitudinally of the central member, the wings being spaced from each other in the direction of the longitudinal axis of the central member so as to provide openings beteen adjacent wings greater in dimension longitudinally of the central member than the thickness of each wing and greater in dimension normal to the longitudinal axis than the width of the central member and spaced upstanding lugs on the central member.

9. An underdrain for filters and the like including a central longitudinal member substantially in the form of an elongated, rectangular plate with its length and width disposed horizontally, a plurality of wings extending therefrom laterally in both directions and projecting beyond the central member, the length and height of each wing being disposed in a vertical plane, the wings being spaced from each other in the direction of the longitudinal axis of the central member and forming open spaces therebetween having a greater dimension in the direction of said axis greater than the width of each wing, and upstanding lugs on the central member spaced apart lengthwise of the member.

10. An underdrain for filters and the like including a central longitudinal member substantially in the form of an elongated, rectangular plate having its length and width disposed horizontally and its vertical thickness of less magnitude than the width, a plurality of wings extending therefrom laterally in both directions and projecting beyond the central member, the vertical cross-section of each wing in a direction parallel to the longitudinal axis of the center member being substantially in the form of a rectangle of about equal dimensions, the wings being spaced longitudinally along the central member to form free spaces therebetween, downwardly extending projections on at least some of said wings, and spaced upstanding lugs on said wings and on said central member, the spacing of the lugs being appropriate for supporting filter media or the like above the portions of the underdrain between said lugs to permit free drainage thereof between the lugs and through the underdrain.

JAMES D. WALKER.