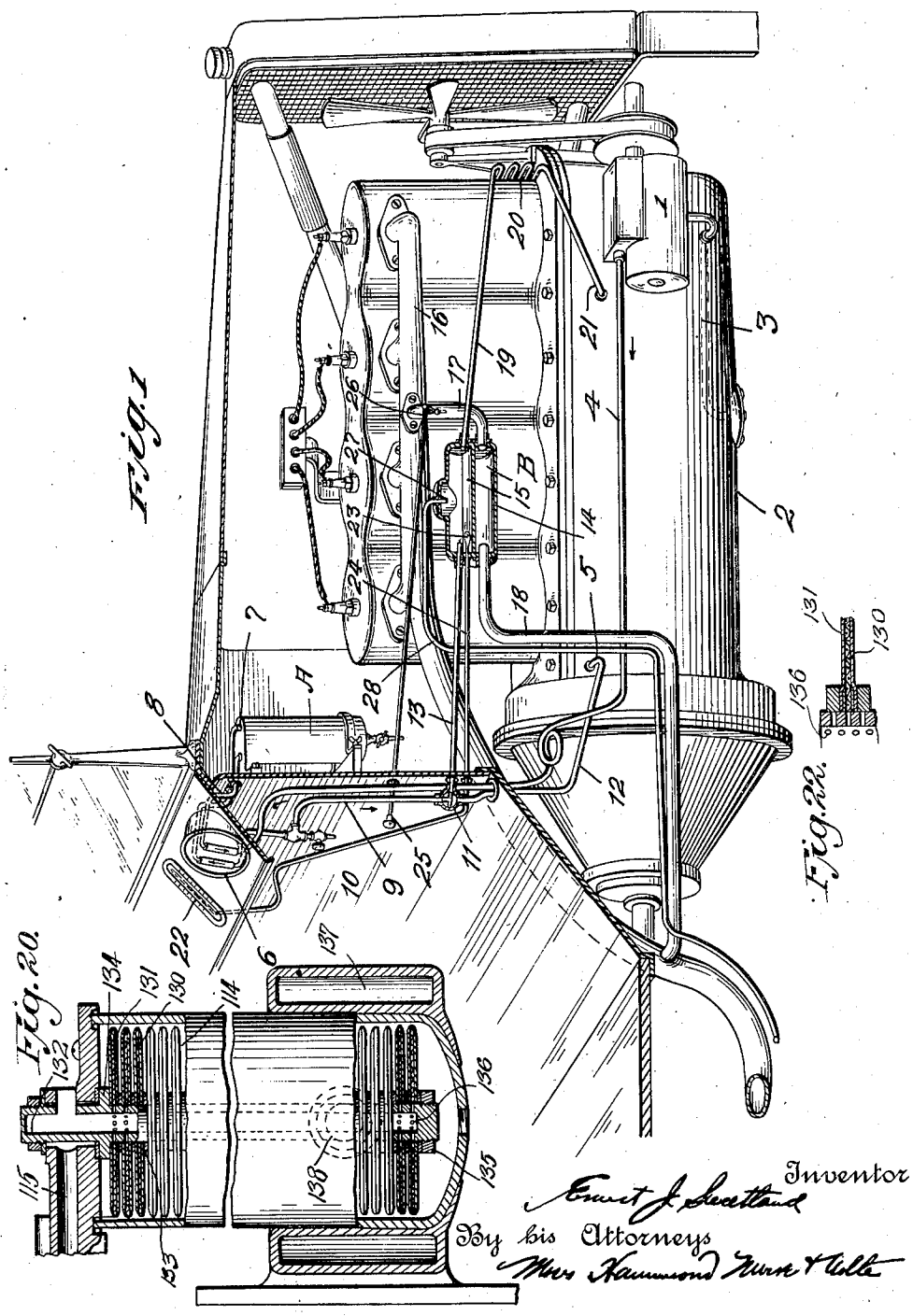
March 14, 1933. E. J. SWEETLAND 1,901,010

APPARATUS FOR RECONDITIONING USED OIL

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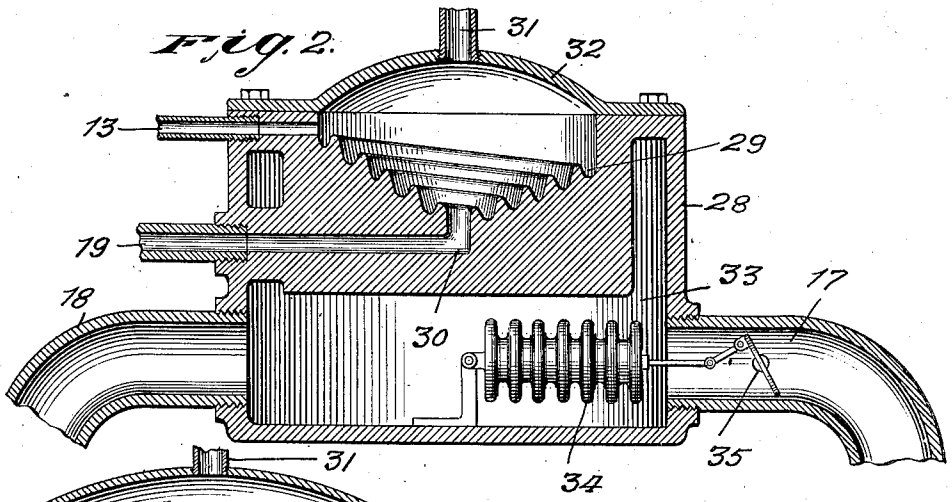


March 14, 1933. E. J. SWEETLAND 1,901,010

APPARATUS FOR RECONDITIONING USED OIL

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Fig. 2.



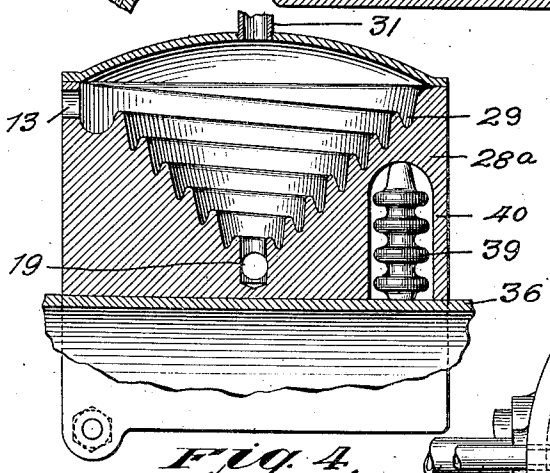


Fig. 3.

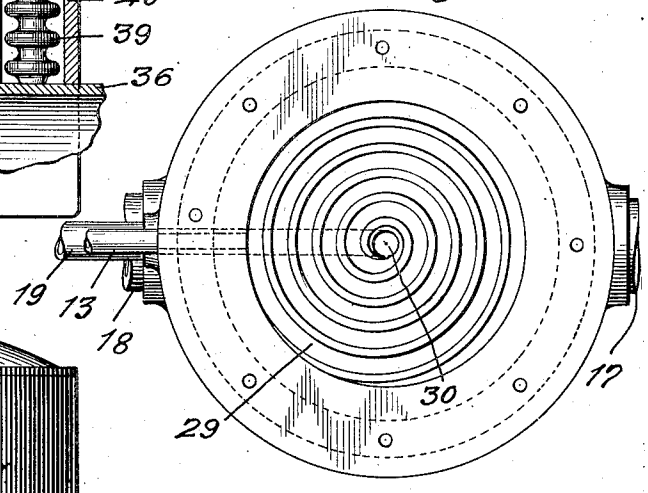


Fig. 4.

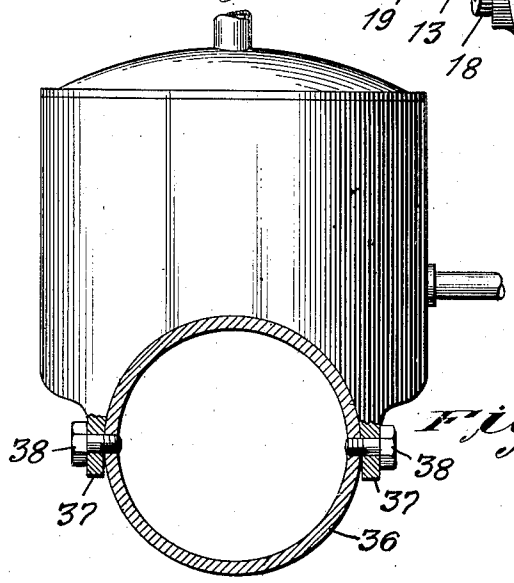


Fig. 5.

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March 14, 1933. E. J. SWEETLAND 1,901,010

APPARATUS FOR RECONDITIONING USED OIL

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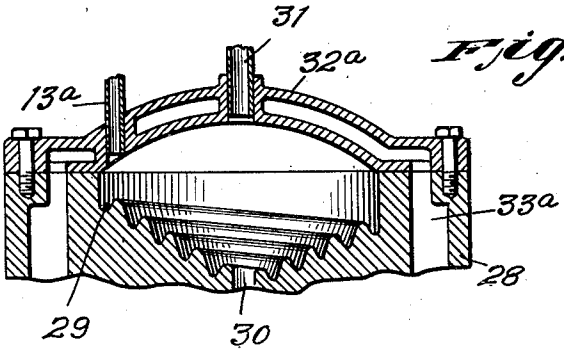


Fig. 6.

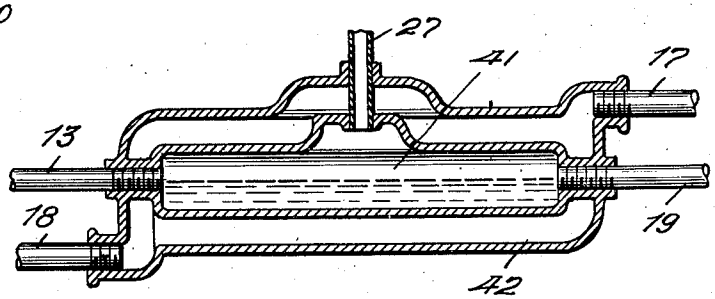


Fig. 7.

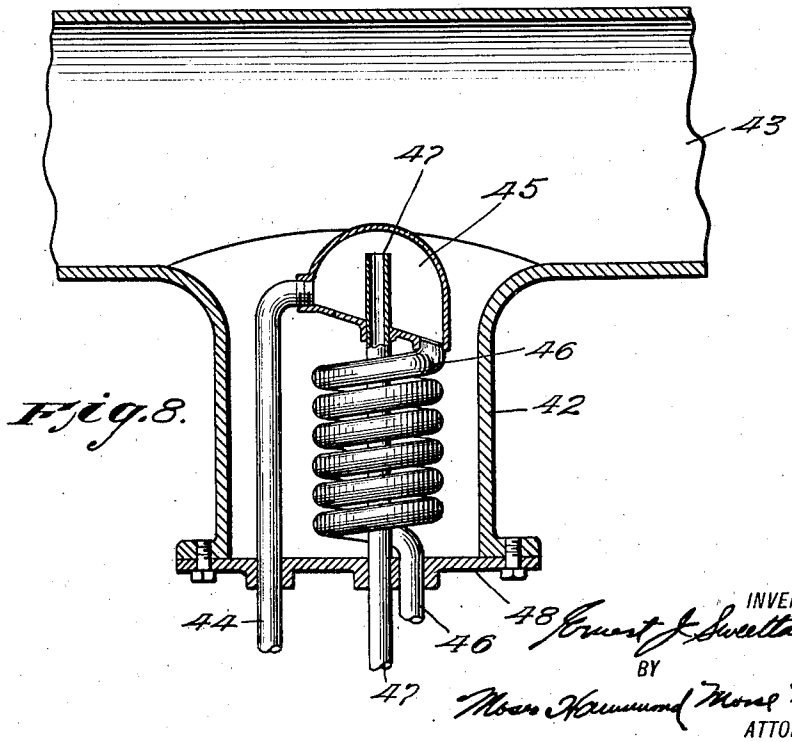


Fig. 8.

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APPARATUS FOR RECONDITIONING USED OIL

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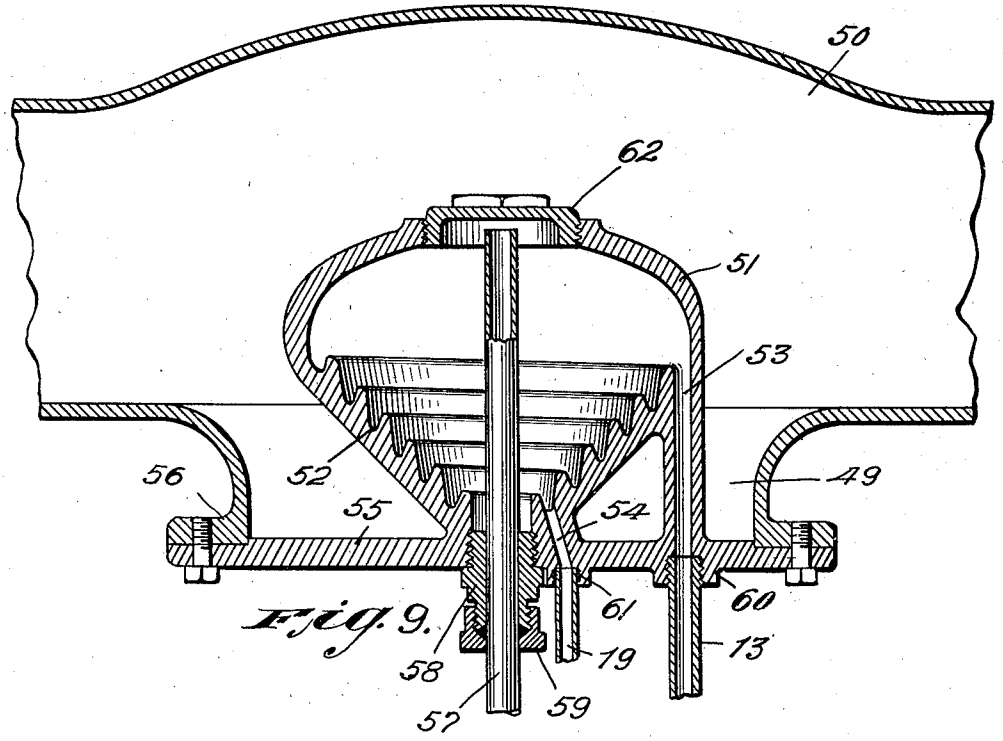
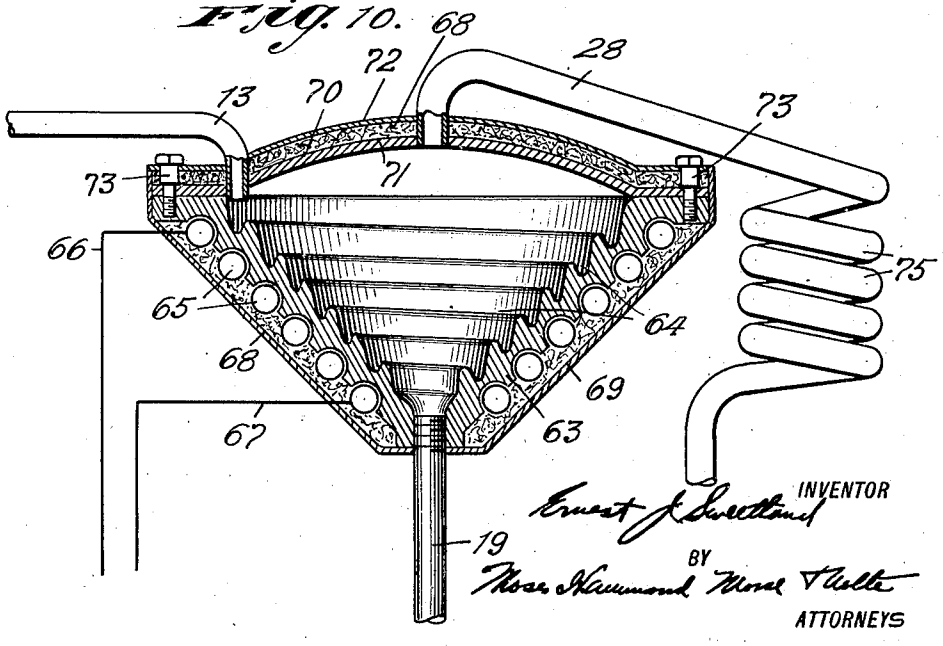


Fig. 9.

Fig. 10.



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Fig. 11.

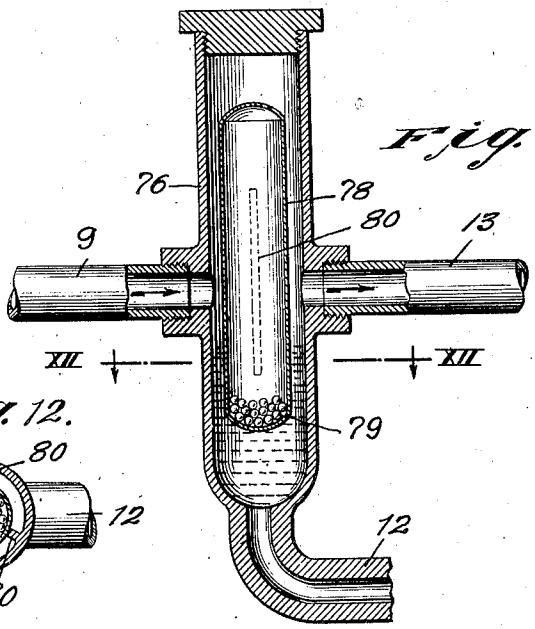


Fig. 12.

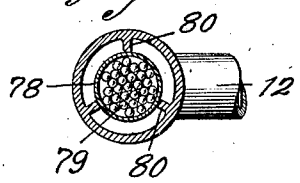


Fig. 13.

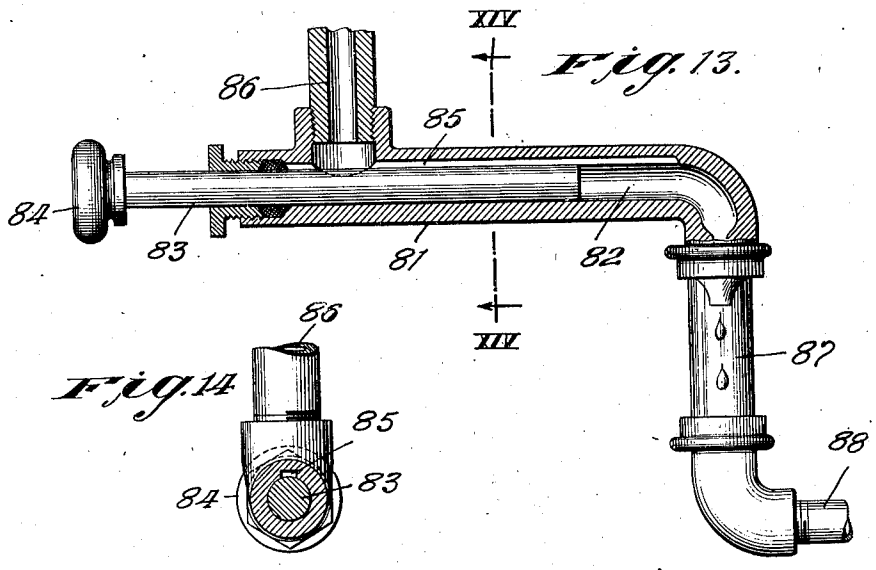


Fig. 14

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Fig. 16.

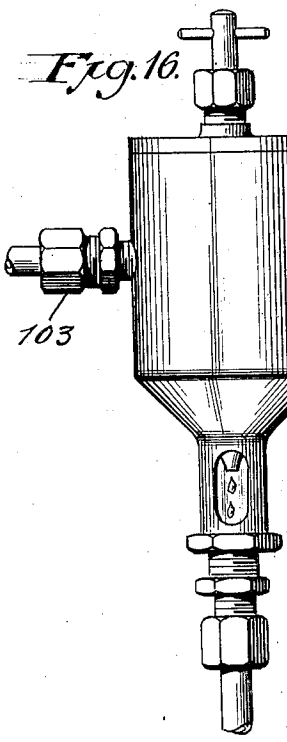


Fig. 15.

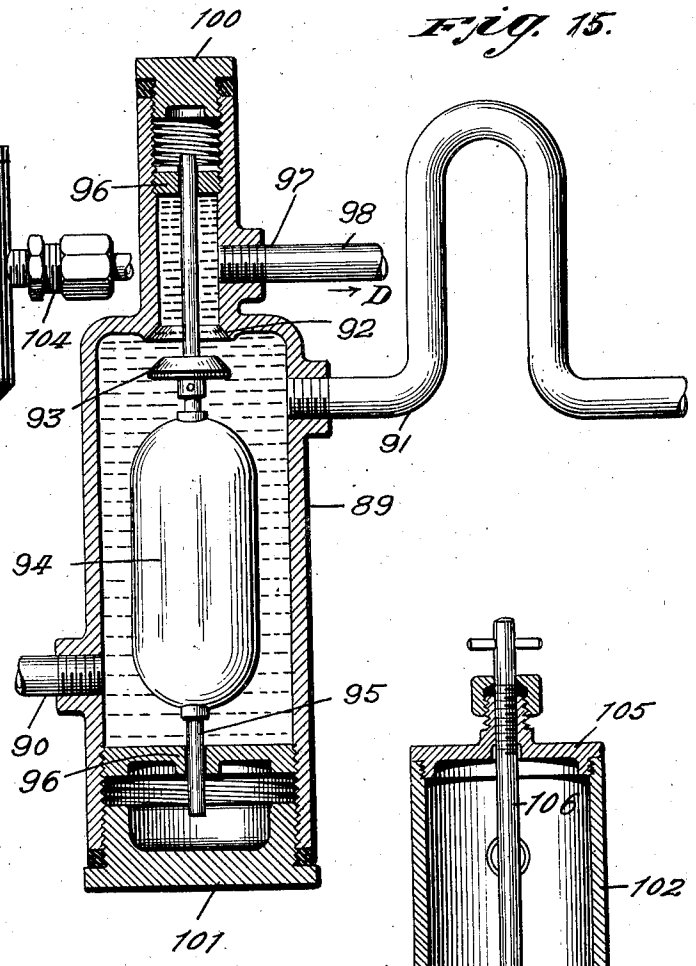
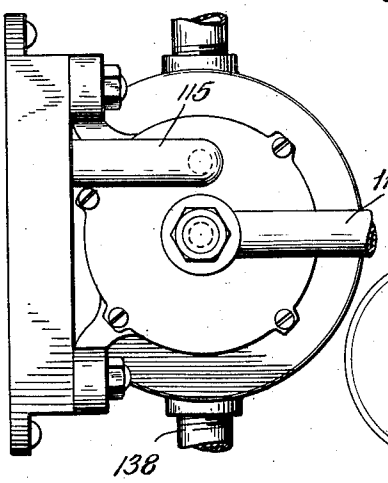


Fig. 19.



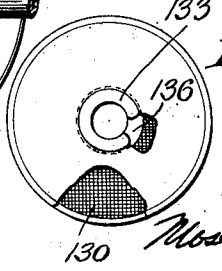


Fig. 17.

Fig. 21.

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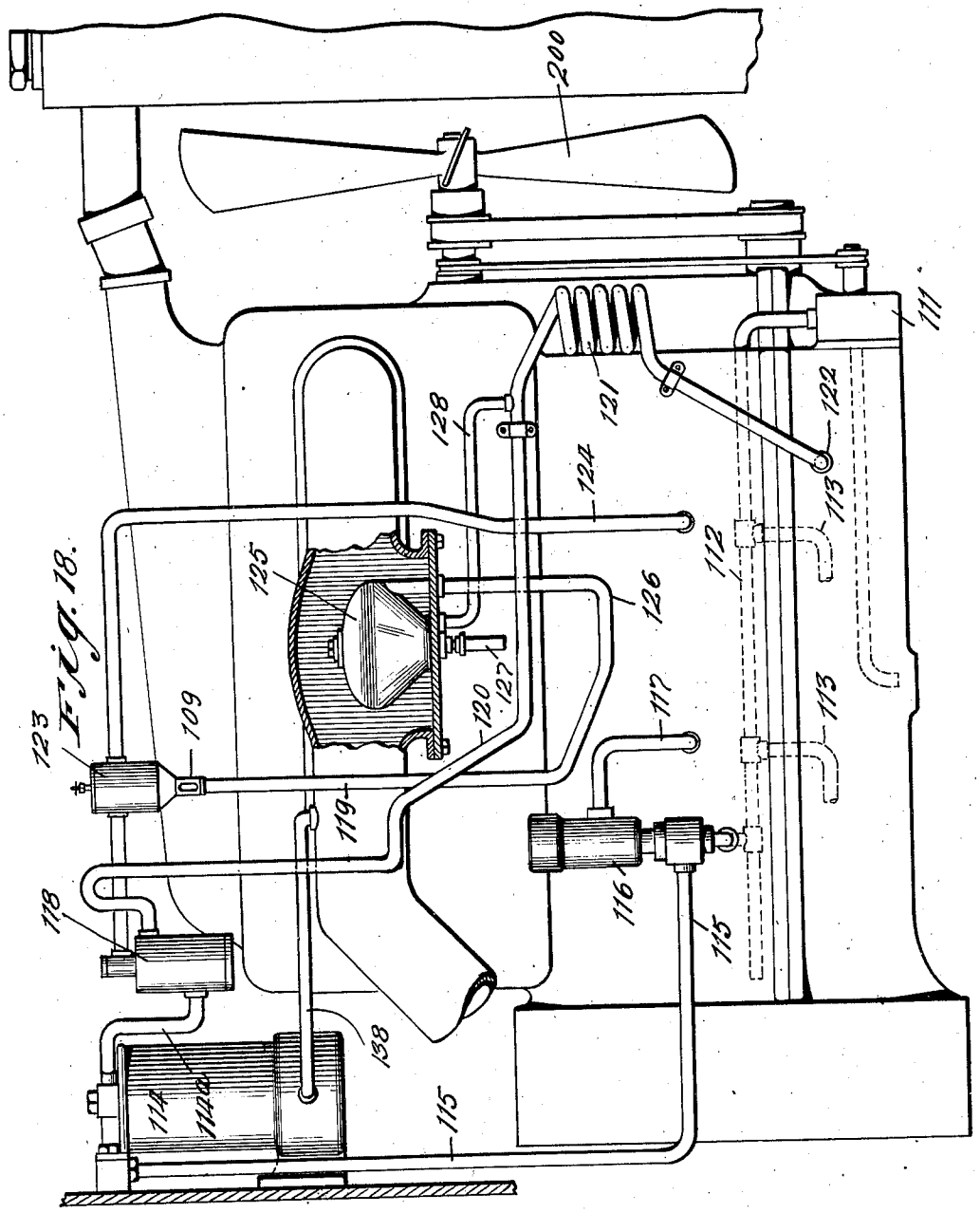


Fig. 18.

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Patented Mar. 14, 1933 1,901,010

UNITED STATES PATENT OFFICE

ERNEST J. SWEETLAND, OF PIEDMONT, CALIFORNIA

APPARATUS FOR RECONDITIONING USED OIL

Application filed April 28, 1922. Serial No. 557,088.

During the operation of internal combustion engines, the lubricating oil becomes fouled, due to the collection of carbon particles, road dust, water through condensation, gasoline and like substances, which contaminates and dilutes the oil to an extent when it soon becomes unfit for further use; its lubricating properties being dissipated so if continued in use, the surfaces of the engine bearings will be no longer separated by an efficient film of oil and will soon become damaged through frictional contact.

In the past, there have been several attempts made to remedy this condition, but so far as I am aware, they have been unsuccessful owing to inefficiency in the filtering and distilling methods and apparatus used. I have improved upon the methods and apparatus heretofore produced for this purpose and have succeeded in not only separating all visible suspended solids and water from the oil but have also very successfully driven off and separated gasoline, kerosene and other volatile liquids from the oil so that the clarity and viscosity of the resulting lubricant substantially equals that which the oil originally possessed.

By the practice of my method in a continuous fashion during the operation of the engine, I have found it possible to maintain the lubricating oil in the system at its maximum lubricating value. In order to so maintain the oil, I believe it to be necessary or at least highly desirable to—as distinct steps in the process—first separate the solids in suspension in the oil by filtration, so as to secure a substantially clear filtrate, and then, second, drive off the entrained volatile liquids by heat, preferably the heat of the exhaust gases of the engine. The clarification of the oil, by removing the products of combustion and dirt which finds its way therein, initially leaves the oil in a condition which is most favorable to efficient distillation and I ascribe to this method of procedure the highly efficient results that I have been able to obtain.

Among the novel structural characteristics of my invention, I desire to emphasize particularly the embodiments of the distilling principles employed. In order to obtain a high degree of efficiency in ridding the oil of obnoxious distillates which interfere with proper lubrication, I have found it desirable to so construct the distilling device that that portion of the oil which is immediately under treatment or influence of the distilling device be subjected to necessary heat treatment for a period of time and in such a manner as will afford the opportunity of satisfactory vaporization of those distillates which ought to be driven off.

I accomplish this by constructing a distilling device in such a manner that preferably a small stream of the lubricating oil will be continuously under the heat treatment for a sufficient length of time and in order to obtain a very high degree of efficiency in this regard, the stream of oil is given a circuitous or extended path within the distilling device, this being accomplished preferably by providing a spiral groove in the shape of an inverted cone, through which the oil is caused to flow. By this arrangement, the distilling device can be made compact and small in size which lends itself readily adapable to internal combustion engines.

A further object of the invention is to so construct the distilling device that the heating chamber thereof will be most efficiently heated. This I accomplish by either jacketing the device and admitting the exhaust gases thereto or by locating the device entirely within the exhaust manifold of the engine.

A further object of the invention is to provide manually and automatically operable means for governing the temperature at which distillation occurs, as well as either manually or automatically operable means for functioning the distilling device, either by the gravity or viscosity of the oil issuing from the filter, said respective means controlling the flow of the oil to either the distilling device or directly to the oil lubricating system, in accordance therewith.

A further advantage of my invention resides in reducing corrosion of the engine parts from sulphuric acid as I have found that by keeping the lubricating oil freed of

water, the formation of sulphuric acid through the combination of water with the sulphur is prevented.

Other objects of the invention will be hereinafter pointed out.

A good understanding of the invention may now be had from the following description of certain forms of embodiment thereof, reference being had to the accompanying drawings, in which:

Figure 1 is a perspective view, partly diagrammatic in character, showing one form of oil circulating system embodying my invention;

Figure 2 is a vertical sectional view of one form of distilling device embodying my invention;

Figure 3 is a top plan view of the device of Figure 2 with the cover removed;

Figure 4 is a vertical, sectional view of a modification of the device of Figure 2;

Figure 5 is a view showing the device of Figure 4 in vertical elevation;

Figure 6 is a view showing a modification of Figure 2;

Figures 7, 8, 9 and 10 are views showing other modifications of the distilling device in vertical section;

Figure 11 is a view showing, in vertical section, one form of mechanism of my invention for automatically controlling the density of the oil;

Figure 12 is a section of Figure 11, taken on line 12—12, looking in the direction of the arrows;

Figure 13 is a view showing, in vertical section, one form of device embodying my invention for automatically controlling the viscosity of the oil;

Figure 14 is a view showing a section of Figure 13 on the line 14—14, looking in the direction of the arrows;

Figure 15 is a view showing a vertical section of one form of modification of the device of Figure 11;

Figures 16 and 17 are views showing, in front elevation and vertical section, respectively, a modification of the device of Figure 13;

Figure 18 is a view showing the oil-circulating system of an internal combustion engine provided with automatic control mechanisms illustrated in Figures 15 and 17 and the distilling device illustrated in Figure 9 and

Figures 19–22 inclusive are detail views showing the construction of the oil filter.

In Figure 1 the system of the present invention is illustrated diagrammatically as applied to the internal combustion engine of an automobile. This engine is of the conventional type and is provided with a system for circulating lubricant, this system comprising a pump designated 1, whereby the lubricant is drawn from the bottom of the crank case 2 through a pipe 3 and returned to the upper part of the crank case through a pipe 4, this pipe being normally arranged so as to enter the crank case at a point such as 5.

In accordance with the present invention, however, the oil or other lubricant before being returned to the crank case is caused to pass through an apparatus for separating particles of foreign matter which may be present in the oil such as carbon or water, this apparatus being designated by the reference character A, and through an apparatus for removing, preferably by distillation, the lighter volatile oils, such as gasoline, kerosene, etc., which may be present in the lubricant, this apparatus being designated B.

In the illustrated diagrammatic form of embodiment the pipe 4 is connected through a sight feed indicating device 6, preferably mounted on the dash of the vehicle, to the inlet opening 7 of the apparatus A, this apparatus being preferably in the form of a filter, the interior construction of which may be of any suitable character, preferably as illustrated and described in my Patent No. 1,680,029, patented August 7, 1928. By means of this filter the oil is cleared of all suspended solids and water as more particularly described in the said patent to which reference may be had. From the filter the oil passes through outlet pipe 8 and sight feed device 6 into pipe 9, a cock 10 being provided in this pipe to permit of the withdrawal of a quantity of the oil for testing purposes. A three-way valve 11 is provided in pipe 9, this valve being so arranged that in one position it communicates with a pipe 12 leading directly to the opening 5 in the upper side of the crank case, and, in the other position, with a pipe 13 which leads to the distilling apparatus B. In the position illustrated, the oil is caused to flow through the distilling apparatus, which, in the illustrated form of embodiment, consists of a casing divided into two compartments by means of a wall 15, the upper compartment serving as a container for the oil, and the lower compartment as a heating chamber therefor. The last-mentioned compartment is connected to the exhaust pipe 16 of the vehicle by means of a pipe 17 whereby a portion of the hot gases is caused to pass through chamber 14 and returned to the exhaust pipe by means of a pipe 18. The upper chamber is provided with an inlet opening for pipe 13 and an outlet opening for a pipe 19, which, after passing through a cooling coil 20 located behind the fan of the engine, returns to the crank case 2 by means of an opening 21. The temperature to which the upper compartment is heated is indicated at the dash of the vehicle by means of a thermometer of the distance type, the bulb 23 thereof extending through the casing into the oil being connected to the indicating in-

strument 22 by means of a suitable pipe connection 24. The temperature of the oil may be regulated from the cowl of the vehicle by means of a handle 25 which operates a butterfly valve 26 in the pipe 17 and thus governs the flow of the exhaust gases through the lower compartment.

The temperature to which the oil is heated in the device is so regulated that the light volatile oils and water present in the lubricant are distilled off. The vaporized fluids pass off to atmosphere through an opening 27 communicating with a pipe 28. If desired, the distilled vapor may be condensed and collected in a suitable receptacle.

The valve 11, hereinbefore referred to, is provided for the purpose of permitting the operator to cut the distilling device out of operation whenever desired, the oil in such case being returned directly to the crank case by means of pipe 12.

A modification of the distilling device of Figure 1 is illustrated in Figures 2 and 3. In this form it comprises a casting 28, the interior of which is formed in the shape of an inverted cone provided with a spiral groove 29, so that the oil which enters the casting through the inlet pipe 13 flows s'owly through the groove to the outlet opening 30, from which it is conducted away by pipe 19. By this construction the oil is given a long path so that there is ample time for it to be sufficiently heated to vaporize any of the lighter oils or moisture which may be present and when the engine is stopped, any oil in the distilling device will drain by gravity from the groove 29 and not be coked or carbonized on the walls of the chamber due to stoppage of circulation. The vapors pass off through a pipe 31 which communicates with a cap 32 bolted on the upper face of the casting 28.

The heating compartment of this form of distilling device is formed by a jacket 33 which surrounds practically the entire heating element, the inlet pipe 17 and outlet pipe 18 being connected to the jacket to pass a portion of the hot exhaust gases therethrough. Interior to the jacket 33 is provided a thermostatic element 34 which serves to control automatically the temperature to which the oil is heated. The thermostat is so adjusted that when the casting 28 exceeds the temperature at which the distillation is to be carried on, it operates the damper 35 so as to decrease the supply of the exhaust gases. Similarly, when the temperature falls below the desired point, the thermostat opens the damper so as to increase the supply of heat. In this manner the damper is continuously and automatically regulated so as to maintain the degree of heat in the evaporating chamber substantially constant.

The form of distilling device illustrated in Figures 4 and 5 is similar to that of Figures 2 and 3, in that it comprises a casting 28^a having a spiral passage 29 for the oil, the inlet for the oil being at 13 and the outlet at 19, as described in connection with Figure 2. It differs from the above noted form of embodiment, however, in that the casting is pivotally mounted on the exhaust manifold 36 of the engine by means of lugs 37 cooperating with screws 38. A thermostatic element 39 is contained in an opening 40 of casting 28^a in such manner as to bear at its upper end against the casting and at its lower end against the exhaust manifold 36 on which the casting is mounted. The hot exhaust gases passing through the manifold heat the casting 28^a, so that the desired distillation takes place. The thermostat is so adjusted, that when the proper temperature is exceeded, it raises in the casting slightly away from the manifold, so that cold air from the ventilating fan is caused to enter between the pipe 36 and casting 28^a, thus preventing the casting from becoming overheated. The temperature of distillation will thus be automatically retained substantially constant.

The modification illustrated in Figure 6 is similar to that of Figures 2 and 3, but shows the heating jacket 33 surrounding the distilling chamber on all sides, the cover 32^a being provided with passages communicating with the passages 33^a in the casting 28^a. The oil inflow pipe, indicated at 13^a, enters the distilling chamber through the cover in such manner that the entering oil will drip into the highest point of spiral 29. The outlet of the distilled oil is at 30 and the outlet for the vapor is at 31, similarly as described in Figure 2.

The form of distilling device illustrated in Figure 7 is similar to that diagrammatically indicated in Figure 1, but differs therefrom mainly in that the distilling chamber 41 is entirely surrounded by the heating chamber 42 through which the exhaust gases are passed by the inlet and outlet pipes 17 and 18, respectively. The oil enters the distilling chamber, as in Figure 1, through pipe 13 and leaves by pipe 19, and the vapor passes off through outlet 27. By surrounding the distilling chamber completely with the hot exhaust gases, as illustrated for example in Figures 6 and 7, a high degree of constancy in temperature may be obtained.

The apparatus illustrated in Figure 8 shows the distilling device located in a pocket 42 of the exhaust pipe manifold 43. The oil is introduced into the distilling device by a pipe 44 which communicates with a chamber 45 hemispherical at its upper end and provided with a sloping bottom at the lowermost portion of which it is open to a helical coil 46. A pipe 47 open at its upper end extends into the chamber 45 to conduct away the vaporized material. A detachable plate 48, through which pipes 44, 45 and 47 extend, is provided to close the lower end of pocket 42.

In operation the oil enters through pipe 44 and passes slowly over the bottom of chamber 45 into coil 46. During this time it is subjected to the heat of the exhaust gases passing through the manifold 43, and the lighter constituents are vaporized and pass upwardly through the helix and into chamber 45 from which they escape through the pipe 47. The lubricant proper continues its passage through the helix and is returned to the crank case by a pipe 46. It will be observed that this form of the device has the advantageous feature that it is located in the exhaust pipe proper and, therefore, has no exhaust gas passages liable to be clogged with soot. The entire instrument, moreover, may readily be removed for purposes of inspection and repair by detaching plate 48.

The form of distilling device illustrated in Figure 9, similarly to that shown in Figure 8, is mounted in a pocket 49 of the exhaust pipe designated 50. It comprises a casting 51 having a conical bottom provided with a spiral groove 52, similarly as hereinbefore noted in the description of previous forms of embodiment of the invention. The lubricant is supplied by means of a passage 53 integral with casting 51 and is conducted away through a passage 54 provided at the lowermost end of the spiral groove 52. Casting 51 is integral with a plate 55 by means of which the apparatus may be secured to the flange 56 provided on the exhaust pipe manifold 50. The outlet pipe 57 for vaporized oil extends upwardly through the center of casting 51, being retained in place by means of a collar 58 in threaded engagement with the casting, a stuffing box 59 being provided to retain the connection air-tight. The passages 53 and 54 for the inflow and outflow of the lubricant terminate in bosses 60 and 61 into which the oil supply pipe 13 and outflow pipe 19 may be threadedly secured. The interior of the distilling device, it should be noted, may readily be examined and cleaned by removing a threaded cover plate 62 provided in the upper end of chamber 51. By virtue of its location in the exhaust pipe proper it has also the advantages noted in the description of Figure 8. These types have the advantage of not being cooled by contact with the air in cold weather.

The modification illustrated in Figure 10 shows a form of device whereby the heat for distilling is provided by electrical means. This form of embodiment comprises a conically shaped casting 63 provided in its inner face with a spiral groove 64, similarly as hereinbefore described. The lower face of casting 63 is provided with recesses in which are mounted electrical resistance elements 65, connected as diagrammatically indicated to wires 66. Insulated packing material 68, such as asbestos, surrounded by a sheet metal casing 69 is provided about the exterior of the heating elements, to prevent a dissipation of the heat through the outer surface of the distilling device. The cover 70 consists of a pair of cupped discs 71 and 72 insulated by the material 68. It may be tightly secured on the casting 63 by means of screws 73. The oil inflow pipe 13 and the vapor outflow pipe 28 extend through the cover, and the oil outflow pipe 19 enters casting 63 at its lowermost point, similarly as described in certain previously noted forms of embodiment of the invention. A helical coil 75 is shown provided in the vapor outflow pipe 28 to indicate that the vapor may be cooled and condensed, if desired, the condensate being collected in a suitable receptacle. This condenser may, of course, be provided on any of the herein-described forms of embodiment.

It should here be noted that any of the devices illustrated in Figures 6 to 10, inclusive, may be provided with manually or automatically operable means for governing the temperature at which the distillation occurs, such for example as are described in connection with Figures 2 to 5, inclusive.

Moreover, instead of providing a manually-operable valve such as 11, indicated in Figure 1, for governing the periods of operation of the distilling device, I may provide automatically operable mechanism such as indicated in Figures 11 and 12. This mechanism comprises a casing 76 containing a float 78 weighted at its lower end by means of lead shot 79. Guides 80 are provided in the walls of casing 76 to restrain the float to longitudinal motion within the casing. Pipes 9 and 13, which, as shown in Figure 1, serve to conduct the oil from the filter to the distilling device, communicate with the casing 76 at approximately mid-height and the passageway 12 which leads directly to the crank case communicates with the lower end of the casing. The lower end of the float conforms to the lower end of the casing and thus acts to shut off the passage 12 when it rests in the bottom of the casing.

In operation, the float 78 acts like a hydrometer. It is so adjusted that if the oil in the chamber has a specific gravity greater than a certain amount, say 25 degrees Baumé, the float will rise and open the passageway 12 and allow the oil to return to the crank case without receiving any heat treatment. When, however, the specific gravity of the oil is reduced by the admixture of gasoline or water or other fluids of lighter weight, the float will no longer remain buoyant but rest on the bottom of casing 76, thus shutting off the passage 12. The oil which now enters the casing 76 through pipe 9 flows downward along the left sides of the float, around the bottom of guides 80, upwardly on the right and out through pipe 13 into the distilling device. The oil inside the cas-

ing is thus kept in circulation, so that the position of the float will accurately correspond to the true specific gravity of the oil circulating through the system.

The oil will continue to flow through the distilling device until the specific gravity of the entire body of the oil is restored to normal whereupon the float 78 is again rendered buoyant, thus enabling the oil to pass directly to the crank case. The specific gravity of the oil is thus automatically maintained constant.

Another form of device for governing the flow of the lubricant to the distilling device is indicated in Figures 13 and 14. This device operates on the principle that the quantity of flow of the lubricant through a narrow passage depends upon its viscosity. As illustrated in the drawings, it comprises a casing 81, inserted into the oil line as a bypass, having an elongated passage 82 into which is placed a plunger 83, the distance of insertion of which may be governed manually by means of a knob 84. A narrow passageway 85 is provided in the wall of chamber 82, this passageway being in communication with an inlet pipe 86. The right end of chamber 82 communicates through a sight feed glass 87 with a pipe 88 which leads to the distilling apparatus. The rate of flow through chamber 82 depends not only upon the distance of insertion of plunger 83 but also upon the viscosity of the oil. When, therefore, the viscosity is low, the quantity of oil which passes to the distilling device is comparatively large, and when the viscosity is high, it is correspondingly small. The degree of viscosity at which the oil is maintained by the distilling device may, therefore, be controlled by the adjustment of plunger 83, a shortening of passage 85 bringing about a larger flow to the distilling device and therefore a greater degree of viscosity, and a lengthening of the passage having the opposite effect. The sight feed glass 87 of Figure 13 is of importance in that it indicates the viscosity of the oil and its rate of flow to the distilling device, so that the operator may be guided in his adjustment of plunger 83. Such a sight feed mechanism may also be employed in connection with the gravity control mechanism illustrated in Figure 11, and both mechanisms may be employed in conjunction with each other, as hereinafter described.

Figure 15 illustrates a modified form of specific gravity-operated device for controlling the flow of oil to the distilling apparatus. This mechanism comprises a chamber 89 provided with an oil inlet 90 and outlet 91, this outlet being connected to a pipe which leads directly to the crank case. Adjacent the upper end of casing 89 is provided a valve seat 92 which cooperates with a valve 93, the position of this valve being governed by means of a weighted float 94 mounted on a rod 95, the upper ends of which cooperate with bearings 96 provided in the upper and lower ends of chamber 89. The weight of float 94 is such that when the specific gravity of the oil is equal to or greater than a predetermined quantity, the valve 93 is closed, so that the oil is sent directly to the crank case through pipe 91. When, however, the gravity is below the desired minimum, the valve 93 opens so that the oil passes into an outlet opening 97 which communicates by means of a pipe 98 with the distilling device. The pipe 91 is bent into the shape of an inverted U, the arms of which extend above the level of pipe 98. By virtue of this feature, the resistance of the flow of oil through passage 91 is greater than that through passage 98, so that when the valve 93 is open, the oil will flow out only through the passage 98. Screw caps 100 and 101 are provided at the ends of casting 89 to facilitate the removal of the bearing member 96 and float 94 for the purpose of cleansing or inspection.

Figures 16 and 17 illustrate a modification of the viscosity control device illustrated in Figure 13. This form of mechanism comprises a casing 102 provided at its sides with inflow and outflow pipes 103 and 104, respectively. A cover 105 is provided on the upper end of casing 102 to render the same air-tight. The stem 106 of a needle valve 107 is mounted in the cover, the position of the stem with relation to the valve being adjustable in the usual manner. The needle valve governs the flow of lubricant through a passageway 108, the lower end of which communicates through a sight feed member 109, with a pipe 110 which leads to the distillating device. According to the degree of viscosity of the oil the flow of oil from the chamber in casing 102 into pipe 110 will depend upon two factors, (*a*), the opening of the needle valve and (*b*), the viscosity of the oil. For a given amount of valve opening the rate of flow of oil will depend upon the viscosity thereof, as hereinbefore explained with reference to Figure 13. By regulating the position of stem 106 the operator is enabled to govern the rate of flow to the distilling device, the remainder of the oil being returned directly to the crank case through the pipe 104.

The system illustrated in Figure 18 is, in general, similar to that of Figure 1, except that the control of the distillation is effected automatically instead of manually. The coil is circulated by means of a pump 111 which draws its supply from the lowermost part of the crank case and forces the oil into a supply pipe 112. From this pipe a part of the oil flows directly to the bearings through branch members 113 and another part flows to the filter 114 through a pipe 115, a pres-

sure-responsive mechanism 116 being interposed in this connection to return the oil directly to the crank case through a pipe 117 when the pressure in pipe 115 exceeds a predetermined amount. This mechanism is not described in detail herein, but may be of any suitable form, such as illustrated in my patent of April 12, 1927, No. 1,624,689. After passing through the filter 114, capable of removing sediment and water from the oil as described in application Serial No. 425,042, the oil enters the pipe 114ª which communicates with a gravity operated flow-controlling device 118 which is constructed as described in Figure 15. According to the gravity of the oil, this mechanism causes it to pass either through the pipe 119 toward the distilling mechanism hereinafter referred to, or through a pipe 120 to the crank case, this pipe being in communication with a coil 121 located behind the fan 200, whereby the oil is cooled before it is passed to the crank case through an opening 122.

The filter 114 is illustrated in detail in Figs. 19 to 22 inclusive. The intake pipe 115 communicates with the interior of the chamber 114. Said chamber contains a plurality of filter elements each comprising a supporting and spacing member 130 of coarse wire screen or other material suitable for permitting the flow of oil therethrough. Each supporting element is enclosed by a filter cloth 131 of canton flannel or other closely woven fabric, which as fully explained in my prior application herein before identified removes not only all suspended solids but also any water which the oil contains.

The filter elements are supported on a central hollow shaft 132, upon which they are held in spaced relation by gaskets 133, the complete set being securely held between a collar 134 at the top, and a nut 135 at the bottom. The hollow shaft which is closed at the lower end, has a series of lateral openings 136, each communicating with the interior of one of the filter elements. This shaft is also in communication with the outlet pipe 114ª.

A heating chamber 137 surrounds the lower part of the filter, and communicates with the exhaust pipe of the engine through a tube 138. It should be noted, however, that whereas the distillation apparatus hereinbefore described is so constructed as to substantially raise the temperature of the oil, the arrangement of the filter heater is such that the rise in temperature of the oil passing therethrough is comparatively small.

The pipe 119 communicates with a sight feed device 123 of the type illustrated and described in Figures 16 and 17. According to the adjustment of the needle valve stem of this mechanism, the oil is divided into two portions, one of which is returned directly to the crank case through a pipe 124, and the other of which is caused to enter the distilling device 125 through a pipe 126. As hereinbefore noted, for any given adjustment of the valve, the portion which enters the still is large or small, depending upon the fluidity of the oil.

The illustrated form of distilling device is similar to that of Figure 9, the vaporized gases being conducted away through a pipe 127 open to atmosphere, and the refined lubricant being returned to the crank case through the pipe 128 and cooling coil 121 hereinbefore referred to.

It will be observed that the present form of embodiment of the invention provides for a completely automatic control of the distillation of the oil, both as to gravity and viscosity, so that once the proper adjustments have been made, the lubricant will be retained not only clear of particles of foreign matter such as are removed at the filter 114, but will be continuously maintained at approximately the desired point of gravity and viscosity.

Although only certain specific forms of embodiment of the invention are shown and described herein, it will be understood that the invention is not limited thereto but that many changes and modifications may be made therein within the spirit and scope of the following claims without departing from the spirit and scope of the invention, it being my intention to claim the same as broadly as the state of the prior art will permit, in whatever form its principles may be employed.

What I claim is:

1. In combination with the lubricating system of an automotive internal combustion engine, a pressure filter including means for separating the solids and water from the lubricating oil forced therethrough, a distilling device in communication with said filter and having return communication with said lubricating system, of automatic control means interposed in the communicating line between the filter and the distilling device and having communication with the lubricating system whereby the lubricating oil at a predetermined viscosity will be returned directly from the filter to the lubricating system.

2. In combination with the lubricating system of an automotive internal combustion engine, a distilling device for removing volatile liquids of low boiling point from the lubricating oil, a passageway for oil forming a circuit communicating with the distilling device and the lubricating system, a communicating passageway leading from said circuit to the engine lubricating system, and means operated by the viscosity of the oil passing through the system for controlling the passage of oil to the distilling device.

3. In combination with the lubricating system of an automotive internal combustion engine, a device for removing contaminating

liquids from the oil circulatory system which comprises means to constantly circulate a stream of oil through said system, a heating chamber, means to convey the oil through said chamber in a thin attenuated stream, said means including a self-draining winding conduit, a drainage conduit at the end of said conduit whereby substantially all of the oil from the heating chamber is drained therefrom immediately when the circulating means is ineffective, said heating chamber having a vent adjacent the uppermost portion thereof for the discharge of the vaporized contaminating fluids.

4. An apparatus for purifying used lubricating oil comprising a plug element adapted to be mounted in the exhaust pipe of an internal combustion engine, means for supporting said element to the wall of said exhaust pipe, said element having an oil circulating conduit embodying a winding passageway for the incoming oil in communication with a return passageway.

5. In combination with the lubricating system of an automotive internal combustion engine, a pressure filter capable of separating solids and water from the lubricating oil, means for continuously feeding a part of said lubricating oil received from said system through said filter, a distilling device cooperatively associated with the engine exhaust and receiving the lubricating oil from the filter, means for heating said distilling device by the heat of the exhaust gases from said engine to drive off the lighter volatile oils, said distilling device having an oil circulating conduit embodying a winding passageway, and being in communication with the lubricating system of the engine to return the clarified oil thereto and means to control the viscosity of the oil returning to said system.

6. In combination with the lubricating system of an automotive internal combustion engine, having an exhaust gas conduit, a circulating system for the lubricating oil including a filter adapted to clarify the lubricant by removal of the solids and water contained therein, a chamber communicating with the filter, a distilling device including a distillator element having a continuous winding oil conducting trough formed therein, said trough being formed in the shape of a helix, said distillator element being located in the exhaust gas conduit and mounted on a wall thereof, the heat being adapted to drive off lighter distillates at a rate sufficient to maintain the viscosity of the oil during normal operating conditions.

7. An apparatus for purifying used lubricating oil comprising an element adapted to be mounted in the exhaust pipe of an internal combustion engine, means for supporting said element from the wall of said exhaust pipe, said element having an oil circulating conduit including a tortuous helical passageway for the incoming oil in communication with a return passageway, said passageways adapted to pass the oil through the heated area at a rate sufficient to drive off the volatile fluids therein.

8. An apparatus for purifying used lubricating oil comprising a hollow member mounted within the exhaust gas chamber of an internal combustion engine, a winding passageway formed within said chamber and means to supply oil to said winding passageway and to withdraw reconditioned oil therefrom, and means to filter said oil before returning said oil to said chamber.

9. An apparatus for purifying used lubricating oil comprising a distillator element adapted to be mounted in the exhaust pipe of an internal combustion engine, means for supporting said element to the wall of said exhaust pipe, said element having an oil circulating conduit embodying a winding passageway for the incoming oil in communication with a return passageway.

In testimony whereof I have affixed my signature to this specification.

ERNEST J. SWEETLAND.