July 13, 1937. E. D. BRADFORD 2,086,763

OIL RECLAIMING APPARATUS

Original Filed Jan. 11, 1934 3 Sheets-Sheet 1

Fig. 1

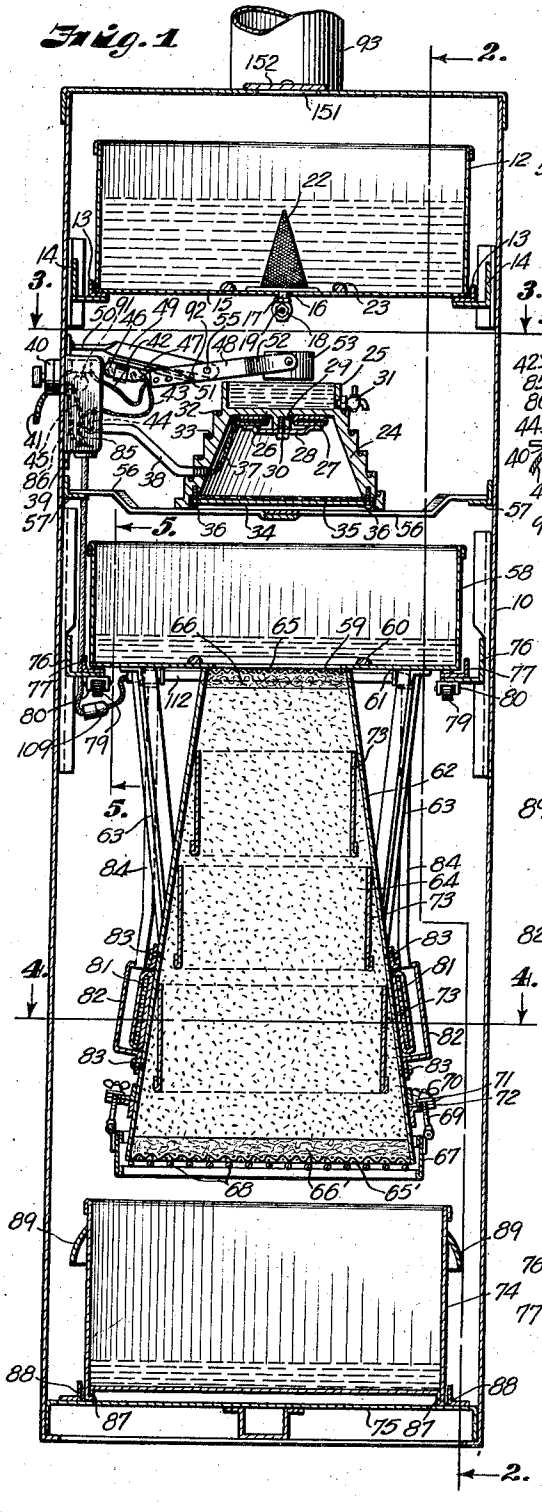


Fig. 3.

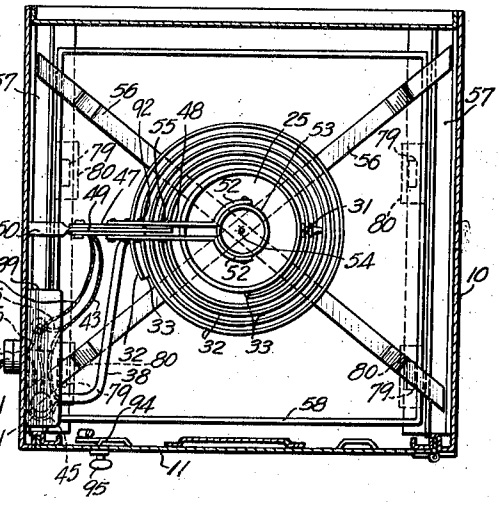


Fig. 4.

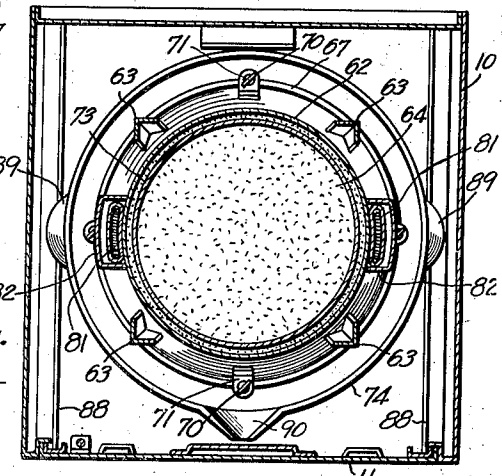
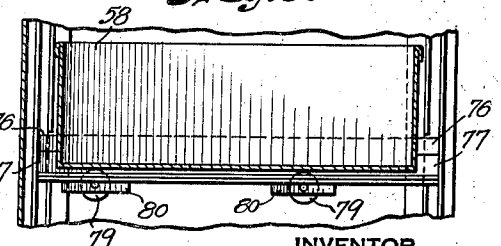


Fig. 5.



INVENTOR
Elmer D. Bradford
BY Alfred P. Fuchs
ATTORNEY

July 13, 1937. E. D. BRADFORD 2,086,763

OIL RECLAIMING APPARATUS

Original Filed Jan. 11, 1934 3 Sheets-Sheet 2

Fig. 2.

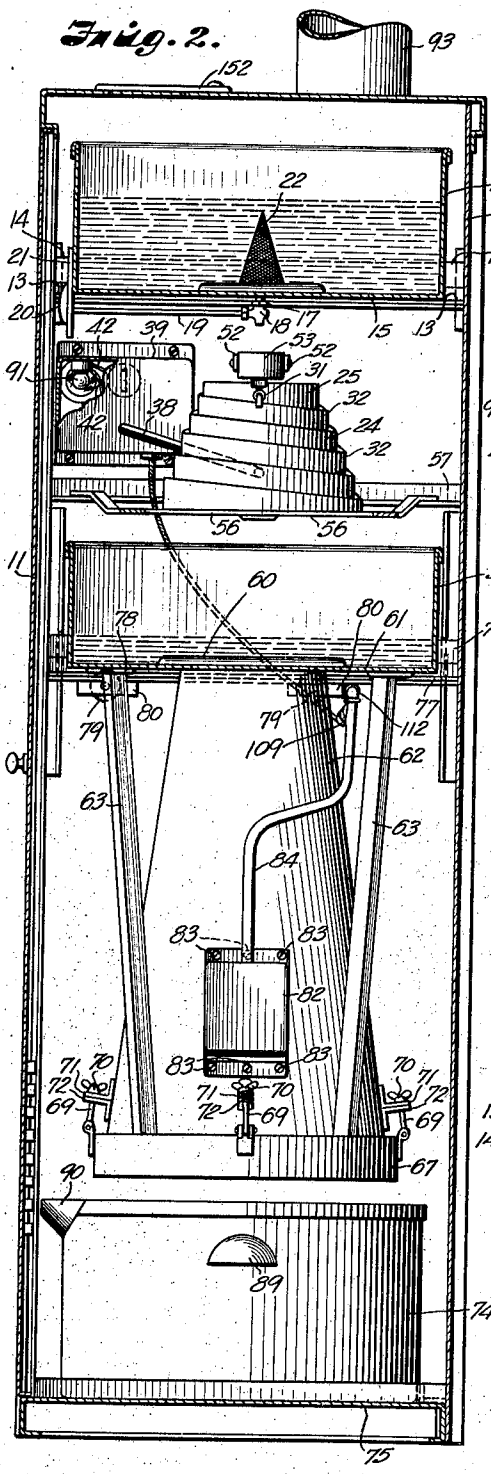


Fig. 6.

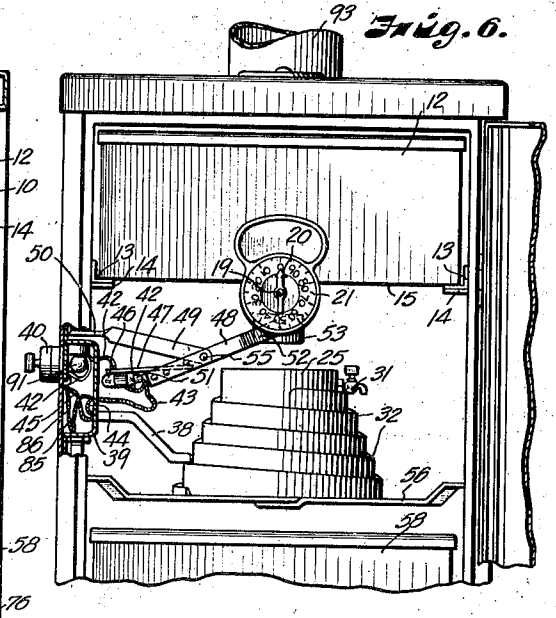


Fig. 7.

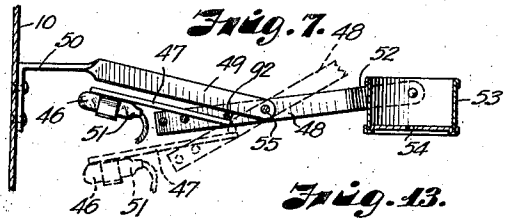
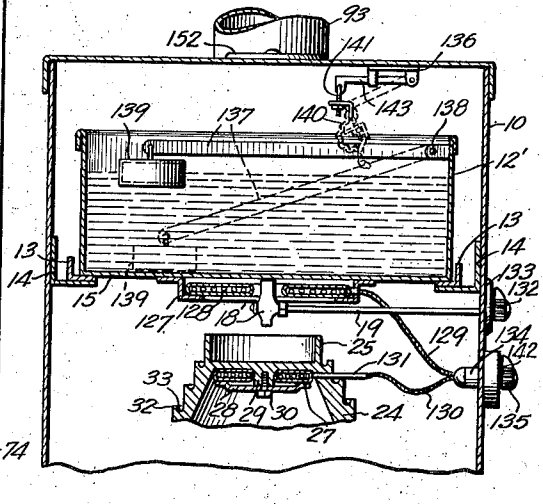


Fig. 13.



INVENTOR
Elmer D. Bradford
BY Alfred R. Fuchs
ATTORNEY

July 13, 1937. E. D. BRADFORD 2,086,763

OIL RECLAIMING APPARATUS

Original Filed Jan. 11, 1934 3 Sheets-Sheet 3

Fig. 8.

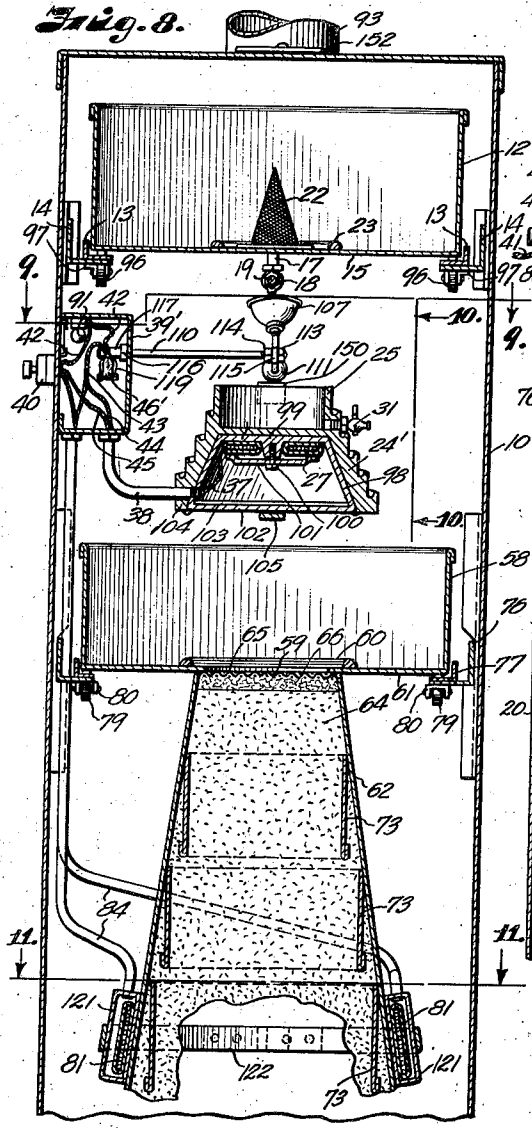


Fig. 9.

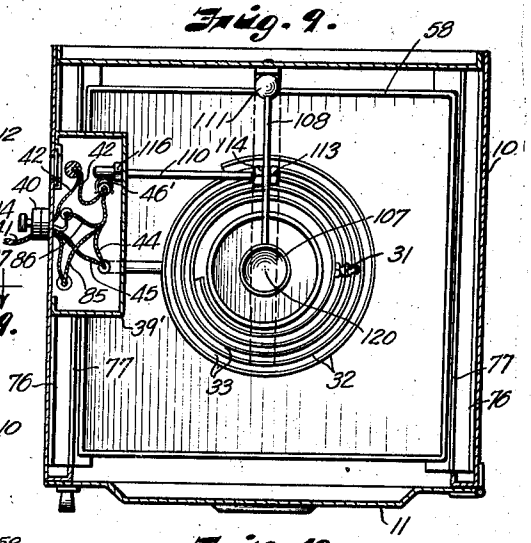


Fig. 10.

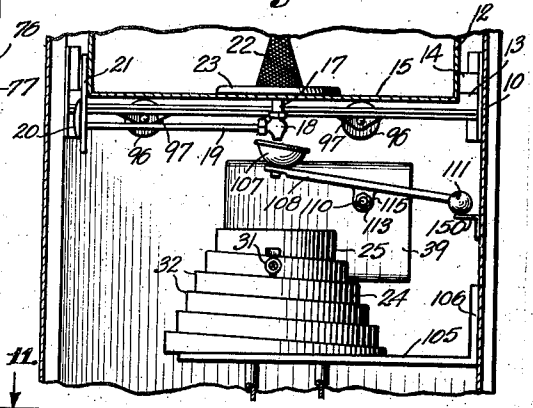


Fig. 11.

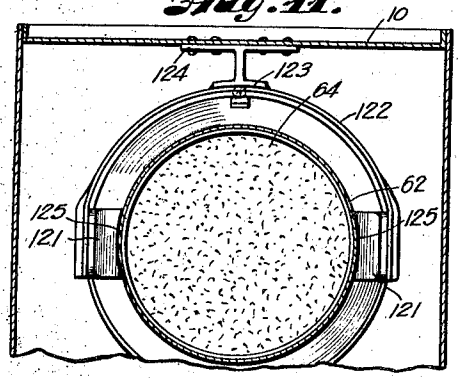


Fig. 12.

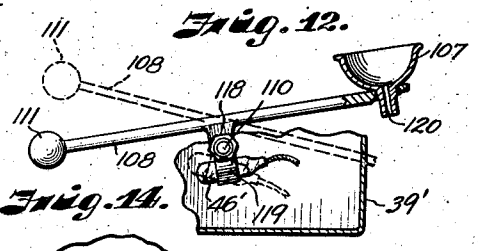
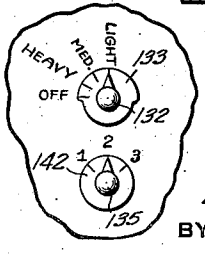


Fig. 14.



INVENTOR
Elmer D. Bradford
BY Alfred R. Fuchs
ATTORNEY

Patented July 13, 1937

2,086,763

UNITED STATES PATENT OFFICE

2,086,763

OIL RECLAIMING APPARATUS

Elmer D. Bradford, Denver, Colo., assignor to Kramlich-Bradford Manufacturing Company, Denver, Colo., a corporation of Colorado

Application January 11, 1934, Serial No. 706,243
Renewed June 26, 1936

8 Claims. (Cl. 196—16)

My invention relates to oil reclaiming devices, and more particularly to an apparatus and a method for reconditioning and reclaiming used lubricating oil, particularly oil from the crank case of an internal combustion engine, this application being a continuation in part of my application Serial No. 623,253, filed July 18, 1932.

It is a particular purpose of my invention to provide an apparatus of extreme simplicity, with a low cost of operation, that requires very little attention from the operator, and which is substantially automatic in operation. More particularly the invention comprises an apparatus that can be filled at the proper place with the oil to be reclaimed and set in operation and will continue to operate without further attention until all of the oil has been acted on by the apparatus, whereupon it will automatically cease its operation.

It is a particular purpose of my invention to provide an apparatus of the above mentioned character, which comprises a reservoir for the oil that is to be acted on by the apparatus, vaporizing means and filtering means, which requires only that the reservoir be filled with the oil to be acted upon by the apparatus, and starting of the apparatus, whereupon the apparatus operates until all of the oil has been acted on thereby and then ceases to operate, there being no handling whatsoever of the oil necessary during the various steps of the process carried out by the apparatus.

It is one of the important objects of the invention to provide a compact and highly efficient reclaiming device, which will take up a very small space in a garage or similar place, and which will vaporize water, gasoline, and other volatile liquids that dilute the lubricating oil, and which will also completely and entirely remove all suspended solid material, such as dirt, carbon, metal particles, and similar materials.

It is a further purpose of my invention to provide a device of the above mentioned character that is adjustable so that the same will produce a finished product, the specific gravity of which may be varied.

It is another object of the invention to provide a device of the above mentioned character that is automatic in operation, in that it automatically shuts off or discontinues operation of the heating means utilized for vaporizing the oil to be acted on by the apparatus, and also the heating means, if any, that may be provided for the filtering apparatus, when the supply of oil in the supply reservoir has been exhausted, or when the oil reservoir is empty or substantially empty.

It is still another purpose of my invention to provide vaporizing means providing a circuitous path for the oil, so that the oil will come into intimate contact with the heated surface over a long path of travel thereof, whereby all of the oil is subjected to heating in intimate contact with the heated surface, providing a highly efficient heating means, whereby a minimum consumption of current for heating the oil to vaporize the undesirable dilutents thereof, is required.

It is a particular purpose of my invention to provide a controlling means for my improved apparatus, which controls the supply of current to the various heating apparatus provided for the device, so that the heating thereof will be controlled by the supply of oil passing from the oil supply reservoir, and which is so constituted and arranged that when there is any appreciable amount of oil in the oil reservoir the circuit will be closed, but when the oil reservoir is empty or substantially empty, the circuit will be opened.

It is another object of my invention to provide a device of the above mentioned character that is entirely closed when in operation, so as to prevent the escape of undersirable and dangerous fumes therefrom, and which is, however, so arranged that the various operating and adjusting means are accessible from the exterior thereof, and so that the various devices utilized for the treatment of the oil, can be readily removed for cleaning purposes.

It is still another purpose of my invention to provide an apparatus of the above mentioned character that is so constructed that it will prevent any grease that may accidentally be contained in the oil to be reclaimed, from reaching the filter utilized in conjunction with my apparatus, whereby the filter is prevented from being clogged or injured by said grease.

Other objects and advantages of my invention will appear as the description of the drawings proceeds. I desire to have it understood, however, that I do not intend to limit myself to the particular details shown or described, except as defined in the claims.

In the drawings:

Fig. 1 is a view in vertical section, of my improved oil reclaiming apparatus.

Fig. 2 is a section taken on the line 2—2 of Fig. 1.

Fig. 3 is a section taken on the line 3—3 of Fig. 1.

Fig. 4 is a section taken on the line 4—4 of Fig. 1.

Fig. 5 is a fragmentary section taken on the line 5—5 of Fig. 1.

Fig. 6 is a fragmentary view, partly in elevation and partly in section, of the upper portion of the apparatus shown in Fig. 1, showing the parts in an alternative position from that shown in Fig. 1.

Fig. 7 is a fragmentary view, partly in section and partly in elevation, of the controlling apparatus provided for the form of the invention shown in Figs. 1 to 6 inclusive.

Fig. 8 is a vertical sectional view of a modified form of oil reclaiming apparatus, the lower portion thereof being broken away.

Fig. 9 is a section taken on the line 9—9 of Fig. 8.

Fig. 10 is a fragmentary section taken on the line 10—10 of Fig. 8.

Fig. 11 is a fragmentary section taken on the line 11—11 of Fig. 8.

Fig. 12 is a fragmentary view, partly in section and partly in elevation, of the controlling apparatus utilized in the form of the invention shown in Figs. 8 to 11 inclusive.

Fig. 13 is a fragmentary vertical sectional view of the upper portion, of a further modification of the apparatus, and

Fig. 14 is a fragmentary elevational view of the apparatus shown in Fig. 13, as viewed from the right end of Fig. 13.

Referring in detail to the drawings, my improved oil reclaiming apparatus comprises a metallic casing 10, which may be closed by means of any suitable closure means, such as a door 11. Removably mounted within the casing 10 is an oil reservoir 12, which is made in the form of a rectangular open topped pan-like member in the form of the invention shown, the same being mounted on a pair of angles 13 fixedly mounted on angular brackets 14, the pan-like member being slidable into and out of position on the angles 13. The bottom 15 of said oil supply reservoir 12 is provided with an opening 16, which has a pipe connection 17 extending therefrom that is provided with a valve 18. The valve 18, as will be obvious from Fig. 2, is provided with an operating rod or shaft 19, which is connected with an operating finger or handle 20 in non-rotatable relation. Thus the handle 20 can be used as an indicator on a dial 21, to indicate the amount that the valve 18 has been opened. Any suitable graduations can be provided on the dial 21.

Mounted over the outlet opening 16 is a conical strainer 22, which is of such mesh as to prevent any large particles of foreign matter in the oil from passing through the same and out through the outlet tube 17. In order to prevent grease or similar heavy lubricants that may be in the crank case drainings, or similar oil, to be reclaimed, from entering the outlet 16, a dam 23 is provided, which is made in the form of a circular or annular member surrounding the outlet 16 and fixed in liquid-tight relation to the bottom 15 of the oil supply reservoir 12. The oil supply receptacle 12 is adapted to be filled with oil by being either removed entirely from the casing and filled exteriorly thereof and then placed in the receptacle by sliding along the angles 13, or else the same can be partly slid out of the casing and the contents of some other container poured into the same. This oil reservoir or supply receptacle 12 is located adjacent the top of the casing 10.

Immediately below the receptacle or reservoir 12, and substantially coaxial with the outlet pipe 17, is a vaporizer 24, said vaporizer 24 comprising a conical body portion having a pan-like member 25 formed at the top thereof in which the oil escaping from the valve 18 is received. Thus the upper portion of the evaporator comprises an oil heating pan that has a bottom 26, below which is located a heating device 27, which is preferably an electrical heating element, and which is held in place by any suitable clamping means, such as the clamping member 28 secured to the boss 29 by means of a headed, screw threaded fastening element 30.

A drain cock 31 is provided on the pan 25 for a purpose to be described below. The body portion 24 increases gradually in diameter from the pan 25 in a downward direction, and is provided with a spiral flange 32, defining a spiral groove 33, running around the member 24 from immediately below the bottom of the pan-like member 25 to the bottom end of the conical body portion 24. The body portion 24 is hollow and the bottom thereof is closed by means of a closure plate 34, which, preferably, has a heat insulating lining 35, the plate 34 being detachably held in position by means of the headed, screw threaded elements 36. The electrical heating element is supplied with electrical energy through the conductors provided in the cord 37, which extends through a metal conduit 38, which is threaded in an opening in the body portion 24, and which leads from a junction box 39. A switch 40 is provided that controls the supply of the current from an exterior source, that is connected with the electrical cord 41, and connected in series with the switch 40, and automatically controlling the operation of the heating element 27, is an automatic switching device, which will be described more in detail below.

The automatic controlling device has a conductor 42 leading to the same from the switch 40, and has a pair of conductors in the cable 43 leading from the same, one of said conductors 44 in the cable 43 and a conductor 45, leading from the switch 40, comprising the conductors in the cord 37 that leads to the electrical heating device 27 through the conduit 38. Said controlling device comprises a switching element that will have alternative open and closed circuit positions, and which is preferably of an enclosed type so as to prevent any possibility of sparks causing explosions in the apparatus. A signal light 91 indicating the condition of the circuit is interposed in the conductor 42, being in series with the switching element 46. In the form of the invention shown, this switching element is a mercury switching element 46 of a well known type, which comprises a glass tube having a pair of contacts therein, mounted in insulated relation to each other, to which the conductors 42 and 43 are connected, which are bridged by the mercury within the insulating housing of said switching element when the switching element is in the position shown in Fig. 1, or in the full line position shown in Fig. 7. The mercury switching element 46 is mounted on a bracket 47 provided on a lever 48, which is pivotally mounted on a downwardly obliquely inclined portion 49 of a bracket 50, the bracket 50 being mounted on the casing 10 in any desired manner. Said bracket 47 and lever 48 are made up of paired members rigidly secured together, as will be evident from

Fig. 3. The bracket 47 is so related to the lever 48 that it will be extending at the proper oblique angle to close the circuit between the contacts at the end 51 of the member 46, by means of the mercury contained in said switching element 46, when the parts are in the position shown in Fig. 7.

The lever 48 is provided with a bifurcated end portion providing a yoke-like member having the arms 52 thereon, between which is pivotally mounted a cup-like member 53, said cup-like member being so located that the same will be in the path of the stream of oil discharged from the valve 18 in any of the positions that said member 53 can assume. A small bleeding opening 54 is provided in the bottom of the cup-like member 53, said bleeding opening 54 being of such size that oil will be discharged therefrom at a slower rate than it would be discharged by the valve 18 in any open position of said valve 18 provided by means of the indicator handle member 20. Thus when the valve 18 is open the cup-like member 53 will be filled more rapidly than the oil will be discharged through the opening 54 and will overflow. The cup-like member 53 will thus be completely filled with oil after the valve 18 has been in an open position for a short period of time and will remain substantially so, as long as there is oil in the reservoir 12 sufficient to be discharged through the valve 18. When this is the case the weight of the oil in the cup-like member 53 will overbalance the weight of the switching means and bracket 47 provided on the lever 48 on the opposite side of the pivot 55 from the cup-like member 53, and said cup-like member 53 will travel to the limit of its downward movement, which is the position shown in Fig. 7, whereupon the switching means 46 will be in such position that the contacts within the same will be bridged by the liquid conducting means, such as the mercury usually provided in such a switching element. Said member 48 is limited in its movement in this direction by engagement of the fastening element 92 with the portion 49 of the bracket 50.

When the reservoir 12 becomes empty so that the oil therein will reach a level that it will not flow over the dam 23, there will be no oil supplied through the valve 18 to the cup 53, and the oil will gradually be discharged through the opening 54 in the bottom of the cup 53, whereupon the switching means 46 and the bracket 47, acting as a counter-weight on the lever 48, will eventually overbalance the empty cup 53 as it is emptying, causing the same to move to the position shown in Fig. 6, the lever 48 and the switching element 46 thereupon assuming the position shown in full lines in Fig. 6, and in dotted lines in Fig. 7. When the parts are in this position the mercury, or other liquid of a conducting character, provided in the switching element 46 will travel to the end of the same opposite that at which the contacts are located, thus breaking the circuit between the contacts in the switching element 46 and the circuit to the heating element 27 provided for the vaporizing device. It will be seen that by the use of this controlling device, the reservoir 12 can be filled and the valve 18 opened to the desired position thereof, and the switch 40 closed, the door 11 to the casing being closed upon setting the apparatus in operation, and the apparatus can then be left without attention and will automatically shut itself off when all of the oil has been discharged from the reservoir or supply receptacle 12, all of the oil that has overflowed the cup in the meantime having been vaporized by the vaporizing device and the last small quantity that is running over the vaporizer after the cup has been emptied is being vaporized by the heat remaining in the same after the heating element has been de-energized by breaking the circuit.

The vaporizing element is mounted on a pair of obliquely extending supporting members 56, which cross at the center of the device and are secured together at said point in any desired manner, as by welding. The members 56 are welded, in the form of the invention shown in Fig. 1, on angle members 57 that are secured to the casing 10 on opposite sides thereof.

Mounted below the vaporizer 24 is a receiving pan or receptacle 58, which is open at the top thereof, and which is adapted to receive the heated oil that has been acted on by the vaporizer 24, and from which the more volatile constituents have been removed by vaporization. Said pan 58 has a relatively large opening 59 in the center thereof, and an annular or ring-like dam member 60 is provided around the opening 59 in liquid tight relation to the bottom 61 of the pan member 58 in order to trap any grease that might have been contained in the crank case drainings or similar oil that has been reclaimed, to prevent the passage of the same into the filtering apparatus forming a part of my invention. The filtering means is suspended from the pan 58 and comprises a conical casing or housing 62, which may be secured in any desired manner, as by welding, to the bottom 61 at the upper, smaller end thereof, and by means of bracing elements 63, which are secured to said bottom 61, by welding or in a similar manner, and to the conical housing 62 near the lower, wider end thereof.

The housing 62 of the filter is preferably filled with a filtering material 64, which is preferably, fuller's earth. At the upper, smaller end of the filter within the housing 62, a screen 65 is provided, and if desired, cotton, mineral wool, or similar porous material 66 may be provided below the screen 65, and a similar screen 65' and similar porous material 66' are provided at the bottom end of the filter housing 62. A clamping ring 67 provided with a plurality of cross rods or wires 68 is provided for holding the screen 65' in position, said clamping ring 67 being held in place by means of pivoted bolts 69 having wing nuts 70, which engage with ears 71 provided on the outside of the housing 62, said bolts 69 passing through said ears 71 and companion ears 72.

Provided within the conical housing 62 are the baffle members 73, said baffle members having substantially vertically extending walls so that the same form substantially open ended cylinders, which are secured at their upper ends to the conical housing 62 and are free of and spaced from the same at their lower ends. The baffle members are provided to prevent the oil, flowing downwardly through the filter, from forming channels in the filtering material adjacent the walls of the housing. The oil that will tend to follow the wall 62 will be diverted by the baffle members 73. Furthermore, due to the conical character of the housing or wall portion 62 of the filter, there will be a tendency for any oil that flows along said wall, to leave the same and travel straight downward. Thus the wall acts as a distributor member, due to its inclined character.

It will be noted that the oil will collect in the pan 58 after leaving the vaporizer 24, and will gradually pass through the filtering material 64 in the filter, depending from said pan 58, and

will be evenly distributed through said material due to the provision of the distributing means provided by the cotton, mineral wool, or other porous material 66 at the top of the filter, and due to the shape of the filter itself; passing through said filtering material, it will be discharged into an oil collecting receptacle 74, located adjacent the bottom 75 of the casing 10. During its passage through the filtering material 64, any solid particles, such as dirt, or grit, or carbon, or metallic particles, will be removed from the oil and the oil received in the pan 74 will be clean, and free of all diluting volatile constituents that may have been present in the crank case drainings that were originally placed in the supply receptacle.

The filter and the pan 58, to which the filter is attached, are preferably removable as a unit from the apparatus for cleaning purposes, and in order to removably mount the same in the casing 10, angular brackets 76 are provided on the casing upon which the angular guide rails 77 are mounted, said angular guide rails 77 having openings 78 therein, through which extend the rollers 79 mounted for rotation in any suitable manner upon brackets 80 secured to the under side of said guide rails 77. Said rollers 79 engage the bottom 61 of the pan 58, and it will be obvious that the pan and the attached filter can be readily slid into position in the casing, due to the provision of said rollers 79, and also readily withdrawn therefrom.

Preferably, heating means is provided for the lower portion of the filter. Said heating means is further particularly desirable in cold weather when the heat contained in the oil, due to having passed over the vaporizer, is insufficient to keep the same in a sufficiently mobile condition to readily pass through the filter at the lower portion thereof, due to its being cooled in its passage through the filter. Said heating means, preferably, comprises a pair of heating elements 81, which are mounted in suitable vapor proof housings 82, attached in any suitable manner, as by means of screw threaded, headed fastening elements 83, to the conical housing 62. Metallic conduits 84 lead to these heating elements 81, a conductor 85 extending from the switching element 46, and a conductor 86 extending from the switch 40, to a separable plug 109 which has the socket part thereof carried by said conductors and the prong part by a conduit 112 from which the conduits 84 branch. The conductors in the conduits 84 are connected in parallel so that while said switch 40 and the switching element 46 are connected in series, said conductors 85 and 86 lead to the heating elements 81, and the heating elements are connected in parallel with each other. Thus the mercury switching element 46 also controls the operation of the heating elements 81, and these are de-energized upon emptying of the cup-like member 53, which, as previously explained, is dependent upon the emptying or substantial emptying of the supply receptacle 12.

The oil receiving receptacle 74 is provided with depending ribs 87 thereon that slidably engage with the bottom 75 of the housing 10, and a pair of angle members 88 is provided on said bottom 75 to guide the oil receiving receptacle 74 into and out of position within the casing in proper position below the filter to receive the filtered oil therefrom. Suitable handles 89 and a suitable pouring spout 90 may be provided on said receptacle if desired.

A vent 93 is provided for the casing, and the vapors created by means of the vaporizer unit 24 pass out through this vent. Thus the vaporizer is, in effect, an open pan with a large area over which the oil to be reclaimed flows continuously in a thin layer over an extended period, and this pan is open to the vent 93 for the escape of the volatile constituents that it is desired to eliminate from the oil. While the device is in operation the door 11, or other suitable closure means, is closed, latching means being provided for the door, which are indicated in a general way at 94, and are operated by means of a knob 95. After each operation of the device, the pan 25 is drained by opening the drain cock 31, and when the apparatus is ready to be set in operation, the pan 25 is empty, as is also the pan 58 and the oil receiving receptacle 74, the filter being also substantially free of oil. The oil supply receptacle or reservoir 12, is first filled in any desired manner, and put in position in the apparatus and with all the parts in proper position and the apparatus ready to begin its operation, the opening of the valve 18, which is preferably, a stop cock, or pet cock, that has an effective opening, dependent upon the amount it is turned by means of the rod-like member 19, is opened to the desired position by setting the handle-like pointer 20 at the point at which it is desired to open the valve. Thereupon the closure means 11 is closed and the switch 40 is actuated to close the circuit through the same. During this time oil has been flowing from the valve 18 into the cup 53, and as soon as the cup 53 is filled the circuits to the heating element 27 and to the heating elements 81 are closed. After the cup 53 overflows, the pan-like member 25 at the top of the vaporizer 24 fills with oil before any of it runs down the circuitous passage provided by the groove 33 back of the flange 32, the pet cock 31, of course, being closed. The oil from a previous operation of the device is removed from the pan 25 so that there will be no cold oil in the pan at the time the operation of the device commences. The entire device 24 being heated up thoroughly by the heating element contained within the same, the oil in the pan will be heated to a relatively high temperature and the oil overflowing the pan, and along the inclined spiral path 33, will be increasingly heated as it passes along the same so as to vaporize the volatile constituents, of the oil to be reclaimed, to the desired extent.

It will be obvious that the wider the valve 18 is opened, the more oil will overflow the pan 25, and the deeper a stream of oil will flow along the spiral runway 33. It will also be obvious that thus the viscosity of the oil can be regulated by the amount that the valve 18 is opened. The wider the valve is opened the less viscous the oil will be, as the oil will flow at a more rapid rate over the vaporizer 24 and will not be as highly heated as when a smaller quantity flows over the vaporizer 24. After the hot oil leaves the vaporizer it accumulates in the pan 58 and passes into the filter 62, the hot oil gradually percolating through the filtering material and discharging through the bottom screen 65' into the oil collecting or receiving receptacle 74. During this operation the fumes and vapors will be carried off through the vent 93, and the device will continue to operate as long as there is oil in the supply reservoir 12, without any attention whatsoever by the person who has set the device in operation. It will thus shut itself off

by opening the switch at 46 when the supply reservoir 12 has been substantially completely emptied, so that no more oil will be flowing into the cup 53, the signal light 91 indicating to the observer whether the process is proceeding or has been completed. Instead of filling the pan 12 after removal from the casing, said pan can be filled by inserting a funnel through the opening 151 in the top of the casing, which opening is provided with a closure 152.

In Figs. 8 to 12, inclusive, a slightly modified form of the invention is shown, which more readily facilitates the removal of certain parts of the apparatus from the casing, and which is so constructed and arranged that all electrical apparatus is in vapor tight housings or conduits. The construction of the casing 10 is substantially the same as previously described, and is provided with a stack 93 for the purpose previously mentioned. The oil supply receptacle 12 is made in the same manner as has been previously described, and is provided with the same appurtenances, which bear the same reference numerals as in the form of the invention shown in Figs. 1 to 7, inclusive. However, instead of merely mounting the oil supply pan 12 on the angle members 13, rollers 96 are provided, which are pivotally mounted in brackets 97 provided on the angle members 13, and which extend through openings in said angle members so as to project above the top faces thereof with the bottom 15 of the pan contacting therewith, these being provided to facilitate sliding of the oil supply pan or receptacle 12 into position in the housing or casing 10.

The valve 18 is mounted in substantially the same manner as previously described, and is controlled in substantially the same manner, as will be obvious from Fig. 10. The vaporizer 24' is very similar to the vaporizer 24, the only difference between the vaporizer 24' and the vaporizer 24 being that the vaporizer 24' has no bottom, but is a separate unit that is set upon a conical housing 98, which is provided with a boss 99 for receiving the securing member 100 for the clamp 101 that secures a heating element 27 in position in said housing 98. The conduit 38 enters a threaded opening in the conical member 98 in vapor-tight relation, and a bottom 102 is welded, or otherwise secured, in vapor-tight relation to the bottom peripheral edge of the member 98, a heat insulation lining 103 being provided therefor.

The vaporizer unit 24' is provided with a slotted opening 104 at the bottom edge thereof for accommodating the conduit 38. The conduit 38 is directly connected in vapor-tight relation with a switch box 39', which is provided with the signal light 91 and with wiring corresponding substantially to that previously described in connection with Figs. 1 to 7 inclusive, the conductors leading to the conduits 38 and 84 in the same manner as described in connection with that form of the invention shown in Figs. 1 to 7. The switch box 39', however, is somewhat larger than the junction box 39, so as to accommodate the switching element constituting part of the automatic controlling means. The member 24' is otherwise made the same as the member 24, and as far as the external configuration thereof is concerned, is substantially the same and operates in substantially the same maner. The inner housing 98 for the heating element is mounted in fixed relation on an arm 105 of a bracket 106 secured to the rear wall of the casing 10.

While the vaporizer 24' is removable readily from the member 98 and from the casing 10 by merely lifting the same off the member 98, the same merely setting thereon, the interior conical wall of the vaporizer 24' fits the outer conical wall of the member 98 snugly, and the bottom of the pan 25 fits the flat top wall of the conical member 98 snugly. Thus heat is transferred through the metal 98 to the member 24' and substantially the same result is obtained, as far as the vaporizing action is concerned, as would be the case if the parts were made integral with each other, and the operation of the device is the same as previously described.

The switch 40 is provided for the same purpose as previously described and is in series with a switching element 46' of a controlling means, dependent in its operation upon the discharge of oil from the valve 18, said controlling means comprising a cup-like member 107, which is mounted on one end of a lever 108 mounted on a shaft 110, said lever 108 being provided with a counter-weight 111, that overbalances the cup 107 when it is empty, and which is overbalanced by the cup 107 when said cup is full of oil. The pivot 110 is a shaft that is fixed, by means of the nuts 113 and 114 engaging a threaded end of said shaft, to the ear 115 provided on the lever 108, said shaft being pivotally mounted in a bearing 116 provided in the wall of the switch box 39', said bearing comprising a bushing for providing a vapor-tight connection between the shaft and the switch box 39.

A mounting for the switch element 46' is provided, which constitutes a sleeve-like portion 117, which is fixed on the shaft 110 in any suitable manner, as by means of a nut 118, and which has a clip portion 119 thereon for holding the glass housing of the switching element 46'. The cup-like member 107 is provided with a small passage 120 therein, which constitutes a bleeding opening similar to that provided in the cup-like member 53. The stop 150 limits movement of the lever 108 in one direction and the vaporizer 24' limits said movement in the opposite direction.

The operation of the controlling means described above is substantially the same as has been previously described in conjunction with the controlling means shown in Figs. 1 to 7 inclusive, the cup-like member 107 filling with oil to cause the parts to move to the dotted line position shown in Fig. 12 whenever oil is discharged from the valve 18, and moving to the full line position shown in Fig. 12, and which is also the position shown in Figs. 8 to 10, when oil has ceased to flow from the valve 18 and the cup 107 is bled through the opening 120. It will be obvious that when the cup is empty or substantially empty, the end of the switching element 46' containing the contacts that are bridged by the mercury or other liquid means contained therein, is uppermost, and the circuit will be open, whereas, when the parts are in the dotted line position shown in Fig. 12, which is that position assumed when the cup 107 is full, the contacts in the member 46' will be bridged by the mercury or other liquid conducting means, and the circuit will be closed.

The switching means and the controlling means therefor shown in Figs. 8 to 12 inclusive, has the advantage that it is simple and very rapid in operation, making a quick make and break, due to the large amount of angular movement through which the member 46' moves during its movement from one alternative position to the other alternative position thereof. The controlling means will operate to open and close the circuit under

the same condition as previously described, and the evaporating means operates in the same manner as has been previously described. The oil receiving pan 58 is made in the same manner as shown in the form of the invention described in Figs. 1 to 7 inclusive, and the filter member 62 has the same relationship thereto and operates in the same manner, the mounting of this filter member being the same as in Figs. 1 to 7 inclusive, except that the bracing elements 63 have been omitted, the entire filter being supported directly from the bottom 61 by welding the conical housing 62 thereto. The same reference numerals are accordingly applied to all the parts of the filter and pan 58 and the parts associated therewith for mounting the same in the casing 10, as were applied thereto in Figs. 1 to 7 inclusive. The heating elements for the filter are mounted in a different manner, however, in order to facilitate removal of the pan 58 and the depending filter 62 from the casing 10.

The heating elements 81 are mounted in vapor proof housings 121, the conduits 84 being connected therewith in vapor tight relation, said housings 121 being secured in fixed relation on the ends of a resilient yieldable member 122, which forms a yoke-like extension on the bracket 123, to which is fixedly secured the bracket 123 having a base 124 that is fixed to the rear wall of the housing or casing 10. The vapor proof housings 121 are preferably curved at 125 to conform substantially to the curvature of the outer conical wall of the filter, and when the filter is moved into position in the casing 10 along with the pan 58, the spring arms formed by the yoke-like member 122 will flex outwardly, permitting the housing 62 of the filter to move between the members 121, and after the parts are in their final position in the casing 10 the members 121 will assume the position shown in Fig. 11, springing back against the outer face of the conical body portion 62 of said filter. Other than noted above the form of the invention shown in Figs. 8 to 12 inclusive, is substantially the same as that shown in Figs. 1 to 7 inclusive, and the apparatus operates in substantially the same manner.

A further modification of the invention is shown in Figs. 13 and 14. The casing 10 is substantially the same as has been previously described, as is the filtering means and the vaporizer 24. The oil supply receptacle 12' is made in substantially the same manner as the receptacle 12, and is mounted in the same manner in the casing 10. A bracket 127 is provided on the bottom 15 of the supply receptacle 12', and electrical heating means 128 surrounding the valve 18' is secured to the bottom 15 by means of the bracket 127. Conductors in the cable 129 lead to this heating element from suitable switching means, and conductors in the cable 130 are connected in parallel with the conductors 129 and lead from the switching means to the heating element 27 through a suitable metal conduit 131. A shaft or rod 19 extends from the valve 18' and has a control knob 132 thereon at the exterior of the cabinet or casing 10, which may be provided with a dial 133 for indicating light, medium or heavy oils. For instance, if the knob is turned to the "light" indication, the oil will flow comparatively rapidly over the vaporizer 24 so that it will not have sufficient time to evaporate all of the volatile constituents, and as a result, will produce a light or less viscous oil than when turned to the medium or heavy indication, the heavy indication allowing but a small flow, and thus causing the oil to be heated to a higher temperature, which would result in vaporizing practically all of the lighter constituents from the oil so as to produce a heavy oil.

This same selective result may be accomplished by connecting the heating element 27 with a three-way switch 134 provided with a suitable control knob 135, which cooperates with a suitable dial 142 to indicate the different positions of the switch, the positions of the switch providing different degrees of heat in the heating element 27. By turning the switch to the proper indication, the temperature of the vaporizer may be controlled to produce the desired amount of vaporization of the oil. The heating elements 128 and 27 are both connected through a main switch 136 with a source of current, the connections not being shown in the drawings, but the switch 136 being connected in series with the switch 134 in a well known manner. The movable element 143 of the switch 136 is connected with an arm 137 pivoted at 138 on a bracket provided in the receptacle 12' and carrying a float 139 at the opposite end thereof, through a flexible connection 140, an adjusting means 141 being provided for adjusting the length of the flexible connection 140 so that the switch element 143 will be moved to open circuit position when the float 139 and the arm 137 reach the dotted line position shown in Fig. 13, which is the position the parts will assume when the receptacle 12' is empty. Thus the switch 136 will be opened when the receptacle 12' is emptied, de-energizing the heating elements 27 and 128, thus throwing the apparatus out of operation automatically, when the supply of oil has been exhausted. Except for the features described above, the apparatus utilized in this form of the invention is the same as has been previously described, and operates in the same manner as previously described

What I claim is:

1. Oil reclaiming apparatus of the character described comprising an oil reservoir having an outlet in the bottom thereof, means for regulating the flow of oil from said outlet, evaporating means disposed below said outlet to receive oil discharged from said reservoir by gravity, filtering means disposed below said evaporating means to receive oil discharged from said evaporating means by gravity, heating means and means for discontinuing the operation of said heating means upon emptying of said oil reservoir, comprising switching means and liquid actuated operating means for said switching means mounted between said reservoir and said evaporating means in the path of oil discharged from said outlet.

2. Oil reclaiming apparatus of the character described comprising an oil reservoir having a discharge outlet, evaporating means disposed to receive oil discharged from said reservoir by gravity, filtering means disposed to receive oil discharged from said evaporating means by gravity, electric heating means for said evaporating means and said filtering means, and means for automatically discontinuing the operation of said heating means upon emptying of said oil reservoir, comprising electrical switching means and liquid actuated operating means for said switching means mounted between said reservoir and evaporating means in the path of the oil discharged from said outlet.

3. Oil reclaiming apparatus of the character described comprising an oil reservoir, evaporating means disposed to receive oil discharged from said reservoir by gravity, heating means for

said evaporating means, controlling means for said heating means interposed between said reservoir and said evaporating means and filtering means disposed to receive oil discharged from said evaporating means by gravity, said controlling means comprising a liquid receiving member receiving oil from said reservoir and discharging oil onto said evaporator.

4. Oil reclaiming apparatus of the character described comprising an oil reservoir having a discharge outlet in the bottom thereof, evaporating means disposed to receive oil discharged from said reservoir by gravity, electrical heating means for said evaporating means, and circuit controlling means for said heating means interposed between said reservoir and said evaporating means, and having an actuating member mounted to receive liquid discharged from said outlet.

5. Apparatus of the character described, comprising an oil reservoir, a vaporizer receiving oil from said reservoir, means for feeding said oil gradually from said reservoir onto said vaporizer, means for controlling the rate of flow of said oil from said reservoir, heating means for said vaporizer and means controlling said heating means to discontinue operation thereof when said reservoir is empty, comprising electrical switching means and actuating means for said switching means comprising an oil receptacle mounted between said reservoir and said vaporizer.

6. Apparatus of the character described, comprising an oil reservoir having a bottom outlet, a vaporizer receiving oil from said reservoir, means on said outlet for feeding said oil gradually from said reservoir onto said vaporizer, electrical heating means for said vaporizer and means between said reservoir and vaporizer controlling the operation of said heating means actuated by the oil discharged from said reservoir through said feeding means.

7. Apparatus of the character described, comprising an oil reservoir having a bottom outlet, a vaporizer receiving oil from said reservoir, means for feeding said oil gradually from said reservoir onto said vaporizer by gravity, electrical heating means for said vaporizer and controlling means for said heating means comprising a receptacle receiving oil from the bottom outlet of said reservoir and having a discharge orifice of such size that said receptacle is normally full during discharge of oil from said reservoir but will be emptied whenever discharge of oil from said reservoir ceases, and means for mounting said receptacle so that the same will assume alternative positions when full and when empty.

8. Apparatus of the character described, comprising an oil reservoir, a vaporizer receiving oil from said reservoir, means for feeding said oil gradually from said reservoir onto said vaporizer, electrical heating means for said vaporizer and controlling means for said heating means comprising switching means and means determining the position of said switching means, comprising a receptacle receiving oil from said reservoir and having a discharge orifice of such size that said receptacle is normally full during discharge of oil from said reservoir but will be emptied whenever discharge of oil from said reservoir ceases, and means for mounting said receptacle so that the same will assume alternative positions when full and when empty.

ELMER D. BRADFORD.