

July 31, 1934.

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1,968,741

STRAINER APPARATUS

Filed July 23, 1930

6 Sheets-Sheet 3

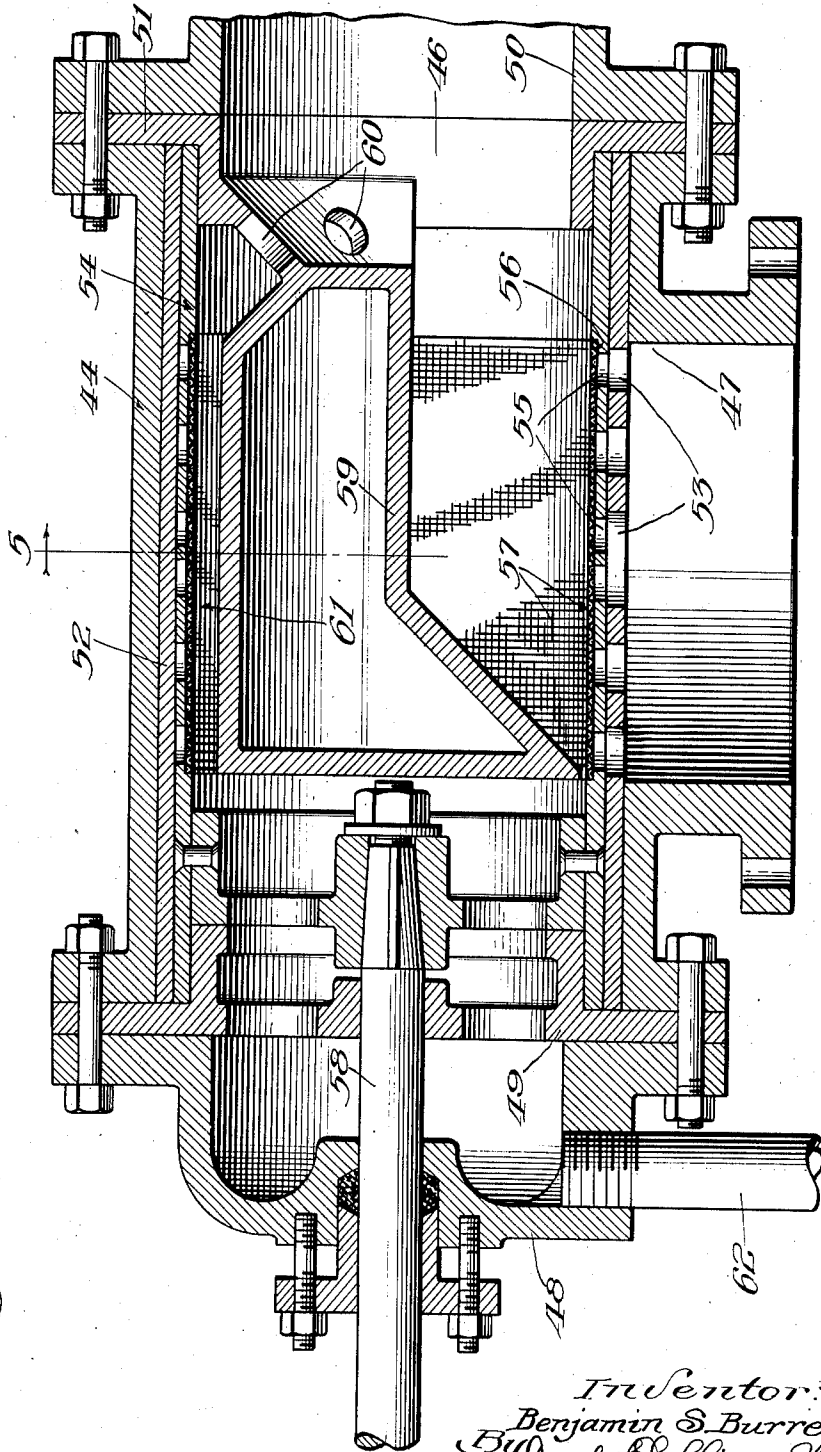


Fig. 1

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6 Sheets-Sheet 4

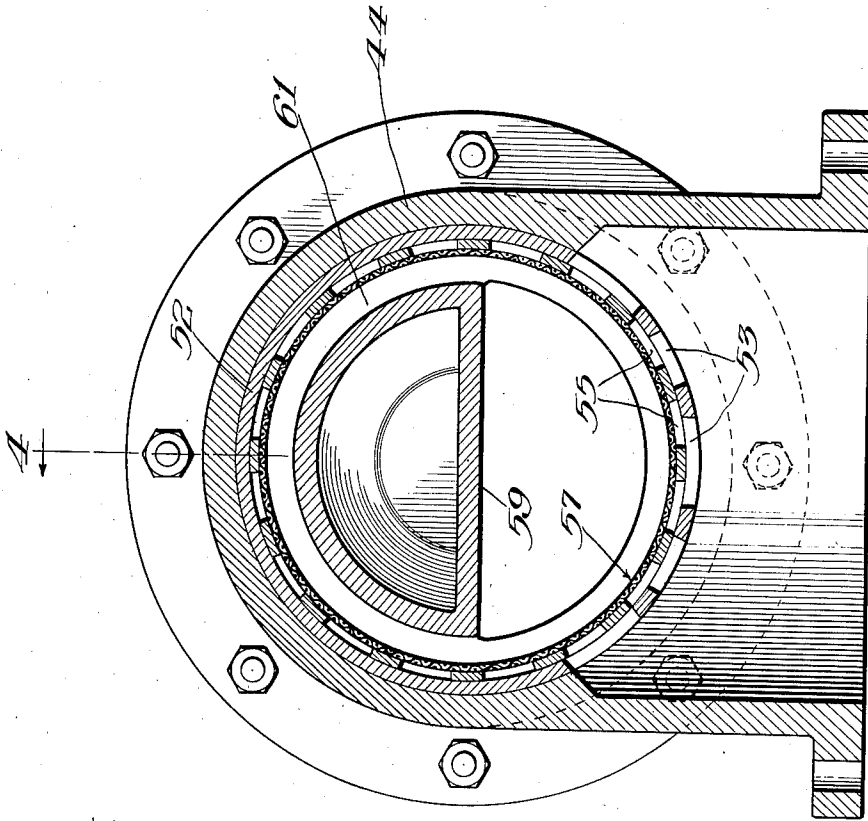


Fig. 5.

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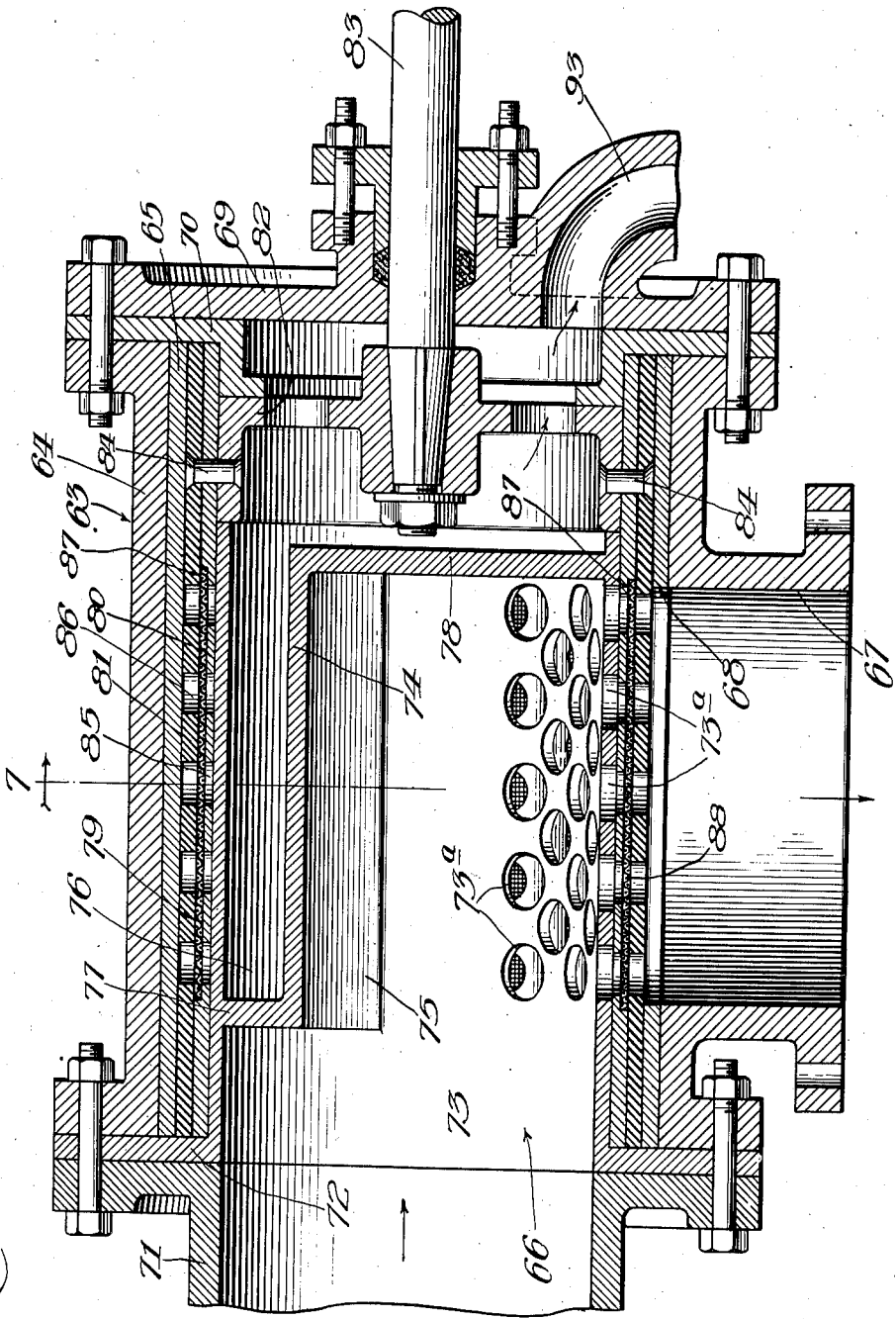
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Fig. 6.



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6 Sheets-Sheet 6

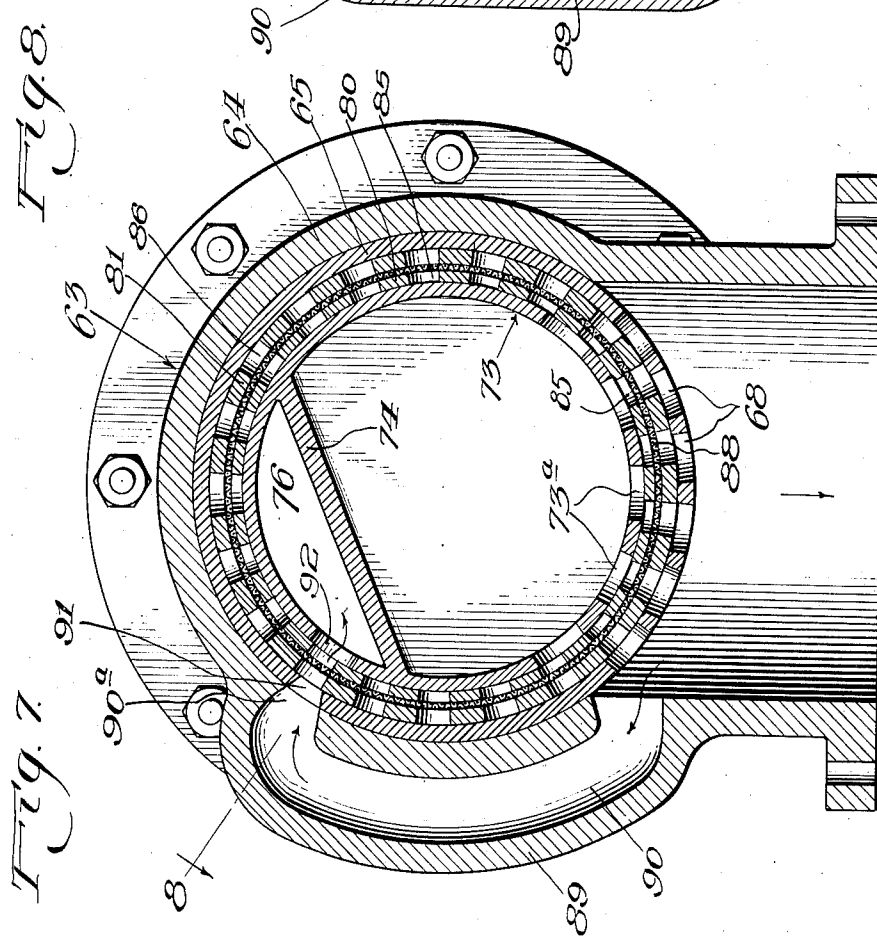
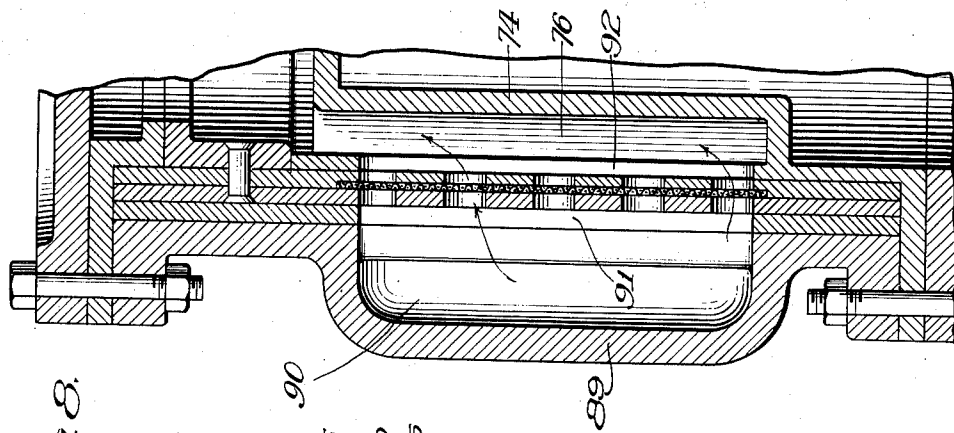


Fig. 7

Fig. 8

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UNITED STATES PATENT OFFICE

1,968,741

STRAINER APPARATUS

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Application July 23, 1930, Serial No. 470,165

15 Claims. (Cl. 210-167)

My invention relates, more particularly, to automatically operating filtering devices for use as for example in cleaning water, sewage disposal, oil separation, oil filtering, food product separation, gas cleaning, cement plant cleaning, and air cleaning, to remove, by way of example, particles of dirt or other solid foreign matter from liquids or gases or separate constituents of different viscosities, as for example in the case of oil separation.

My primary object is to provide a construction of the character above referred to whereby the apparatus will continuously function to effect the desired separation and not require dismantling of its parts for cleaning, and which shall have a capacity for screening the material effectually while flowing therethrough in relatively large volume.

Another object is to provide a construction whereby wear of the parts tending to impair the proper functioning of the apparatus will be reduced to the minimum; and other objects as will be manifest from the following description.

Referring to the accompanying drawings:

Figure 1 is a view in vertical sectional elevation of one of the forms in which my invention may be embodied, the section being taken at the line 1 on Fig. 2 and viewed in the direction of the arrow.

Figure 2 is a section taken at the line 2 on Fig. 1 and viewed in the direction of the arrow.

Figure 3 is a broken section taken at the line 3 on Fig. 2 and viewed in the direction of the arrow.

Figure 4 is a longitudinal section of another form of construction in which my invention may be embodied, the section being taken at the line 4 on Fig. 5 and viewed in the direction of the arrow.

Figure 5 is a section taken at the line 5 on Fig. 4 and viewed in the direction of the arrow.

Figure 6 is a view like Figure 4 of another form of construction in which my invention may be embodied.

Figure 7 is a section taken at the line 7 on Fig. 6 and viewed in the direction of the arrow; and

Figure 8, a broken section taken at the line 8 on Fig. 7 and viewed in the direction of the arrow.

Referring to the construction shown in Figs. 1, 2 and 3, 9 is a casing containing an inlet 10 in its cylindrical side-wall 11 as for example for water to be screened, and an outlet 12 at its lower end for the clear water.

The casing 9 contains a stationary tubular liner-member 13 cylindrical on its outer surface and tapered on its inner surface toward the upper

end of the casing 9, this liner-member containing a series of openings 14 in its side wall in registration with the inlet 10 and a vertically elongated slot 15 in the portion of its side wall opposite that containing the openings 14 which opens into a chamber 16 in the casing 9 having an outlet 17 through which the accumulations on the rotary screening member hereinafter described are discharged by water flowing from the inside of the strainer.

The casing 9 comprises, in addition to the parts described, a ring 18 at its lower end which is clamped between a flange 19 on the lower end of the wall portion 11 of the casing and a flange 20 on an outlet pipe 21 opening into the outlet 12, the ring 18 being provided at its inner periphery with an annular flange 22 which extends upwardly into the confines of the side wall 11 of the casing 9 and the lower end of the liner member in concentrically spaced relation to the latter as represented in Fig. 1.

The upper end of the casing 9 is formed of an end plate 23 clamped at its peripheral edge to a flange 24 on the side-wall 11, with a ring 25 interposed therebetween, the ring 25 having a depending annular flange 26 extending into the confines of the side-wall 11 and the upper end of the liner member in concentrically spaced relation to the latter.

Rotatably mounted in the liner member 13 is a drum 27 the lower end of which extends into the space between the flange 22 and the liner 13 and the upper end of which extends into the space between the flange 26 and the liner 13, whereby the drum has both inside and outside bearing contact with stationary parts of the apparatus.

The drum 27 is formed of two concentrically arranged, nested, shells 28 and 29 rigidly secured together as by the rivets represented at 30, the outer surface of the shell 29 containing a peripheral endless groove 31 in which an endless screening or straining member 32 is positioned, the member 32 being preferably formed of No. 40 wire mesh. The shells 28 and 29 contain registering openings 33 and 34, respectively, extending through their side walls disposed substantially throughout the entire peripheral areas of these shells, the openings 33 forming cavities or pockets, the bottoms of which are formed of the screen 32, in which the particles removed from the water in the operation of the apparatus as hereinafter described, collect and from which they are discharged as hereinafter described.

It may be stated that in the use of the appara-

tus the drum 27 is continuously rotated and as a means for driving it, I have shown the drum as connected, at a spider frame 35 held to the shells 28 and 29 by the rivets 30, with a drive shaft 36 which would be driven by any suitable means (not shown).

Inside of the drum 27 is a nozzle or orifice member 37 shown as pivotally connected at 38 with links 39 in turn pivotally connected at 40 with upstanding ears 41 on a cross-member 42 carried by the flange 22. The member 37 thus is constantly urged or biased for movement in an outward and downward direction on pivotal axes 38 and 40 and bears, by gravity, against the inner surface of the drum 27 in a position in which its orifice or port 43, registers with the slot 15 in the liner 13, the face of the nozzle member 37 at which it engages the liner being curved to conformingly fit the latter. The inner portion of the port or orifice 43 and the outer portion of the slot 15 preferably flare inwardly and outwardly, respectively, to cause the passage formed thereby to be of Venturi form to accelerate the flow of sediment-removing water through the screen at this point, the orifice 43 constituting a limiting and measuring means for the sediment-removing fluid.

In the use of this apparatus the water to be screened enters the inlet 10, passes through the openings 14 and 33, screen 32, openings 34 and thence, as to the major part, out through the outlet 12. The screen 32 serves to intercept the solid particles in the water which become lodged in the cavity, or pocket, forming openings 33 and are carried therein in the continuous rotation of the drum to a position in which they register with the orifice 43 from which pockets they are washed out through the outlet 15 and 17 to waste by the pressure of the water in the drum 27 or if desired by suction exerted on the outlet 17 as by a suction pump (not shown) connected with the outlet 17.

Thus it will be understood that the solid matter screened from the water in its passage through the apparatus is automatically removed from the apparatus and the screen cleared for subsequent screening, by a counterflow of water through the screen as its successive portions move past the outlet passage 15.

Referring to Figs. 4 and 5 the construction shown therein and constituting another embodiment of my invention, comprises a casing 44 having a cylindrical side-wall-forming portion 45 containing an inlet 46 at one end for the water to be screened and an outlet 47 in its side wall for the clear water. The casing 44 also comprises an end plate 48 secured to the side-wall-forming portion 45 with a flanged ring 49 interposed therebetween as described of the flanged ring 26 of Figs. 1-3. The opposite end of the portion 45 connects with an outlet pipe 50 opening into the outlet 46 of the casing, with a flanged ring 51 interposed therebetween as explained of the ring 18.

The casing also comprises a cylindrical stationary liner member 52 located in the side-wall-forming portion 44 of the casing and containing a series of openings 53 in registration with the outlet 47 of the casing.

This structure also comprises a rotatable drum 54 journaled in the liner member 52 with its ends extending into the spaces between the flanges of the rings 49 and 51 and the adjacent ends of the liner member 52 and having journal

bearing thereagainst as explained of the drum of Figs. 1-3.

The drum 54 contains openings 55 extending therethrough throughout its circumference and its inner surface is grooved as indicated at 56 to receive an endless strainer-member 57 preferably of No. 40 wire mesh, the drum being shown as associated with a shaft 58 by which it may be rotated as explained of the construction of the preceding figures.

Extending into the drum 54, but out of contact therewith, is a stationary partition member 59 shown as supported by the flange of the ring 51. The member 59 at the end thereof adjacent the inlet 46 closes substantially one half of the drum 54 (its upper half) to the inlet 46, except through a series of passages 60 which open into an arc-shaped passage 61 provided between the upper portion of the partition 59 and the drum 54 and opening at its left-hand end in Fig. 4 into the interior of the drum 54 which communicates with an outlet pipe 62 leading to waste and through which the particles deposited on the strainer 57 and washed therefrom by water traveling through the passage 61, are discharged. The partition member 59 is so shaped as shown that the end thereof opposite that adjacent the inlet 46 substantially closes the drum except for the passage 61.

In the operation of this construction of apparatus the water to be strained flows into the casing through the inlet 46, the main body of the water flowing through the strainer portion 57 of the drum and thence through the openings 55 therein and the openings 53, to the outlet 47 in which operation the solid particles in the water are intercepted by the screen 57 and collects on its inner surface. The remaining portion of the water entering the inlet 46, flows through the openings 60 and along the passage 61 thereby subjecting the accumulations on the screen 57 to a washing action for cleansing the latter, in the carrying of the portions of the screen 57 upon which the particles have been accumulated into a position to be subjected to the flow of water as stated.

Referring to the construction shown in Figs. 6, 7, and 8, 63 is a casing formed of a side-wall portion 64 containing a cylindrical liner member 65 the casing 63 containing an inlet 66 at one end for the water to be screened and a clear water outlet 67 in its side wall portion 64, in registration with slot 68 in the liner member 65.

One end of the casing 63 is formed of a plate 69 secured to the adjacent end of the member 64 with a flanged ring 70, like the ring 26 of Figs. 1-3, interposed therebetween. The other end of the casing 63 connects at its inlet end with an inlet-pipe 71, there being interposed between the casing-portion 64 and the pipe 71 a ring 72 formed on an end of a cylindrical member 73 located in, and concentrically spaced from, the liner 65 and containing openings 73^a registering with the opening 68. The member 73 is provided with a partition-forming member comprising a plate portion 74 which extends lengthwise of the strainer apparatus and divides the interior of the member 73 into two passages 75 and 76, one end of the portion 74 being connected with a wall portion 77 extending crosswise of the strainer apparatus and united with the adjacent side wall portion of the member 73 and the other end of the portion 74 connected with a wall portion 78 extending crosswise of the strainer apparatus but in a direction from the portion 74 opposite that

in which the portion 77 extends therefrom, and united with the opposite portion of the side wall of the member 73. Thus all the water to be cleansed and entering the apparatus through the inlet 66 flows into the passage 75 and thence through the strainer means hereinafter described, and discharges through the outlet 67.

The apparatus also comprises a drum 79 rotatably mounted in the space between the member 73 and the liner 65 and at one end between the liner 65 and the flange on ring 70 and having bearing contact with these parts. The drum is formed of two concentric, nested, shells 80 and 81 secured together, and to a spider frame 82 connected with a drive shaft 83 for rotating the drum, by rivets 84, the shells 80 and 81 containing registering openings 85 and 86, respectively, disposed circumferentially around the shells.

The outer surface of the shell 80 contains an endless circumferential groove 87 in which an endless strainer element 88 preferably of No. 40 wire mesh is located, the strainer 88 forming the bottoms of the cavities or pockets, formed by the openings 85, in which the particles screened from the water in the operation of the apparatus as hereinafter described, accumulate.

The casing-portion 64 is formed with a bulged portion 89 containing a passage 90 which opens at one end into the clear-water outlet 67 and at its opposite end into an orifice 91 in the liner-member 65, the orifice 91 serving as an entraining, limiting and measuring means for the cleaning fluid and registering with a slot 92 in the cylinder-member 73, the slot 92 opening into the passage 76. The passage 90 at the portion thereof where it opens into the slot 92 is preferably flared, as represented at 90^a, in a direction reverse to the flow of water through the passage 90 to provide a nozzle action producing acceleration of the flow of water through the strainer element 88 thereby augmenting the cleaning action.

In the use of this apparatus the water to be screened enters the inlet 66, passes through the openings 73^a and 85, screen 88 and openings 86 and thence through opening 68 to the outlet 67, the screen 88 serving to intercept the solid particles in the water which become lodged in the cavity, or pocket, forming openings 85 in which they are carried, in the continuous rotation of the drum 79, into registration with the slots 91 and 92 and from which pockets they are washed out into the passage 76 and thence to an outlet represented at 93 and leading to waste, by the back pressure of water in the outlet 67 or, if desired, by suction exerted on the outlet 93 as by a suction pump (not shown) connected with the outlet 93.

It will be noted from the foregoing that in the case of each apparatus shown the flow of water for cleansing the strainer drum of accumulated particles screened from the water is applied locally to the drum or in other words at a predetermined portion only of the drum; and further that while adequate provision is made for preventing leakage of dirty water into the clear water rubbing contact of the relatively vulnerable screen with other parts of the apparatus is prevented which makes for long life of the apparatus, it being noted that in each apparatus the ends of the open-ended drum are journaled between stationary bearing members.

As regards the apparatuses of Figs. 1, 2, 3, 6, 7 and 8 it will be noted that the screen is very effectually protected by reason of its interposition between the nested shells forming elements of the strainer

drum, and that provision is made for collecting the particles, removed from the water, in pockets or cavities in the drum so that the particles will extend out of rubbing contact with parts of the apparatus thereby making the apparatus practical for long continuous service.

The backing of the screen in the constructions shown permits of the use of relatively fine screen which is of advantage not only because more effective cleansing of the water may be effected but because the finer the screen the easier it may be cleaned of particles accumulating thereon.

The provision of the taper on the part in which the drum is rotatably mounted as illustrated in Fig. 1, is of advantage as it permits, by relative longitudinal adjustment of these parts, compensation for wear, it being understood that, while the other forms of apparatus shown do not embody this taper feature, such feature may be incorporated therein.

While I have illustrated certain particular forms of apparatus in which my invention may be embodied I do not wish to be understood as intending to limit it thereto as the same may be variously modified and altered and the invention embodied in other forms of apparatus; and as an example of such a modification instead of providing a single inlet for the water to be cleansed and a single outlet for the cleansing water a plurality of diametrically disposed inlets and a plurality of diametrically disposed cleansing water outlets, may be provided therein thereby effecting the balancing of the forces of the incoming water against the rotating parts of the structure and providing a cleansing-water outlet for each inlet and closely adjacent thereto.

What I claim as new and desire to secure by Letters Patent is:

1. A strainer apparatus comprising a casing having an inlet for fluid to be cleansed and an outlet for the cleansed fluid, said casing having annular bearing sockets opening toward each other and each formed of annular spaced apart concentric walls, and a rotary strainer drum having a side wall substantially circular in cross-section, said drum being journaled at its opposite ends in said sockets and through a side of which the fluid in flowing from said inlet to said outlet passes.

2. A strainer apparatus comprising a casing having an inlet for fluid to be cleansed and an outlet for the cleansed fluid, said casing having annular bearing sockets opening toward each other and formed of annular spaced apart concentric walls, and a rotary strainer drum having a side wall substantially circular in cross-section, said drum being journaled at its opposite ends in said sockets and through a side of which the fluid in flowing from said inlet to said outlet passes, said side wall being formed of perforated shells at which it extends into said sockets and a mesh element interposed between said shells.

3. A strainer apparatus comprising a casing having an inlet for fluid to be cleansed and an outlet for the cleansed fluid, a rotary strainer drum in said casing the side wall of which is substantially circular in cross-section and constitutes the strainer portion of said drum through which the fluid supplied to said inlet passes into said drum, liner means between said casing and drum and means beyond said inlet for causing fluid to flow from the inside of said drum through its side wall for removing the accumulations from said side wall, said casing comprising an inner perforated shell, an outer perforated shell and

a mesh element between said shells, the outer shell having rubbing contact with said liner means throughout the full length of said outer shell.

5 4. A strainer apparatus comprising a casing having an inlet for fluid to be cleansed and an outlet for the cleansed fluid, a rotary strainer drum in said casing the side wall of which is substantially circular in cross-section and constitutes the strainer portion of said drum and through which the fluid supplied to said inlet passes into said drum, and means beyond said inlet for causing fluid to flow from the inside of said drum through its side wall for removing accumulations from said side wall comprising a ported nozzle member bearing against the inner surface of said strainer portion, link means pivoted to the casing, and means above the pivotal axis of the link means and closer to the said surface than said axis pivotally connecting said link means to the nozzle member to maintain bearing contact with said strainer portion under wear.

5 5. A strainer apparatus comprising a casing having an inlet for fluid to be cleansed and an outlet for the cleansed fluid, said casing having annular bearing sockets opening toward each other and each formed of annular spaced apart concentric walls, and a rotary strainer drum having a side wall substantially circular in cross-section, said drum being journaled at its opposite ends in said sockets and through a side of which the fluid in flowing from said inlet to said outlet passes, said drum having bearing contact throughout its length with the inner surface of said casing.

6. A strainer apparatus comprising a casing having an inlet for fluid to be cleansed and an outlet for the cleansed fluid, said casing having annular bearing sockets opening toward each other and each formed of annular spaced apart concentric walls, and a rotary strainer drum having a side wall substantially circular in cross-section, said drum being journaled at its opposite ends in said sockets and through a side of which the fluid in flowing from said inlet to said outlet passes, said drum having bearing contact throughout its length with the inner surface of said casing, said drum comprising perforate shells disposed one within the other and a mesh element interposed between said shells and the bearing contact between said drum and casing being at the outer circumferential surface of said outer shell.

7. A strainer apparatus comprising a casing having an inlet for fluid to be cleansed and an outlet for the cleansed fluid, a rotary strainer drum in said casing the side wall of which is substantially circular in cross-section and constitutes the strainer portion of said drum and through which the fluid supplied to said inlet passes into said drum from the exterior to the interior thereof, and means beyond said inlet for causing fluid to flow from the inside of said drum through its side wall for removing accumulations from said side wall comprising a ported nozzle member, and means mounting said nozzle member on the casing for movement by gravity in a downward and outward direction for pressing against the inner surface of said strainer portion to maintain bearing contact with the strainer portion under wear.

8. A strainer apparatus comprising a casing having an inlet for fluid to be cleansed and an outlet for the cleansed fluid, a rotary drum

through a side of which the fluid in flowing passes, said drum having a side wall substantially circular in cross-section, said drum having screened perforations and being journaled in the casing between the inlet and the outlet, said casing having a separate opening, means within said drum for directing the flow of fluid therefrom through said opening to cleanse the screened perforations of the drum without having recourse to a separate source of pressure, the walls of the opening through which the cleansing fluid passes being shaped to form a venturi, whereby the flow of cleansing fluid through said drum is accelerated.

9. A strainer apparatus comprising a rotary strainer drum in the form of a perforated shell, said shell having a side wall substantially circular in cross-section, a casing for the shell, said casing having an opening leading into the interior of the shell and another opening leading from the interior of the shell, means for rotating the shell in the casing, means positioning the screening means adjacent each perforation to restrict the flow of fluid therethrough, and means in the drum for directing flow of liquid therefrom to cleanse the screened perforations of the drum without having recourse to a separate source of pressure, the walls of the opening through which the cleansing fluid passes being shaped to form a venturi whereby the flow of fluid through the drum is accelerated.

10. A strainer apparatus comprising a casing having an inlet for the fluid to be cleansed and an outlet for the cleansed fluid, a rotary drum in said casing and tapering toward one end thereof, removable liner means between said casing and drum, said drum being formed of tapered inner and outer perforated shells and screening means between said shells and extending across the perforations therein, said drum being so disposed that the fluid in passing from said inlet to said outlet, passes through, and is screened by, said drum, means whereby the surface of said drum carrying the substance removed from the fluid is subjected to a localized flow of water for removing the substance from said drum, and power means for continuously revolving said drum.

11. A strainer apparatus comprising a casing having an inlet for fluid to be cleansed and an outlet for the cleansed fluid, a rotary strainer drum in said casing so disposed that the fluid in passing from said inlet to said outlet passes through and is strained by said drum, said drum having a side wall substantially circular in cross-section and means through which a portion of said fluid admitted to the casing passes to utilize the pressure thereof for producing a counter-flow of fluid through said drum for removing therefrom the particles removed from the fluid and accumulated thereon comprising a nozzle member having a port opening to the strainer portion of the drum and flaring in a direction reverse to the flow of the cleansing fluid thereto for entraining and accelerating the velocity of flow of fluid through said strainer portion, and means mounting said nozzle member in the apparatus for substantial radial movement away from the axis of the drum so as to be maintained in contact with the drum through the pressure of the fluid.

12. A strainer apparatus comprising a casing having an inlet for fluid to be cleansed and an outlet for the cleansed fluid, a rotary strainer drum in said casing the side wall of which constitutes the strainer portion of said drum and through which the fluid supplied to said inlet passes into said drum, said drum having a side

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wall substantially circular in cross-section and means for producing a counter-flow of fluid through said strainer portion to remove accumulations thereon comprising a ported nozzle member bearing against said drum and means pivotally mounting said nozzle member whereby gravity urges it into contact with the drum and maintains engagement therewith at all times.

13. A strainer apparatus comprising a casing having an inlet for fluid to be cleansed and an outlet for the cleansed fluid, and a rotary strainer drum in said casing so disposed that the fluid in passing from said inlet to said outlet passes through a side wall of the drum and is screened thereby, removable liner means between said casing and drum and presenting a port for flow there-through of fluid for cleansing said strainer drum, said drum having rubbing engagement with said liner means.

14. A strainer apparatus comprising a casing having an inlet for fluid to be cleansed and an outlet for the cleansed fluid, a rotary drum through a side of which the fluid in flowing passes, the side wall of said drum constituting the strainer portion of said drum and through which the fluid supplied to said inlet passes, said drum having a side wall substantially circular in cross-

section, said drum being journaled in the casing between said inlet and outlet and said casing having a separate opening, and means for directing fluid through said strainer portion to cleanse it of accumulations thereon without having recourse to a separate source of pressure, the walls of the opening through which the cleansing fluid passes being shaped to form a venturi whereby the flow of cleansing fluid through the drum is accelerated.

15. A strainer apparatus comprising a casing having an inlet for fluid to be cleansed and an outlet for the cleansed fluid, a rotary drum through a side of which the fluid in flowing passes, said drum having screened perforations and being journaled in the casing between the inlet and the outlet, said drum having a side wall substantially circular in cross-section, said casing having a separate opening, means within said drum for directing the flow of fluid therefrom through said opening to cleanse the screened perforations of the drum, liner means in said casing and interposed between the latter and said drum, said liner means having an opening in registration with said opening in said casing.

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