March 20, 1934. J. K. DELANO 1,951,649

CRANK CASE FLUSHING APPARATUS

Filed June 29, 1933 2 Sheets-Sheet 1

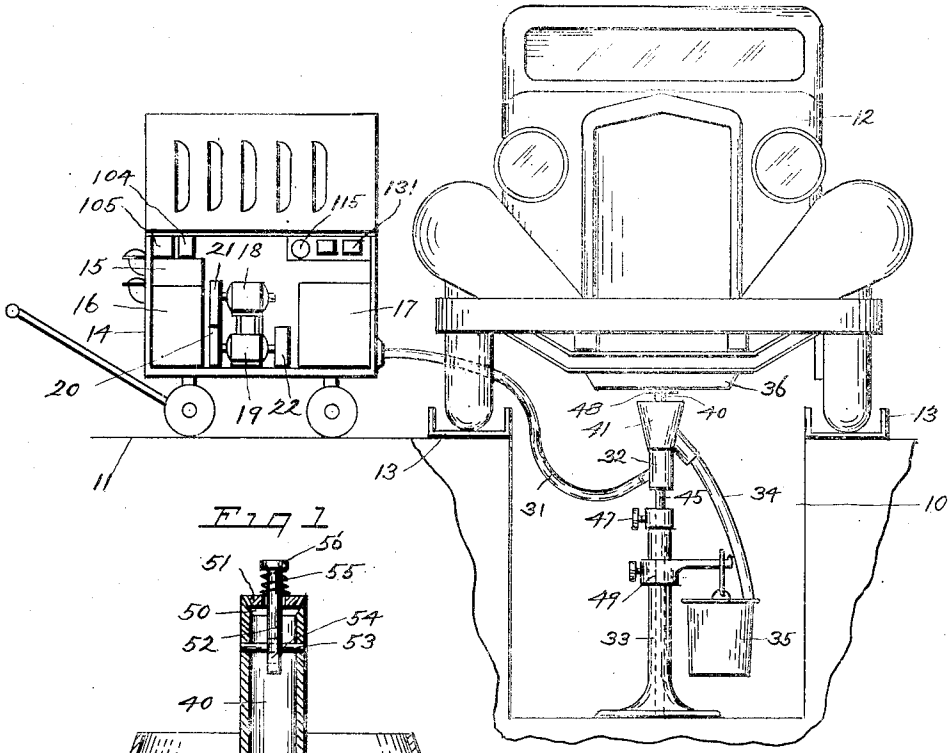


Fig 1

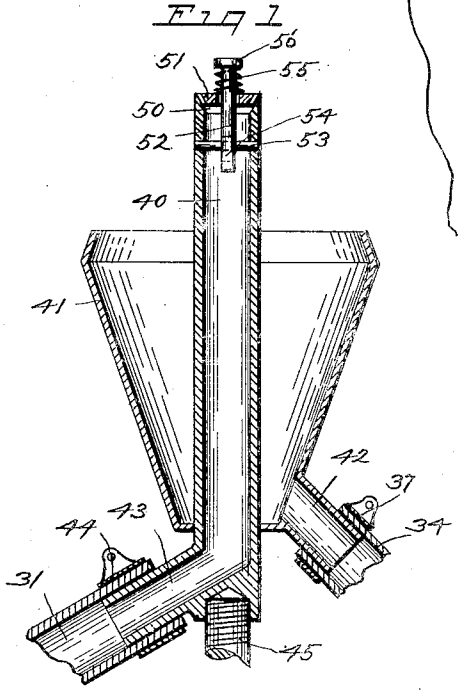


Fig 2

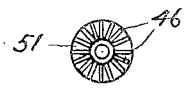


Fig 3

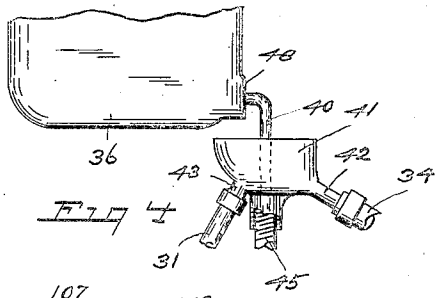


Fig 4

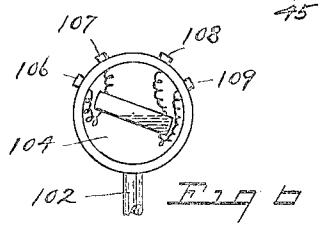


Fig 5

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CRANK CASE FLUSHING APPARATUS

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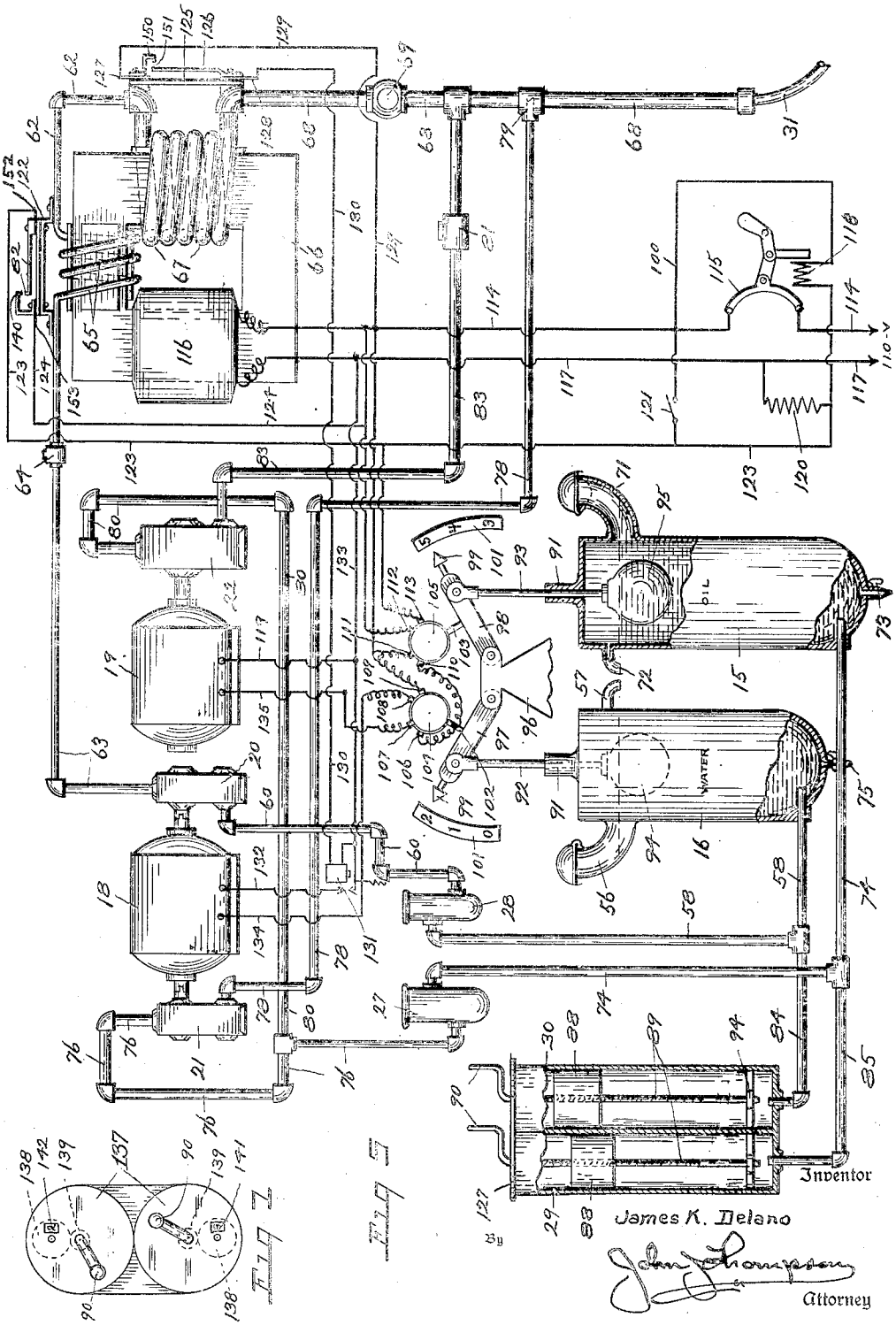


Fig 7

Fig 2

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CRANK CASE FLUSHING APPARATUS

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10 Claims. (Cl. 184—1.5)

This invention relates primarily to the cleaning of the power plants of automotive vehicles, and more particularly to the interior of the engine and its component parts, such as the crank-case, etc.

There are many types of apparatus and methods of cleaning and flushing, as it is called, that have been proposed and tried, but these methods are directed toward the idea of cleaning out the lower crank-case or sump and in most part relate to circulating or forcing a cleansing fluid under pressure through the normal oil path; that is from the filler pipe to the drain plug, which while removing most of the crank-case settlings in the path of such flow, does not however get the accumulated grit and dirt from the upper part of the interior of the engine housing and parts, as the oil level due to the design of the engine, cannot be raised higher than the crank-shaft without causing a waste or leakage of oil through the main bearings of the engine.

Attempts have also been made to fill the lower crank-case with cleansing fluid and to violently agitate it by either compressed air or high pressure applied to the fluid to make it reach the upper parts of the interior of the engine in this manner, but this method results in spraying the interior of the engine with a mixture of accumulated grit and crank-case settlings which are liable to cause the dirt to be taken up by the bearings and other working parts, so that this method is not to be recommended in practice.

In the method that I herewith disclose, I do not endeavor to cause any other than a natural drainage of the crank-case chamber and the sediment therein contained.

The sediment left in a crank-case after the used lubricating oil is drained off, is more or less firmly attached to the sides, top and bottom of the casing or chamber, and is of such viscous consistency that it will not drain off of its own account unless it is heated and diluted so that it becomes flowable. This is the method that I employ to bring the accumulated viscous oil down from the upper engine parts to the drain sump where I can easily wash it out together with the bottom crank-case settlings.

For this purpose I employ heat in the form of steam which is introduced into the crank-case through the lower or side drain hole in said case, and I mix with this steam a quantity of cleansing fluid, of some suitable kind, such as oil, etc.; the volume of steam supplied being sufficient to heat the crank-case. The steam reaching the most inaccessible interior parts of the engine where it gives up its heat and condenses allowing the oil which was carried in the vapor to combine with the thick accumulations of dirt and oil on the parts, causing the dirt etc., to drain down to the sump, the hot condensation assisting very materially.

After the interior of the crank-case has been heated by the steam-oil bath, a sufficient volume of cleansing fluid is then introduced through the sump and washes out the drainage, and any condensation that does not drain out readily will evaporate as soon as the engine is operated, due to interior heat and the breathing action of the engine.

I have shown in the accompanying drawings a complete cleaning unit having its various parts arranged for cyclic operations so that all the attendant is called upon to do, after draining off the used lubricating oil from the crank-case is to insert the nozzle of the service hose of the apparatus into the drain hole in the crank-case, and throw or close the main electrical switch to the "on" position. The various phases are timed and operated in an automatic manner and without any personal attention on the part of the attendant until the cleaning operation is completed.

I have also taken into consideration that the operation must be done in the least possible time so as not to delay the operation of the automobile beyond a reasonable time and I have therefore shown a method employing a steam unit which is practically instantaneous in its operation, and which forms the subject matter of a separate application, this unit being supplied with the necessary electrical controls, etc., which are all set at the most efficient operating speeds.

The boiler makes use of heat that is generated in pipe coils of conductive material which are electrically heated by being in short circuited relation to a primary winding and a magnetic field which heats the pipe coil instantly, and water being pumped through this coil is evaporated into steam.

The water feed pump is arranged to supply a certain predetermined amount of water to the boiler pipe coils and I make use of the water thereby consumed to control the time that the steam cycle shall operate, and when a certain amount of water has been converted into steam, a float switch which is controlled by the water level, sets into operation a second pump unit for washing out the engine crank-case. When the second pump unit has lowered the flushing oil level to a predetermined point, a float switch

actuated by the oil causes the main switch to open and the entire device ceases to operate.

While I have here shown the several units of my apparatus as mounted upon a hand truck, it is understood that they may be mounted in any desired manner or in any convenient place, and be of any desired size and materials.

With these and other objects in view, my invention consists in certain construction and combination of parts, system and method, as will hereinafter be fully described in the specification and illustrated in the drawings which form a part hereof and in which like figures of reference refer to corresponding parts in all of the views, and that slight changes may be made without departing from the spirit of the invention.

In the drawings:

Figure 1 shows a front elevation, partly in section of a greasing pit, with an automobile in position above, and my device in position for cleaning the crank-case.

Figure 2 is an enlarged detail view in section of the nozzle which is attached to the service hose and which is entered into the drain hole in the crank-case.

Figure 3 is a top plan view of the valve for the nozzle.

Figure 4 indicates a side form of nozzle for use where the drain hole is on the side of the crank-case.

Figure 5 is a diagrammatical view, showing the various parts and the electrical circuits for operating the same.

Figure 6 shows a detail view of one of the mercury switches.

Figure 7 is an enlarged detail view of the top of the tanks 29 and 30.

Referring to Figures 1 and 2, of the drawings, a greasing pit is indicated by the numeral 10, and the ground line by 11, the runways 13 for the automobile 12; while my portable apparatus is mounted upon the hand truck 14, of which one side is shown in a raised position to display the units mounted therein, and which comprise the oil tank 15, the water tank 16, the boiler 17, the motors 18 and 19, the pumps 20, 21 and 22, together with the main electrical switch 115 and the float operated switches 104 and 105, and the relay 131. The filters 27 and 28 and the extra water and oil tanks 29 and 30, are mounted on the opposite side of the truck 14, and therefore can not be seen in Figure 1.

The flexible service hose 31 shown is connected at one end to the boiler 17 in the truck 14 and has mounted on the other end the nozzle 32; said nozzle 32 being mounted on an adjustable standard 33 in the pit 10, and supplied with a drain pipe 34 and a waste pail 35 to receive the oil drained from the crank-case 36 of the engine.

The nozzle 32 as here shown in Figure 2, comprises a tubular member 40, having an outer funnel shaped drain shield 41, which is formed with an outlet 42 to which is attached the drain hose 34 by the clamp 37; the lower parts of said tubular member 40 having an inlet pipe 43 to which is attached the end of the flexible hose 31 by the clamp 44; while to the lower end of said tubular member 40 is attached the upper end of an adjustable rod 45 mounted in the standard 33 and held therein by a set screw 47 in adjustable relation with the crank-case 36, so that the upper end of said nozzle is entered into the drain hole 48 of the crank-case 36, and a bracket 49 is also provided to hold the waste pail 35.

The upper end of the nozzle member 40 is formed with a valve seat 50, within which is mounted a valve 51, formed as shown in Figure 3, with a series of grooves 46 in its face to prevent it from closing tightly, and this valve 51 is secured on the upper end of a rod 52 which is provided with an elongated hole 54 near its lower end and is slidably mounted on a cross rod 53 secured in the sides of the member 40; while a spiral spring 55 is placed upon said rod 52 above the valve 51, and a nut 56 is secured on the rod 52 so that said valve is normally held against the seat 50, being raised or opened by the pressure of the steam and cleaning fluid passing therethrough.

Referring to Figure 5, of the drawings, the apparatus comprises a water tank 16 which is formed with a filler spout 56, an overflow 57, and a drain 75; and which is connected by a pipe 58 to a filter 28, and from said filter 28 by a pipe 60 to a pump 20 which is driven by a motor 18; the water being carried from said pump 20 by a pipe 63 through a check valve 64 to a small feed water heater pipe coil 65 which is shown as wound upon the upper part of the transformer 66, but which could be placed at the bottom if desired. The preheated water is carried from said preheater coil 65 to one end of a larger heater pipe coil 67 which is wound upon one leg of the transformer 66; the other end being connected by a pipe 68 to the flexible service hose 31, which is also supplied with a check valve 69 to prevent any back flow of either steam or oil.

The oil tank 15 is of similar design and is also formed with a filler spout 71, an overflow 72, drain 73, and is connected by a pipe 74 to the filter 27, and from said filter 27 the oil is carried by a pipe 76 to an oil pump 21 which is also rotated by the motor 18. From said pump 21 the oil is carried by a small pipe 78 to a T 79 which is placed in the feed pipe 68 adjacent the end where the hose 31 is attached and enters into said pipe 68 and is so arranged mechanically that the passing steam in the pipe 68 atomizes the oil, mixing it with the steam and the mixture thus formed is discharged through the service hose 31 and nozzle into the crank-case. The oil from the filter 27 is also carried by the pipes 76 and 80 from the tank 15 to a larger pump 22 which is driven by the motor 19 and from this oil pump 22 the oil is carried through a pipe 83 and check valve 81 to the feed pipe 68 and enters the same at a point between the valve 69 and the small oil pipe 79, the purpose of which will be explained later.

Both the water tank 16 and the oil tank 15 are attached by the pipes 84 and 85 to the supply water and oil tanks 29 and 30 which are used to supply additional water and oil to the regular tanks should a very large engine crank-case be cleaned; the amount being fed from said tanks 29 and 30 being regulated by the displacement members 88 which are mounted in said tanks and which are adjusted by a threaded rod 89 which is threaded in the member 88 and is rotated in the top 137 of the tanks and the lower bearing 136 by the handle 90.

The tops 137 shown in Figure 7, are formed with a casing having therein a geared plate 138 in mesh with and rotated by a pinion 139 on the rod 89, and said plate 138 has thereon figures 142 which show through a window 141 in said casing to indicate the amount of liquid that is in the tanks 29 and 30.

Each of the oil and water tanks 15 and 16 have their tops formed with the bearings 91 within which are slidably mounted the rods 92 and 93, and to the lower ends of these rods are secured

the floats 94 and 95, which rest upon and are operated by the liquid in said tanks.

Above these tanks 15 and 16 is mounted a support 96 to which are pivoted the inner ends of the arms 97 and 98 which are also connected to the rods 92 and 93 in such a manner that these arms 97 and 98 will be moved up and down by the floats 94 and 95 as the liquid in the tanks 15 and 16 is raised or lowered; and each of said arms 97 and 98 is supplied with a pointer 99 to indicate on the dials 101 the position of the floats in the tanks and the amount of liquid therein.

On each of the arms 97 and 98 are mounted by the rods 102 and 103 the mercury switches 104 and 105, each of said switches having four terminals 106, 107, 108 and 109 on the switch 104, and the terminals 110, 111, 112 and 113 on the switch 105.

The electrical wiring for the apparatus is as follows:

The main feed wire 114 leads in to one side of a main switch 115 and from said switch to one side of a primary coil 116 which is mounted on the transformer 66. The other side of the primary coil 116 is fed from the main line by the wire 117. A tap 100 is taken from the wire 114 to a push button 121, and from this push button 121 by a wire 123 to a high resistance 120 and to the wire 117.

To supply heating current to the small preheater coil 65, said coil 65 is short circuited by a strip 122 and has mounted thereon and insulated therefrom a thermostat 82, one terminal 152 of which is connected by the wire 123 to the feed wire 117, the other terminal 153 being connected by the wire 124 to the feed wire 114.

Electrical current is supplied to the larger heater pipe coil 67 in a similar manner, the pipe coil 67 being shorted by a strip 125 secured across the same, and upon which is mounted and insulated therefrom a thermostat 126, having the terminals 127 and 128, the terminal 127 being connected by a wire 129 to the feed wire 114 and to the terminals 109 and 111 on the mercury switches 104 and 105; while the terminal 128 is connected by the wire 130 to a relay magnet 131, and from there by a wire 132 to one terminal of the motor 18, and to the main feed line 117. This relay 131 closes a circuit formed by the wire 133 from the main line 117, and a wire 132 from one terminal of the motor 18; the other terminal of the motor 18 being connected by the wire 134 to the terminal 108 of the switch 104. One terminal of the motor 19 is connected by the wire 135 to the terminal 107 of the switch 104; and the other terminal of the motor 19 is connected by the wire 119 to the main line 117.

The operation of the device is as follows:

The tanks 15 and 16 are filled to the amount of oil and water as shown on the indicators 101, which show the amount in each tank and which are adjusted by the displacements 88 in the tanks 29 and 30, for either a larger or smaller crank-case to be flushed or cleaned.

The nozzle 40 is placed in the drain hole 48 of the crank-case 36. The main switch 115 is closed which energizes the transformer primary 116. Heat is then developed in the secondary 67 and preheater pipe coil 65 by reason of the short circuiting strip 122. The thermostat 82 is arranged to act in case anything goes wrong with the water supply. So long as cold water is pumped through the feed water coil the temperature can not go very high. If however the water should fail, the water in the preheater coil will turn into steam and this will raise the temperature and cause the thermostat contacts 82 and 140 to close and short circuit the coil 118 of the main circuit breaker and open the circuit.

The water pump 20 being driven by the motor 18 draws water from the tank 16 through the filter 28 and forces the water through the pipe 63 and check valve 64 through the preheater pipe coil 65 into the large heater pipe coil 67, where it is instantly converted into steam, which passes through the pipe 68 and valve 69 to the service hose 31, and through the nozzle 40 into the crank-case 36.

Pump 21 is also driven by the motor 18, pumping oil from the tank 15 through the filter 28 to the pump 21, and from there through the small pipe 78 and injecting same into the pipe 68 in the form of spray. This operation is continued until the water in the tank 16 reaches a low level so that the float 94 falls sufficiently low to cause the mercury switch 104 to tilt over and interrupt the circuit through the two terminals 108 and 109 stopping the motor 18 and pumps 20 and 21, and closing the circuits through the terminals 107 and 106 energizing the motor 19 which drives the large oil pump 22 which draws oil from the tank 15 through the filter 27 and pipes 76 and 80 to the pump 22 and from there forces the oil through the pipe 83 and valve 81 to the feed pipe 68 and there through the service pipe 31 to the nozzle 40 and into the crank-case, the oil being drained therefrom through the drain pipe 34 into the pail 35; the greater flow of oil which enters the crank-case having sufficient pressure to thoroughly wash out the crank-case.

The device could be so arranged that the action of the float 94 and the switches operated thereby would cause the motor 19 and pump 22 to be operated while steam was still being generated in the pipe coil 67 so that the greater volume of oil would be mixed with the steam.

When the float 95 in the oil tank 15 reaches the lower level of its travel due to the oil having been pumped out of the tank 15. Said float operates the mercury switch 105 tilting it and causing the circuit through the contacts 110 and 111 to break, closing the circuit through the terminals 112 and 113 which will short circuit the coil 118 of the circuit breaker, which is energized through the resistance 120 and the demagnetizing of the coil 118 causes the contacts of the switch 115 to open the circuit 114 and 117 to the transformer 66 and thus stops the motor 19.

The thermostat 126 is a regulator for the pipe coil 67 and if cooled by low temperature of the water, this thermostat 126 will stop the action of the pump 20 for a second or two, and it will also allow the pipe coils 67 to be heated before the water is pumped into them.

It is to be noted that both the tanks 15 and 16 must be filled to a sufficient level before the pumps 20 and 21 will operate and the circuit breaker 115 will remain closed.

The check valves 64, 69 and 81 are provided to prevent the steam or oil from backing up into the feed lines.

The transformer circuit could be caused to operate if desired by employing a relay actuated by a push button of the "open and closed" type if desired; and by winding another heating coil around the core of the transformer 66, the oil could be heated independently of the water or steam mixture.

As shown in Figure 4, for use with a crank-case having a side drain 48, the nozzle 40 is pro-

vided with a bent to enter the side, and the member 41 is so shaped as to catch the drain.

In Figure 6, is shown an enlarged detail of one of the mercury switches which are of the usual type.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In an automobile crank-case cleaner, a unit comprising an electrically heated boiler, a water supply system for said boiler, a cleansing fluid supply system, a flexible pipe connection for supplying steam and oil to the interior of the crank-case, automatic controls to regulate the supply of steam from said boiler and the cleansing fluid, to the interior of said crank-case.

2. In an automobile crank-case flushing device arranged for automatic cyclic operation after being manually turned "on" means for supplying a jet of steam and a cleaning fluid to the crank-case for a predetermined time, means for turning off the steam, and for continuing to supply the cleaning fluid, and means to automatically stop said supply after a predetermined amount of cleaning fluid has been admitted to said crank-case.

3. In an automatic automobile crank-case cleaning system, comprising an electrically heated steam unit, a pipe connection introduced into the interior of the crank-case, a water supplying means for the steam unit, a cleaning fluid supplying means, electrically controlled devices arranged for cyclic operation to admit steam to the flexible pipe connection, in an admixture with a limited amount of cleaning fluid with the steam, and to increase the amount of cleaning fluid when a predetermined amount of steam has passed into the crank-case and cause the electrical connections of the various units to be turned "off" when a predetermined amount of cleaning fluid has been admitted to the crank-case.

4. A crank-case cleaner and flusher, comprising a water supply tank and a cleansing liquid supply tank, an electrically operated boiler and means for transferring the water from the supply tank to the boiler, a service connection between the boiler and the crank-case for introducing the steam therein, means for forcing the cleansing liquid from the supply tank into and mixing with the steam, means controlled by the quantity of water in the supply tank for shutting off the steam entering the crank-case and means for increasing the volume of liquid entering the crank-case to flush the same.

5. An automobile crank-case cleaner, comprising an electrically heated boiler and a water supply therefor, a cleaning fluid supply system and means for feeding the same, a flexible pipe connection for introducing both steam and oil into said crank-case, automatic controls for regulating the supply of steam to said crank-case, automatic controls for regulating the supply of oil to said crank-case, and for regulating the supply of a mixture of both steam and oil to the interior of the crank-case.

6. In an automobile lubricant case flushing system having an electrically heated steam generating unit, and a water supply system for the same having electrically controlled means for turning on and off the heating current for the generating unit, a means for supplying a cleaning fluid and electrically operated means for controlling said supply actuated by the consumption of the cleaning fluid.

7. In an automobile crank-case cleaning system comprising means for injecting steam in admixture with a cleaning fluid into said crank-case under pressure for heating the same, means actuated by the amount of admixture of steam and cleaning fluid consumed during a predetermined period of time for interrupting the steam supply, means for increasing the volume of cleaning fluid after the steam has been cut off, and means for regulating the flow of cleaning fluid thus used during a predetermined period of time by the volume of cleaning fluid thus consumed.

8. In a system for cleaning automobile crank-cases, the combination with a flash type steam boiler electrically heated, of means for supplying water to said boiler, means for injecting steam from the boiler to the interior of the crank-case, means for introducing a cleaning liquid into said crank-case in admixture with the steam for heating the same, and means for increasing the volume of cleaning liquid without the steam.

9. In a system for cleaning automobile crank-cases, the combination with an electrically operated flash boiler, and means for injecting the steam therefrom into the crank-case for a predetermined period of time to heat the same, of means for pumping water to said boiler, means controlled by the quantity of water consumed for actuating said pumping means, means for pumping a cleaning liquid to and mixing the same with the steam, and means for increasing the volume of cleaning liquid pumped into the crank-case after the steam has been consumed, and means for discontinuing the pumping of the cleaning liquid controlled by the amount of cleaning fluid consumed.

10. In a system for cleaning automobile crank-cases, the combination with an electrically heated flash water boiler and means for injecting the steam therefrom into the crank-case for a predetermined period of time to heat the same, of automatic pumping means for supplying a predetermined quantity of water to the boiler and adapted to cut out when the predetermined quantity of water has been consumed, an automatic means for pumping a cleaning fluid to and mixing the same with the steam during its injection into the crank-case, an automatic pumping means for forcing under pressure a cleaning liquid into said crank-case and adapted to cut out after a predetermined quantity of the cleaning fluid has been consumed.

JAMES K. DELANO.