

Nov. 28, 1939.

J. K. RUSSELL ET AL

2,181,608

LIQUID REFINER

Filed March 4, 1935

2 Sheets-Sheet 1

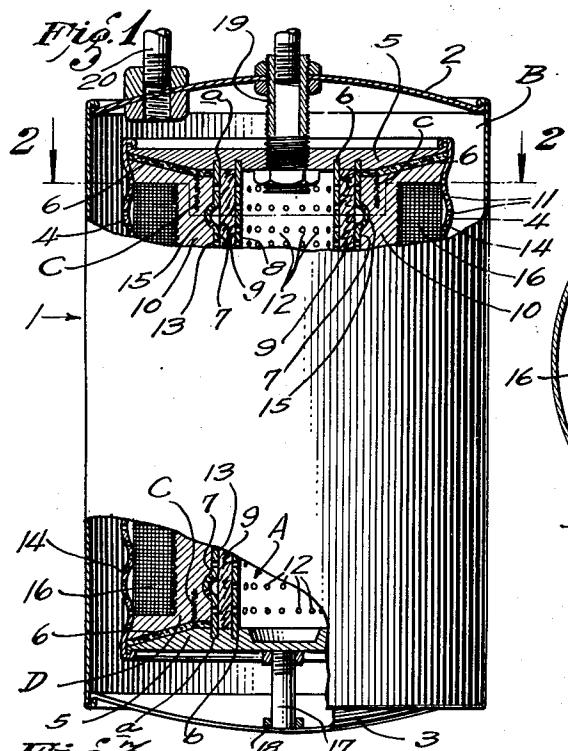


Fig. 2

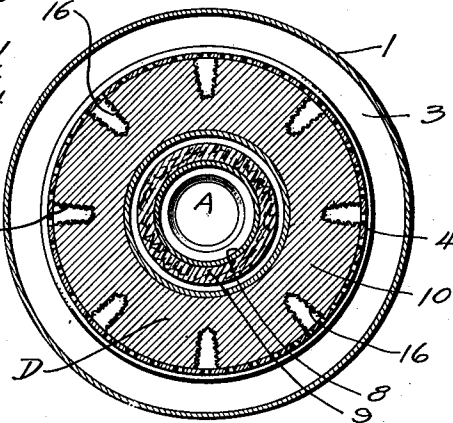
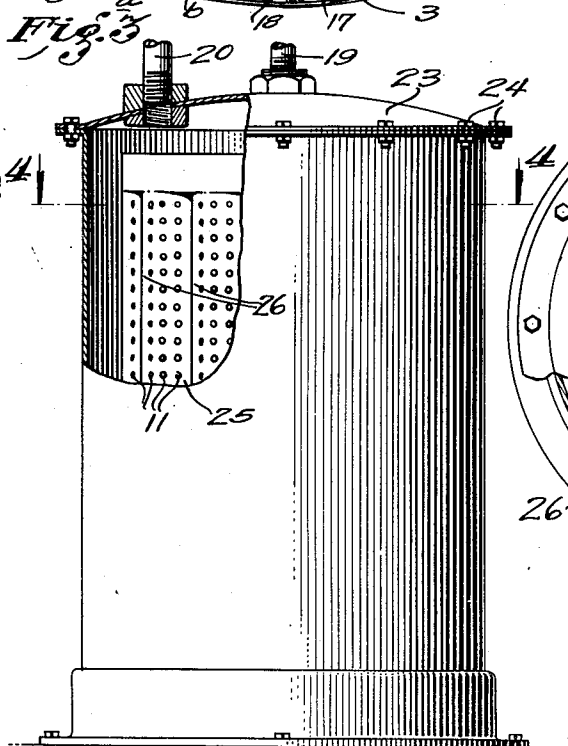
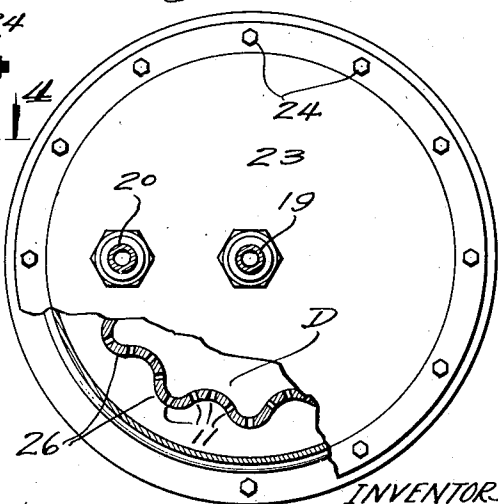


Fig. 4



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2 Sheets-Sheet 2

Fig. 1

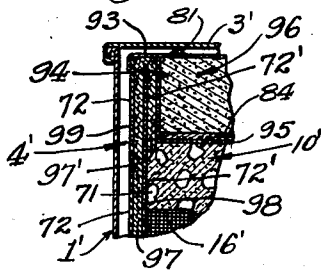


Fig. 8

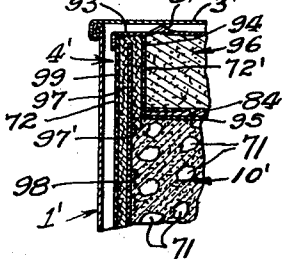


Fig. 5

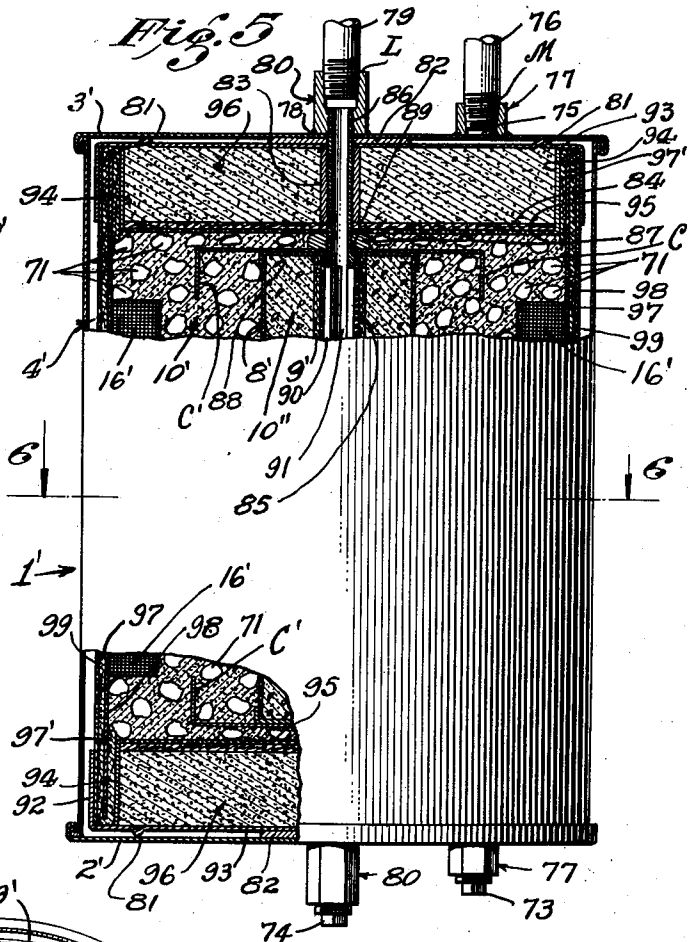
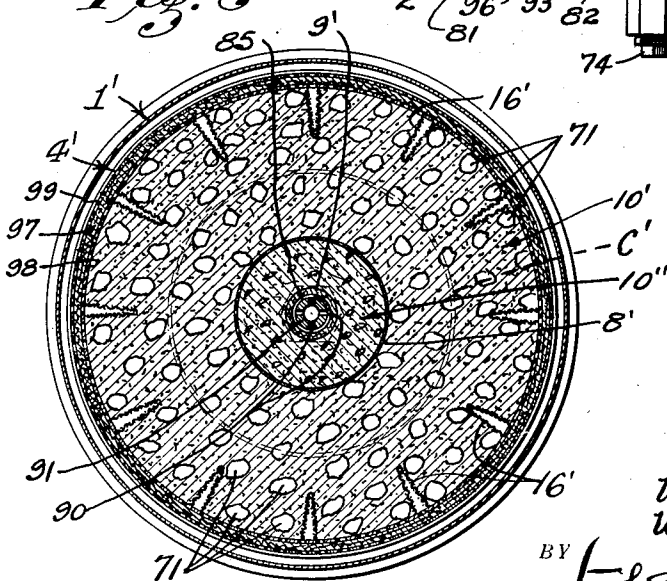


Fig. 6



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UNITED STATES PATENT OFFICE

2,181,608

LIQUID REFINER

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Application March 4, 1935, Serial No. 9,252

14 Claims. (Cl. 210—134)

This invention relates to liquid refiners, and more particularly to a refiner for lubricating oil, and is particularly adapted for association with internal combustion engines to maintain the oil in the crank case in a refined condition.

An object of this invention is to provide a refiner which may be installed in the oil circulating system of an internal combustion engine or other power plant, but is capable of use wherever it is desired to refine and purify oil or analogous liquids.

An object of this invention is to provide a refiner which is capable of operating under wide and fluctuating pressure conditions that may be present in the lubricating systems of combustion engines thus providing a refiner which has a wide field of use.

An object of this invention is to provide a novel refining element which does not channel or otherwise break down to permit passage of untreated liquid.

Another object of this invention is to provide a refining element employing activated clay, particularly chemically activated clay or analogous materials which incorporates a novel means of maintaining such clay or the like in suspension, that is, so that such clay will at all times be prevented from settling to an impervious state and will be maintained evenly distributed throughout the chamber so as to be porous and in an effective and efficient operating position.

A further object of this invention is to provide a novel composition of matter particularly suited for use as a refining element wherein the ingredients are relatively inexpensive and easily compounded.

A further object of this invention is to provide an oil refiner which is particularly compact and sturdy of construction, proportional to its capacity.

A further object of this invention is to provide an oil refiner which incorporates a novel means of introducing the oil or other liquid undergoing treatment into intimate association with the refining element.

A still further object of this invention is to provide a novel oil refining unit of the above character and which will be in such compact form that the same may be easily installed and carried under the hood of automobiles of present makes.

A still further object of this invention is to provide a novel oil refining unit of the above character in which any untreated oil that attempts to channel through the refining element

will be forced into the refining pack and thereby prevent "channeling" of untreated liquid without its being subjected to the action of the refining pack.

A still further object of this invention is to provide a novel oil refining unit which may be incorporated and associated with the oil distributing system of portable internal combustion engines used in automobiles, airplanes and the like, whereby the oil used to lubricate such engines may be continuously subjected to a refining medium to continuously refine the oil used in the crank case of such engines during operation thereof.

This application is a continuation in part of our co-pending application for a liquid refiner filed October 9, 1934, Serial No. 747,566.

The method of purification disclosed in the present application is claimed in our copending application Serial No. 137,516, and, in addition, our copending application Serial No. 288,700 contains claims bearing upon the present disclosure.

Other objects, advantages and features of invention may appear from the accompanying drawings, the subjoined detail description and the appended claims.

The accompanying drawings illustrate the invention in some of the forms we at present deem preferable.

Figure 1 is an elevational view of our novel liquid refiner in one of its forms, particularly suited for use in conjunction with vehicle engines, with its upper portion and a corner of its lower portion broken away, and in section, to disclose the inner construction.

Fig. 2 is a transverse sectional view thereof on line 2—2, Fig. 1.

Fig. 3 is an elevational view of another embodiment of our liquid refiner as arranged for large capacity installation with a corner of the casing broken away exposing a portion of the refiner shell, and illustrating a modified form of said shell.

Fig. 4 is a partial plan, partial section, of the modified refiner taken on line 4—4, Fig. 3.

Fig. 5 is an elevational view of a modified form of our novel liquid refiner, particularly suited for use in conjunction with the oil circulating system of internal combustion engines, and with its upper portion and a corner of its lower portion broken away, and in section, to disclose the inner construction.

Fig. 6 is a transverse sectional view of the construction shown in Fig. 5, as taken on line 6—6, Fig. 5.

Fig. 7 is a fragmental sectional view of a corner

of our novel liquid refiner showing a modified form of construction thereof.

Fig. 8 is a fragmental sectional view of a corner of our novel liquid refiner, analogous to the construction shown in Fig. 5 but showing a modified form thereof, by omitting the longitudinal ribs.

Attention is first directed to Figs. 1 and 2. The embodiment of the present invention here illustrated is encased in a cylindrical housing 1 to the ends of which are secured outwardly convexed end plates 2 and 3. Mounted within the housing is a cylindrical refiner element outer shell 4 which is closed at its ends by disks 5 which make sealed connections therewith. The margins of the disks 5 are beveled at their inner sides and the beveled portions are covered with annular pads 6 formed of felt or the like which are preferably cemented or otherwise secured in position.

Each disk 5 is provided radially inwardly of the pad 6 with a pair of concentric annular channels *a* and *b*. Retained between the opposing outer channels *a* of the two disks 5 is a substantially cylindrical retainer member 7 and between the inner channels *b* is mounted an inner shell 8.

Between the inner shell 8 and retainer member 7 is mounted a secondary or final cleaning pack 9, while the space between the retainer member 7 and outer shell 4 is filled with a primary refining element 10, the character of which will be hereinafter described in detail.

The outer and inner shells 4 and 8 and the retainer member 7 are provided with a multiplicity of apertures 11, 12 and 13 respectively, making these members foraminous throughout their lengths except for short portions adjacent their extremities. The outer shell 4 is provided with a plurality of corrugations or reinforcements 14 which are shown annular but may extend longitudinally as shown in Fig. 3 or may be separately attached ribs. The retaining member 7 is likewise provided with corrugations 15. The corrugations are preferable as they not only aid in reinforcing the outer shell and retainer member against crushing stresses, but also increase their surfaces so that the number of apertures 11 and 13 may be increased although in many instances they are not necessary.

To further increase the outer or exposed surface of the refining element 10, and to aid in reinforcing the same the outer shell 4 is provided internally with a plurality of foraminous hollow ribs or channel members 16 preferably of V-shape in cross-section, which extend longitudinally of the outer shell 4 with the extremities of their leg portions attached to the walls of the outer shell as best shown in Fig. 2. These ribs 16 preferably terminate a short distance from the top and bottom of the housing 3 so as to prevent channelling of the oil. The refining element entirely fills the spaces between the several foraminous ribs 16, and such ribs 16 extend into the material forming the refining element to also aid in preventing said refining material from falling away from the upper half of the foraminous cylinder when the same is mounted in a horizontal position.

The bottom disk 5 is supported in spaced relation with the bottom plate 3 of the housing by means of a stem 17 preferably threaded into the bottom disk 5 and which fits into a retainer socket 18 formed in centered relation on the inner side of the bottom plate 3. The upper disk 5 receives the lower end of an outlet tube 19 which extends upwardly and through the upper plate 2 in sealed relation therewith, the inner shell thus

forming an outlet chamber A. The upper plate 2 also carries an inlet pipe 20 which communicates with the inlet chamber B formed between the shell 4 and the housing 1. The top and bottom disks 5 are provided with an annular depending flange member C which is of foraminous material such as wire cloth and such member C will form a support for the refining material and cause oil, that may flow along the top or bottom of the container to be introduced into the refining material so as to be subjected to its action.

With reference to Fig. 3, the structure here shown differs from the foregoing in that the housing 21 is provided with a flanged base 22 for mounting on a flat surface and is provided with a removable top or cover 23 secured thereto by bolts 24, so that access may be had to the interior of the device so that the refining unit may be replaced or renewed; and further in that the outer shell 25 of the refining unit, corresponding to shell 4 is provided with longitudinally pressed ribs or corrugations 26 which terminate short of its extremities. Like the shell 4, the shell 25 is provided with perforations 11. The interior construction of the refining unit is similar to the first described structure and is provided with the outlet tube 19 and the inlet pipe 20.

The refining element 10 consists principally of chemically or otherwise activated clay which may be of one grade or of several different grades, such as a coarse grade preferably small enough to pass through a thirty mesh screen and be retained on a sixty mesh screen, and preferably a fine grade capable of passing a three hundred and sixty mesh screen, or if only one grade is used it is preferably of such particles that may pass a ten mesh screen and be retained on a thirty mesh screen. Fuller's earth which has been chemically activated, has been found satisfactory as well as other well known brands of chemically activated clay and even a synthetic chemical product of the same resultant characteristics has been found satisfactory.

Also we have found that the coarse grade of the clay we use in our refining element need not necessarily be chemically or otherwise activated, although it is preferable, and pumice, infusorial earth, diatomaceous earth, kieselguhr, and bentonite may be used, although the chemically activated coarse clay or synthetic product is preferable.

The activated clay or refining medium is then thoroughly mixed with a medium to maintain the clay in suspension, such as mineral wool, rock wool, asbestos, cotton waste, curled hair, steel wool or a similar suspensory medium in such a manner that the structure of the suspensory medium is not broken up. The suspensory medium thus forms a foraminous mass in which the activated clay is impregnated. Sawdust or sand may in some instances be used. In any event the suspensory medium acts to keep the refining medium uniformly distributed and suspended in the space between the outer shell and retainer and between the pads 6.

The secondary cleaning pack 9 is formed of felt, asbestos, cloth, mineral wool, curled hair, sawdust or similar material capable of preventing escape of the activated clay into the inner or outlet chamber A.

The coarse grade and fine grade of activated clay and rock wool may be mixed in the following proportions, to wit; 50% in weight of coarse clay, activated or otherwise, 25% in weight of fine activated clay, and 25% in weight of mineral

wool, although other proportions may be satisfactorily used. It has been found that the refining medium pack 10, if it is proportioned as above set forth, and is also packed in the chamber D under a predetermined pressure that will not break down the mineral wool structure, will provide a dense field through which the oil must pass under relatively low pressure and will be not only refined of foreign substances, carbon materials, petroleum resins and waxes and sludges but will be decolorized.

It is to be observed that by the use of the activated clay and a suspensory medium such as the mineral wool, there is provided a filtrate pack which will obtain a substantially complete filtration of the oil being acted upon, due to the simultaneous action of the activated clay and suspensory medium upon the body of oil circulating through the filtrate pack. This is accomplished because the activated clay will make the deleterious materials, including the finer particles thereof, readily separable from the oil so that the combined action of the activated clay and suspensory medium will adsorb, entrap, and retain substantially all deleterious materials in the oil circulating through the filtrate pack.

From this it will be seen that the refining medium including the activated clay and suspensory medium is adapted to separate and retain from the lubricating oil, substantially all deleterious or foreign substances, including the microscopic solids, so as to maintain the characteristics of said oil in substantially its original refined state.

The operation of the liquid refiner shown in Figs. 1-4 is as follows:

The liquid, such as oil from an internal combustion engine, which is to undergo treatment is preferably introduced under pressure through the inlet pipe 20 into the receiving chamber B. The liquid flows, either by gravity or by reason of being introduced under pressure or by reason of a suction or negative pressure being maintained in the outlet tube, into the openings or apertures 11 of the outer shell 4 and into the several channels or hollow ribs 16 so that the liquid enters the refining elements from said ribs 16 as well as the walls of the outer shell 4. The refining medium or activated clay acts upon the liquid as the liquid flows to the retainer cylinder 7. The treated liquid then flows through the secondary cleaning pack 9 and is there freed of any particles of activated clay that might migrate. The liquid then enters the outlet chamber A and enters the outlet 19. The end pads 6 serve to provide a rough surface onto which the mineral or rock wool and clay may engage and adhere to so as to prevent channeling of the liquid across the ends of the filtering element 10.

It is to be observed that there is provided in this device an outer casing receiving the oil, an inner casing of foraminous character through which the oil passes from the receiving casing and a central casing receiving the outflow of the oil. The inner casing is provided with beveled heads so that the pressure of the oil from the outer casing compacts the refining material contained between the inner casing and the central casing. It is furthermore to be observed that the inner casing consists of a double walled structure, the outer wall of which is corrugated to support the resistance due to the pressure thereon. Therefore, when the pressure of the oil on the outer casing becomes great there is a distinct increase of the impermeability of the refining material because of the inclined surfaces of the

heads which serve to compress the material as the pressure on the outside is exerted. Finally, there is provided between the corrugated outer wall of the central casing and the inner wall thereof, these casings being double walled, a further refining material. Thus, no matter under what conditions of pressure the oil flows into the space between the outer and inner casings there is a constantly adjusted refining pack, the density of the pack being adjusted in accordance with the variation in pressure between the outer part of the device and the center thereof.

However, we have found that when the pressures of the oil admitted to our liquid refiner attains a predetermined higher pressure, but still being a relatively low pressure as compared to that used in refining oil in filter presses, that we obtain better results by reversing the flow of oil through the refiner 1, that is to say, the oil enters the unit through the tube 19 and leaves the unit through the pipe 20 and the pressure of the oil then tends, due to the inclined surfaces of the heads to loosen the refining pack sufficiently to permit the oil to pass therethrough at such pressures. However, in this respect the refiner pack will be maintained in sufficient density due to the increased pressures of the oil flowing there-through.

In the construction of our invention illustrated in Figs. 5 to 8, the housing 1' has end plates 2', 3' sealed thereto so as to make a liquid tight enclosure. Mounted within the housing is a refiner element outer shell 4' which is preferably built-up of an outer foraminous shell 99 and an inner foraminous shell 98 having a cleaning pack 97 formed of felt, or the like, therebetween and preferably such cleaning pack 97 is longer than the foraminous shells 99, 98 so that the ends 97' thereof may be inturned as shown in Figs. 5, 7 and 8. Preferably the perforations in the foraminous shell 98 are of larger diameter than the perforations in the foraminous shell 99 and the foraminous shell 98 tends in the main to retain the cleaning pack 97 in position, although a plurality of foraminous hollow ribs or channel members 16', preferably of V-shape in cross-section, extend longitudinally of the outer shell 4' with the extremities of their leg portions attached to the foraminous shell 98. These ribs 16' are analogous in purpose and function to the ribs 16 shown in Figs. 1 and 2.

At each end of the outer shell 4' a chamber 96 is provided by a foraminous cup-shaped member 95, the side walls 94 of which engage the inturned edges of the inturned ends 97' of the cleaning pack 97; and an imperforate cover plate 93 closes said chambers 96 and said cover plates 93 are provided with flanges 92 which encircle the foraminous shell 99.

Within the housing 1' and spaced therefrom is an inner shell 8' which is of foraminous material and within said inner shell 8' is a secondary cleaning pack 9' formed of felt or the like.

The space between the inner shell 8' and the outer shell 4' is filled with a refining element 10' and the space between the inner shell 8' and the secondary cleaning pack 9' is also filled with a refining element 10'', both of which will be hereinafter more fully described in detail.

At the ends of the inner shell 8' and extending therefrom are annular depending flange members or baffle plates C' which may be termed anti-channelling members, the free ends of which members C' terminate within and depend into the refining element 10' so as to cause any oil that

may flow along the top or bottom of the inner shell 8' to be introduced into the refining material so as to be subjected to its action before flowing out of the housing 1'.

In the more detailed construction of the devices shown in Figs. 5 to 8, and for a sturdy and novel construction and assembly thereof, our device includes a central hollow stem 91 that is preferably provided throughout a portion of its length and within the shell 8' with a series of slits or openings 90 and said hollow stem 91 is reduced at its ends to form a shoulder 89 upon which rests a cup-shaped member 88 which closes one end of the inner shell 8'. Upon the member 88 the baffle plate C' is placed and such member 88 and baffle plate C' are held against shoulder 89 as by the nut 87 threaded onto the stem 91 which is threaded as at 86 from the shoulder 89 to its free end.

Within the inner shell 8' and encircling the stem 91 we provide around the openings 90 a diffusion member 85 which we have found may be in the form of a coil spring encircling the stem 91 and the coils of which spring are disposed in very close relationship one with the other. Around the spring 85 the secondary cleaning pack 9' is positioned and between such pack 9' and the shell 8' the refining element 10'' is positioned.

Upon the nut 87 the member 95 is positioned with its flanges 94 extending outwardly of the housing 1' and within said member 95, which, with the cover 93 forms the chamber 96, a layer of a filtrative material 84 such as felt or the like is placed. A spacing member 83 encircles the threaded end 86 of stem 91 and retains the cover 93 at its central portion in spaced relation with the member 95. A spacing washer 82 is positioned between the cover member 93 and the end plates of the housing, and protuberances 81 formed in cover plate 93 are provided to engage the end plates so as to maintain the periphery of the cover plate 93 in spaced relation to the housing 1'.

The parts are held in assembled position by a nut 80 that is threaded onto the reduced end of stem 91 and which nut is also provided with a tapered thread to receive a threaded end of an oil circulating pipe 79. The nut 80, after being screwed home is preferably soldered or otherwise sealed as at 78 to the end plates to insure a liquid tight connection. An internally threaded boss 77 is also connected to each end plate and receives another threaded end of an oil circulating pipe 76 which communicates with the interior of the housing 1' through an orifice 75 formed in the end plate.

In the installation of our device in the oil circulating system of an internal combustion engine, such as used in automobiles and airplanes, we have found that it is preferable to admit the uncleaned oil into our refining element through the pipe 79 which communicates with the stem 91 and to remove the refined oil from the housing through the pipe 76. However, in many installations it has been found that the uncleaned oil may be admitted through the pipe 76 and the refined oil removed through the pipe 79; and also by making our refining element alike at both ends with respect to the nuts 80 and boss 77 and closing the unused openings therein with plugs 74, 73, we are able to adapt our refining element to many and varied installations in the oil circulating system of internal combustion engines. That is to say, the oil may enter the refiner through the opening L and leave the refiner

through the opening M or the oil may leave through the opening closed by the plug 73; or the oil may enter the refiner through a connection attached to the opening closed by plug 74 and leave the refiner from either the opening M or that closed by the plug 73; or as hereinbefore stated the entrance of the oil to the refiner may be through the opening M or the opening closed by the plug 73 and leave the refiner through either the opening L or that closed by the plug 74.

In Fig. 7 we have shown a slight modification of our device with respect to the refiner element outer shell 4' and in which the openings 72, 72' forming the foraminous shells 99 and 98 extend throughout the length of said shells instead of being imperforate for a short distance from each end thereof as shown in Fig. 5 and which distance preferably extends to a point approximating the base of the cup-shaped member 95.

It has been found in some installations that the foraminous ribs 16' may be omitted as shown in Fig. 8 in the drawings.

The chambers 96 are filled with a refining element, preferably magnesium oxide and magnesium carbonate in approximately equal proportions and preferably in a powder form although a granular form may be used.

The refining element 10'' is preferably magnesium oxide in granular form which will pass through a 10-mesh screen and be retained on a 30-mesh screen; although in some instances the refining element 10'' may be both magnesium oxide and magnesium carbonate of the aforesaid fineness; in the event they are both used, the proportions are preferably about eighty per cent of magnesium oxide to about twenty per cent of magnesium carbonate.

The refining elements 10 and 10' consist principally of activated clay which may be either chemically or otherwise activated and throughout which wads or lumps 71 of mineral wool, rock wool, cotton waste, asbestos, curled hair, steel wool, or a similar suspensory medium is interspersed. The activated clay, which as before stated may be either chemically or otherwise activated is preferably of such fineness that the same will pass through an 8-mesh screen and be retained on a 30-mesh screen. In making the refining elements 10 and 10', we preferably use mineral wool and such activated clay in predetermined quantities, and place the same in a container and then rub the mineral wool, as for example, between the hands, so that the mineral wool is formed into small pellets, pledgets, lumps, rolls, or wads; and by rubbing the mineral wool in such manner in association with the activated clay, particles of such clay will be impregnated in the mineral wool which forms a suspensory medium that presents a more or less supporting labyrinth for the refining medium.

It has been found that in preparing the suspensory or filtering medium by rubbing or rolling the mineral or rock wool, etc., as hereinbefore described, that the result is that such wool, etc., is formed into separate, distinct, irregular sized and individual pieces or masses of indefinite or irregular shape which is a relatively soft porous mass of a loose fibrous substance that may be defined as a pellet, pledget, roll, wad or lump and for sake of convenience in this specification we will use the term "lump" which is to be understood to mean a structure such as above outlined, and which may be formed in any manner so as to form a resultant article having the properties thereof as herein contemplated.

The mineral or rock wool when formed into said lumps are not subjected to sufficient pressure that its structure is broken down, but instead the rough fibrous strands thereof remain substantially intact without being broken down. The activated clay separates or precipitates the impurities, foreign substances, carbon materials, petroleum, resins, waxes and sludges from the oil particles and retains some thereof by absorption, and the mineral wool entraps and retains the same after such separation. The lumps hereinbefore described of mineral wool, etc., also act to provide a supporting labyrinth and suspensory medium for the activated clay and serve as a means to entrap and maintain said activated clay or refining material in substantially uniformly distributed relation, so as to prevent such clay from packing as a result of vibrations and varying pressures when our refining element is used in combination with the oil circulating system of internal combustion engines.

In operation of the liquid refiner shown in Figs. 5 to 8, when the uncleaned oil is admitted to the refining element through the pipe 79, it passes through the openings 90 and the spring 85 diffuses the oil emitted from the openings 90 after which it passes through the felt 9' into the refining element 10'' and thence through the refining element 10' into the space 70 around the outer shell 4' and thence to the pipe 76. As the oil is passing through the refining elements a certain portion thereof will seep into the chambers 96 where the magnesium oxide and magnesium carbonate will act upon it and the oil thus acted upon in chamber 96 will again seep back into the refining element 10' in a more or less highly saturated condition, but in sufficient amount to cooperate with the oil passing through the unit to further aid in decolorizing the oil and to neutralize the acidity thereof.

In the construction shown in Fig. 5, both ends of the apparatus are identical in construction and therefore the description of one end as hereinbefore defined will suffice for the opposite end.

The coarser particles of the chemically activated clay used in our refining mediums tend to keep the lumps of mineral wool separated and from forming a more or less solid pack, thereby keeping the refining element in a sufficient porous condition to permit oil to pass therethrough.

The magnesium oxide in our cleaning pack will precipitate the foreign substances in the uncleaned oil and decolorizes the same, as well as aids in neutralizing the acidity thereof, and the magnesium carbonate in our cleaning pack neutralizes the acidity of the oil as well as aids in precipitating the foreign substances therein and also aids in decolorizing the same.

In the construction shown in Fig. 5 all of the oil to be refined will, during its flow through the refiner 1' contact the refiner pack 10'' because such pack 10'' is interposed in a direct line of the flow of oil through the inlet and outlet of our refiner unit 1' and thereby subjects such oil to the decolorizing action of the pack 10''; and as the unit is continued in use and the pack 10'' loses some of its effectiveness occasioned by such continued use, the seepage of oil from chambers 96 after being acted upon by the refining medium therein contained, will continue the decolorization of the oil over a longer period of time than such results would be accomplished in the event the refining medium in chambers 96 was in the direct flow or circulation of the oil passing through our refiner unit 1'.

It has been found that the preferable proportions of activated clay and lumps forming the suspensory medium of the packs 10, 10', should be approximately equal proportions of clay and such lumps, after the lumps have been formed and packed under slight pressure into the unit.

We have found that by making the refining elements or packs 10, 10' in substantially the foregoing proportions and of the foregoing materials, that cold oil remaining therein, as for example, when the refiner is combined with the lubricating system of an internal combustion engine which has not been operated for a sufficient length of time to allow the oil to get cold, that the same will freely flow through the unit to permit warm oil heated by the internal combustion engine to enter the unit and be acted upon therein.

We have also discovered that our refining element may be used for the purpose of refining fuel oil for Diesel engines as well as for other fuel oil burners.

From the foregoing it will be apparent that the lubricating system of an internal combustion engine is a closed circuit and in which the oil in said circuit is passed between two relatively moving surfaces whereby the surfaces are lubricated and that during such lubrication the oil is subjected to pressure and heat and will acquire deleterious products or develop therein hydrocarbon oxidation and by combining our refiner with the lubricating system of the combustion engine we are able to refine the oil in a closed circuit with such relatively moving surfaces whereby the deleterious and oxidation products of such lubricant are removed from the circuit and the oil therein, and such relatively moving surfaces are supplied with purified lubricating oil. It will thus be seen that we are able to fit a lubricating oil for reuse as a lubricant by reason of the fact that during its contamination and heating by a lubricating use we continuously subject the lubricant while hot to intimate contact with an adsorptive decolorizing medium such as the activated particles or acid activated absorbent clay which cleanses the oil of discoloring matter and also by passing such oil through a filtering medium such as the mineral wool whereby relatively large solid or abrasive particles or impurities are removed therefrom at substantially the rate of their introduction, and by re-passing such treated oil between said moving surfaces any deposited oxidation products thereon are removed therefrom.

We have provided a method of preventing the accumulation of discoloring impurities in the oil in the lubricating system of an automotive internal combustion engine, normally containing a substantially constant volume of oil and which method comprises providing a casing 1 or 1' that is of a size small enough to be carried beneath the hood of an automobile and in which casing we provide a decolorizing adsorbent medium of a density to remove the discoloring impurities by adsorption from the oil passing through such medium and whereby the volume of oil in the system and the oil pressure and the rate of oil flow from the engine pump are correlated so that the oil content of the system is circulated through such medium under normal engine operation with sufficient frequency to remove the discoloring impurities substantially at the rate they appear in the oil.

We claim:

1. In a liquid refiner, a refining element com-

prising a refining medium, in the form of finely divided particles, and a multiplicity of lumps having absorbent and cushioning characteristics interspersed throughout said medium, said lumps preventing substantial settling or packing of said finely divided particles.

2. In a refiner for lubricating oil, a refining element comprising a refining medium in the form of finely divided particles, and a multiplicity of absorbent cushioning lumps interspersed throughout said medium to prevent substantial settling or packing of said finely divided particles; and a retainer for said refining element including foraminous wall members on the inlet and outlet sides of said refining element and fibrous layers covering said wall members for retaining said finely divided particles in said refining element.

3. In a liquid refiner, a housing having an outer shell of foraminous material in spaced relation thereto; an inner shell of foraminous material in spaced relation to said outer shell; an acid neutralizing refining medium within said inner shell; a refining medium within the space between said inner and outer shells in the form of finely divided particles and a multiplicity of lumps of cushioning material interspersed throughout said particles to provide a supporting labyrinth therefor; and connections for an oil circulating system connected to the space within said inner shell and to the space between said outer shell and said housing.

4. The combination with the lubricating system of an internal combustion engine; of a refining element for the lubricant of said engine interposed in said system and comprising a refining element including a granular oil refining medium, and a plurality of lumps of fibrous material interspersed in substantial uniformly spaced relation throughout said medium.

5. A refining element comprising a mixture of comparatively fine and coarse chemically activated clay to separate foreign substances from lubricating oil; and a substance of rough fibrous material in the form of lumps interspersed throughout said clay to gather and retain said foreign substances and to support and suspend said clay to prevent compacting thereof.

6. In a liquid refiner; a pair of chambers; a refining element within said chambers and affording communication of a liquid therethrough, said refining element in one of said chambers comprising a refining material of chemically activated clay and wads of a rough fibrous cushioning and suspensory material interspersed throughout said clay; a liquid inlet connected to one of said chambers; a liquid outlet connected to the other of said chambers; baffle plates in one of said chambers having end portions terminating in said refining element to direct into said element, liquids otherwise tending to channel from one chamber to the other without passing through said element; other chambers in said refiner and in communication with the ends of one of said pair of chambers; and a liquid treating material in said last mentioned chambers adapted to receive and subject to its action a portion of the liquid passing through said first mentioned chambers and permit the return of said liquid to the chamber with which it communicates.

7. A refining element comprising a refining medium including finely divided particles of chemically activated adsorbent material, and a substance of rough fibrous material in the form

of lumps interspersed throughout said adsorbent material, said lumps being so formed that the voids therein are of such dimension as to subject the liquid passing therethrough to a filtering action.

8. A unit for refining lubricating oil, comprising a casing, a refining element within said casing comprising a porous mass including a plurality of lumps of porous fibrous material and a granular adsorbent refining material substantially completely filling the voids between said lumps, whereby intermittent passage of oil through said element will not sufficiently settle or pack said element to prevent subsequent flow of oil therethrough.

9. In a device for treating fluids, the combination of: an adsorbent medium and lumps of a non-adsorbent material, said lumps having absorbent and cushioning characteristics interspersed throughout said medium whereby said medium is maintained in position for intimate contact with substantially all of the fluid passing therethrough.

10. In a liquid refiner the combination of a refining medium in the form of particles passing through a screen of 10 meshes to the square inch and being retained on a screen of 100 meshes to the square inch, and resilient lumps of fibrous material interspersed throughout said medium, said lumps preventing settling or packing of said medium.

11. In a liquid refiner, a refining element including a refining medium in the form of particles of an acid activated adsorbent clay of a size to pass a screen of 16 meshes to the square inch and to be retained on a screen of 60 meshes to the square inch, and lumps of material substantially inert as regards the liquid to be refined, said lumps having absorbent and cushioning properties interspersed throughout said medium, said lumps preventing substantial settling or packing of said particles.

12. In a liquid refiner; a cylindrical casing; a cylindrical foraminous shell mounted therein and spaced from the walls of the casing to form a chamber; an inner foraminous shell within the cylindrical shell defining a second chamber; reinforcing means incorporated in the cylindrical shell; a refining element positioned between the shells and comprising a refining medium and a suspensory medium to maintain the refining medium evenly distributed throughout the refining element; and a plurality of longitudinally disposed foraminous hollow ribs mounted within said cylindrical shell and projecting into the refining element.

13. In a liquid refiner; an enclosing casing; a plurality of concentrically arranged foraminous cylinders disposed therein; sealing plates common to and closing the extremities of said cylinders, the outermost cylinder forming with the casing an intake chamber and the innermost cylinder forming an outlet chamber; a refining element retained between the outermost and intermediate cylinders; a secondary cleaning means interposed between said intermediate cylinder and said innermost cylinder; reinforcing means for the outermost cylinder to resist external pressures; and longitudinally disposed foraminous liquid spreading means mounted within the outermost cylinder and projecting into the refining element.

14. In a liquid refiner, a housing; an outer foraminous shell within and spaced from said housing; an oil passage tube extending through

said housing; an inner foraminous shell within said outer shell and forming a chamber within itself and between said inner and outer shells, said oil passage tube being in communication with the chamber within said inner shell; a refining element in the chamber between said inner and said outer shells; end plates closing the ends of said inner chamber; anti-channelling means extending from said end plates and terminating

in said refining element; means associated with one end of said outer shell forming a liquid treating chamber in communication with said outer chamber; and a liquid refining element in said liquid treating chamber and said inner chamber. 8

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