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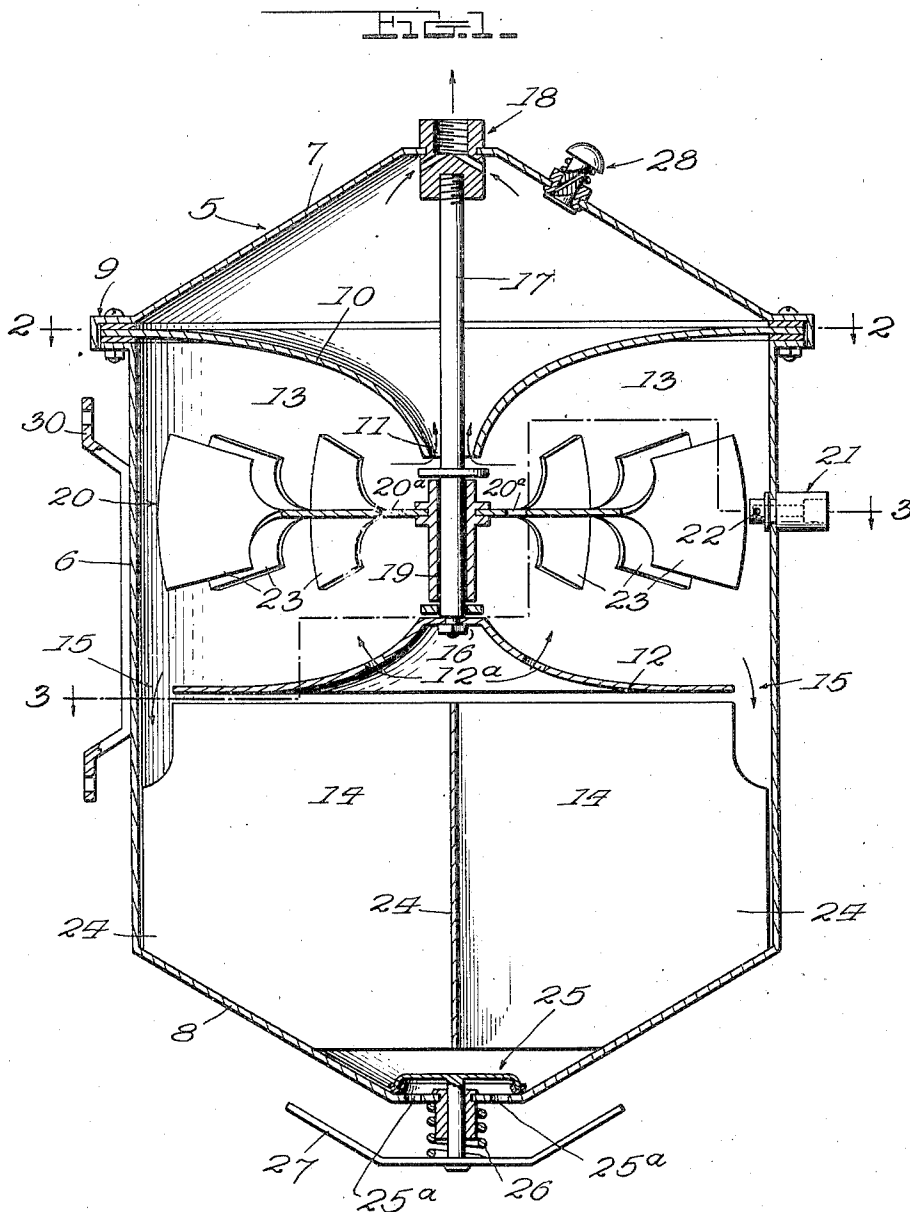
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2,491,801

CENTRIFUGAL LIQUID CLEANERS

Filed June 5, 1946

3 Sheets-Sheet 1



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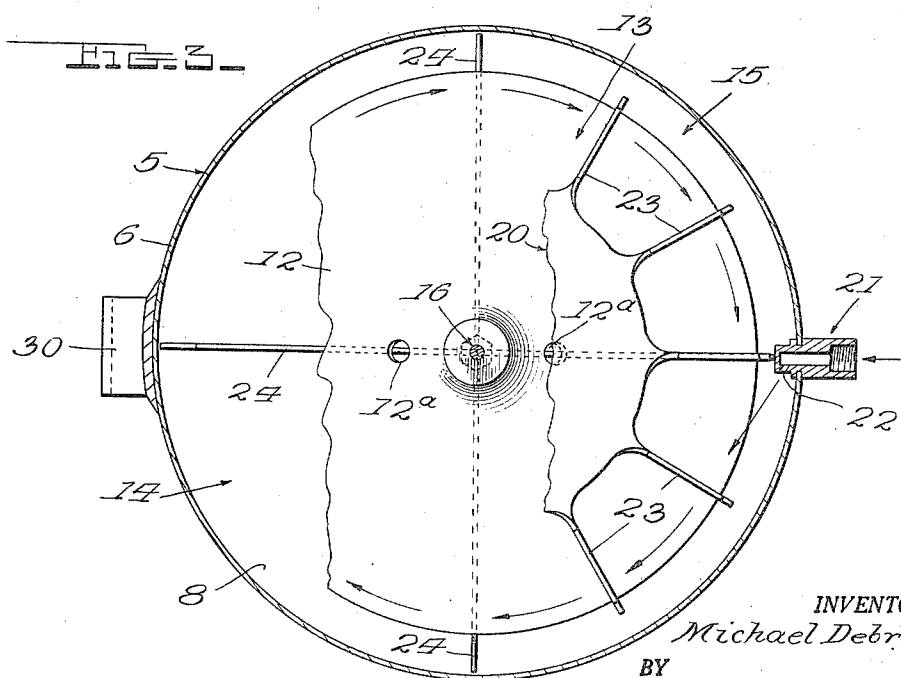
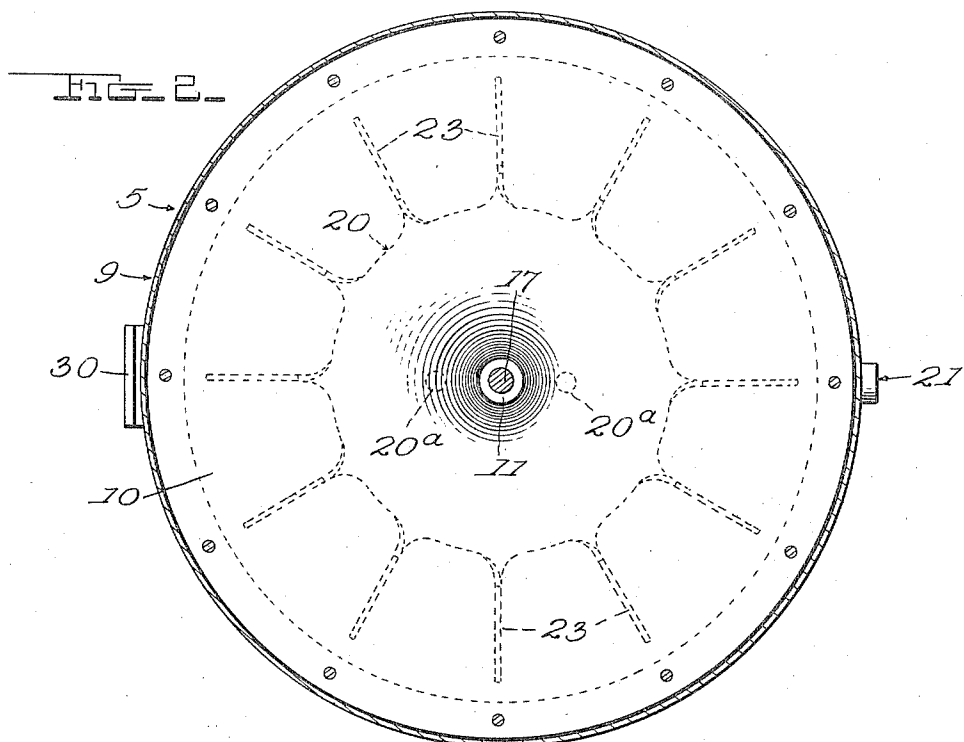
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3 Sheets-Sheet 2



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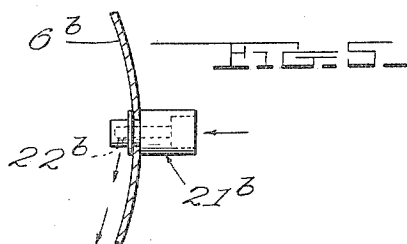
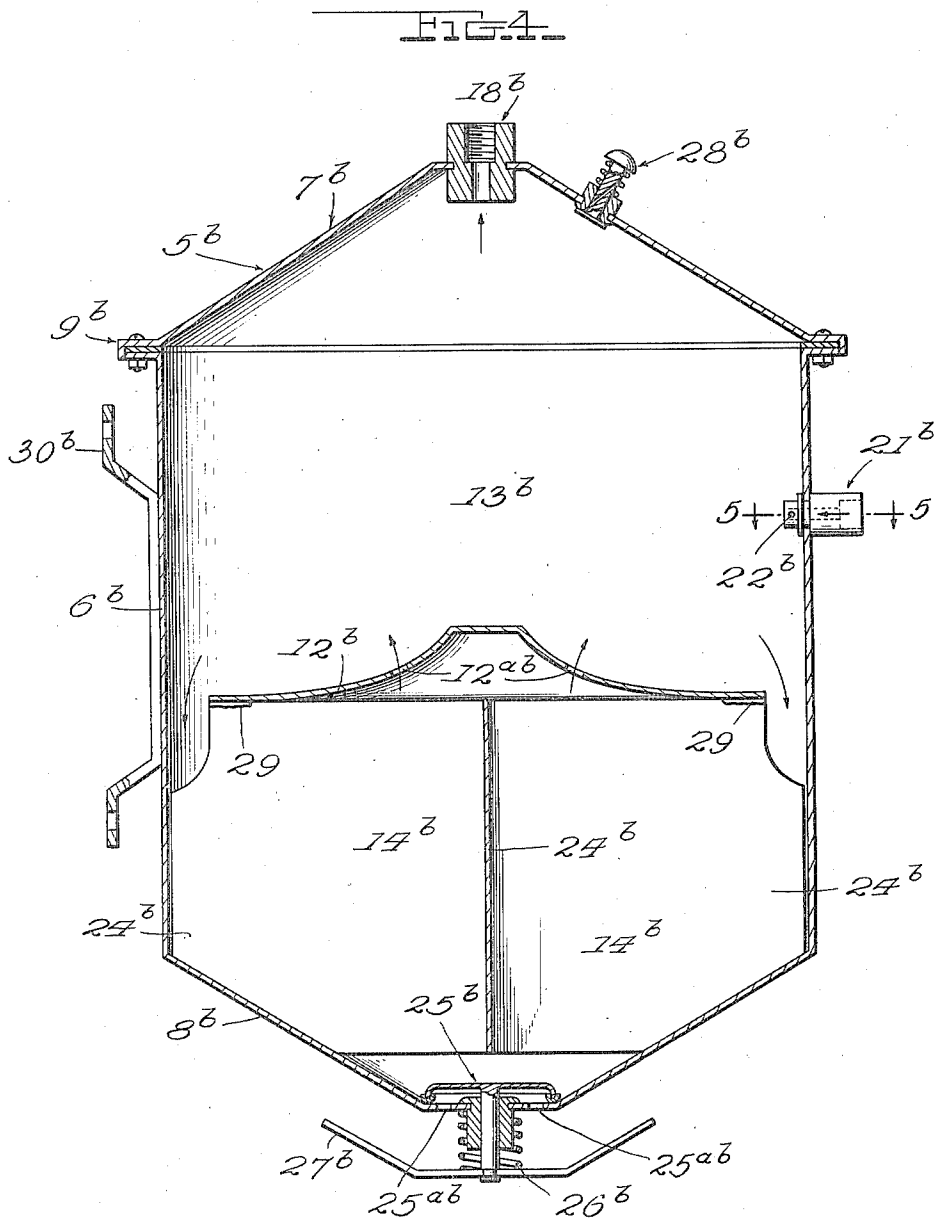
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CENTRIFUGAL LIQUID CLEANERS

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CENTRIFUGAL LIQUID CLEANER

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4 Claims. (Cl. 210-57)

1

The invention aims to provide a new and improved device for centrifugally separating foreign matter from a liquid and depositing the separated foreign matter, commonly known as sludge, in a sump, from which it may be periodically drained to keep the device in perfect working condition.

The device is particularly adapted for continuously cleaning engine lubricating oil and cooling liquids used in some types of machines and is, therefore, useable to advantage in place of customary filters which require periodic replacement of filter cartridges instead of mere draining off of accumulated sludge.

Figure 1 of the accompanying drawings is a vertical sectional view of one form of cleaner constructed in accordance with the invention.

Figs. 2 and 3 are horizontal sectional views substantially on lines 2-2 and 3-3 of Fig. 1.

Fig. 4 is a vertical section showing another form of construction.

Fig. 5 is a detail horizontal section on line 5-5 of Fig. 4.

The construction shown in the drawings will be rather specifically described but attention is invited to the possibility of making variations within the scope of the invention as claimed.

In Figs. 1 to 3, a casing 5 is provided, said casing having a vertical cylindrical side wall 6, a dome-like top 7 and a cupped bottom 8. A suitable flange-gasket-and-bolt connection 9 is shown between the top 7 and the side wall 6, and the bottom 8 is permanently connected with said side wall. A mounting bracket 30 is provided on wall 6.

An upper partition disk 10 extends across the casing 5 and is anchored at its peripheral edge by means of the connection 9, said partition disk 10 being declined from said edge to its center and having an opening 11 at the latter; and a lower partition disk 12 extends across said casing and divides the latter into an upper liquid-cleaning chamber 13 and a lower sump chamber 14. This lower partition disk 12 has a flat outer portion the peripheral edge of which is spaced inwardly from the side wall 6 to provide a continuous passage 15 placing the two chambers 13 and 14 in communication with each other. The lower partition disk 12 has a raised central portion and its intermediate portion declines from said central portion to said flat outer portion. The lower partition disk 12 is provided in its declined intermediate portion with openings 12a and is centrally secured at 16 to the lower end of a central vertical shaft 17 which is secured to and projects downwardly from the casing top 7, said shaft

2

extending centrally through the opening 11. In the present disclosure, the upper end of the shaft 17 is threaded into the lower end of a liquid outlet connection 18, said connection 18 being secured in a central opening in the cone-shaped casing top 7 and adapted for connecting a hose or pipe to the casing 5 to conduct the cleaned liquid from said casing. The portion of the shaft 17 between the two partition disks 10 and 12 is rotatably surrounded by the hub 19 of a paddle wheel 20; and a liquid inlet connection 21, for connection with a liquid conducting hose or pipe, is secured in an opening in the casing side wall 6 at the periphery of said paddle wheel, said connection being substantially midway of the height of the chamber 13. The connection 21 has a liquid-injecting opening 22 for circumferentially directing a jet of liquid in the cleaning chamber 13 and against the paddles 23 of the paddle wheel 20. This wheel 20 has openings 20a near its center.

Radial upright baffles 24 are located in the sump chamber 14, and a drain valve 25 is provided for the lower end of said chamber 14 in the center of the inverted cone-shaped bottom wall 8. Said valve is held normally closed by means of a spring 26 and carries a yoke 27 against which a cam or the like may be upwardly pushed to effect valve opening. To admit air to the casing 5 and permit sump draining, through holes 25a, a suitable spring-closed, manually-opened valve 28 has been shown. It will be noted that the radial upright baffles 24 have their outer edges in contact with the side wall 6 and the bottom wall 8, and that their upper edges are spaced below the raised central and intermediate portions of the partition 12 while their lower edges are spaced above the valve 25.

The liquid to be cleaned is forced into the casing 5 through the inlet connection 21, rotates the paddle wheel 20, and gradually fills said casing. During this initial filling, as soon as the liquid rises to the paddle wheel 20, said liquid will be circumferentially whirled by said wheel, and when the liquid rises above the jet opening 22, the incoming liquid jet also acts directly on the rising body of liquid to exert a whirling force. Due to the whirling of the liquid, relatively heavy foreign matter, in suspension in said liquid, will be centrifugally thrown against the side wall 6 and will gravitate through the passage 15 into the sump chamber 14, and the cleaned liquid will rise through the opening 11, and when it reaches the outlet connection 18, will gradually discharge. The liquid and foreign matter entering the sump

chamber 14 are quieted by the baffles 24 and the foreign matter settles to the lower end of said sump chamber, the liquid in the upper portion of this chamber being, therefore, comparatively clean. Foreign matter descending into the sump chamber 14 through the passage 15, must displace liquid from the upper end of said sump chamber 14 and this liquid rises through the openings 12a into the central zone of the cleaning chamber 13 without mingling with the descending foreign matter and is subjected to re-whirling and re-cleaning. Any foreign matter descending onto the lower partition 12 will be directed toward the passage 15 for entrance into the sump chamber 14, and any which has passed the upper partition 10 will gravitate onto said partition, descend through the opening 11 and enter the cleaning chamber 13 where it will be further subjected to the separating action. The openings 20a in the paddle wheel 20 permit the relatively quiet liquid at the center of the whirling body to ascend with little agitation toward the opening 11 for upward flow to the outlet connection 18, but if a spoke-type wheel were used, these openings would not be necessary. Periodically, the sludge must be drained from the sump by opening the valve 25. When this is done, the air admission valve 28 must be opened to admit air unless the installation be such that air can enter through the outlet line. Otherwise the sump could be drained only very slowly if at all. After each draining, the device will again operate efficiently for a period of time depending of course upon the quantity of foreign matter with which the liquid is laden.

Attention is invited to the fact that upward removal of the casing top 7 will effect upward withdrawal of the shaft 17, partition 10, paddle wheel 20 and partition 12, unitarily with said top 7. This is of advantage should it be necessary to disassemble the apparatus for any reason and when reassembling. Then too, the unitary connection of these elements is of particular advantage when initially assembling at the factory.

In Figs. 4 and 5, a simplified construction is disclosed having no paddle wheel and no upper partition. The elements used in the construction have been given the same reference numbers as the corresponding elements of Figs. 1 to 3, plus the exponent b, and the only additional explanations necessary are that the partition 12b is welded at 29 to the baffles 24b, and the jet of liquid from the opening 22b of the inlet connection 21b alone acts to whirl the liquid in the cleaning chamber. This simplified construction is adequate for cleaners of the smaller sizes, but the first described construction is more efficient for larger cleaners.

From the foregoing, it will be seen that a novel and efficient cleaner has been provided which will require only periodic draining off of sludge instead of any renewal of filter cartridges. While preferences have been disclosed, attention is again invited to the possibility of making variations within the scope of the invention as claimed.

I claim:

1. In a centrifugal liquid cleaner, a casing having an upright cylindrical side wall, a cone-shaped top wall having its periphery fixed to the top of said side wall and having at its center a clean liquid outlet, an inverted cone-shaped bottom wall having its periphery secured to the bottom of said side wall and provided at its center with a valve-controlled sediment outlet, a circular partition supported horizontally in said cas-

ing approximately midway of the height of said side wall and dividing said casing into an upper liquid-cleaning chamber and a lower settling chamber, said partition having a flat outer portion with its peripheral edged spaced inwardly from said side wall to provide a continuous passage placing said chambers in communication with each other, said partition also having a raised central portion and an intermediate portion which declines from said central portion to said flat outer portion, an inlet connection for the liquid to be cleaned positioned in said side wall at a point substantially midway of the height of said liquid cleaning chamber, said connection having a liquid-injecting opening directed to circumferentially whirl the liquid in said liquid-cleaning chamber, whereby relatively heavy foreign matter suspended in the liquid will be centrifugally moved to said side wall and will gravitate through said continuous passage into said settling chamber, said continuous passage being the sole means for admitting descending foreign matter into said settling chamber, and a plurality of upright radial baffles in said settling chamber extending from the under side of the flat outer portion of said partition down to said bottom wall, the upper edges of said baffles being spaced downwardly from the raised central and intermediate portions of said partition and the lower edges of said baffles being spaced upwardly from said valve-controlled sediment outlet, the outer edges of said baffles being in contact with said side wall and bottom wall of said casing whereby said baffles will quiet the liquid in said settling chamber and permit the foreign matter entering through said continuous passage to settle into the low central portion of said settling chamber above said sediment outlet, leaving comparatively clean liquid in the upper part of said settling chamber, said partition having in its declined intermediate portion a plurality of small openings through which comparatively clean liquid in the upper part of the settling chamber may ascend into the central zone of said liquid-cleaning chamber without mingling with foreign matter descending from said liquid-cleaning chamber as said comparatively clean liquid is displaced by foreign matter entering said settling chamber only through said continuous passage.

2. A structure as specified in claim 1, together with a second circular partition extending entirely across said casing above the aforesaid partition and having its outer periphery at the juncture of said top wall with said side wall, said second partition being declined from its peripheral edge toward its center and having a central opening through which the outgoing liquid ascends, a paddle wheel in said liquid-cleaning chamber between said two partitions and having peripheral paddles in close proximity to the casing side wall, and means mounting said paddle wheel on a vertical axis in position to be driven solely by the liquid jet from said liquid-injecting opening.

3. In a centrifugal liquid cleaner, a casing provided with a cylindrical vertical side wall having an inwardly projecting inlet for the liquid to be cleaned, a bottom, and an upwardly removable top having a cleaned liquid outlet; a central vertical shaft secured to and projecting downwardly from said top, a disk centrally secured to the lower end of said shaft and dividing said casing into an upper liquid-cleaning chamber and a lower liquid-settling chamber, said disk being declined from its center toward its peripheral edge and

5

having the latter spaced from said side wall to provide a continuous passage placing said chambers in communication with each other, and a paddle wheel rotatably mounted on said shaft within said liquid-cleaning chamber, said disk and paddle wheel being of sufficiently small diameter to clear said inwardly projecting liquid inlet when said casing top, said cleaned liquid outlet, said shaft, said disk and said paddle wheel are upwardly moved as a single unit from said side wall, said liquid inlet having a liquid-injecting opening for directing a liquid jet against the paddles of said paddle wheel to drive the latter and thereby whirl the liquid in said liquid-cleaning chamber, whereby relatively heavy foreign matter suspended in the liquid will be centrifugally moved to said side wall and will gravitate through said continuous passage into said settling chamber, said continuous passage being the sole means for admitting descending foreign matter into said settling chamber, and means in said settling chamber for quieting the liquid therein to permit the foreign matter entering said settling chamber through said continuous passage to settle into the lower end of said settling chamber, leaving comparatively clean liquid in the upper end of said settling chamber, said disk having at least one opening near its center through which said comparatively clean liquid in the upper end of said settling chamber may

6

ascend to the central zone of said liquid-cleaning chamber without mingling with foreign matter descending from said liquid-cleaning chamber as said comparatively clean liquid is displaced by foreign matter entering said settling chamber only through said continuous passage.

4. A structure as specified in claim 3; together with a second partition extending entirely across said casing above said paddle wheel and held in place by said casing top, said second partition being declined toward its center and having a central opening through which said shaft extends, this opening being of greater diameter than said shaft to permit it to upwardly conduct the outgoing cleaned liquid.

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