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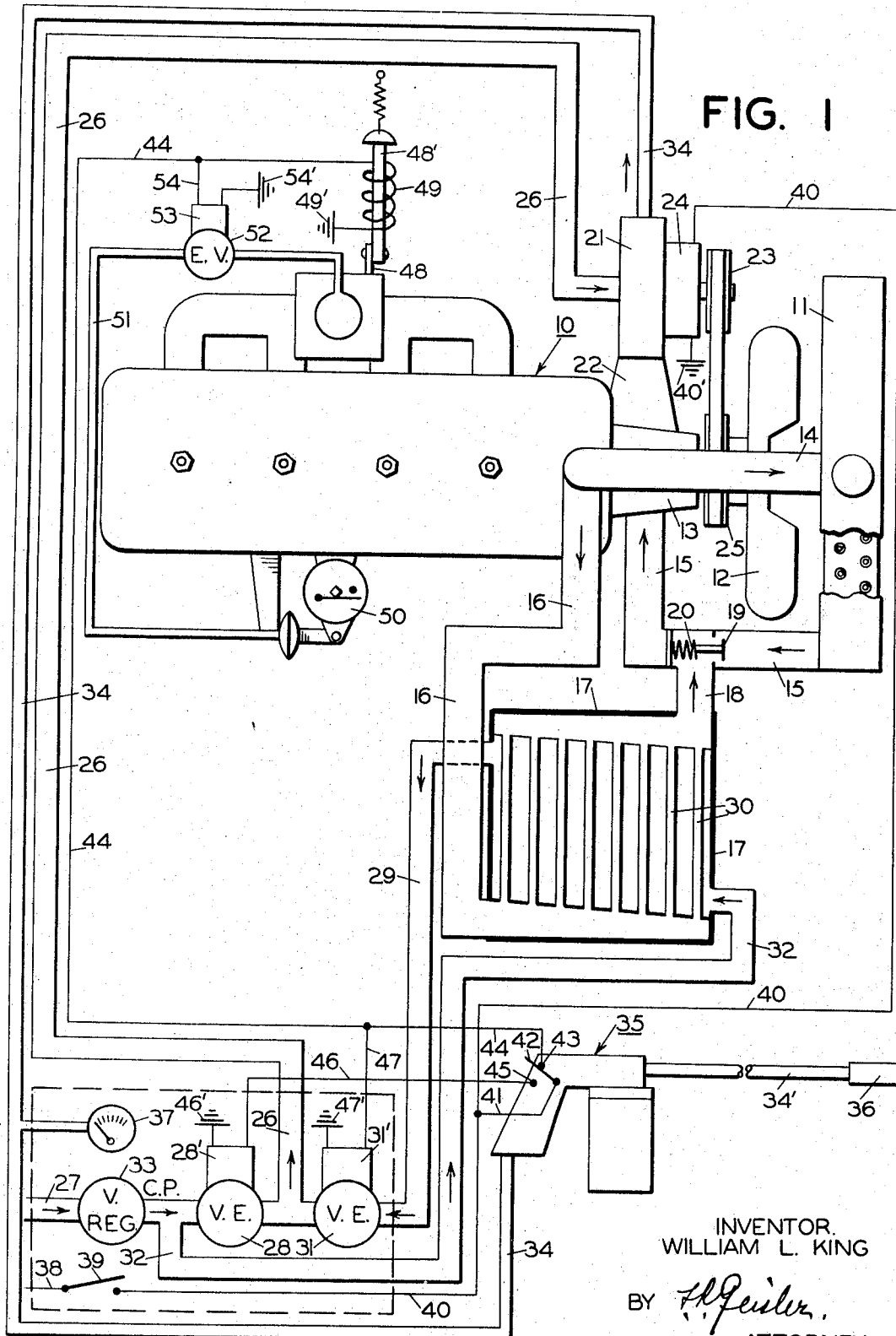
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PORTABLE HOT WATER WASHING APPARATUS

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1

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PORTABLE HOT WATER WASHING APPARATUS

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This invention relates in general to portable means for providing a controlled jet stream of hot water particularly adapted for use in washing vehicles, machinery and other articles in the washing or cleaning of which hot water, with or without a solvent, is required in order to remove dirt or grease.

More specifically, the invention relates to means adapted to be connected up with an internal combustion engine whereby heat obtainable from such engine can be employed effectively for heating cold water from any suitable supply so as to enable a jet of hot washing water to be produced with the running of the engine.

This invention has been developed particularly for use in the washing of vehicles, such as logging trucks and the like, or for the cleaning of machinery, when such vehicles and machinery are located out in the field or in places where the necessary hot water for properly performing such washing or cleaning would otherwise not be available or conveniently obtainable.

An object of the invention is to provide a novel, practical and portable apparatus for delivering hot water for use in the washing of vehicles and machinery.

Another object of the invention is to provide practical means for heating water for such washing purposes merely by making use of the heat which it is possible to cause to be generated in the operation of an internal combustion engine.

An additional object is to provide a portable hot water washing apparatus which will be simple and easy to operate and which can be employed in any location capable of being reached by a motor vehicle and in which location cold water is available.

The manner in which and the means by which these objects and incidental advantages are attained with the present invention will be briefly explained and described with the reference to the accompanying drawings wherein:

FIG. 1 is a diagrammatic plan view illustrating the operation of the entire apparatus; and

FIG. 2 is a sectional elevation, drawn to a much larger scale, showing the nozzle assembly, including the nozzle and associated members of the assembly, through the medium of which the hot water is discharged in the form of a desired jet suitable for the washing operation.

Referring first to FIG. 1, a common internal combustion engine, which may be assumed to be an ordinary automotive engine installed on a service truck or other vehicle and used for driving such vehicle, is indicated in general by the reference character 10. The engine is provided with the usual radiator 11, cooling fan 12, and cooling water pump 13. A hot water conduit 14 leads from the pump 13 to the top of the radiator as usual and the cooled water from the radiator is drawn back into the engine through the conduit 15 as is customary with internal combustion engines of this common type.

2

In carrying out the present invention, however, a branch water conduit 16 is connected with the conduit 14 or hot water outlet from the pump 13 and this branch conduit 16 leads to a heat exchanger 17 in which the water circulating from the engine cooling system is caused to give off its heat to the washing water as presently explained. The heating water delivered to this heat exchanger from the engine cooling system by the engine pump 13 returns through a branch conduit 18 which is connected to the return conduit 15 to the engine pump 13 as indicated in the drawing. Consequently operation of the water pump 13 of the engine causes water from the engine cooling system to pass through the heat exchanger 17 in addition to passing through the radiator 11.

A flow control valve 19 is located in the return conduit 15 between the radiator 11 and the return branch 18 from the heat exchanger 17. The valve 19 is operated by a temperature sensitive bellows 20 which is so arranged that when the water delivered by the water pump 13 of the engine is cold the valve 19 will be closed. This blocks the circulation of water through the radiator 11 and forces all the circulating water from the engine pump through the heat exchanger 17. However when the water returning to the pump 13 from the heat exchanger 17 rises above the predetermined maximum temperature, the valve 19 will automatically open, whereupon circulation of part of the water from the cooling system for the engine will pass through the radiator 11 and be cooled and so cause the temperature of the water in the engine cooling system to drop to prevent over-heating of the engine. The operating bellows 20 for the valve 19 is so sensitive that it will be affected by approximately a 5° change in temperature when the circulating water returning to the water pump 13 approaches the predetermined desired maximum. The purpose of this control valve 19 will be referred to again later in this description.

For the carrying out of the invention a separate washing water pump 21 is so arranged as to be easily and quickly connected up with the engine 10. This washing water pump 21 is supported on a bracket 22 secured to the engine block. The pump 21 is driven from a pulley 23 through the intermediary of an electrically-actuated clutch 24. The pulley 23 is connected by an endless belt with a pulley 25 secured on the engine shaft or secured on the shaft for the engine fan 12. The pump 21 operates only during such time as the clutch 24 is activated and such activation of this clutch takes place only upon the closing of a circuit to the clutch which occurs in the manner mentioned later.

A water intake line 26 leads to the washing water pump 21. This water intake line 26, on one hand, is directly connected with a supply line 27, which in turn is connected with any suitable outside supply of cold water (not shown). A valve 28, when open, then allows water from such outside supply to pass directly into the intake line 26 and thence to the pump 21. The valve 28 is operated by a solenoid 28' and is normally closed, being open only when the solenoid 28' is activated by the closing of a circuit to the solenoid 28'. On the other hand, the pump intake line 26 is also connected to a branch line 29 leading from the outlet of a coil 30 in the heat exchanger 17. A valve 31, operated by a sole-

noid 31', controls the passage of water from the branch line 29 to the intake line 26. This valve 31 is opened by the closing of a circuit to the solenoid 31' causing activation of the solenoid 31'. Water from the outside supply line 27 is delivered to the coil 30 through the line 32.

When the valve 31 is opened and the valve 28 remains closed the operation of the pump 21 causes water to be drawn through the lines 27 and 32 thence through the coil 30 and line 26 into the washing water pump 21 as shown in FIG. 1. The passage of outside water through the supply line 27 and through either of these two routes to pump 21 is regulated by a manually set regulating valve 33.

The operation of the washing pump 21 causes the water drawn into the pump through the intake line 26 to be delivered under pressure through a discharge line 34 which leads to a nozzle assembly 35, the nozzle assembly being equipped with an adjustable water-discharging nozzle 36. This discharge line 34, which leads to the nozzle assembly 35 is preferably provided with a suitable pressure indicator 37.

The operation of the washing apparatus, apart from the operation of the engine 10 itself, is controlled by simple electric circuit and switch means which is connected up to any suitable source of electric energy, preferably the engine battery, through the conductor wire 38, the branches of the circuit having suitable ground contacts with the common ground or body of the engine. A main control switch 39, when closed, connects the wire 40, leading to the clutch 24, to the conductor wire 38, the grounding for the clutch 24 being indicated at 40'. Thus, with the engine 10 in operation, the closing of the main switch 39 actuates the clutch 24 and causes the washing pump 21 to operate. A wire, connected with the wire 40, leads to a push button switch 42 located in the handle of the nozzle assembly 35. The switch 42, in the nozzle assembly, is arranged so as to close either a contact 43 for a wire 44 or a contact 45 for a wire 46. The wire 44 has a branch 47 which leads to the solenoid 31' for the valve 31, the solenoid 31' being grounded at 47'. The wire 46 leads directly to the solenoid 28' for the valve 28, the solenoid 28' being grounded at 46'.

Thus when the main switch 39 is closed (assuming that the engine 10 is operating), causing the washing pump 21 to operate as previously mentioned, the closing of the contact 43 of the wire 44 by the switch 42, by actuating the solenoid 31' and causing the valve 31 to be opened, while valve 28 remains closed, will result in water from the outside source being drawn through water lines 27 and 32, thence through the coil 30 in the heat exchanger 17, and through the water line 29, the open valve 31, and intake line 26 to the pump 21, the water received by the pump 21 then being forcibly discharged through the water line 34 and nozzle 36.

Since the heat exchanger 17 is warmed by water from the engine cooling system as previously explained, which passes around the coil 30, the passage of the washing water from the outside source through the coil 30 by the operation of the washing water pump 21 results in the heating of this washing water as it is delivered to the pump 21 and in the discharging of such heated washing water from the nozzle 36.

If it is desired to have cold or unheated water discharged from the nozzle 36, instead of warmed water, then, by having the switch 42 in the nozzle assembly close the contact 45 instead of the contact 43, the opening of valve 28 and the returning of valve 31 to closed position will result in the water from the outside source being drawn through water line 27 and valve 28 directly into the intake line 26 to the washing water pump 21, by-passing the water heating coil 30 of the heat exchanger.

When the water in the engine cooling system, circulated by the engine pump 13 and passing through the heat exchanger 17, reaches a predetermined maximum temperature (which would occur if the cold outside water

is caused to pass directly to the washing water pump 21 and by-pass the coil 30 in the heat exchanger, and thus without having the washing water absorb any heat from the heat exchanger), then the automatic opening of the valve 19 will enable water from the engine cooling system to pass through the radiator 11 and be cooled in the normal manner.

When the engine 10 is to be used only for the washing operation, and not for the purpose of driving the vehicle on which it be mounted, it is important to have the heat produced by the engine operation considerably exceed that which would normally be desirable in the operation of the engine for driving the vehicle. This extra heat in the engine is developed by having the engine under such conditions operate in what would ordinarily be considered an inefficient manner. This is brought about by increased opening of the throttle while at the same time preventing the distributor of the engine from advancing as the distributor would normally do with the increased opening of the throttle.

For opening the throttle, for the purpose of increasing the heat developed by the engine, an arm 48 is connected with the throttle lever (not shown), which arm 48 is attached to a spring mounted thruster of a solenoid 49. The conductor wire 44, previously mentioned, leads to the solenoid 49, this solenoid being grounded at 49'. The activation of the solenoid 49 causes the throttle to be automatically opened to the extent desired for producing extra heat from the engine. A governor (not shown) of well-known construction is provided on the engine and so arranged as to limit such automatic opening of the throttle to the maximum amount desired for producing the extra heating. In order at the same time to prevent the distributor 50 from advancing in the normal manner with the opening of the throttle a shut-off valve 52 is located in the vacuum line to the distributor assembly. The valve 52, which is normally open, is closed by the energizing of an operating solenoid 53. A branch line 54 connected to the line 44 leads to the solenoid 53, this solenoid being grounded at 54'. Consequently the closing of the contact 43 by the switch 42 in the nozzle assembly, in addition to opening the hot water valve 31, opens the engine throttle and closes the vacuum line to the distributor, thus resulting in greater amount of heat being produced by the operation of the engine 10.

Referring now to FIG. 2, the nozzle assembly 35 has a handle portion 35' in which is located a switch box 42' for the switch 42. The wires 41, 44 and 46 (FIG. 1) pass to the switch box 42' through the tube 55. The switch 42 is operated by a spring controlled push button 56 in the nozzle handle. A tube 34', to which the water conduit or hose 34 is attached, passes through the nozzle assembly and leads to the discharging nozzle 36 through a restricted passageway 63. The nozzle 36 preferably is provided with the usual means (not shown) for adjusting the jet or spray of water discharged from the nozzle 36.

Since it may be desired to use a detergent or some other washing aid with the washing water, the nozzle assembly is provided with a holder 57 for the top of a container 58 for such liquid cleaning aid. A tube 59 in the nozzle assembly has an outlet 61 positioned adjacent the outlet from the restricted passageway 63 to the nozzle so that suction will be exerted on the outlet 61 in the well-known manner by the discharge of the water from the restricted passageway 63. A branch 60 of the tube 59 extends down into the container 58. The other end 62 of the tube 59 is open and is located near the switch box 52' in the nozzle handle. The operator, holding the nozzle assembly by the handle portion 35', can then, by placing a finger over the open end 62 of the tube 59, cause the liquid from the container 58 to be drawn into the nozzle and mixed with the water discharging from the nozzle.

Obviously other nozzle assemblies could be used with the apparatus, but the simple nozzle assembly illustrated has been found to be very satisfactory. Also other minor modifications would be possible in various parts of the apparatus without departing from the principle of the invention. While various types of water pumps can be used for the washing water pump 21 it is considered preferable to use a novel design of water pump to be described in a separate application for patent. However the present invention is not to be understood as limited to the use of any special pump or to be limited otherwise than as set forth in the claims.

I claim:

1. In a hot water washing apparatus of the character described, an internal combustion engine having the usual water cooling circulating system with cooling water pump and radiator, a heat exchanger, a water conduit from said cooling water circulating pump to said heat exchanger, a return conduit from said heat exchanger to said cooling water pump, automatic means stopping the circulation of water through said radiator until the water returning to the engine cooling system from said heat exchanger has reached a predetermined temperature, whereby to obtain a greater proportion of heat from said engine cooling system for said heat exchanger, a washing water pump, means for driving said washing water pump from said engine, a clutch in said last mentioned means, an intake line for said washing water pump leading from an outside water supply source, said intake line passing through said heat exchanger, whereby to enable the water taken in said washing water pump to be heated by said heat exchanger, valve means controlling the passage of outside water through said heat exchanger to said washing water pump, a by-pass in said intake line enabling the outside water to pass directly to said washing water pump without going through said heat exchanger, valve means controlling the passage of water through said by-pass, a discharge line leading from said washing water pump, and a nozzle assembly at the end of said discharge line.

2. The combination set forth in claim 1 with the addition of special means for opening the throttle of the engine when said washing water pump is operated and with related means for preventing the advancing of the engine distributor with such opening of the engine throttle.

3. In a hot water washing apparatus of the character described, an internal combustion engine having the usual water cooling circulating system with cooling water pump and a radiator, a heat exchanger, a water conduit from said cooling water pump to said heat exchanger, a return conduit from said heat exchanger to said cooling water pump, means for stopping the circulation of water through said radiator until the water returning to the engine cooling system from said heat exchanger has reached a predetermined temperature, whereby to obtain a greater proportion of heat from said engine cooling system for said heat exchanger, a washing water pump, means for driving said washing water pump from said engine, an electrically operated clutch in said last mentioned means, an intake line for said washing water pump leading from an outside water supply source, said intake line passing through said heat exchanger, whereby to enable the water taken in by said washing water pump to be heated by said heat exchanger, valve means controlling the passage of outside water through said heat exchanger to said washing water pump, a by-pass in said intake line enabling the outside water to pass directly to said washing water pump without going through said heat exchanger, valve means controlling the passage of water through said by-pass, a discharge line leading from said washing water pump, a nozzle assembly at the end of said discharge line, electric circuitry connected with a source of electric energy controlling the operation of the washing apparatus when said engine is operating, a master switch in said circuitry, said clutch connected to said circuitry, electrically operated throttle opening means for said engine in said circuitry,

and electrically operated distributor restraining means in said circuitry preventing the advancing of the distributor for said engine upon increased opening of the engine throttle.

4. A portable hot water washing apparatus comprising an automotive internal combustion engine having the usual water cooling circulating system with cooling water pump and radiator, a heat exchanger, a water conduit from said cooling water pump to said heat exchanger, a return conduit from said heat exchanger to said cooling water pump, automatic means stopping the circulation of water through said radiator until the water returning to the engine cooling system from said heat exchanger has reached a predetermined temperature, whereby to obtain a greater proportion of heat from said engine cooling system for said heat exchanger, a washing water pump, means for driving said washing water pump from said engine, an electrically operated clutch in said last mentioned means, an intake line for said washing water pump leading from an outside water supply source, said intake line passing through said heat exchanger, whereby to enable the water taken in by said washing water pump to be heated by said heat exchanger, a solenoid controlled valve controlling the passage of outside water through said heat exchanger to said washing water pump, a by-pass in said intake line enabling the outside water to pass directly to said washing water pump without going through said heat exchanger, a solenoid controlled valve controlling the passage of water through said by-pass, a discharge line leading from said washing water pump, a nozzle assembly at the end of said discharge line, electric circuitry connected with a source of electric energy controlling the operation of the washing apparatus when said engine is operating, a master switch in said circuitry, electrically operated throttle opening means for said engine and electrically operated distributor restraining means preventing the advancing of the distributor for said engine upon increased opening of the engine throttle, said throttle opening means and said distributor restraining means and said clutch connected to said circuitry, and additional switch means in said circuitry for separately controlling the operation of said solenoid controlled valves.

5. The apparatus as described in claim 4 with said additional means for separately controlling the operation of said solenoid controlled valves located in said nozzle assembly.

6. In a hot water washing apparatus of the character described, the combination of an internal combustion engine having the usual water cooling circulating system with cooling water pump and radiator, a heat exchanger, a water conduit from said cooling water pump to said heat exchanger, a return conduit from said heat exchanger to said cooling water pump, a washing water pump, means for driving said washing water pump from said engine, an intake line for said washing water pump leading from an outside water supply source, said intake line passing through the said heat exchanger, whereby to enable the water taken in by said washing water pump to be heated by said heat exchanger, a discharge line leading from said washing water pump, a nozzle assembly at the end of said discharge line, and means for stopping the circulation of cooling water through said engine radiator until the water return from said heat exchanger to the engine cooling system has reached a desired temperature.

7. In a hot water washing apparatus of the character described, the combination of an internal combustion engine having the usual water-cooling circulating system with cooling water pump and radiator, a heat exchanger, a water conduit from said cooling water pump to said heat exchanger, a return conduit from said heat exchanger to said cooling water pump, a washing water pump, means for driving said washing water pump, an intake line for said washing water pump leading from an outside water supply source, said intake line passing through said heat exchanger, whereby to enable the water taken in by said

7

washing water pump to be heated by said heat exchanger, a discharge line leading from said washing water pump, a nozzle assembly at the end of said discharge line, electrically-operated throttle opening means for said internal combustion engine, electrically-operated distributor restraining means for preventing the advancing of the distributor for said engine with the increased opening of said engine throttle, and a control switch controlling the actuation of said electrically-operated throttle opening means and of said electrically-operated distributor restraining means.

5

10

8

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