March 24, 1931. L. M. O'NEILL 1,797,584

WASHING APPARATUS

Filed July 15, 1927

Fig. 1

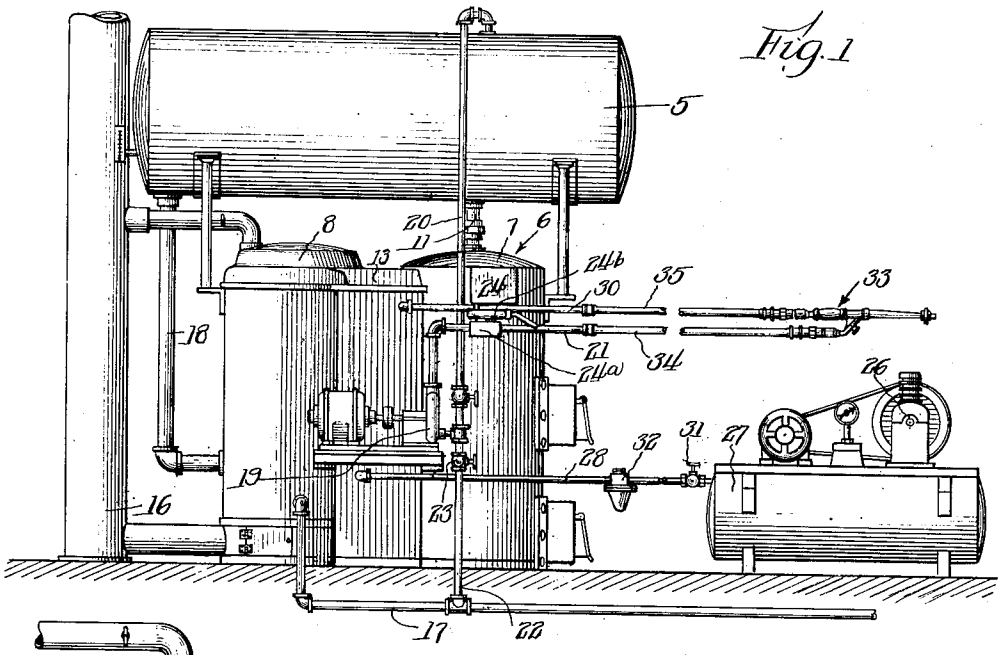
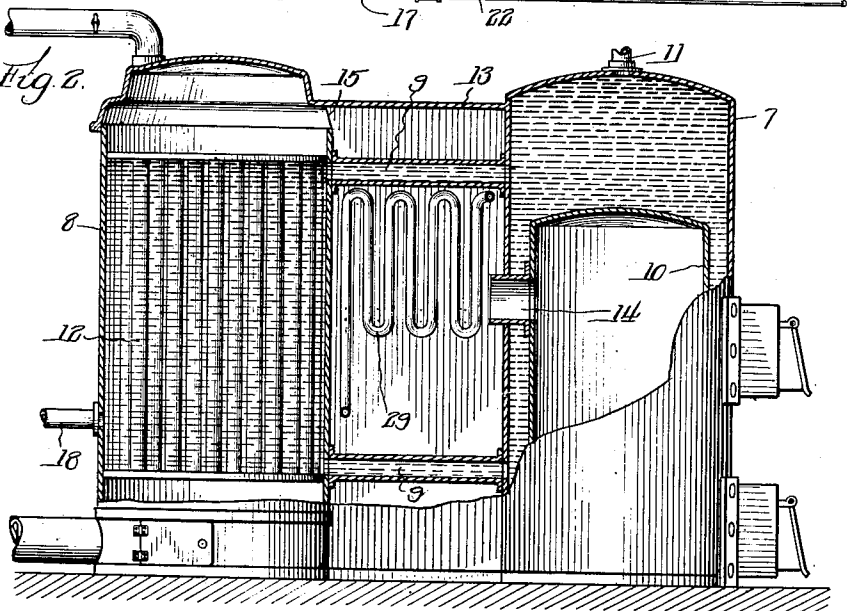


Fig. 2.



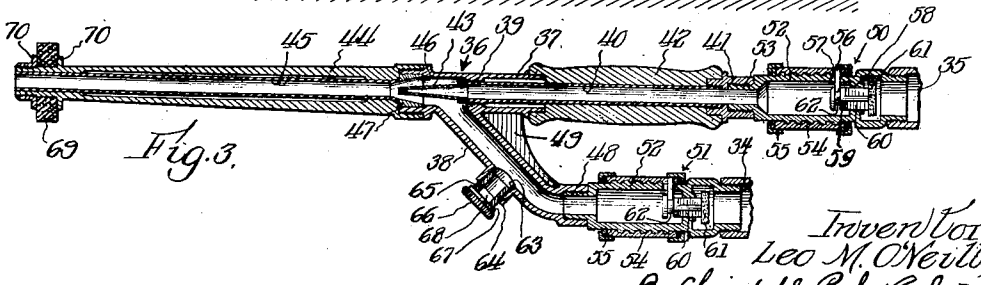


Fig. 3.

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UNITED STATES PATENT OFFICE

LEO M. O'NEILL, OF EVANSTON, ILLINOIS

WASHING APPARATUS

Application filed July 15, 1927. Serial No. 205,897.

This invention relates to an apparatus for cleaning, washing and drying machines such as automobiles and trucks which are subject to accumulations of grease and dirt, and the invention has reference to apparatus in which a powerful jet of mixed water and air is utilized to clean and scour the various parts of the vehicle or the machine.

It is well known that certain parts of motor vehicles such as the chassis, motor, etc. become coated or caked with a mixture of grease and dirt which solidifies and adheres to such an extent that it is difficult to remove. It is the general object of my invention to provide an apparatus for removing such foreign matter from vehicles or the like in an extremely expeditious and effective manner, leaving the vehicle clean and dry.

Another object of the invention is to provide a novel apparatus capable of various manipulations by which the steps of cleaning the machine may be readily performed. To this end, I have provided means by which a stream of hot water is ejected, means by which the pressure, temperature and volume of the water may be regulated at will, means for mixing a jet of air under pressure with the stream of hot water, means for heating the air, means for varying the pressure on the air, means by which the discharge of the air and water may be severally controlled so as to permit of ejecting a stream of air alone for the final step of blowing off water and foreign matter from the machine to leave the latter clean and dry, and means for admitting free air under atmospheric pressure to the stream of hot air for increasing the volume of air ejected and for tempering the hot air to avoid injury to painted or varnished surfaces.

Another object of the invention is to provide an apparatus of this character which minimizes both installation and maintenance costs by employing a relatively low volume of air and a relatively high volume of water in accomplishing its purpose.

A further object of the invention is to provide an apparatus which is simple in construction, which may be cheaply manufactured and which is highly efficient and expeditious in operation.

Other objects and advantages will become apparent from the following description and the accompanying drawings in which:

Figure 1 is an elevational view of the preferred form of an apparatus embodying the invention.

Fig. 2 is an enlarged elevational view of the heater unit, parts thereof being broken away to disclose the interior.

Fig. 3 is an enlarged section of the preferred form of the spray nozzle.

In attaining the objects of the invention means is provided for heating the water and at the same time for heating the air to be used in the cleaning operation.

In the preferred embodiment a water supply tank 5 is arranged to receive water heated by a suitable heating unit 6. Preferably the heating unit is of the preheating type in which spent gases are used to warm the water before passing to the flue. The type of heater shown herein comprises a boiler 7 and a preheater 8 suitably connected for the passage of water therebetween, as by means of the pipes 9. The boiler 7 has a fire box or chamber 10 mounted therein in spaced relation to the walls, which space receives the water to be heated. A pipe connection 11 between the upper part of the boiler 7 and the supply tank 5 permits the hot water to rise to the supply tank.

The preheater 8 is of the usual boiler construction embodying a plurality of fire tubes 12 about which the incoming water flows to be heated thereby. The space between the boiler and the preheater is closed, as by means of the walls 13, and suitable openings 14, 15 connecting the fire box 10 and the preheater 8 with the closed space permit the passage of the spent hot gases and flame from the fire box through said space to the preheater, from which the gases are conducted to a flue 16 in the usual manner.

Water enters the lower portion of the preheater from a water supply main 17 leading from a source of water (not shown), and is first warmed by the spent gases in their passage through the preheater 8. The warm water then passes to the boiler 7 from which, after being heated to a temperature some-

what under the boiling point, it flows to the supply tank 5. A return line 18 from the supply tank 5 to the preheater 8 permits the free circulation of water through the heating system when the water is being heated but not being used.

In order for the apparatus to function properly the hot water must be supplied to the mixing and ejecting means under substantially high pressure. To this end a suitable power drive pump 19 is provided which draws the heated water from the upper part of the supply tank 5 through the pipe line 20 and discharges it through the pipe line 21. A line 22 leading from the water supply main 17 to the pipe line 20 is controlled by a suitable valve 23 whereby cold water may be admitted to the stream of hot water flowing into the pump thus regulating the temperature to any degree. Upon very difficult cleaning jobs it may be desirable to increase the efficiency of the cleaning jet by adding a small amount of rust or grease solvent to the jet. To this end a chemical supply tank 24 is suitably mounted adjacent the pipe line 21 from the pump. Incorporated in the line 21 is a suitable type of water meter 24^a arranged to be rotated by the passage of water through the line 21. The meter rotates a shaft which drives a rotary pump 24^b so connected with the chemical tank 24 and the line 21 as to pump chemicals from the tank into the line 21. Since the speed of the pump depends upon the rate of flow of water through the line 21, the amount of chemicals pumped will vary with the volume of water passing through the line.

The compressed air necessary in the operation of the apparatus is supplied from a suitable air compressor unit comprising the usual motor driven compressor 26 and compressed air storage tank 27. A pipe line 28 conducts the compressed air from the air tank 27 to a coil 29 (Fig. 2) mounted in the path of the gases passing between the boiler 7 and the preheater 8, and a continuing line 30 conducts the heated air from the coil 29 to a point preferably adjacent the free end of the water pipe line 21. A suitable shut-off valve 31 and an air pressure reduction valve 32 are interposed at appropriate points in the line for controlling the working pressure of the air supplied.

Preferably the water and air under pressure are conducted to a suitable means which mixes and expells them in the form of a high velocity jet. By using water and air under substantially equal pressures a greater volume of water will be used. The water alone would be expelled in a jet having a high velocity and the addition of the compressed air thereto increases the velocity and multiplies the impact and scouring force of the jet.

Figs. 1 and 3 of the drawings show the preferred embodiment of this means in the form of a jet gun 33 to which the air and water are delivered from the pipe lines 21, 30 by means of the flexible lines 34, 35 of pressure hose or the like. The gun 33 comprises an elongated tubular duct through which air flows with a water duct intersecting the air duct at an angle thereto, the gun being so formed that a venturi is provided at substantially the intersections of the two ducts. In this instance a hollow V shaped casing 36 is provided one leg 37 of which forms an air passage and the other leg 38 the water passage. The leg 37 is provided with an inwardly projecting flange 39 arranged to have a screw-threaded engagement with one end of a rearwardly extending tube 40 to provide an extension of the air passage. The free or rear end of the tube 40 is screw-threaded to receive a suitable nipple 41 and a handle 42 of any preferred heat insulating medium may be mounted about the tube 40 between the nipple 41 and the casing 36. The forward end of the tube 40 is internally screw-threaded to receive a restricted Venturi tip 43.

The forward end of the leg of the air passage is externally screw-threaded to be engaged by a forwardly extending tubular member 44 which comprises the nozzle of the spray gun. Preferably the nozzle is provided with an inner sleeve 45 rigidly secured thereto which assures a perfectly smooth passageway therethrough. Internally, the forward end of the leg is provided with an inwardly projecting shoulder 46 which forms an annular groove in the end. An annular bushing 47 of a size to fit relatively snugly in the groove has a beveled inner surface which registers at one end with the slightly flared end of the sleeve 45 and at the other end with the inner surface of the leg. Thus the inner surface of the leg with the beveled ring 47 form a Venturi chamber through which the restricted tip 43 on the air duct 40 projects. By this construction the ring 47 and the tip 43 may be readily removed for replacement if, for any reason, it becomes necessary or desirable.

The second leg 38 of the casing which constitutes the water passage intersects the elongated air passage at an angle thereto and is provided at the rear end thereof with a suitable nipple connection 48. A reenforcing web 49 preferably is provided between the legs of the casing to lend added strength to the spray gun.

Controlling valves 50 and 51 are provided at the rear ends of both the air and the water passages and since, in this embodiment, both are substantially similar only one valve will be described. As shown the valve 50 comprises a hollow casing 52 having a restricted externally screw-threaded end 53 arranged to engage the nipple 41 on the end of the air duct. The other end of the valve is also

screw-threaded to receive a connection on the end of the flexible hose 35.

A sleeve 54 rotatably mounted on the body of the casing has an engagement therewith which, upon rotation of the sleeve on the casing, will move the sleeve longitudinally of the casing. In this instance, such an engagement comprises screw threads of relatively large pitch so that a small rotation of the sleeve effects a considerable longitudinal movement thereof. Each end of the sleeve 54 may be provided with a suitable packing gland 55 which prevents leakage between the sleeve and the casing. A pin 56 carried by the sleeve 54 extends inwardly of the casing 52 through an appropriately formed slot 57, the purpose of which will become hereinafter apparent.

Near one end of the valve casing is an inwardly extending flange or web 58 having a central substantially circular opening therein. A valve stem 59 mounted to slide in the opening has portions of the body thereof cut away as at 60 to provide ports through the opening. One end of the valve stem 59 carries a flexible washer 61 of rubber or other suitable material, which is adapted to be seated against the flange 58 in one position of the stem to close the central opening therein. The other end of the stem 59 is provided with an appropriately positioned annular groove 62 which is engaged by the end of the projecting pin 56 on the sleeve 54. The arrangement of parts is such that rotation of the sleeve 54 moves the valve stem 59 longitudinally of the valve casing 52 to open or close the valve.

During the cleaning operation of the apparatus and particularly during the final step thereof it becomes desirable to produce a strong blast of air for blowing, drying or similar purposes. To this end, the leg 38 of the casing through which the water normally flows is provided with an aperture 63 defined by an outstanding peripheral flange 64. A valve in the form of a tubular nut 65 having a head 66 closing one end thereof, has a screw-threaded engagement with the flange 64. A suitable gasket 67 is mounted adjacent the head and portions of the tubular body of the nut 65 are cut away, below the gasket, to provide ports 68 therethrough. Thus if the valve 51 is closed and the nut 65 is screwed out of the flange 64 air may be drawn into the gun through the ports 68 in the nut 65 but, by screwing the nut into the flange, the gasket and the head seal the aperture 63.

If desired the outer or forward end of the gun may be provided with a suitable bumper to prevent the marring of finished or polished surfaces by the end of the gun. In the present instance such a bumper comprises a resilient ring 69 held in position, upon the end of the nozzle 44 by such means as a pair of annular flanges 70 secured thereon.

In operation the apparatus is simple, easily operated, efficient and highly economical. For cleaning greasy or oily machinery the powerful jet of hot water and hot air quickly dissolves, scours and removes such dirt. For the ordinary washing of painted or varnished surfaces such as the polished finish of an automobile, a stream of water cooled to the desired temperature by adding sufficient cold water from the main may be quickly obtained. To dry a surface or the like a hot stream of air may be obtained by merely closing the readily accessible water valve on the gun or, if an increased volume of cooler air is desired, it is only necessary to open the nut a desired distance to permit air to be drawn into the gun by the Venturi action of the gun.

An important feature of the invention is the economical use of a greater volume of water than air under substantially the same pressures, which use reduces substantially the volume of compressed air which must be supplied. This reduction in the necessary volume of air supplied lessens the cost of the apparatus considerably since an air compressor unit of substantially smaller capacity may be used than has been possible in prior apparatus of this character. Moreover, the apparatus may be installed in garages, filling stations or like places which already have a small type compressor therein and the necessary compressed air may be taken from such compressor units.

The use of pre-heated air effects a further substantial saving since by heating the air already under pressure an increase in volume and pressure thereof is obtained. Furthermore in mixing the hot air with the hot water undesirable cooling of the water before it is used is eliminated.

It will be apparent from the foregoing that a washing apparatus has been provided which is efficient in operation; which is exceedingly economical; which is simple; and which may be readily and easily controlled by an operator to produce cleansing media for the various steps in a cleaning, washing and drying operation.

While the invention is susceptible of various modifications and alternative constructions, I have shown and herein described in detail the preferred embodiment but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

I claim as my invention:

1. In an apparatus of the character described, a storage tank adapted to contain a supply of water, a supply main for supplying water to said tank, a heating unit adapted to heat the water in said tank, a

power driven pump, a pipe line connecting said storage tank with the inlet side of said pump, a second line connecting said water supply main with the inlet side of said pump, a valve controlling said last mentioned line whereby the temperature of the water drawn into said pump may be controlled, a jet gun, means connecting said gun with the outlet of said pump, an air compressor unit, a line connecting said air compressor unit with said gun, said line including an interposed coil mounted in the heating unit to heat said compressed air during the passage of said air from the compressor unit to the gun, and means on said gun for controlling the passage of the air and water therethrough.

2. An apparatus of the character described comprising, in combination, a gun constructed to mix and discharge water and air, a hot water storage tank, a boiler connected to said tank and arranged to heat water and circulate it through the tank, a pump connected at its inlet side to said tank and at its discharge side to said gun and arranged to deliver hot water under high pressure to said gun, an air compressor outfit including a storage tank connected by a pipe line to said gun, a pipe coil in said pipe line associated with said boiler to be heated thereby, means for admitting cool water into the supply line to said gun to vary the temperature of the water discharged therefrom, means for completely cutting off the discharge of water from said gun, and means for admitting free air to the gun to be mixed with the stream of heated air therein.

3. An apparatus of the character described comprising, in combination, means for supplying hot water under pressure, means for supplying hot air under pressure, a gun connected to said two means arranged to mix and discharge the air and water in the form of a jet, manually operable valves on the gun for cutting off the hot air and the hot water, and a manually operable valve on the gun for permitting free air under atmospheric temperature and pressure to be drawn in by and mixed with the stream of hot air in the gun when the water valve is closed.

4. An apparatus of the character described comprising, in combination, a gun adapted to mix and discharge a stream of hot water and hot air in the form of a jet, means for delivering hot water under pressure to said gun, means for delivering hot air under pressure to said gun, means for cutting off the discharge of hot water, and means for admitting air under atmospheric temperature and pressure to the gun to mix with the stream of hot air in the gun.

5. An apparatus of the character described comprising, in combination, a gun provided with inlets for air and water and having a venturi by means of which the air stream increases the volume and velocity of the water discharged from the gun, manually operable valves for independently regulating said inlets and a manually operable valve in the water inlet located forwardly from the aforesaid valve therein for admitting free air into the water inlet when the water valve is closed, and means for supplying water and air under pressure to said inlets, to be mixed and discharged from the gun in the form of a powerful jet.

6. A gun of the character described comprising, in combination, a discharge barrel, an air inlet in substantial alinement with the rear end thereof, a water inlet angularly disposed to said air inlet, a Venturi chamber into which said inlets merge and having a nozzle through which the air is discharged into said barrel to act upon the water stream, independently operable manual valves in said two inlets and a third valve in said water inlet located forwardly of the aforesaid valve therein for admitting free air into the water inlet when the water valve is closed.

In testimony whereof, I have hereunto affixed my signature.

LEO M. O'NEILL.