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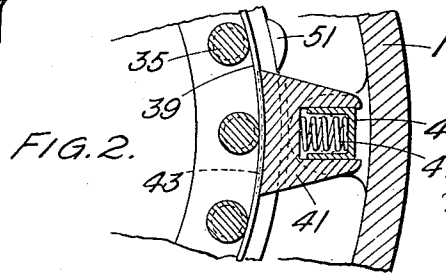
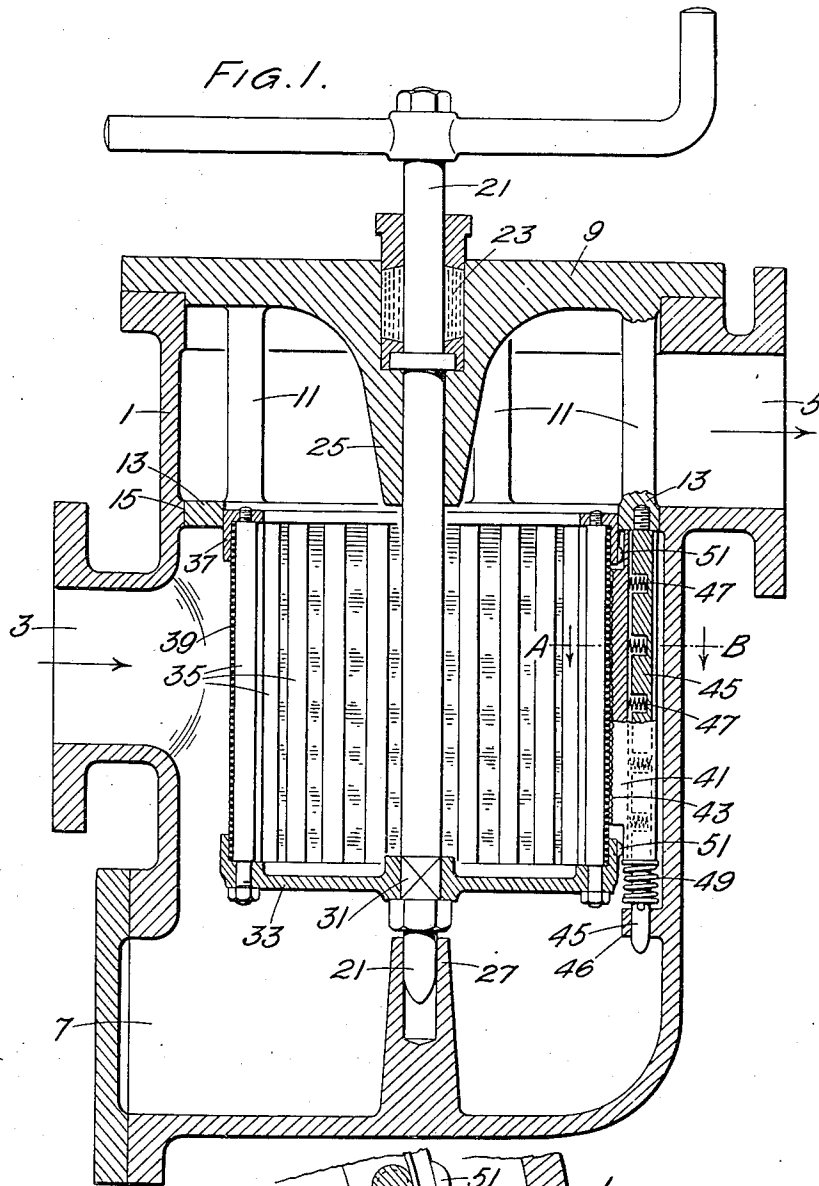
W. R. BELDAM

2,065,263

FILTERING OR STRAINING APPARATUS

Filed March 16, 1933

2 Sheets-Sheet 1



Inventory: -

William R. Beldam

by Robert E. Peck attn

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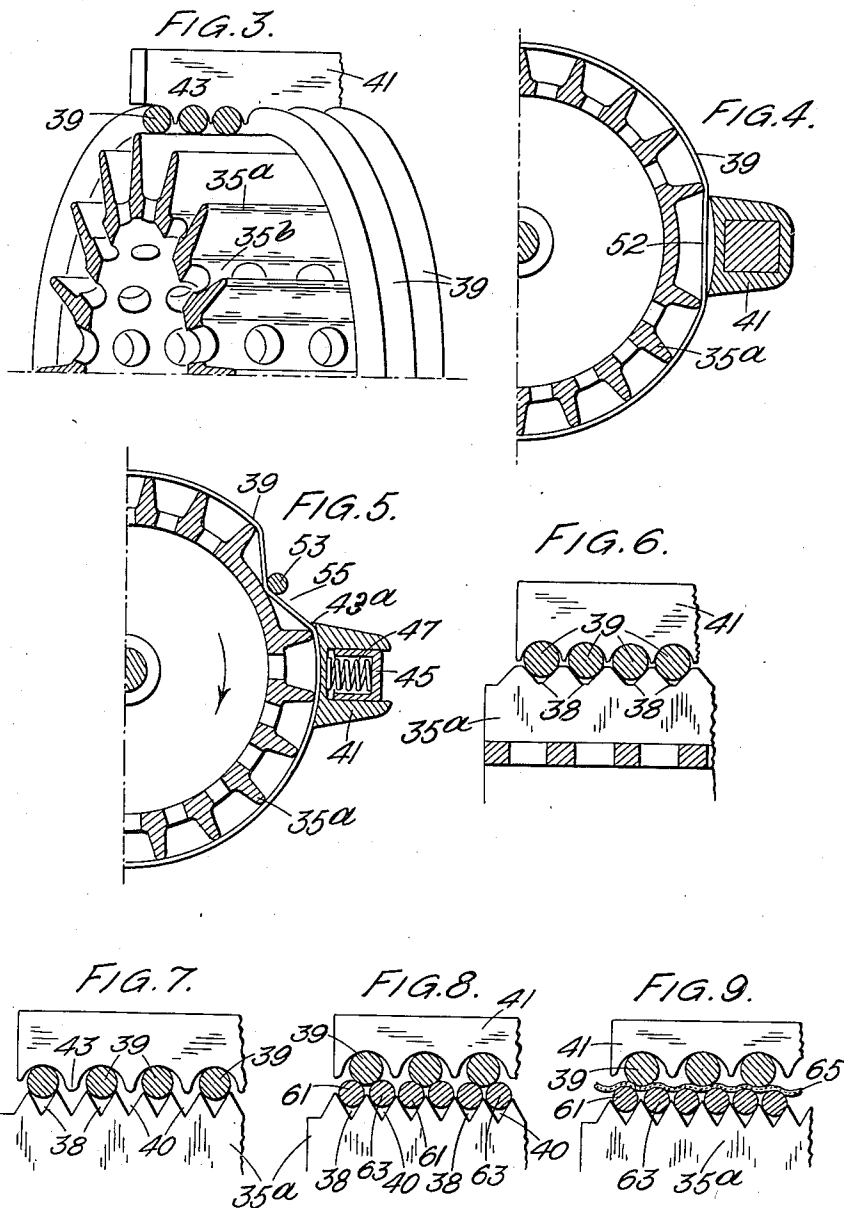
W. R. BELDAM

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2 Sheets-Sheet 2



Inventor: -
 William R. Beldam
 by Herbert E. Beck, atty

UNITED STATES PATENT OFFICE

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FILTERING OR STRAINING APPARATUS

William Robert Beldam, Hounslow, England

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In Great Britain March 22, 1932

16 Claims. (Cl. 210—167)

The present invention concerns improvements in straining apparatus of the kind which employs a screening wall comprising wire coiled on a support, in contradistinction to a medium such as gauze or fabric or spaced plates.

Various methods for cleaning strainers have been employed. Some form of scraper has been found to be very efficient in many cases, but so far as I am aware this has not been used with a wire strainer coiled upon a support, probably by reason of the fact that the dirt strained from the fluid lodges in the spaces between the coils of the wire and it is difficult to provide scraping means that will operate efficiently in such spaces. To be effective the scraping means must not merely scrape along the surface as that would be apt to force the deposit through the straining wall. The main object of the present invention is to provide straining apparatus of the kind hereinbefore specified in which there is scraping means, the said apparatus being robust and comparatively cheap to manufacture and little likely to get out of order during considerable periods of operation.

Further objects and the several features of the invention will become more fully apparent to those skilled in the art from the following description, in conjunction with the accompanying diagrammatic drawings, of the aforementioned constructions illustrative of the invention.

In the drawings,

Fig. 1 is a sectional elevation of a wound wire strainer provided with a scraper;

Fig. 2 is a detail to an enlarged scale in sectional plan on the line A—B of Fig. 1;

Fig. 3 is a perspective diagram indicating an alternative construction of support for the straining wall;

Fig. 4 is a diagram indicating another form of the construction shown in Fig. 3;

Fig. 5 is a diagram indicating a modification of the construction shown in Fig. 4; and

Figs. 6 to 9 inclusive are diagrams indicating various ways in which the straining wire may be wound, the actual parts being exaggerated in size for clearness.

The filter shown in Figs. 1 and 2 comprises a casing 1 having an inlet 3, an outlet 5, and a sump 7. The casing 1 is closed by a cover 9 which has a number of depending rods 11 that support at their lower ends a ring 13, the outer surface of which bears against the inner surface 15 of a horizontal rib on the interior of the casing 1. A shaft 21 passes centrally through the cover 9, being made fluid-tight by means of packing 23. The shaft 21 has an elongated bearing in a de-

pending portion 25 of the cover 9. The lower end of the shaft 21 is located in a bearing 27 projecting upwardly from the bottom of the sump 7.

Near the lower end of the shaft 21 there is a squared portion 31 upon which is fixed the base 33 of a straining cage which is built up of rods 35 bolted at their lower ends to the base 33 and at their upper ends screwing into a circular channel-piece 37, the outer surface of which has sliding contact with the inner periphery of the ring 13. The straining medium consists of wire 39 which is helically wound upon the outside of the rods 35. The fluid to be strained enters the inlet 3, passes through the helical groove formed between the turns of the wire 39 into the interior of the straining cage, and thence out through the top of the straining cage into the space below the cover 9, and finally to the outlet 5.

In order to provide for the cleaning of the helical groove between the turns of wire a scraper 41 which will now be described is provided. The scraper 41 is in the form of a vertical bar having cut upon its surface adjacent the wire 39 a comb or portions of a thread 43 of the same pitch as the wound wire 39 so that the points of the thread 43 will enter adjacent portions of the helical groove between the turns of wire; the said points of the thread or comb penetrate the narrowest portion of the groove between the coils of wire but pass into the groove less than the thickness of the wire so that the said points shall not come into contact with rods 35 which support the wire. The bar 41 is mounted for sliding movement both axially and radially of the straining cage upon a spindle 45 which is screwed into the ring 13 at its upper end and is received in a bracket 46 at its lower end. Springs 47 received in recesses in the spindle 45 press the scraper 41 radially into engagement with the straining wall 39. A light spring 49 supports the scraper 41. Two cams 51 located vertically above one another upon the straining cage wall will, once in every revolution of the straining cage, force the scraper 41 outwardly against its springs 47 and so release it from engagement with the wire 39 of the straining wall.

During the cleaning action the straining cage is rotated with the threaded scraper in mesh with the helical groove provided by the wound wire 39, and in consequence of such rotation the scraper will be forced downwardly against the action of its spring 49. When the scraper is moved axially by the cams 51 its threads or scraping blades being no longer in engagement with the wire 39, will no longer hold it downwardly; consequently the

spring 49 will return it to uppermost position so that as the straining cage continues to rotate the scraper will re-engage with the helical groove in the straining wall as soon as permitted to do so by the cams 51. If desired this vertical movement of the scraper might be controlled by a cam instead of by the spring 49.

It is an advantage of such a construction that the straining wall may be rotated always in the same direction in spite of the fact that it is provided with a scraper meshing with a helical groove, the scraping means being given a four-motion movement, first, scraping travel in operative relation with the straining wall, second, movement away from the straining wall, third, reverse travel in inoperative relation with the straining wall, and fourth, movement into operative relation with the straining wall. This is in contradistinction to rotating the straining wall first in one direction and then reversely; if, however, it is convenient to rotate the straining cage reversely then the cams 51 may be omitted, the scraper moving merely up and down as the straining cage is rotated first in one direction and then reversely.

In Fig. 3 there is indicated a construction of straining cage in which the rods 35 are replaced by ribs 35a projecting outwardly from an apertured cylinder 35b which is integral with the base 33 and the channel-piece 37. The wire 39 is wound upon the outer edges of the ribs 35a.

In Fig. 4 there is indicated a construction similar to that of Fig. 3 except that one of the ribs 35a is omitted so that the wire 39 is considerably flattened at 52. In this case there are no radially-acting springs 47 to press the scraper inwardly. When the scraper 41 reaches the flat part 52 of the wire it will be automatically out of engagement with the wire 39 and will then be moved back to its original position by its spring 49.

In the construction shown in Fig. 5, one of the ribs 35a is omitted as in the construction of Fig. 4, and the straining wire 39 is dipped under a rod 53. In this case it is not intended that the scraper blades (threads) 43 shall come completely out of engagement with the wire 39, but that the straining cage shall be reversed. If it is assumed that in Fig. 5 the straining cage is moving in a clockwise direction, then when the edges 43a of the scraping blades 43 reach the position indicated in the figure they will have pushed before them the solid material from between the coils of wire 39 and will have projected it into the depression 55 formed by the dipping part of the wire 39; from this depression 55 it will fall into the sump.

In the constructions described it has been assumed that the straining wall is rotated past the scraper; it will be understood, however, that the straining wall might be stationary and the scraper moved round it.

If it is considered desirable the scraper may be given a small movement circumferentially of the straining wall either when it is in mesh with the straining wall or when it is forced away from the straining wall. Thus, although the straining wall may be rotated continuously, such an arrangement permits the scraper to re-engage with a part of the straining wall which has already been scraped, so that the scraper when re-engaging with the straining wall will not push dirt before it into the stream of strained fluid.

If desired the cleaning may be intermittent by lifting the cleaning means from mesh with the straining wall and after an interval causing it to mesh with the said wall again; this may be done

either in the case in which the relative movement between the straining wall and the scraper is in one direction, or in the case in which it is in reverse directions. Such a method is sometimes useful in that it permits the use of dissimilar metals for the scraper and straining wall which would set up disadvantageous electrolytic action if in continuous mesh,—the thin metal edges of the scraping comb are easily attacked by electrolytic action. Also, it is useful in those cases in which the scraping blades are of such length peripherally of the straining wall as to reduce considerably the straining area when in mesh.

The material of which the comb of the scraper is made may be softer than that of the straining wire so that the scraper comb will continually bed or wear itself to the wire, thus retaining permanently a fine cleaning edge; for example, it might be brass or Monel metal.

It will be appreciated that although in the drawings the coils of wire 39 are indicated as comparatively widely separated the actual separation will be according to the fineness of straining required and may in the case of fluids such as petrol be of the order of one half of one-thousandth of an inch or even less.

In the constructions so far described the coils of the wire 39 may be kept separated on its support by means of its own inherent resiliency assisted by the teeth 43 of the comb or scraper 41 between which and the said coils there will be continuous relative movement during the cleaning action. On the other hand it may be that the desired spacing of the coils of wire is obtained by winding the wire upon a helical thread formed on the surface of its support; such a construction produces a robust strainer. For example, the support may have an ordinary single thread formed in its surface as by cutting, pressing or moulding or by winding the wire so as to cause it to bed slightly into the support. Again, the support may be provided with a multiple-start thread instead of a single thread; alternatively, there might be used a thread of a coarse single pitch, the pitch being such relatively to the diameter of the filament that when the latter is wound in the thread adjacent turns of the filament will form between them a proper straining space and the filament will sink into the thread less than half its diameter. Such a thread will be included in the term multiple-start thread since it is equivalent so far as the spacing of the turns of the filament is concerned to a multiple-start thread with one of the starts omitted.

Fig. 6 indicates a wire 39 wound in a helical thread 38 cut in the support 35a.

Fig. 7 indicates a wire 39 wound in one part 38 of a two-start helical thread 38, 40, the teeth 43 of the comb scraper being opposite the other part 40 of the two-start thread so as to make more sure the non-contacting of the delicate points 43 of the comb scraper with the support 35a.

In Fig. 8 there is indicated a two-start thread 38, 40, cut in the support 35a. In the part 38 is wound a wire 61, and in the part 40 is wound a wire 63; in the helical thread formed between the wires 61, 63 is wound the wire 39. The scraper cleans the outer and coarser layer 39, while the inner layer may be cleaned by reverse flow of the cleaned fluid.

The construction indicated in Fig. 9 is the same as that of Fig. 8 except that a layer of fabric 65 is inserted between the wire 39 and the wires 61, 63; the fabric may be gauze, cloth or paper.

It is to be observed that although the straining slot or groove between the turns of the wire 39 may be of extreme fineness yet the illustrative blades of the scraper are of a stumpy V-formation and are consequently robust. This is in strong contrast to the scraping blades associated with disc pattern strainers in which the form of the blade is long and extremely thin, of course thinner than the width of the groove it has to clean. With the illustrative form of robust blade the length of life of the blade is considerable even if used for straining fluids from dirt having an abrasive action and even if the blades are deliberately made of a material softer than the material of which the straining wall is made. The total length of the cleaning blade need be little more than half the thickness of the helically wound straining wire, and the root of the blade is of a width about equal to its length.

20 What I claim is:—

1. Straining apparatus comprising a support, a straining wall composed of wire coiled helically upon the support with a space between adjacent turns, bladed scraping means penetrating into the narrowest part of said space but not to the full depth of the wire, a mounting for said scraping means which permits of movement thereof axially of said straining wall, means for producing relative rotation between said scraping means and said straining wall whereby said scraping means is caused to move axially of said straining wall, cam means for removing said scraping means radially from engagement with said straining wall at a desired location, and return-spring means for first displacing said scraping means axially to its original location, and then radially into engagement with said straining wall.

2. Straining apparatus comprising a support, an inner wire coiled helically upon said support with a space between adjacent turns, a straining wall composed of an outer wire coiled helically in the said space with a straining space between its own adjacent turns, bladed scraping means penetrating into the narrowest part of the straining space but not to the full depth of the outer wire, and means for producing relative movement between the straining wall and scraping means both axially and peripherally.

3. Straining apparatus comprising a support, a straining wall composed of wire coiled helically upon the support with a space between adjacent turns, bladed scraping means penetrating into the narrowest part of said space but not to the full depth of the wire, means for producing relative rotation between the straining wall and scraping means and thereby relative axial movement owing to the engagement of said scraping means with the aforesaid space, and return means adapted for returning said scraping means axially to a starting position, said straining wall being formed with an axially extending depression whereat said scraping means becomes disengaged from the aforesaid space and is returned axially to the starting position by said return means.

4. Straining apparatus comprising a support, a straining wall composed of wire coiled helically upon the support with a space between adjacent turns, bladed scraping means penetrating into the said space, a mounting for said scraping means which permits of movement thereof axially of said straining wall, means for producing relative rotation between said scraping means and said straining wall whereby said scraping means is caused to move axially of said straining wall, cam means for removing said scraping means

radially from engagement with said straining wall at a desired location, and return-spring means for first displacing said scraping means axially to its original location, and then radially into engagement with said straining wall.

5. Apparatus for straining fluid comprising, a spirally wound wire straining wall for passage of fluid between the wire convolutions; and mechanical cleaning means for said wall including a cleaner bar arranged longitudinally of said wall and provided with a mounting holding said bar against rotation on its longitudinal axis, said bar having a longitudinal face of substantial width transversely curved to accommodate the arcuate surface of said wall with a sliding fit during relative rotatory movements between said wall and said bar that are peripheral with respect to said wall and lateral with respect to said bar, said curved face of the cleaner bar formed with a longitudinal series of spaced fixed transverse shallow-tooth-like thread lengths operatively meshing with said spiral winding by extending into the same between the wire convolutions thereof.

6. Apparatus for straining fluid, comprising a cage provided with a longitudinal straining wall of wire spirally wound on said cage, said wall providing for fluid passage therethrough between adjacent wire convolutions, said wire winding providing the wall with a spiral thread extending longitudinally thereof; a cleaner bar arranged longitudinally of said straining wall, and provided with a transversely arcuate longitudinal face complementary to and of substantially the same radius as that of said annular wall, said arcuate face normally operatively fitting said wall and extending longitudinally thereof, and forming a wire cleaning comb embodying a longitudinal series of fixed projecting thread lengths extending across said face and of substantially the same pitch as said spiral thread and adapted to operatively intermesh with said wall by the projection of said thread lengths into said spiral thread; means providing for relative rotatory movements between said straining wall and said bar on the longitudinal axis of said straining wall; means providing for relative longitudinal movements between said straining wall and said bar; and means whereby said threaded face of the bar and said wall can be freed from intermeshing operative association, preparatory to relative longitudinal movements between said wall and said bar.

7. Apparatus for straining fluid, comprising a cage provided with a longitudinal straining wall of wire spirally wound on said cage, said wall providing for fluid passage therethrough between adjacent wire convolutions, said wire winding providing the wall with a spiral thread extending longitudinally thereof; a cleaner bar arranged longitudinally of said straining wall, and provided with a transversely arcuate longitudinal face complementary to and of substantially the same radius as that of said annular wall, said arcuate face normally operatively fitting said wall and extending longitudinally thereof, and forming a wire cleaning comb embodying a longitudinal series of fixed projecting thread lengths extending across said face and of substantially the same pitch as said spiral thread and adapted to operatively intermesh with said wall by the projection of said thread lengths into said spiral thread.

8. Apparatus for straining fluid, comprising a cage provided with a longitudinal straining wall

of wire spirally wound on said cage, said wall providing for fluid passage therethrough between adjacent wire convolutions, said wire winding providing the wall with a spiral thread extending longitudinally thereof; a cleaner bar arranged longitudinally of said straining wall, and provided with a transversely arcuate longitudinal face complementary to and of substantially the same radius as that of said annular wall, said arcuate face normally operatively fitting said wall and extending longitudinally thereof, and forming a wire cleaning comb embodying a longitudinal series of fixed projecting thread lengths extending across said face and of substantially the same pitch as said spiral thread and adapted to operatively intermesh with said wall by the projection of said thread lengths into said spiral thread; means providing for relative rotatory movements between said straining wall and said bar on the longitudinal axis of said straining wall; and means providing for relative longitudinal movements between said straining wall and said bar.

9. Apparatus for straining fluid, including a spirally-wound wire straining wall for passage of fluid between the wire convolutions, and its support; and mechanical cleaner means for said wall including a bar arranged longitudinally of said wall, means being provided for relative movements between the bar and wall peripherally with respect to the wall and laterally with respect to the bar, and for relative longitudinal movements between the wall and bar; said wire winding providing said wall with a longitudinal spiral thread, said bar provided with a longitudinal series of spaced shallow fixed thread lengths complementary to said spiral thread of said wall and when operatively intermeshed therewith extending into the wall between the wire convolutions for a distance substantially equal to one-half that diameter of the wire which is radially of said wall.

10. Apparatus for straining fluid, including a spirally-wound wire straining wall for passage of fluid between the wire convolutions, and its support; and mechanical cleaner means for said wall including a bar arranged longitudinally of said wall, means being provided for relative movements between the bar and wall peripherally with respect to the wall and laterally with respect to the bar, and for relative longitudinal movements between the wall and bar; said wire winding providing said wall with a longitudinal spiral thread, said bar provided with a longitudinal series of spaced shallow fixed thread lengths complementary to said spiral thread of said wall and when operatively intermeshed therewith extending into the wall between the wire convolutions; and means whereby said thread lengths of said bar and said wall can be freed from said operative intermeshing association for relative longitudinal movements between said wall and said bar.

11. Apparatus for straining fluids, including a spirally wound wire straining wall for passage of fluid between the wire convolutions thereof, said spiral winding providing said wall with a longitudinal spiral thread, said wall having a longitudinal thread-interrupting panel deflected inwardly from the circumferential plane of said wall; mechanical cleaning means for said wall including a cleaner bar held against rotation on its longitudinal axis, and arranged longitudinally of said wall; means providing for relative rotative movements between said wall and said bar; said bar having a longitudinal face forming

a cleaning comb with shallow partial thread-forming teeth normally intermeshing with said thread of the wall by entering between the wire convolutions thereof.

12. Apparatus for straining fluids, including a spirally-wound wire straining wall for passage of fluid between the wire convolutions thereof, said spiral winding providing said wall with a spiral thread; mechanical cleaning means for said wall including a cleaner bar arranged longitudinally of said wall and formed with a longitudinal face providing a cleaning comb having shallow partial thread-forming teeth normally intermeshing with said thread of the wall by entering between the wire convolutions thereof; means providing for relative radial movements between said wall and said bar for breaking and restoring said intermesh between said wall and said teeth; and means providing for relative longitudinal movements between said wall and said bar, and for relative rotative movements between said wall and said bar.

13. Apparatus for straining fluids, including a spirally-wound wire straining wall for passage of fluid between the wire convolutions thereof, said spiral winding providing said wall with a spiral thread; mechanical cleaning means for said wall including a cleaner bar arranged longitudinally of said wall and formed with a longitudinal face providing a cleaning comb having shallow partial thread-forming teeth normally intermeshing with said thread of the wall by entering between the wire convolutions thereof; said bar being bodily movable toward and from said wall to cause separation and intermesh of said teeth and said thread; means for controlling said movement of the bar including devices to force the bar from the wall; and means providing for relative longitudinal movements between said wall and said bar, and for relative rotative movements between said wall and said bar.

14. Apparatus for straining fluids, including a spirally-wound wire straining wall for passage of fluid between the wire convolutions thereof, said spiral winding providing said wall with a spiral thread; mechanical cleaning means for said wall including a cleaner bar arranged longitudinally of said wall and formed with a longitudinal face providing a cleaning comb having shallow partial thread-forming teeth normally intermeshing with said thread of the wall by entering between the wire convolutions thereof; said teeth being short and of substantially V-formation, and in length equal to substantially one-half the diameter of said spirally wound wire, the bases of the teeth being in width substantially equal to the length of the teeth, whereby said teeth extend but part way through the thickness of said wall and are of sturdy formation.

15. Straining apparatus comprising a support, a straining wall composed of wire coiled helically upon the support with a space between adjacent turns; bladed scraping means penetrating into the said space; a mounting for said scraping means which permits of movement thereof axially of said straining wall; means for producing relative rotation between said scraping means and said straining wall whereby said scraping means is caused to move axially of said straining wall; means for disengaging said scraping means from engagement with said straining wall at a desired location; and means for displacing said scraping

means axially to its original location for re-engagement with said straining wall.

16. Apparatus for straining fluids, including a straining wall support provided with a multiple-start spiral thread; a straining wall embodying wire spirally coiled on said support in only one of the portions of said multiple-start thread,

whereby a spiral space is left between the wire convolutions; non-rotary toothed cleaning means extending into said space; and means for producing relative movements between the straining wall and cleaning means both axially and peripherally. 5

WILLIAM ROBERT BELDAM.