April 13, 1926. 1,581,089

E. ROBERTS

CENTRIFUGAL BASKET

Filed June 30, 1923 5 Sheets-Sheet 1

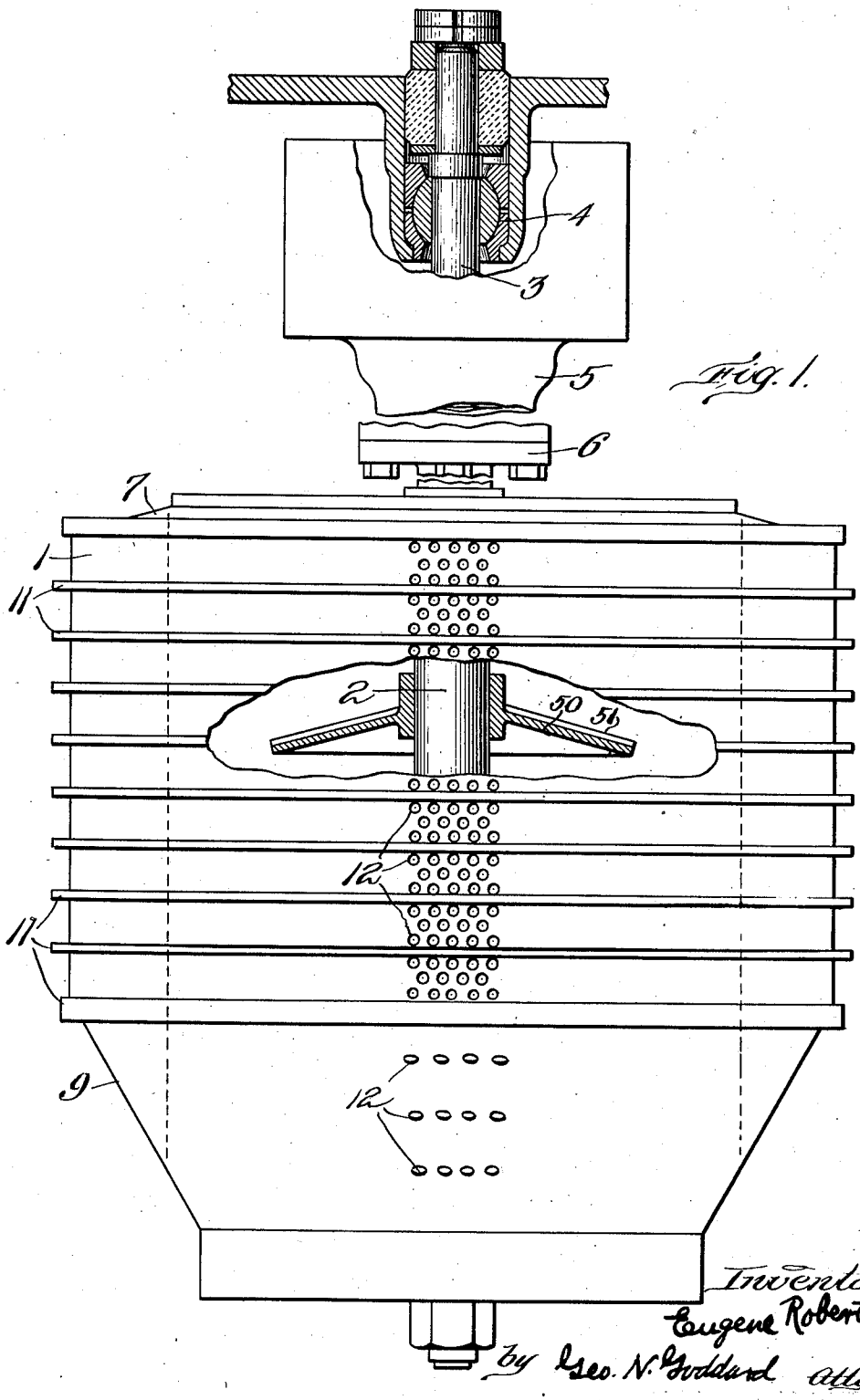


Fig. 1.

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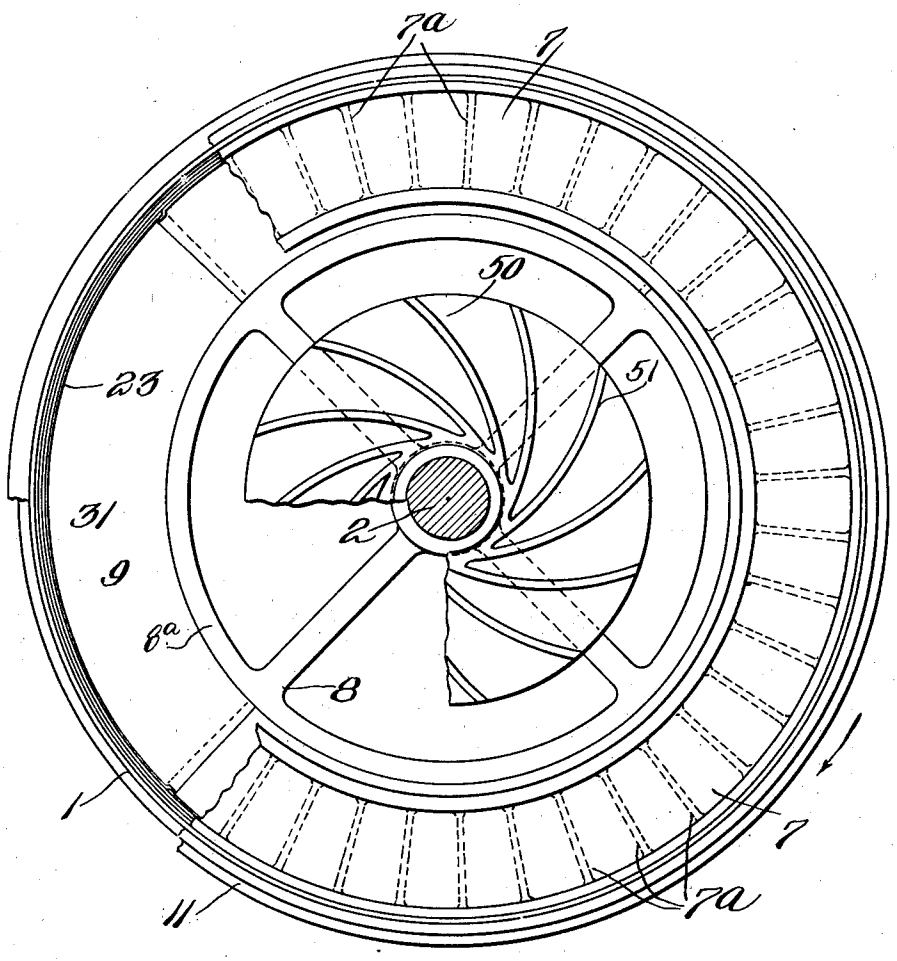


Fig. 2.

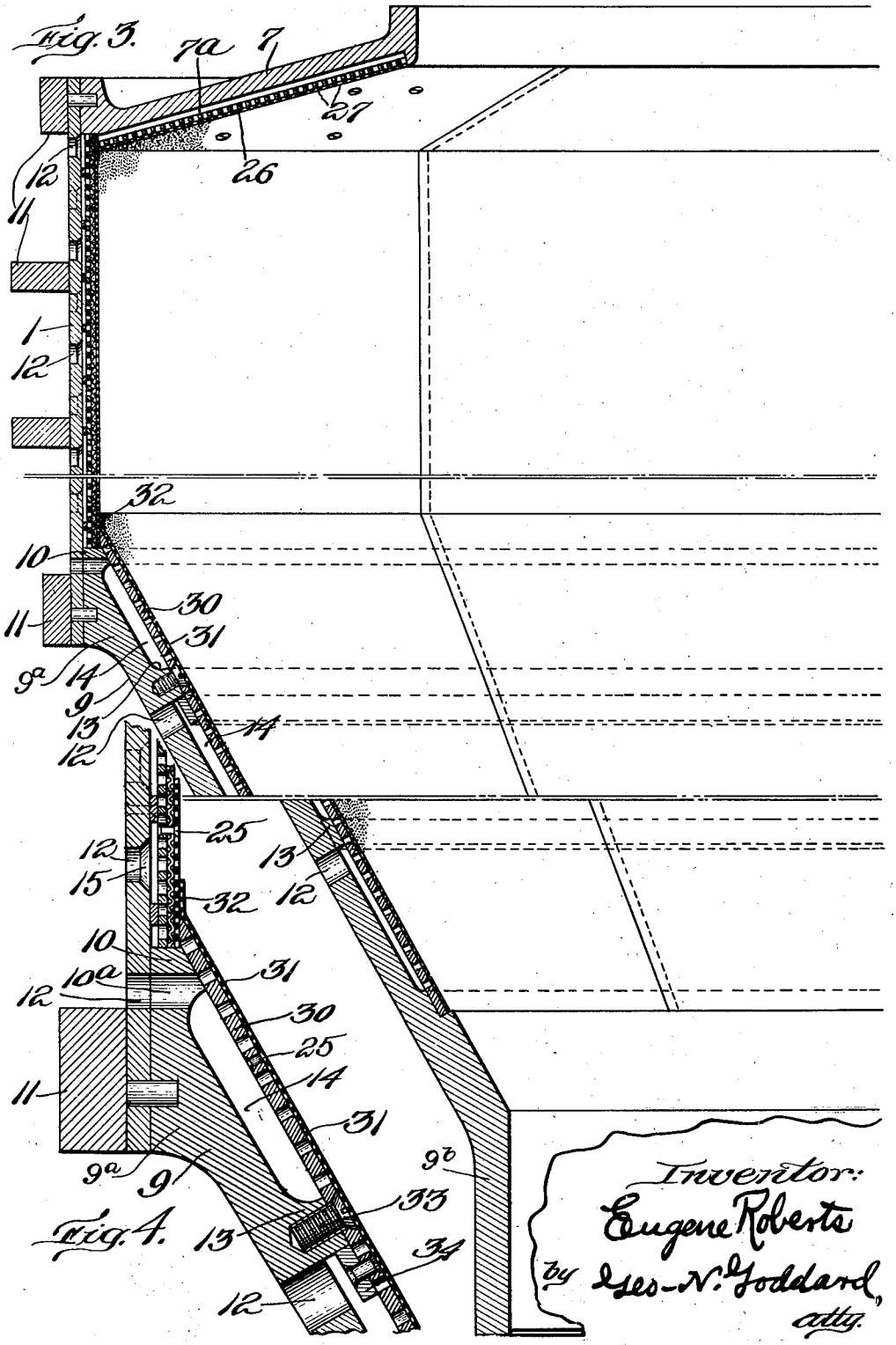
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CENTRIFUGAL BASKET

Filed June 30, 1923 5 Sheets-Sheet 3



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April 13, 1926. 1,581,089

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CENTRIFUGAL BASKET

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Fig. 5.

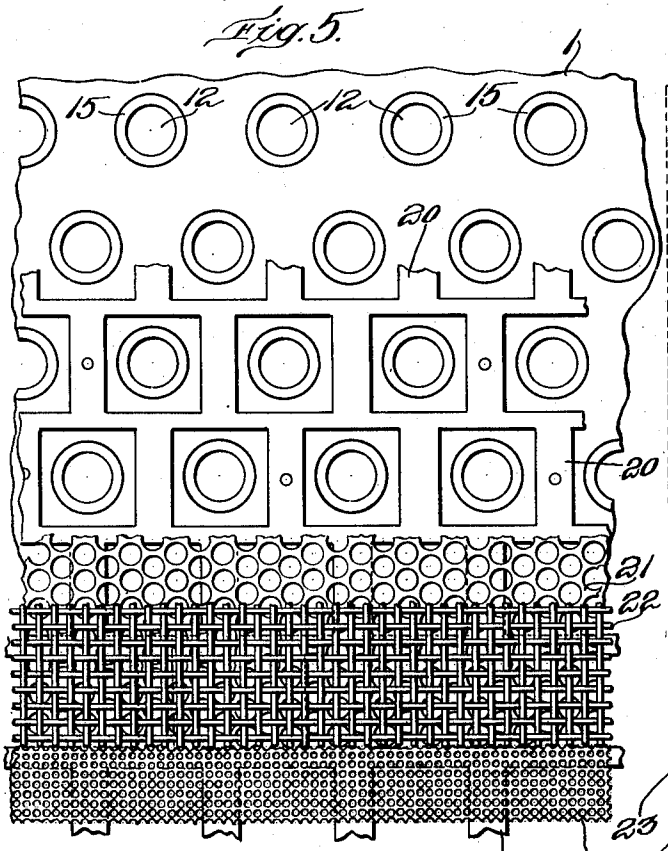


Fig. 6.

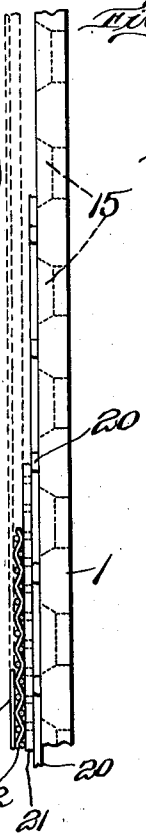
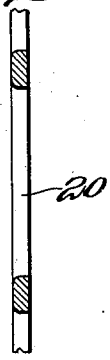


Fig. 7.



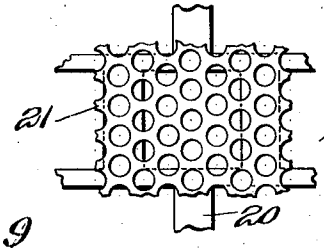


Fig. 8.

Fig. 9.

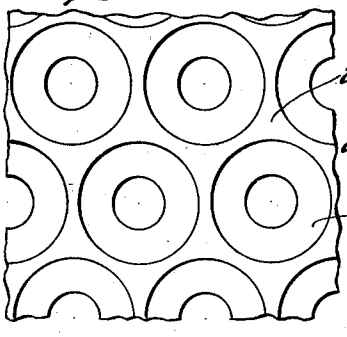
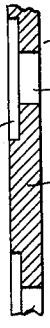


Fig. 10.



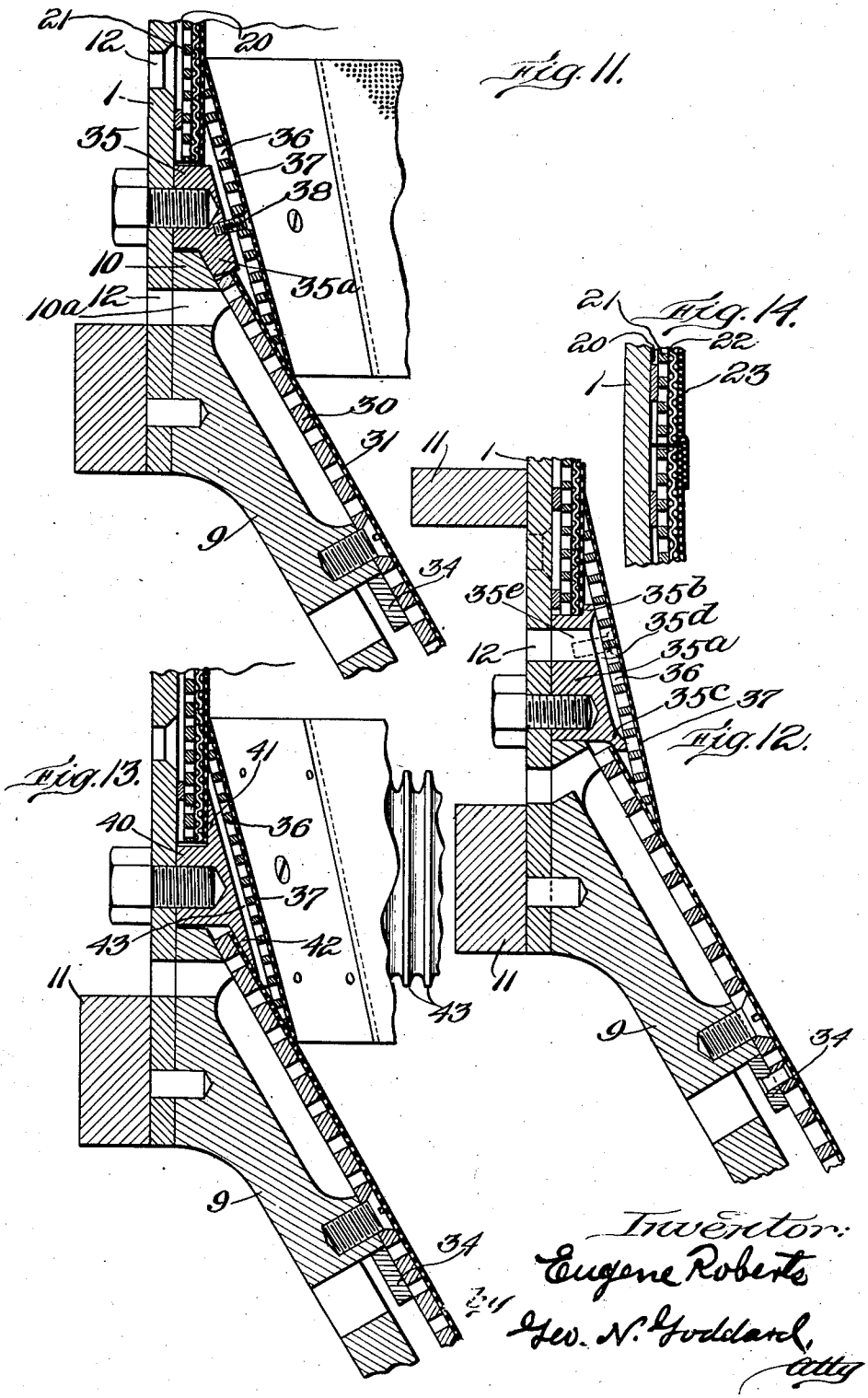
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CENTRIFUGAL BASKET

Filed June 30, 1923 5 Sheets-Sheet 5



Patented Apr. 13, 1926. 1,581,089

UNITED STATES PATENT OFFICE.

EUGENE ROBERTS, OF SALT LAKE CITY, UTAH, ASSIGNOR TO THE WESTERN STATES MACHINE COMPANY, OF SALT LAKE CITY, UTAH, A CORPORATION OF UTAH.

CENTRIFUGAL BASKET.

Application filed June 30, 1923. Serial No. 648,676.

To all whom it may concern:

Be it known that I, EUGENE ROBERTS, a citizen of the United States, and resident of Salt Lake City, in the county of Salt Lake and State of Utah, have invented certain new and useful Improvements in Centrifugal Baskets, of which the following is a specification.

In the manufacture or refining of sugar or like materials by centrifugal separation of the liquid content, whether syrup or wash liquid, from the solid content or grains, much difficulty has been experienced in providing means for effectively retaining in the centrifugal basket the solid grains or crystals, while permitting the rapid escape of the liquid content through the basket wall.

Heretofore it has been the practice to punch or drill discharge holes of ¼ inch or less diameter through the basket wall with centers an inch or more apart. Against the inside face of such perforated basket wall was placed the filter elements comprising a very finely and closely perforated screen of thin sheet brass or the like with a backing of wire mesh. The great outward pressure of the solid sugar against the screen due to centrifugal force tended to flatten the wire mesh against the inside wall of the basket so that there was practically little or no drainage of the liquid over the greater portion of the imperforate areas of the basket between the basket wall perforations. As the perforations occupied only a small percentage of the total area of the basket wall the process of effecting the desired separation of the liquid juice from the solid grains of sugar or other material was unduly prolonged, thus wasting time and thereby reducing the output of each machine, while the washing operation was not only unduly prolonged but also required a larger supply of water and in consequence produced excessive dissolving and carrying off of the sugar which necessitated expensive operations for the recovery of the sugar thus lost.

To make the basket wall perforations of large enough diameter to occupy the major part of the basket wall would be objectionable because such larger perforations would greatly weaken the basket wall which is required to sustain a very heavy outward pressure and would allow the thin sieve-like screen under the pressure of the sugar to press the wire mesh backing into such holes and thus injure both lining and screen and cause them to "smear" with sugar whenever such backing or stretching occurred.

The present invention overcomes these difficulties by providing a filter construction for the basket wall so arranged and dimensioned as to afford practically complete drainage for the entire area of the sugar-sustaining basket wall instead of affording drainage merely for only a small portion of said area as heretofore, thereby materially abbreviating both the duration of the juice-separating operation and that of the washing operation besides decreasing materially the quantity of water required and the consequent waste of sugar carried off in solution thereby, as well as greatly improving the quality or cleanness of the sugar so treated.

A further improvement relates to that type of centrifugal basket known as a self-discharging basket in which the bottom of the basket, of frustro-conical form, has a shaft-connecting spider in its reduced open bottom and an attaching ring or flange at its top for connection with and support of the cylindrical wall of the basket. In this type of machine there is of necessity an annular area of considerable extent that is normally closed against percolation of the liquid by reason of the fact that the attaching ring, the sub-tending part of the basket and the outer reenforcing band form a solid annular wall preventing any effective drainage so that the opposed section of the sugar wall is very imperfectly treated both as to extraction of the juice and as to washing of the sugar grains.

According to the present invention I overcome this difficulty by providing this attaching rim or flange of the basket bottom in this type of machine, with adequate drainage passages which are covered by a sieve-like screen or strainer so supported as to resist the powerful outward thrust of the sugar and yet allow the liquids to flow freely into the drainage passages without material obstruction.

For the first time in the history of the art this invention provides a filter construction for a centrifugal basket in which the entire sugar-sustaining area of the basket wall is

effectively drained without leaving considerable areas practically devoid of drainage facilities.

These and other features of the invention will be particularly described in the following specification and will be defined in the claims hereto annexed.

In the accompanying drawings I have illustrated some of the forms which illustrate the principles and practice of this invention, in which:

Figure 1 is an elevation of a centrifugal basket as ordinarily suspended for use, the wall being partly broken away to show the interior deflector.

Figure 2 is a plan view of the same, part of the top of the basket being broken away.

Figure 3 is a centrifugal section through one side of the basket illustrating the arrangement and construction of filter elements.

Figure 4 is a similar section showing the basket adjacent to the wall-supporting rim of the basket bottom on a larger scale.

Figure 5 is an isometric elevation of a portion of the basket wall as viewed from the interior illustrating the progressive building up of the different layers or elements of the filtering wall.

Figure 6 is a side elevation partly in section of the assemblage shown in Figure 5.

Figure 7 is a similar view showing a part of the grid or pocket-forming element of the filtering wall.

Figure 8 is a face view as seen from the inside of the bridge plate which forms a support for the filtering elements over the shallow pockets.

Figures 9 and 10, show, respectively, in elevation and in cross section a modified form of a portion of the basket wall in which the filter-supporting grid is integral with the basket wall itself.

Figures 11, 12 and 13 are sectional views through the basket wall adjacent to the overlapped joint of the bottom and side wall illustrating modified constructions for draining this area.

Figure 14 is a horizontal section through a short length of the basket wall adjacent to one of the joints between the sections.

Since a similarly constructed filter wall for covering the perforations in the peripheral or cylindrical wall of the basket may be equally well used for the flat valved bottom type of basket and for the tapered bottom self-discharging basket, in the accompanying drawings I have illustrated the construction and arrangement as applied to the latter type of basket because of certain additional features that are peculiarly applicable to protecting the joint between the conical bottom and the cylindrical wall of a self-discharging basket.

The perforated basket, therefore, embracing the cylindrical wall 1, the sloping top ring 7, and the conical base or bottom 9, formed with an upper attaching ring or flange 9^a and a lower attaching flange 9^b, is suspended in the usual manner by means of a central spider 8 whose peripheral band 8^a fits inside the lower flanged end of the conical bottom on the rotary basket shaft 2, which is coupled to the upper rotary shaft section 5, carried by the gyratory suspender 3 hung on a ball and socket joint at 4, by means of a flanged connection shown at 6, according to present well known practice, in order that the basket may rotate and gyrate in use.

Both the cylidrical wall 1, and the bottom wall 9 are provided with liquid discharge openings 12 whose inner edges are preferably slightly flared or countersunk as shown at 15 in order to more readily collect the liquid that percolates through the filtering material into the shallow collecting pockets, hereinafter mentioned, surrounding each discharge perforation.

In order that the imperforate parts of the basket surrounding each discharge perforation 12 may be properly drained I provide the basket walls with shallow drainage pockets on its interior face, preferably by placing against said interior face a grid 20 consisting usually of sheet metal with the major part of the sheet cut out to form windows or openings arranged to surround each perforation 12 but of considerably larger area than such perforations, these pockets being bounded by relatively narrow ribs forming the grid as best shown in Figure 5. Such grid is placed inside the basket and is preferably riveted or otherwise secured thereto at suitable intervals, the abutting ends being brought together but not overlapping. This construction, therefore, provides a series of shallow drainage pockets on the interior face of the basket wall of much larger area than it would be practicable to make the perforations themselves and of much larger area than the solid ribs or parts of the grid that bound the pockets.

The preferred construction for the filtering elements comprises a finely and closely perforated sheet metal screen or sieve 23 backed by a somewhat coarser wire mesh fabric 22 which itself is supported against buckling into the shallow pockets or recesses by means of a somewhat heavier and more coarsely perforated bridge plate 21, as shown in enlarged view in Figure 4. These three elements may conveniently be riveted together and preferably, instead of making them in one continuous ring to fit inside the basket wall, they are made in any desired number of sections divided vertically with the screen or sieve portion 23 continued slightly beyond the abutting joint of the sections to overlap and protect the vertical

crack where two adjacent sections join. Usually the basket rotates in a clockwise direction, and in such case the overlap of the screen cross joint would be that indicated in Figure 14, the rear edge of each section overlapping the forward edge of each following section considered with regard to the direction of rotation of the basket.

With the sectional arrangement described it will usually be found advantageous to rivet the coarsely perforated bridge or supporting plate 21 and the two filtering layers 22, 23, together as illustrated at 25 in Figure 4. Any suitable means may be employed for retaining the interior composite filtering wall in position, but in the present instance I have shown such filtering wall held in place by the outer adjacent edge of the top filtering element 26 and of the lower filtering element 30 which slightly overlap the top and bottom eaves respectively of the composite filtering element, as illustrated in Figure 3, but in this case without tightly binding against the filtering element since a slight creep of the latter relative to the basket wall is not necessarily injurious.

The ring of sugar building up against the underside of the top ring or rim 7 of the basket should be completely drained to obtain the most effective results and, therefore, I provide an annular composite filtering element comprising the coarsely perforated plate 26 similar to plate 21 which is covered on the side toward the sugar wall with a corresponding plate or strip 27 of finely perforated screen, similar to the screen 23, which is preferably riveted to the supporting plate 26. In order to space this top filtering wall from the solid face of the ring I provide a series of narrow radial ribs 7^a on the underside of the ring 7 so as to form shallow radial passages for the flow of the extracted liquid outwardly to the adjacent discharge openings 12.

To effect full and complete drainage of the filtering wall covering the frustro-conical bottom of the basket I provide the inner face of the inclined bottom wall 9 with a series of shallow supporting ribs 13, which, in this instance although not necessarily, extend around the inside of the bottom at properly spaced intervals in a circumferential direction in order to form shallow drainage pockets 14. The uppermost of these drainage pockets as most clearly shown in Figure 4, extends well toward the top of the connecting ring or flange 10 and at its upper edge communicates at intervals through drainage passages 10^a with the perforations 12 formed in the outer wall of the basket. All these drainage passages in the bottom are covered by means of a relatively heavy bridge plate or screen-supporting element 30 on the inside of which is mounted a finely perforated screen or sieve 31, similar to screen 23. As shown in Figures 3 and 4, the upper edge of the filtering screen 31 projects slightly beyond the edge of its supporting plate, as shown at 32 to form a slight overlap. Attaching screws 33 or equivalent means are passed at intervals through the screen wall 30, 31, into the ribs 13 to hold the filtering wall in place, and as an additional means of resisting the upward thrust due to centrifugal force annular ribs 34 are fastened to the outer face of the plate 30 in position to engage the lower side of the spacing ribs 13 and thus relieve the pressure on the attaching screws.

From the foregoing description and an inspection of the detailed construction and arrangement illustrated in Figure 3 it will be seen that there is no part of the finely perforated filtering screen that is not in communication with outlet or drainage passages and that, consequently every smallest portion of the wall of sugar or other solid is subjected to the most complete drainage action since there is no solid wall preventing the flow of liquid to the basket wall discharge outlets under the action of centrifugal force. With all parts of the sugar wall fully drained very rapid and effective separation of the liquid syrup or wash water is accomplished without producing substantial areas of imperfectly washed material.

In Figures 9 and 10 I have shown a slightly modified form in which the pocket-forming grid 20^a corresponding to the pocket-forming grid 20, above described, is formed integrally with the basket wall by countersinking shallow pockets 20^b which communicate with the discharge openings 12 in the basket wall 1^a. As will be seen these circular pockets 20^b cover much the greater portion of the inside face of the basket wall and function precisely as do the pockets formed by the separate grid 20.

In Figure 11 I have shown in vertical cross section a modified form of construction in which a separate detachable ring 35 is inserted above the attaching ring 10 to form a supporting ledge upon which the bottom edge of the composite filtering wall rests, and also a downwardly turned ledge 35^a to support the upward thrust of the filtering wall 30, 31, which latter is similar to that already described for the conical bottom 9. In this case the inclined inner face of the screen-supporting ring 35 is protected by means of an annular bridge plate 36 made in circumferential sections and covered with the finely perforated screen 37. This protecting screen is held in spaced relationship to the inside wall of the ring 35 by means of attaching screws 38 and has its upper and lower edges bevelled to overlap and bear against adjacent portions of the cylindrical screen element and of the conical screen element. The liquid discharges into the

drainage space between the ring and the protecting filtering element whence it flows readily to the nearest discharge opening 12 in the basket wall.

In Figure 12 is shown a slightly different modification in which the ring 35^a is provided with upper and lower holding flanges 35^b, 35^c, which overlap the adjacent edge portions of the conical bottom screen and the cylindrical screen. The ring is provided on its inner face with an annular drainage passage 35^d in comunication with a discharge passage 35^e leading to the outlet 12. In this case the narrow screen element 36, 37, similar to that above described rests upon narrow annular ribs 35^b and 35^c instead of getting its outward bearing against the cylindrical filtering element and the conical filtering element, as in the form shown in Figure 11.

In the form shown in Figure 13, the retaining ring 40, is provided with an upper screen-retaining flange 41 and a lower screen-retaining flange 42, and is provided with vertical ribs 43 to support the filtering plate 36 at frequent intervals. It will, therefore, be seen that where such a screen-supporting ring is used in the centrifugal basket provision may be made in various ways, in accordance with the principle of this invention, to prevent "smearing" of the sugar against the ring by providing ample drainage passages for the inside surface of the ring in communication with the sieve-like perforations of the screen and with the outlet perforations of the basket wall.

The perforations in the filter-supporting or bridge plates are made large enough to cover a number of interstitial spaces in the wire mesh layer and are arranged as closely as practicable without making the bridge plate too weak to prevent bulging of the filtering element into the large shallow drainage recesses which they cover. The wire mesh is coarse enough to enable each interstitial space to subtend several of the fine perforations in the screen while the round wires and undulating surface of the wire mesh allow sufficient lateral circulation for the very short distance involved to give perfect drainage between the screen perforating and the discharge holes in the basket. The punching out of the grid and of the bridge plate tends to somewhat indent or round the edges surrounding the openings so that there is nowhere presented throughout the whole sugar subtended wall any substantial impediment to the rapid escape of liquid through the basket wall. Thus full drainage is provided for every portion of the walled up material, and all the screen perforations are in communication with the discharge holes in the basket wall.

This will be clear if we consider that the solid strips forming the spacing grid need not exceed $\frac{1}{8}$th inch in width, and as the perforations in the bridge plate may be of $\frac{3}{16}$th inch diameter even the solid parts of the grid form no obstacle to the circulation of the liquid to the discharge holes of the basket wall. Furthermore, as the interstices of the wire mesh may be as wide or wider than the width of the solid portions of the bridge plate, and as the wires of the mesh, even when directly opposed to a row of fine perforations of the screen, still leave room for the escape of liquid through the fine perforations the percolation of the liquid, under centrifugal force, from every perforation in the strainer screen is permitted. Hence it is that complete drainage is afforded to every part of the walled-up material with resulting absence of any dark zones or areas of syrup-bearing or unwashed sugar and this, too, with the use of a less volume of wash water and with a material shortening of the cycle of centrifugal operations.

Intermediate of the top and bottom annular walls of the basket I provide a circular deflector plate 50 secured to the basket shaft 2, and having on its upper face radiating ribs or flanges 51, which are bent back relative to the direction of rotation of the basket in order to retard the centrifugal action from throwing off the fed-in material to the wall of the basket while accelerating the rotary motion of the material before it impinges against the surrounding basket wall.

What I claim is:

1. A filtering construction for a centrifugal basket embracing in combination with a surrounding basket wall formed with discharge perforations well spaced apart, an interiorly disposed fine foraminous filter screen, an intermediately disposed relatively stiff bridge plate having closely arranged coarse perforations while providing substantially level support at intervals to sustain the screen against outward bulging under pressure, and spacing means affording at intervals exterior supporting engagement with the bridge plate to form drainage spaces on the interior of the basket wall directly tributary to discharge perforations in the basket wall.

2. A filtering construction for a centrifugal basket embracing in combination with the surrounding perforated basket wall, a grid member whose openings occupy the major portion of the area thereof and afford drainage pockets directly tributary to the liquid discharge perforations of the basket wall, a fine foraminous filter screen supported against bulging into said pockets under the outward thrust of the basket load by a relatively stiff bridge plate being interposed between said screen and said grid and provided with closely arranged relatively coarse perforations affording free communication

between the filter perforations and said drainage pockets whereby the rapid escape of the centrifugally extracted liquid is facilitated, substantially as described.

3. A filtering construction for a centrifugal basket embracing in combination with the perforated basket wall, a finely perforated filtering screen, a relatively stiff supporting bridge plate arranged to sustain the screen against bulging under the outward thrust of the basket load, said bridge plate being provided with closely arranged perforations of a size intermediate of the perforations in the basket wall and those in the filter-screen, and a supporting grid interposed between the basket wall and the bridge-plate to separate the bridge-plate from contact with the basket wall, said grid having openings of substantially larger area than the area of the basket wall perforations forming drainage pockets around the basket wall perforations, substantially as described.

4. A filtering construction for a centrifugal basket embracing in combination with a perforated basket wall, a spacing element arranged against the inside of the basket and provided with openings of substantially larger area than the basket wall perforations thereby forming shallow drainage pockets around the basket wall perforations, a fine foraminous filter screen arranged interiorly of the spacing element to allow the escape of centrifugally extracted liquid while retaining the solid contents of the basket, and means interposed between the spacing element and the filter screen to support the filter screen against bulging into said pockets while allowing the extracted liquid to flow freely thereto, substantially as described.

5. A filtering construction for a centrifugal basket embracing in combination with a perforated thrust-sustaining basket wall, spacing means arranged inside the interior face of the basket to leave shallow drainage pockets of larger area than the area of the perforations in the basket wall, a relatively stiff closely-perforated bridge plate arranged to bridge over said pockets, a finely perforated sheet metal filter screen, arranged inside said bridge plate and a reticulated backing interposed between the bridge plate and the screen, substantially as described.

6. A filter construction for a centrifugal basket, embracing in combination with a perforated thrust-sustaining basket wall, a thin finely perforated metallic filter screen, a relatively stiff bridge plate having relatively coarse closely arranged perforations for the escape of the liquid extracted through said screen, said bridge plate affording firm support for the screen to prevent the screen from bulging out under internal pressure, and spacing means arranged to separate the bridge-plate from the subtending portions of the basket wall and form drainage pockets communicating with liquid discharge openings in the basket wall, thereby affording free drainage outlets for all parts of the screen, substantially as described.

7. A filter construction for a centrifugal basket embracing in combination with the perforated basket wall, spacing means on its inner face arranged to form shallow drainage pockets of larger area than that of the basket wall perforations, segmental filtering elements each comprising a relatively stiff coarsely perforated bridge plate of segmental form, and a thin sheet metal finely perforated screen of similar form firmly secured to said segmental bridge plate, substantially as described.

8. A filtering element for a centrifugal basket embracing a relatively stiff coarsely perforated bridge plate of segmental form and a finely perforated thin sheet metal filter screen of like form riveted thereto with one side edge extending slightly beyond the corresponding side edge of the bridge plate to overlap the edge of the next adjacent element when assembled in the basket, substantially as described.

9. A bottom for a centrifugal basket embracing a funnel shaped perforated member having upper and lower attaching flanges for connection respectively with a peripheral basket and with an interior supporting spider, interiorly projecting ledges forming drainage passages leading to liquid discharge openings, a rigid closely-perforated frustro-conical bridge member interiorly supported upon said ledges, and a frustro-conical filter screen of finely perforated thin metal supported on said bridge plate against outward bulging under pressure, substantially as described.

10. A filtering construction for a self-discharging centrifugal basket embracing in combination with a perforated peripheral side wall, a downwardly converging perforated conical bottom whose upper edge portion forms an attaching ring in overlapped relation to the lower edge portion of said side wall, filtering elements arranged to cover respectively the perforations of the side wall and of the bottom, the bottom filter element embracing a finely perforated filter screen extending over the inside of the overlapped attaching ring with its perforations subtending said ring draining into liquid discharge openings in the basket, substantially as described.

11. A filtering construction for a self-discharging centrifugal basket embracing in combination a perforated side wall, a downwardly converging conical bottom secured to the lower edge of the side wall by an overlapped attaching rim portion, a filter-

ing element embracing a thin finely perforated filter screen forming an inside cover for shallow drainage pockets surrounding the perforations in the side wall of the basket, and means for supporting said screen against bulging into said pockets while allowing extracted liquid to pass thereto, a similar filtering element arranged inside the conical bottom to cover drainage areas leading to liquid discharge perforations, the latter filtering element extending upward to cover liquid discharge passages in the overlapped rim portion of the bottom, substantially as described.

12. A self-discharging centrifugal basket embracing a perforated side wall and a downwardly converging perforated conical bottom secured together with their adjacent edges overlapped, interiorly disposed finely perforated filtering screens supported in spaced relation to the side wall and the bottom respectively to afford lateral drainage to the perforations therein the filtering screen of the bottom being extended up to overlap the lower edge of the filtering element of the side wall, there being provided liquid discharge passages to drain the screen perforations subtending the overlapped portions of the side wall and the bottom.

13. A filtering element for the conical bottom of a self-discharging centifugal basket embracing a segmental frustro-conical screen of thin finely perforated material, a bridge member of similar shape to which the screen is secured, and means carried by the bridge plate to engage ledges in the bottom of the basket to prevent upward shifting of the filtering element under the stress of centrifugal force, substantially as described.

In witness whereof, I have subscribed the above specification.

EUGENE ROBERTS.