

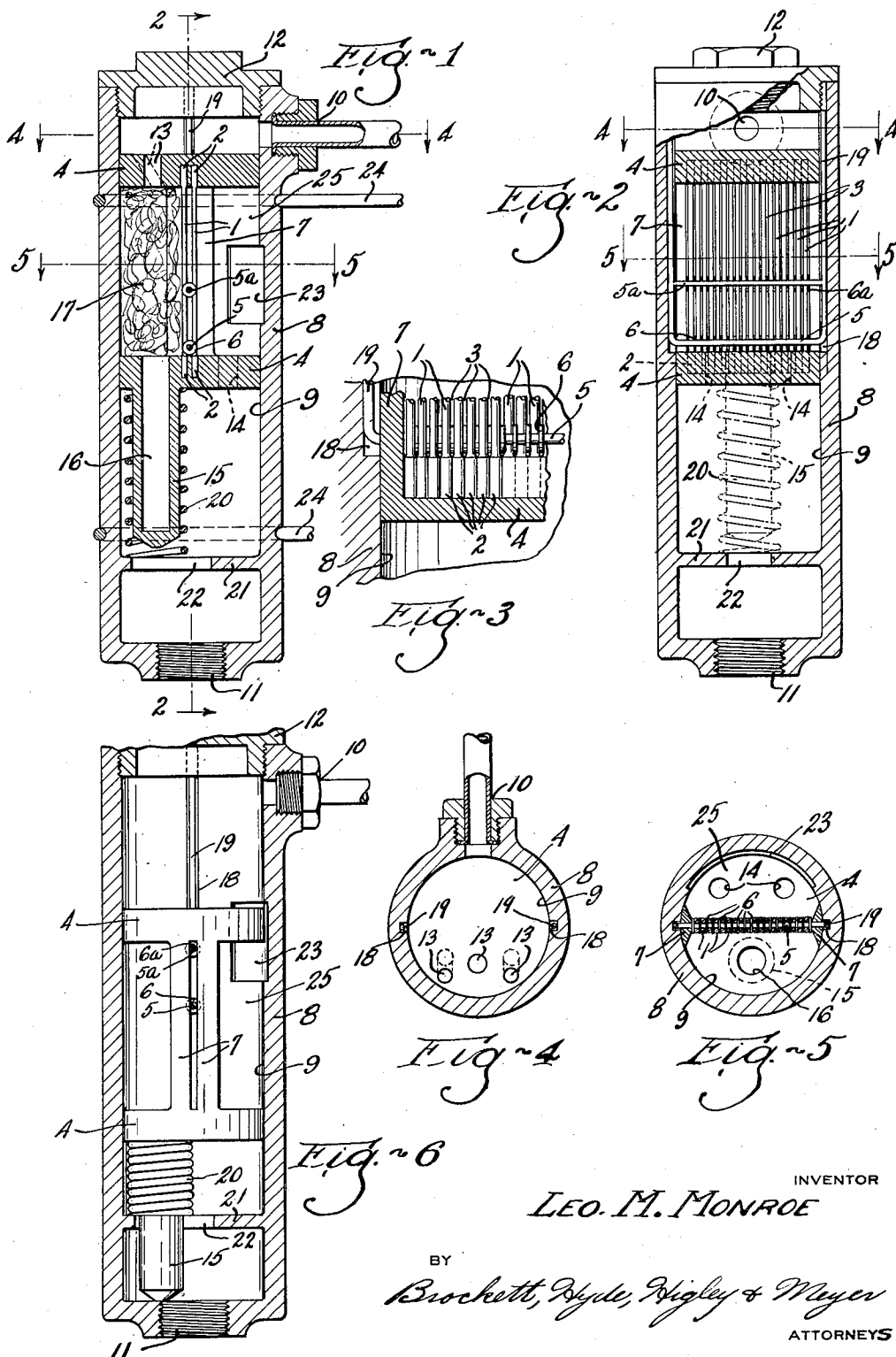
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OIL FILTER

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OIL FILTER

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This invention relates to filtering means for liquids, and more particularly to such means, of strainer type, adapted for use in circulating lubricating systems and the like.

An object of the invention is to provide a novel device of the character described, of construction simple yet of such accuracy that the straining characteristic is perfectly predetermined.

A further object is to provide automatic cleaning means whereby such characteristic is maintained throughout the operation of the device.

And still another object is to provide that there shall be no interruption to flow during the cleaning operation or even should the cleaning device fail to function.

The exact nature of this invention together with further objects and advantages thereof will be apparent from the following description taken in connection with the accompanying drawing, in which Fig. 1 is a typical longitudinal section through an embodiment of the invention, as in a plane transverse of the filter screen unit, and showing the parts in their usual operating position; Fig. 2 is a section as in the plane of line 2—2, Fig. 1; Fig. 3 is an enlarged detail of parts illustrated in Figs. 1 and 2; Fig. 4 is a transverse section as in the plane of line 4—4, Figs. 1 and 2; Fig. 5 is a typical transverse section, taken through the filter screen unit, as in the plane of line 5—5, Figs. 1 and 2; and Fig. 6 is a view following the section of Fig. 1 and illustrating the operation of the parts.

With reference now to the drawing, the filter or strainer itself is made up of a plurality of rod elements 1 arranged in parallel relation. These elements are cylindrical and each has enlargements on its ends forming heads 2 leaving an intermediate cylindrical part of smaller diameter; so that when a row of these elements are arranged with their heads contiguous, there will be parallel clearances 3 therebetween, these clearances being determined by the difference in diameter between the enlargements and the intermediate parts of the elements. The elements may be inexpensively and accurately made by rolling.

To secure the elements related as described, a plunger is provided, in the form of a carrier having end members 4 in which the heads 2 of the rod elements are embedded. The carrier thus conveniently comprises a die casting having its end members 4 cast about the heads of the rod elements.

The simplest filter unit which could be so formed would obviously comprise a single row of rod elements arranged in a plane. According to

this invention I provide two such units, slightly spaced as indicated Fig. 1, to receive therebetween a bar 5 extending transversely of the elements. Upon this bar is provided a plurality of disks 6 each disk extending into the clearance openings 3 formed by two adjacent pairs of rod elements, one of each screen unit. It will be apparent that movement of the bar 5 to move its disks 6 along the clearances 3 will clean both filter screens of any accumulations between their elements, the disks 6 being cleaning members.

The end members 4 of the filter carrier are circular in contour and are joined by members 7 to form a frame extending about the filter screen units which latter are thus disposed substantially in a diametrical longitudinal plane with respect to the cylinder defined by the carrier.

The carrier is arranged in a casing 8 having a cylindrical cavity 9 fitting the two heads 4 of the carrier which acts therein as a double-headed free piston. The casing 8 is provided with a lateral inlet connection 10 near one end and an outlet connection 11 at its other end. A closure 12 is provided at the inlet end of the casing, through which the carrier may be withdrawn. The carrier head 4 on the inlet end and on one side of the plane of the filter screens is provided with through openings 13, one of which may be parallel with the filter screens and others diagonally disposed as indicated, in directions toward the filter screens. The head 4 of the carrier on its outlet end, and on the opposite side of the filter screens, is provided with openings 14 providing communication from the screens to the outlet connection 11 of the casing. Thus while the filter screen unit extends substantially in the general direction of flow between the casing connections 10 and 11, such flow will be from the inlet connection 10 by way of the openings 13, the filter screen units, the openings 14 and to the outlet connection 11.

The parts being intended for use with the inlet opening at the top and the outlet opening at the bottom, as shown in the drawing, the lower carrier head 4 is provided with a downwardly extending post 15 hollowed to provide a sump 16 leading downwardly from in front of the filter screens, and preferably located opposite the aligned opening 13 in the far carrier head 4. Sediment-accumulating masses 17 of plaster of Paris or the like, may be arranged between these parts as indicated Fig. 1.

The casing 8 is provided with a pair of oppositely disposed longitudinally extending grooves 18 extending from the casing and carrying the

closure 12. The cleaner bar 5 extends into these grooves with end parts 19 running therealong up to the closure. A second cleaner bar 5a having cleaner disks 6a thereon may be arranged between the parts 19 as indicated Figs. 1, 2 and 6. By this arrangement the cleaner is removable with the carrier as a unit, upon removal of the closure 12; and when the parts are assembled as illustrated, the cleaner is secured in the casing. Preferably the grooves 18 extend slightly longer than the cleaner end parts 19 allowing the latter limited movement longitudinally of the casing.

A compression spring 20 is arranged about the post 15 to bear between the lower carrier head 4 and a web 21 in the casing, the web having an enlarged opening 22 which allows free flow of liquid while the web forms an abutment for the spring. The spring is of sufficient strength to urge the carrier upwardly toward the inlet end of the casing until its motion is limited by the cleaner bar 5. The parts are so proportioned and arranged that under certain pressure conditions at the inlet end of the casing the carrier will be lowered, against the action of the spring 20 until the cleaner bar 5a is engaged by the upper head of the carrier, as indicated Fig. 6.

The casing is provided with a bypass clearance 23 adapted to become operative as indicated Fig. 6, when the carrier is lowered to this extreme position.

Operation will be as follows, assuming the parts as indicated Figs. 1 and 2, the casing being mounted vertically disposed as shown, as by brackets 24 and liquid entering through the inlet connection 10. Flow will be downwardly first through the openings 13. The central aligned opening 13 directs flowing liquid toward the sump 16 or onto the masses 17 where entrained solid particles are removed, first adhering to the masses 17 and ultimately settling into the sump 16 therebelow. Liquid flowing through the oblique openings 13 is directed against and along the elements 1 of the near filter screen unit, that is of the near row of elements, tending to wipe them free of accumulations. The liquid passes through the clearances 3 of the near screen, the screen removing entrained solid particles which cannot pass through the minute clearance openings 3. From the first screen the liquid flows through the second screen immediately therebehind and into the chamber 25 back of the screens and between the heads 4 of the carrier. Thence the strained liquid flows downwardly through the openings 14 and thence freely through the opening 22 and to the outlet connection 11.

No flow takes place by way of the grooves 18, these being substantially filled by the parts 19 of the cleaner. Similarly because of the frame parts 7 overlying these grooves and fitting the bore 9 of the casing, all flow transverse of the screens must be by way of the openings 3 therein.

Ultimately foreign matter will accumulate upon the first filter screen tending to close its openings 3. This will result in increased resistance to flow. As soon as this resistance becomes great enough to overcome the action of the spring 20, by the preponderance of pressure above abutments 4 over the pressure below the abutments, the carrier will be moved downwardly as a pressure responsive plunger until the cleaner bar 5 reaches the lower ends of the grooves 18, the cleaner moving with the carrier to this extent. Thereupon the cleaner will be fixed but the carrier may continue downwardly, the cleaner mo-

tion terminating with a bump or jar as its limit of motion is reached. The carrier moving downwardly and the cleaner being fixed, there is relative motion of the cleaner elements 6, upwardly along the grooves 3 of the filter screens, the cleaner elements thus mechanically removing any particles wedged between the filter elements.

As soon as the resistance to flow of the filter screens, thus cleaned, is reduced to a normal amount, the pressure above the carrier will be correspondingly reduced and the spring 20 will return the carrier to its original shown position. This cleaning action obviously takes place entirely automatically.

Should the cleaning action for any reason fail to take place, the carrier will continue downwardly until attaining the position of Fig. 6, in which the upper head 4 of the carrier moves opposite the bypass clearance 23. Thereupon the filter screens are bypassed, flow being had by way of the bypass 23 and openings 14. Thus if the filter be employed in a lubricating system, lubrication will not fail even though the straining of the lubricant might be temporarily interrupted.

What I claim is:

1. Filter means of the class described comprising a plurality of rod elements arranged in spaced parallel relation to form a pair of spaced screen units each comprising a row of rod elements with filtering clearances therebetween, and cleaning means for said clearances and comprising a bar arranged between said screen units transversely of the rods thereof and a plurality of cleaning members each mounted on said bar and extending into an adjacent pair of said clearances, one of each screen element, said bar and screen units being mounted for relative movement lengthwise of said rod elements to move said cleaning members along their clearances.

2. Filtering means of the class described comprising a casing having a cavity with connections for flow therethrough of liquid to be filtered, a filter screen unit and a carrier therefor, said carrier being arranged in said cavity to dispose said filter screen in the path of said flow and being arranged for movement in one direction in said cavity dependent upon increased resistance of said filter unit to said flow, means for returning said carrier in the opposite direction when said resistance decreases, and cleaning means for said unit, said cleaning means being operable by said movement.

3. Filtering means of the class described comprising a casing having a cavity with connections for flow therethrough of liquid to be filtered, a filter screen unit and a carrier therefor, said carrier being arranged in said cavity to dispose said filter screen in the path of said flow and being arranged for movement in said cavity dependent upon resistance of said filter unit to said flow, cleaning means for said unit, said cleaning means being operable by said movement, and resilient means arranged to oppose said movement and to return said carrier thereafter.

4. Filtering means of the class described comprising a casing having a cavity with connections for flow therethrough of liquid to be filtered, a filter screen unit comprising a plurality of rod elements arranged in spaced parallel relation with filtering clearances therebetween, a carrier for said unit arranged in said cavity to dispose said filter screen in the path of said flow and being arranged for movement in said cavity dependent upon resistance of said filter unit to said flow, said movement being in the direction of

said rod elements, cleaning means for said clearances and comprising a bar arranged transversely of said rods and having a plurality of cleaning members extending into said clearances, said bar being secured with said casing to have relative movement lengthwise of said cleaning members dependent upon said carrier movement.

5. Filtering means of the class described comprising a casing having a cavity with connections for flow therethrough of liquid to be filtered, a filter screen unit, a carrier for said unit arranged in said cavity to dispose said filter screen in the path of said flow and being arranged for movement in said cavity dependent upon resistance of said filter unit to said flow, said casing having a removable closure arranged to permit removal of said carrier, cleaning means for said screen unit and including a bar permanently associated with said screen unit and having ends extending beyond said carrier, said casing having slots to receive said bar ends and leading from said closure to permit insertion and removal of said cleaning means together with said carrier, said bar ends extending in said slots to bear upon said closure and thereby secure said cleaning means against said movement of said carrier.

6. Filtering means of the class described comprising a casing having a cavity with connections for flow therethrough of liquid to be filtered, a filter screen unit and a carrier therefor, said carrier being arranged in said cavity to dispose said filter screen in the path of said flow and being arranged for movement within predetermined limits in said cavity dependent upon resistance of said filter unit to said flow, resilient means arranged to oppose said movement, cleaning means for said unit operable by said movement, and means for bypassing said filter unit when said carrier approaches one of said limits.

7. Filtering means of the class described, comprising a casing having a cavity with connections for flow therethrough of liquid to be filtered, a filter screen unit disposed in said cavity in the path of said flow, said unit being supported for movement relative to said cavity, said movement in one direction being initiated by increased resistance of said unit to said flow, means for returning said unit in the opposite direction, and cleaning means for said unit, said cleaning means being operable by said movement.

8. Filtering means of the class described, comprising a casing member having a cavity with connections for flow therethrough of liquid to be filtered, a filter screen unit comprising a plurality of rod elements arranged in spaced parallel relation with filtering clearances therebetween, a carrier member supported for movement relative to said casing member, said movement being dependent upon the resistance of said filter unit to said flow, said relative movement in one direction being caused by increased resistance of said unit, means for causing relative movement in the opposite direction upon decreased resistance of said unit, said movement being in the direction of said rod elements, cleaning elements adapted to extend into said clearances, said cleaning elements being supported by one of said members and said filter unit being supported by the other of said members.

9. Filtering means of the class described, comprising a casing having a cavity with connections for flow therethrough of liquid to be filtered, a filter screen unit comprising a plurality of rod elements arranged in spaced parallel relation with filtering clearances therebetween, a carrier

for said unit arranged in said cavity to dispose said filter screen in the path of said flow, said carrier being arranged for movement in one direction in said cavity dependent upon increased resistance of said filter unit to said flow, means for moving said carrier in the opposite direction upon decreased resistance of said unit, said movement being in the direction of said rod elements, cleaning means for said clearances comprising a plurality of bars arranged transversely of said rods, said bars supporting a plurality of cleaning members extending into said clearances, said bars being secured to said casing, one of said bars limiting the carrier movement in one direction and the other of said bars limiting the carrier movement in the other direction.

10. Filtering means of the class described, comprising a casing having connections for flow therethrough of liquid to be filtered, a carrier comprising spaced members extending transversely of the casing and movable as pistons therealong, a filter screen extending longitudinally of the casing and supported between the members at their mid-region, said screen dividing the space between said members into chambers on opposite sides of the screen, there being an opening through one member communicating with the chamber on one side of said screen, there being an opening through the other member communicating with the chamber on the opposite side of said screen, whereby the flow of the liquid is caused to pass through said screen and clogging of the screen causes movement of the carrier in one direction, means for returning the carrier in the opposite direction, and cleaning means for said filter arranged to be made effective by said carrier movement.

11. Filtering means of the class described comprising, a casing having a cavity with inlet and outlet connections for flow therethrough of liquid to be filtered, a filter screen disposed in said cavity in the path of said flow, a movable abutment having opposed faces only one of which is normally exposed to pressure from said inlet, the other face being normally subjected to a slightly lower pressure whereby said abutment is moved in one direction when clogging of the screen increases said inlet pressure, means biasing said abutment in the opposite direction independent of said pressures, cleaning means for said screen movable thereacross by movement of said abutment, and means for equalizing the pressure on the opposed faces of said abutment when said cleaning means reaches a predetermined limit.

12. Filtering means of the class described comprising, a casing having a cavity with inlet and outlet connections for flow therethrough of liquid to be filtered, a filter screen disposed in said cavity in the path of said flow, a movable abutment having opposed faces only one of which is normally exposed to pressure from said inlet, the other face being normally subjected to a slightly lower pressure whereby said abutment is moved in one direction when clogging of the screen increases said inlet pressure, means biasing said abutment in the opposite direction independent of said pressures, cleaning means for said screen operable by movement of said abutment, a by-pass between said inlet and outlet connections, and means for opening said by-pass when said cleaning means reaches a predetermined limit.

13. Filtering means of the class described comprising, a casing having a cavity with inlet

and outlet connections for flow therethrough of liquid to be filtered, a filter screen disposed in said cavity in the path of said flow, a movable abutment having opposed faces only one of which is normally exposed to pressure from said inlet, the other face being normally subjected to a slightly lower pressure whereby said abutment is moved in one direction when partial clogging of the screen increases said inlet pressure, means biasing said abutment in the opposite direction independent of said pressures, cleaning means for said screen operable by movement of said abutment, a by-pass between said inlet and outlet connections, and means for opening said by-pass upon substantially complete clogging of said screen.

14. Filtering means of the class described comprising, a casing having a cavity with inlet and outlet connections for flow therethrough of liquid to be filtered, a filter screen disposed in said cavity in the path of said flow, a movable abutment having opposed faces only one of which is normally exposed to pressure from said inlet, the other face being normally subjected to a slightly lower pressure whereby said abutment is moved in one direction when clogging of the screen increases said inlet pressure, means biasing said abutment in the opposite direction independent of said pressures, and cleaning means for said screen operable by movement of said abutment, said abutment being arranged for sufficient movement in one direction to cause said cleaning means to traverse substantially the entire filtering surface of said screen.

15. A device for the purpose described comprising a casing having connections for flow therethrough of liquid to be filtered, a filter unit having parallel filtering elements arranged with-

in said casing in the path of said flow, a cleaning unit for said filter unit having cleaning elements extending between said filtering elements, plunger means mounted for movement responsive to relative pressures on opposite sides of said filter unit, and means connecting said plunger with one of said units to provide cleaning actuation of the latter relative to the other unit.

16. A device for the purpose described comprising a casing having connections for flow therethrough of liquid to be filtered, a filter unit having parallel filtering elements arranged within said casing in the path of said flow, a cleaning unit for said filter unit having cleaning elements extending between said filtering elements, plunger means mounted for movement in the direction of said filter elements responsive to relative pressures on opposite sides of said filter unit, means rigidly connecting said plunger with one of said units to provide cleaning actuation of the latter relative to the other unit, and means connecting said other unit with said casing.

17. A device for the purpose described comprising a casing having connections for flow therethrough of liquid to be filtered, a filter unit having parallel filtering elements arranged within said casing in the path of said flow, a cleaning unit for said filter unit having cleaning elements extending between said filtering elements, plunger means mounted for movement in the direction of said filtering elements responsive to relative pressures on opposite sides of said filter unit, one of said units being mounted upon said plunger whereby the latter may act as a carrier thereof, and means securing the other unit with said casing.

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