Oct. 13, 1936. T. A. MACKIN 2,057,388

APPARATUS FOR CLEANING VEHICLES

Filed April 28, 1930 5 Sheets-Sheet 1

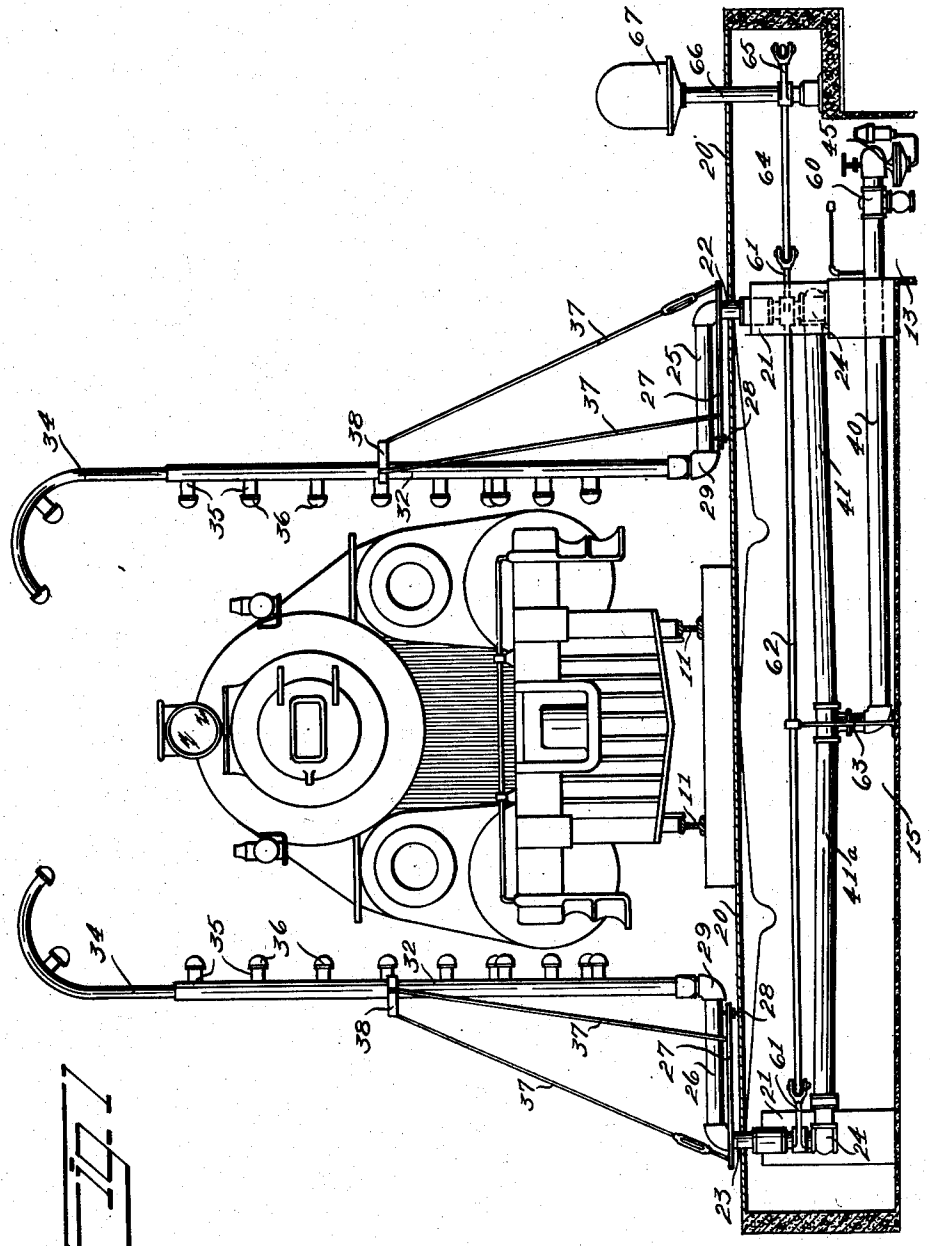


FIG. 1

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APPARATUS FOR CLEANING VEHICLES

Filed April 28, 1930 5 Sheets-Sheet 2

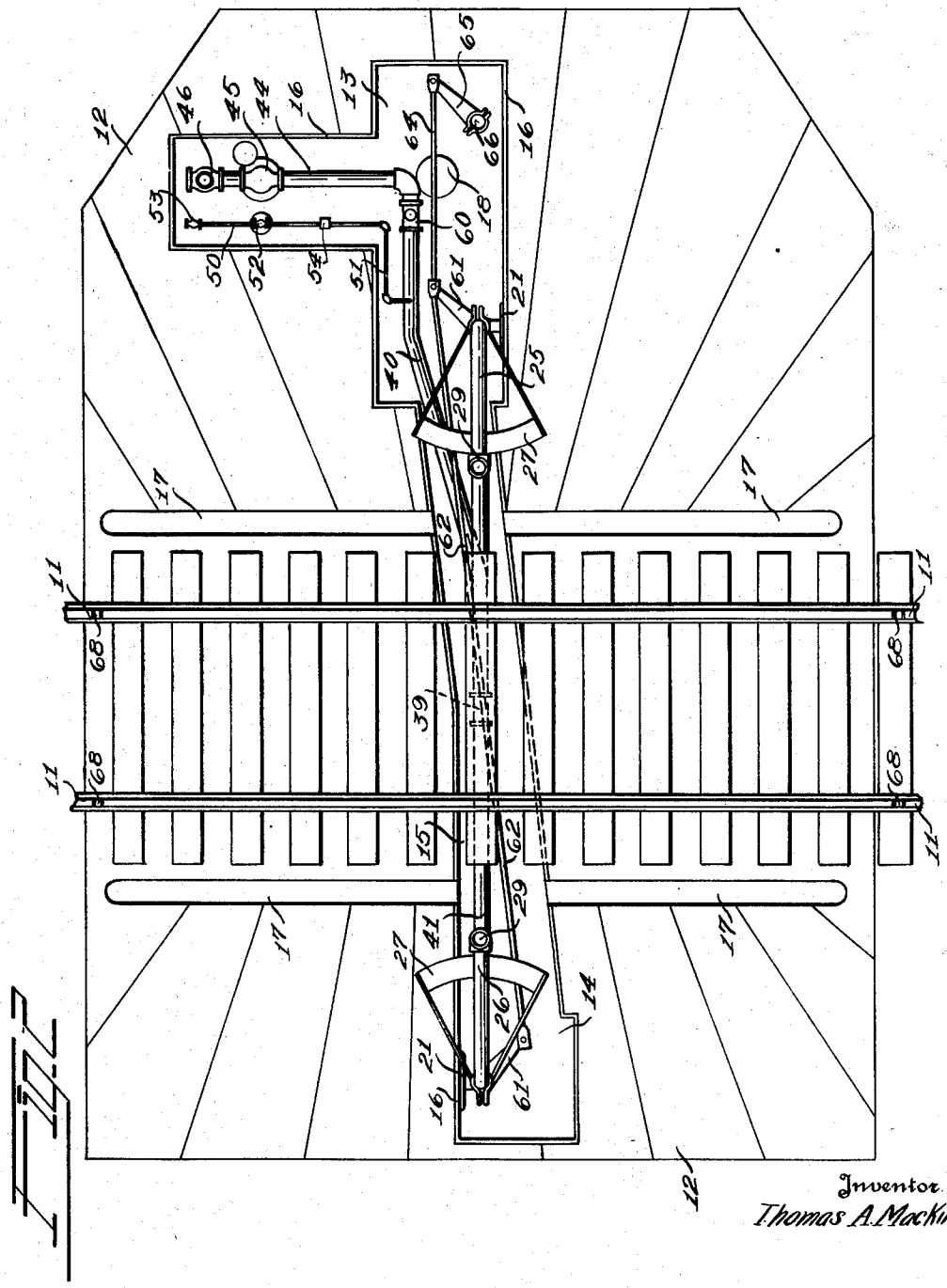


Fig. 2

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APPARATUS FOR CLEANING VEHICLES

Filed April 28, 1930 5 Sheets-Sheet 3

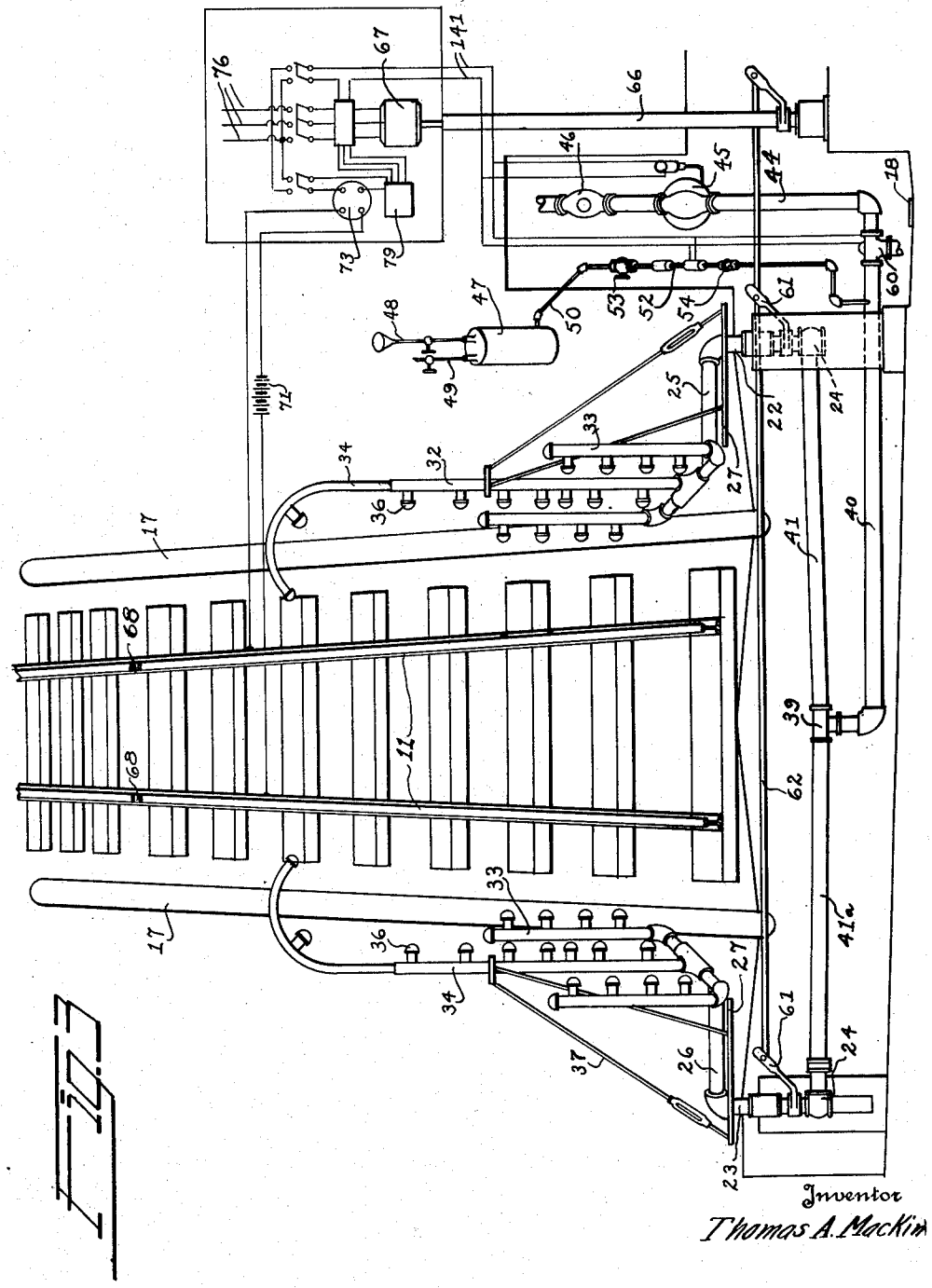


Fig. 3

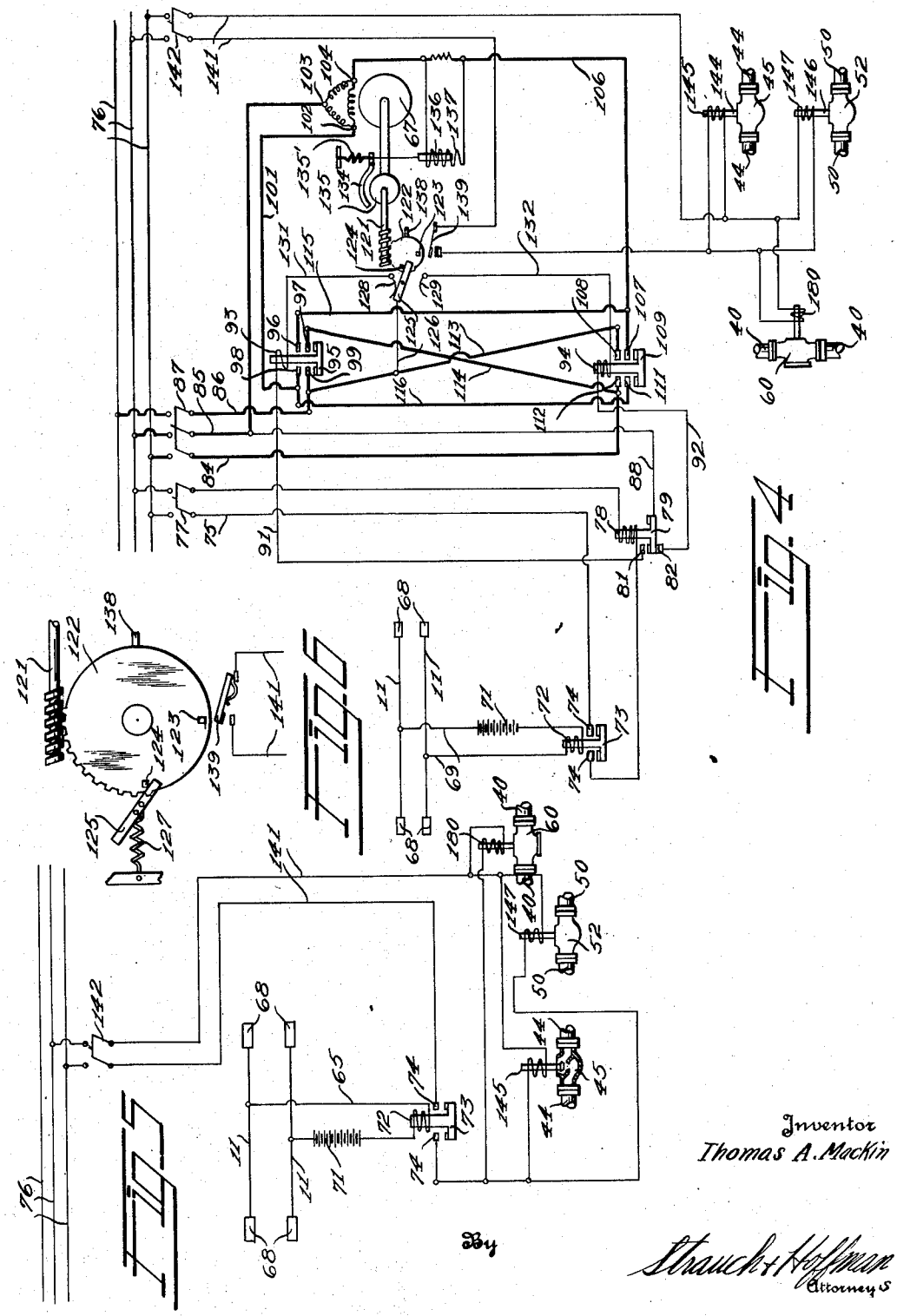
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APPARATUS FOR CLEANING VEHICLES

Filed April 28, 1930 5 Sheets-Sheet 4



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APPARATUS FOR CLEANING VEHICLES

Filed April 28, 1930 5 Sheets-Sheet 5

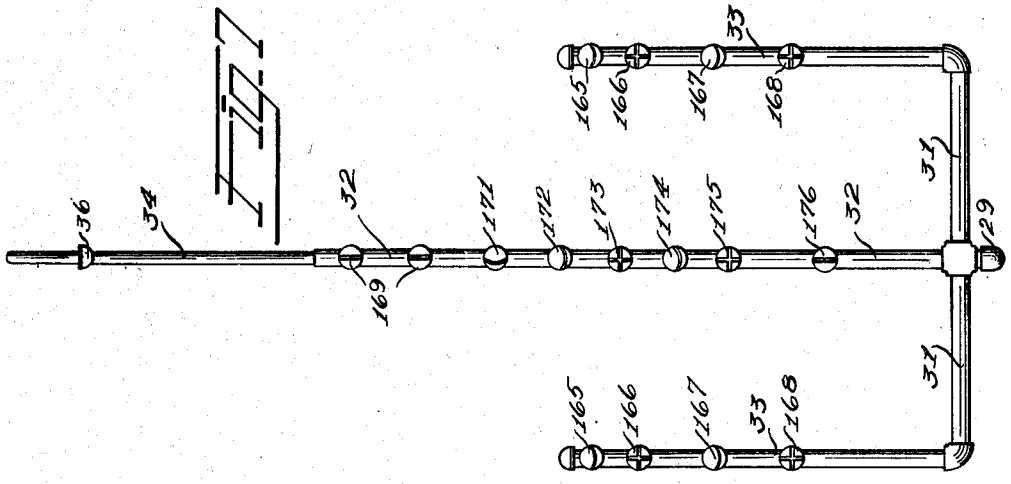


FIG. 1

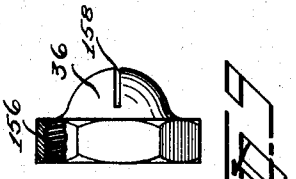


FIG. 9

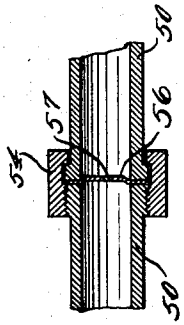


FIG. 11

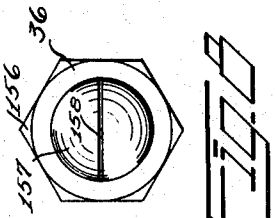


FIG. 8

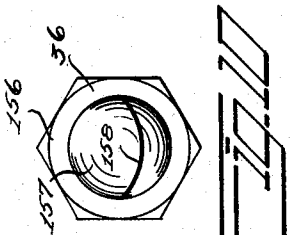


FIG. 10

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UNITED STATES PATENT OFFICE

2,057,388

APPARATUS FOR CLEANING VEHICLES

Thomas A. Mackin, Wilkes-Barre, Pa.

Application April 28, 1930, Serial No. 448,137

11 Claims. (Cl. 141—1)

This invention relates to methods and apparatus for cleaning vehicles, and more particularly to the cleaning of vehicles such as railway locomotives and cars, automobiles, busses and the like, by passing them through a washing station, whereby they are automatically thoroughly cleaned and preferably provided with a fine protecting coating that leaves a polished surface and protects and preserves the finish of the vehicle.

The cleaning of railway rolling stock, and especially the cleaning of locomotives, has always been a difficult problem for the railway companies. When a locomotive comes in from a run it is covered with ashes, dust and grease which adhere closely to all exposed surfaces. This grime packs into all the cracks and openings making thorough cleaning very difficult.

Both for the sake of the appearance of the locomotive, and for the sake of safety, since it is necessary that the various parts of the locomotive be carefully inspected after each run, it is necessary that this grime be removed from the surfaces. In the past, railway companies have cleaned their locomotives by manual labor, the exposed parts being wiped down with oily waste or rags. Obviously this was a laborious, time-consuming operation requiring a number of wipers working for long periods of time, depending upon the size of the locomotive and the wipers employed, to do a reasonably thorough job. Because of the high cost of such operations in recent years locomotives have been cleaned by two or mor operators walking around and directing against the locomotives high velocity streams of water and compressed air containing a fairly heavy oil in colloidal suspension.

In the latter method of washing locomotives it has always been considered essential that the liquid must impinge in high velocity streams directly upon the surface to be cleaned, in order to loosen the grime and dirt thereon. No matter how carefully the locomotives are washed by the use of such high velocity streams, due to the complexity of shape of the outer surface of a locomotive, workmen directing a hose upward from the ground cannot effectively clean the horizontal top and recessed surfaces. Two men working a half an hour or more are required to clean a locomotive by this method and it is impossible for them to do an effective job. Furthermore, it has been found in many cases that these impinging streams of oil and water leave the exposed surfaces of a locomotive and the running boards in slippery condition, due to excess of the oil used in coating the various surfaces. In numerous instances the steps and running boards of locomotives which have been washed by the high velocity stream method have been found to be dangerously slippery, and many injurious falls have resulted therefrom to employees whose duty it is to inspect and operate the locomotives.

Various high pressure spray methods have also been proposed for washing automobiles, busses and like motor vehicles all of which utilize high pressure spray systems depending upon high velocity to dislodge the dirt and grease therefrom. Such high velocity spray systems tend to injure the finish of the vehicle surfaces and tend to dry in streaks requiring manual labor to polish the surfaces after the spray wash.

I have discovered that contrary to prior belief, a vehicle such as an automobile, bus, railway car, and even a locomotive covered with grease, dirt, and ashes may be thoroughly cleaned and left with a bright polished and protecting coated surface in a very short period of time by subjecting the vehicle to a flowing wash by application of a low velocity spray or cloud-like atmosphere of washing fluid. By the provision of suitable nozzle-equipped pipes arranged adjacent a washing station it has been found that a mist or cloud-like atmosphere of a washing fluid may be generated, which will settle upon and run down the surfaces of a locomotive to thoroughly cut the dirt and grease therefrom and leave the surface in a clean condition. The cloud or mist of washing fluid thus formed penetrates to all exposed surfaces and crevices of the locomotive not heretofore reached by high velocity streams and thoroughly cleans these surfaces. This feature of subjecting a vehicle to a cloud or atmosphere of washing fluid may be compared to an immersion or dipping the locomotive in a washing fluid whereby all surfaces are acted upon by the solution. This atmosphere settles upon the locomotive and reaches the crevices and cracks to thoroughly loosen the accumulated grime, the washing solution running down and carrying with it the loosened dirt. In practice my improved methods are surprisingly efficient, the largest types of locomotives being thoroughly cleansed in approximately thirty seconds without manual labor, and by running past a washing station.

One embodiment of the broad aspect of my present invention is disclosed and claimed in my Patent Number 1,931,444, granted October 17, 1933, for "Vehicle washing and polishing appa-

ratus" of which this application is a continuation-in-part.

One object of this invention therefore is to provide novel methods and apparatus for the thorough cleansing of vehicles by subjecting them to a mist or cloud-like atmosphere of washing fluid whereby the vehicle is thoroughly cleaned without manual wiping.

Another object of this invention is to provide a completely automatic washer in which the passage of a vehicle through a washing station serves to operate all controls for the washing apparatus, the washing operation beginning upon the entrance of a vehicle and discontinuing when the vehicle leaves the washing station.

A further object of this invention is to provide a washing apparatus for vehicles, in which novel forms of nozzles are provided from which washing fluid is emitted in the form of a mist which is widely dispersed in all directions to reach all exposed parts of a vehicle.

Another object of my invention is to provide a washing station for vehicles, such as railway rolling stock in which the washing operations are completely automatic, and in which the pipes and operating valves and mechanism are arranged in pits, the surface of the washing station being concreted, whereby the washing station is neat in appearance and all excess fluid is drained away.

Still another object of this invention is to provide an automatic washing station of the above described character wherein a plurality of permanently mounted pipes are arranged to project low velocity sprays of washing solution on the vehicle passing through the washing station, with automatic means whereby the washing solution is at once drained from the pipes when the washing is completed, to thus prevent the possibility of freezing the solution in the pipes during cold weather, and to insure against undesirable separation of the oil or solvent used in the washing solution.

Another object of this invention is to provide an automatic washing means for vehicles, wherein the vehicles are sprayed with a solution of oil carried by hot water, with automatic regulating means provided in the connections for the oil, whereby a small regulated quantity of oil is continuously fed to the water to become thoroughly mixed with and vaporized by the water and spread evenly on the surfaces to be cleaned in a thin layer.

In carrying out my invention I have found that while excellent results can be secured by using an ordinary mixture of mineral oil of the type previously used in washing locomotives, of the approximate consistency of a light lubricating oil, I have secured considerably improved results by utilizing a special and more volatile solvent oil. This special solvent oil is primarily composed of an oil having a solvent action and at least a portion of which is volatile, preferably of wax or paraffin base, and may be a mineral hydrocarbon product. One form of solvent oil which has been successfully used by me is a special distillate of paraffin mineral oils between the gasoline distillates and kerosene, known as "M & P Thinner". It is used as a paint thinner, and has the approximate volatility of solvent naphtha, xylene and similar solvents which may also be effectively used. Excellent results have also been obtained by a special solvent oil composed of gasoline or similar volatile solvent, polishing wax such as floor wax, and a small quantity of light oil.

When a vehicle is sprayed with a washing fluid of hot water and a solvent oil such as described, all surfaces are cleaned of the grime and the water runs off leaving a fine coating of the solvent oil on the cleaned surfaces. The volatile constituents of the solvent then vaporize off, leaving a thin coating of wax or paraffin and very light oil which gives the cleaned surfaces a polished appearance and preserves them from rust, without leaving them greasy or sticky.

These and various other objects of my invention will be apparent from the following description and appended claims when taken in connection with the accompanying drawings, wherein—

Figure 1 is a central vertical section taken through the washing station showing the position of the pipes in relation to a locomotive in a preferred embodiment of apparatus forming part of my invention.

Figure 2 is a top plan view partially in section of the washing station shown in Figure 1 with the pit covers removed.

Figure 3 is a more or less diagrammatic view showing in perspective the position of the pipe and the mechanical connections for the arrangement shown in Figures 1 and 2.

Figure 4 is a circuit diagram of the automatic control arrangements for the preferred embodiment of my washing apparatus.

Figure 5 is a diagram of the circuit connections of a slightly modified form of control arrangement.

Figure 6 is a top plan of the operating mechanism for the limit switch shown in Figure 4.

Figure 7 is a front elevation of one of the vertical pipe sections forming part of my invention showing the nozzles thereon.

Figures 8 and 9 are front and side views of one form of nozzle used, a part of the shank portion of Figure 9 being broken away.

Figure 10 is a front elevation of another form of nozzle.

Figure 11 is an enlarged detail showing a preferred form of regulating disk for the solvent pipe line used in the preferred embodiment of my invention.

Referring to the drawings by reference characters, in which like characters designate like parts, 11 designates railway track sections upon which locomotives or other railway rolling stock to be cleaned are adapted to be run through a washing station. Referring particularly to Figure 2, it will be seen that the washing station includes a large concrete surface 12 extending transversely from the tracks a sufficient distance to catch all liquid discharged from the washing apparatus, and extending between the rails and the ties.

Formed on the one side of the tracks is a pit 13 and on the opposite side of the tracks is a similar and smaller pit 14, there being a cross pit or passage 15 connecting said pits. The pits 13, 14 and 15 are concreted and there is an upstanding wall 16 around the same, the upper edge of which is adapted to receive covers for closing the pits. Extending parallel to the rails 11 and on opposite sides of the tracks, are drain troughs 17. The concrete washing surface 12 is arranged to drain into the drain trough 17 from both directions from the center line passing through the washing station parallel to the tracks. That is, the drainage is so arranged that surface liquids pass into the drain troughs 17 and these drain troughs 17 slant inwardly toward the cross pit 15, discharging into said

cross pit. By referring to Figure 1 it will be seen that cross pit 15 slants toward the right so that liquid will drain therefrom into the bottom of the pit 13 and thus to a sewer or drain pipe 18. By this arrangement of surface drainage no accumulation of water or washing fluid occurs since all extra fluid is at once drained away from the washing station. The pits in which the operating mechanism and the pipes are positioned are completely covered when in use by plates 20 (Figure 1) leaving the entire washing station always neat in appearance and with no dangerous pits or holes, nor any accumulations of water or oil.

Rotatably journaled in brackets 21 secured to the vertical walls of the pits 13 and 14 are vertical pipes 22 and 23 and also supported by the brackets 21 in each pit are suitable water tight joints or connections 24 provided with an upper rotatable and a lower stationary pipe connection. For example, a Barco joint of well known construction may be used, the upper rotatable part of which is connected to the lower end of the respective vertical pipe sections 22 and 23 thus permitting rotation of the vertical pipe sections while maintaining a fluid tight joint.

The vertical pipe sections 22 and 23 project upwardly from their respective pits and have secured thereto horizontal pipe sections 25 and 26 respectively. The horizontal pipe sections 25 and 26 are secured to the upper surface of triangular shaped carriages or tables 27 which are secured at one corner to the vertical pipes 22 and 23 and are provided with supporting antifriction rollers 28. At their inner ends, the horizontal pipe sections 25 and 26 are provided with upwardly extending elbows 29 (Figures 1, 3 and 7) which are connected into horizontal sections 31 positioned at right angles to the horizontal sections 25 and 26. The horizontal pipe sections 31 are connected to and communicate with centrally positioned main vertical pipe members 32. At each end each horizontal pipe section 31 is connected to shorter vertical pipe sections 33 which are parallel to the sections 32. At their upper ends the main vertical sections 32 are connected to upwardly and inwardly curved pipe sections 34 which may be of smaller diameter than the main pipe section 32.

The main vertical pipe sections 32 and the inwardly curved sections 34 and the shorter vertical pipe sections 33 are all provided with a series of threaded openings for the reception of nipples 35 to the ends of which are removably secured nozzle members 36. These nozzle members 36 are shown in detail in Figures 8, 9 and 10, and are arranged in a manner to be described in more detail later.

Guy rods or guy wires 37 are secured at one end to a bracket 38 on the main vertical pipe section 32, said guy rods being secured at spaced points to the triangular table members 27 to brace the upright pipes.

The stationary lower portions of the Barco joints 24 are connected to pipes 41 and 41*a* which as seen from Figures 2 and 3, extend across the washing station through the cross pit 15. The pipes 41 and 41*a* are connected to a T-pipe section 39, the lower connection of which is connected to a supply pipe 40 which extends to the right hand control pit 13 and is there connected to a hot water supply pipe 44. It will be noted that the pipes 41 and 41*a* slope inwardly toward the T-section 39, and the pipe 40 slopes to the right hand pit 13.

As thus far described, it will be apparent that the nozzles 36 provided on the upright pipes 32 and 33 will be supplied with hot water from the connecting pipes including the cross pipes 41, 41*a*, the T-connection 39, and the supply pipes 40 and 44. The upright pipes 32, 33 and 34 are rotatably mounted about their respective Barco joints 24 for movement into and out of operative washing position by mechanism to be hereinafter described. In Figure 1 the pipe sections are shown positioned in their washing position whereby sprays emitted from the nozzles 36 will completely envelop and wash a locomotive or other railway car positioned on the tracks 11. When the washing is completed the pipe sections may be swung 90° away from the track to a non-washing position where they will not endanger employees and passing of railway rolling stock.

From the description given as to the slope of the washing surfaces it will be apparent that any excess washing fluid will be drained into the drain troughs 17 and thence into the cross pit 15 and by way of the pit 13 to the drain pipe 18.

Flow of hot water through the supply pipe 44 is controlled by a solenoid operated valve designated generally by reference character 45, there being a hand controlled valve 46 positioned in this line.

The control for the solenoid operated valve 46 is such that the flow of washing fluid to the apparatus is automatically controlled by passage of a vehicle through the washing position by a control mechanism hereinafter described.

In order to thoroughly cleanse a vehicle such as a locomotive which is covered with grease, ashes, dust, dirt and soot it is necessary that a cleansing oil and preferably my improved solvent be incorporated in and mixed with the hot water for spraying upon the vehicle. A supply pipe for this solvent or oil leads from the oil tank 47 having a filling connection 48 and a connection 49 leading to a source of air pressure. Pipe 50 connects the solvent oil pipe 47 to the hot water supply pipe 40 by way of the pipe connection 51. A solenoid operated valve 52 and a hand operated valve 53 are interposed in the solvent or oil supply line 50.

In order to accurately proportion the amount of solvent or oil to the water, a union coupling 54 is interposed in the oil line 50 in which is positioned a regulating device for the solvent oil. The regulating device, as seen more clearly in Figure 11, comprises a metal disk 56 provided with a small opening or orifice 57 therein to allow passage of solvent or oil. The opening 57 is usually about $\frac{1}{32}$ of an inch in diameter, but obviously the size of this opening will be regulated in accordance with the amount of oil or solvent necessary for the particular cleaning job at hand. The disk 56 is readily detachable from the oil line and may be replaced by other disks, each disk having a hole therein of slightly different size, whereby the amount of solvent oil for mixing with the hot water may be readily regulated. Other means of regulating the amount of solvent oil may be used such as an adjustable needle valve but it is desirable that the adjustment be accessible only to an authorized workman since otherwise the mixture may be changed to proportions which are inefficient.

As thus far described, it will be clear that with the hand operated valves 46 and 53 open, the opening of the solenoid operated valves 45 and 52 will allow flow of hot water and solvent or oil to the spraying pipes and said mixture will be ejected through the nozzles 36. It will be noted

that the solvent or oil enters the hot water lines at a point remote from the nozzles 36 so that the oil is picked up and thoroughly mixed with the hot water, prior to the ejection of the washing fluid from the nozzles. By this construction the solvent or oil is equally distributed throughout the mass of water prior to the ejection from the nozzles. As hereinafter described, the nozzles are so arranged that the washing fluid is ejected therefrom at comparatively low velocity to form a cloud of spray that envelops the vehicle, and cleanses the surfaces thereof by a flowing action rather than by an impinging action of high velocity streams as used in the prior art.

The vertical pipes 22 and 23 have been described as being rotatably supported in the brackets 21 for rotation about the stationary portions of the Barco joints 24. Each pipe 22 and 23 has securely fixed thereto a crank arm 61 (Figure 2) positioned within the pits 13 and 14. The arms 61 are connected by a reach rod 62 passing through cross pit or trough 15 and supported for reciprocation by a suitable bearing or guide 63 (Figure 1) which may be swiveled on its support. An operating crank 64 is connected at one end to the right hand crank arm 61 and at its other end to a crank arm 65 which is connected to the rotary shaft 66 (Figure 1) which is operatively connected by any suitable gearing to the shaft of an electric motor 67 in a manner well understood by those skilled in the art. It will thus be seen that rotation of the motor driven shaft 66 will impart rotation to the upright pipes 22 and 23 by way of connections as described, rotating nozzle-equipped pipes 32, 33 and 34 about the axes defined by the pipes 22 and 23. Electric motor 67 is adapted to be automatically energized to move the nozzle-equipped pipes from their operative washing position shown in Figure 1, to a position entirely clear of the tracks, and out of operative position, by means of mechanism now to be described.

As seen in Figure 3, interposed in tracks 11 are electrical insulating sections 68 whereby an insulated track section is provided. Conductors 69 are connected to the insulated track sections 11 and have included therein a battery 71 or other source of power and are connected to winding 72 (Figure 4) of a relay 73. When a locomotive or other piece of railway rolling stock enters the insulated track section 11, the wheels and axles thereof bridge the insulated track sections to close the circuit including conductors 69 and coil 72 and energize relay 73. Relay 73 when energized bridges contacts 74 in a circuit including conductors 75 which are connected to power supply conductors 76 by switch 77. Connected in series in conductors 75 is winding 78 of a main relay 79. The armature of relay 79 is adapted to alternately engage or disengage contacts 81 and 82, contact 82 being engaged when the relay is deenergized, and contact 81 being engaged when the relay is energized.

The relay contacts 81 and 82 are connected in a circuit to control the operation of a reversing switch mechanism for motor 67. This control is effected as follows. Main conductors 84, 85 and 86 are connected to the three phase A. C. supply circuit 76 by way of the knife switch 87. The armature of relay 79 is connected by conductor 88 with the conductor 85, so that conductor 85 will be connected to either contact 81 or contact 82 depending upon the position of the armature of the relay. Contact 81 is connected by conductor 91 to solenoid winding 93 of a control switch for the motor, and contact 82 is connected by wire 92 to the solenoid winding 94 of a second control switch for the motor.

The solenoid winding 93 is adapted to move core 95 upwardly to close contacts 96 and 97, and contacts 98 and 99. Contact 99 is connected to main conductor 86 and contact 98 is connected by a lead 101 to terminal 102 of the motor 67. The terminal 103 of motor 67 is connected to the neutral or common conductor 85 of the three phase supply circuit.

The terminal 104 of the motor 67 is connected by lead 106 to contact 107 adapted to engage contact 108 when actuated by armature 109 of solenoid 94. Armature 109 when actuated also closes contacts 111 and 112. Contact 108 is connected by a cross lead 113 to the conductor 86, and contact 112 is connected directly to the main conductor 84, and is also connected by a cross connection 114 to contact 97 controlled by solenoid 93. Contacts 96 and 107 are connected by a lead 115, and contacts 111 and 98 are connected by a lead 116.

By the connections as thus far described current will be supplied to the motor 67 to operate the same in a direction dependent upon whether solenoid winding 93 or 94 is energized. The energization of windings 93 and 94 is dependent upon the position of the main relay armature 79, since if armature 79 engages contact 82, which occurs when the coil 78 is deenergized, the coil 94 pulls the core 109 upward to close contacts 112 and 111, and contacts 107 and 108. Current will then be supplied to the motor for operating it in one direction, it being noted that the main lead 85 is connected directly to the terminal 103 of the motor. When the coil 93 is energized the motor operates in a reverse direction. The operation of the above circuit arrangement will be described in more detail hereinafter.

It will be understood that the shaft of the motor 67 is connected to the crank 65 to operate the upright pipes 23 and 22, as previously described. However, when the pipes are rotated the movement thereof is only 90° and they must be stopped in the position facing the tracks, or in the position away from the tracks and out of washing position. Therefore, I have associated a limit switch with the motor mechanism for breaking the electrical circuit when the motor has turned the pipes to the two rest positions thereof. This limit switch includes a worm shaft 121 (Figures 4 and 6) which is driven from the motor shaft, said shaft 121 having the worm teeth in engagement with a worm gear 122. The gear 122 has lugs 123 and 124 upstanding from one face thereof adapted to alternately engage pivoted limit switch lever 125. The lever 125 is connected by conductor 126 to the lead 113 and is adapted to alternately engage with spring contacts 128 and 129 (Figure 4), spring contact 128 being connected in series with winding 93 by conductor 131, and spring contact 129 being connected in series with winding 94 by conductor 132. When the motor 67 has rotated the upright pipes 22 and 23 90° from either rest position, one of the stops 123 or 124 engages the end of the pivoted lever 125 to reverse the engagement of the same with respect to the spring fingers 128 and 129 to thus break the control circuit for the motor in the direction of movement and to close the circuit of the motor for reverse movement. A snap spring 127 is connected with lever 125 for quickly moving the lever after one of

the lugs 123 or 124 has moved it beyond dead center.

In order that the motor may not over-run, or carry the upright pipes beyond their washing or non-washing positions after the current is disconnected, I have associated a brake with the motor for stopping the same in proper position. This brake includes a pivoted brake shoe 134 (Figure 4) normally held in engagement with a brake drum 135 on the motor shaft by spring means 135' or otherwise, the brake being electrically released by solenoid plunger 136 connected thereto and positioned to be operated by winding 137 connected in shunt around a resistance in return motor lead 106. It will thus be seen that the brake 134 is applied as soon as current ceases to flow through the motor to at once stop the motor. The brake is automatically released as soon as the current flows through the motor, since current in the lead 106 will cause current to flow in winding 137 to pull the plunger 136 downwardly to release the brake.

In order that my washer may be fully automatic in its operation it is necessary that the valves which control flow to the pipes be automatic in their operation. Referring further to Figures 4 and 6 it will be seen that the gear 122 is provided with a projection 138 for engagement with the movable contact 139 of the switch which controls the current for operating the valves. The switch 139 is serially connected with conductors 141 connected to the supply mains 76 by way of a switch 142, the current from the wires 141 controlling operation of the valves 45 and 52 one of which is connected in the water line and the other of which is connected in the solvent or oil line. The valve 45 is provided with a movable valve member 144 which is pulled upwardly to open the valve by a solenoid winding 145 connected in series in conductors 141. The valve 52 is also provided with a movable valve member 146 pulled upwardly to open the valve when winding 147 is energized, said winding being connected in shunt to winding 145. Each of the valves 45 and 52 is preferably provided with spring closing means operative when windings 145 and 147 are deenergized.

Operation

The complete operation of the automatic features of my invention will now be described. Assuming that there is no rail vehicle on the washing station, the coil 72 of the track relay will be deenergized and the solenoid 73 will open the circuit between the contacts 74. Therefore, the main relay winding 78 will be deenergized, and the core 79 be down into engagement with the contact 82, it being understood that the switches 77, 87 and 142 are closed. With the above described condition the circuits will be as follows: The main lead 85 is connected to conductor 88, movable armature 79 of the main relay, contact 82, and by conductor 92, to the winding 94 of the reversing switch mechanism. From the winding 94 conductor 132 connects with the spring contact 129. Due to the previous operation of the motor, the lug 124 on the gear 122 has moved the pivoted limit switch lever 125 to the position in Figure 4 out of engagement with the spring lever 129. Therefore, no current flows in the winding 94 and the motor is not operated.

If now a rail vehicle enters the insulated track section current will flow in the circuit closing wires 69 to close the contact 74 through armature 73. This energizes the circuit including winding 78 of the main relay to pull the core thereof upwardly disengaging contact 82, and closing contact 81. Current may then flow from conductor 85 through conductor 88, contact 79, to contact 81 and by conductor 91 to the upper coil 93, by wire 131 to the spring contact 128 and thus to lever 125 and by conductor 126 to the cross lead 113. Lead 113 is directly connected to supply conductor 86 and it will be clear that current will flow in the upper winding 93 of the reversing switch mechanism pulling core 95 thereof upwardly and closing contact 97 against contact 96 and contact 99 against contact 98.

Current then passes to the electric motor 67 as follows: From the conductor 86 to contact 99, contact 98, conductor 101 through the terminal 102 of the motor; conductor 84, cross connection 114, through contact 97, contact 96, conductor 115 and conductor 106 and thus to the terminal 104 of the motor; through the motor to terminal 103 and conductor to the neutral supply conductor 85 of the three phase current supply.

As soon as current flows in conductor 106 winding 137 is energized to release the brake 134 and the motor starts to rotate. By the mechanical levers as previously described, the vertical pipes 22 and 23 are then rotated from their non-washing position to their washing position with the nozzles on the upright pipes facing the locomotive to be washed.

This 90° rotation of the pipes is simultaneously accompanied by a 90° rotation of gear 122 driven by worm 121. At the end of the 90° rotation of the gear 122 the stop lug 123 thereon engages the lower side of the pivoted lever 125 to move it, spring 127 serving to snap this lever from the position shown in Figure 4, to the lower position wherein it engages the spring contact 129. As soon as the lever 125 disengages the spring finger 128, current ceases to flow in winding 93 and the solenoid deenergizes opening contacts 96 and 97 and contacts 99 and 98. Thus the motor ceases to operate and as soon as the current ceases to flow in the conductor 106 the spring on the brake 134 at once applies the brake so that rotation of the pipes is stopped at once.

Just prior to the end of the rotation of gear 122 lug 138 thereon engages the spring contact 139 to close the circuit through conductors 141, causing current to flow in windings 145 and 147 of the valves 45 and 52, thus opening the valves 144 and 146 to allow the flow of solvent or oil and hot water in the pipes.

The mechanism remains in this position with the washing liquid flowing until the rail vehicle leaves the insulated track section. When the rail vehicle leaves the track section the circuit including conductors 69 is broken and contact 73 breaks the circuit including the winding 78 of the main relay. The core 79 of the relay then drops into contact with the contact 82 causing current to flow as follows and reverse the rotation of the motor: From the main conductor 85 by way of conductor 88, contact 79, contact 82, conductor 92 to winding 94, conductor 132, spring contact 129, lever 125 and lead 126 to the cross lead 113 and thus back to the main conductor 86. Energization of the winding 94 actuates core 109 to close contact 107 against contact 108, and contact 111 against contact 112. Current then flows through the motor in the reverse direction as follows: From supply line conductor 84 to contact 112, contact 111, conductor 116, conductor 101 to the motor terminal 102; from supply line 86 to cross lead 113, contact 108, contact 107, conductor

106 to the motor terminal 104; and from the supply 85 to the motor terminal 103. The brake solenoid 137 is thus energized to release the brake and the motor reverses its operation, turning worm shaft 121 in reverse direction to reverse rotation of the gear 122 and to turn the pipes 22 and 23 back to their non-washing positions. As soon as this rotation starts the lug 138 disengages the spring contact 139, which opens, thus deenergizing windings 145 and 147 and the movable valve members 144 and 146 at once close to stop flow of the washing fluid. Rotation of the motor continues until the lug 124 engages pivoted limit switch lever 125 to snap said lever to its opposite position thus deenergizing the winding 94 and opening the motor circuit and conditioning winding 94 for energization. The apparatus is then in non-operative position, and ready for entrance of another rail vehicle on the washing station section.

Referring now to Figures 7 to 10, in which are shown details of the nozzles 36, it will be seen that each nozzle comprises an internally threaded shank portion 156 with a dome 157 at its outer end. The portion 156 is adapted to be threaded on the ends of the nipples 35. The dome 157 is provided with a saw cut 158 extending completely across the end of the nozzle 36. As seen in Figures 8 and 9, this saw cut 158 is parallel to the longitudinal axis of the nipple 35 to which the nozzle is secured.

As seen in Figure 10 the saw cut 158 is angularly disposed with respect to the longitudinal axis of the nipple 35. This angular arrangement of the cut is designed to give a fan-shaped spray which slants downwardly or upwardly toward the surfaces of the vehicle to be cleaned. Furthermore, some of the nozzles are provided with two saw cuts made in the dome end 157 of the nozzles, said saw cuts being usually arranged at right angles to one another, as seen in Figure 7, to form the washing cloud effectively. In some instances these two cuts may be angularly disposed similar to that of Figure 10, to give a dispersing effect to the spray.

Referring to Figure 7 wherein is shown a front elevation of the upright stand pipes with the nozzles connected thereto, one arrangement of the saw cut nozzles is shown which has been found to be particularly effective for cleaning a locomotive. It will be seen that the central vertical pipe 32 is provided with eight spaced nozzles and each shorter vertical pipe 33 is provided with four nozzles. Referring first to the shorter pipes 33, the top nozzles 165 thereof preferably have the angle of the saw cuts arranged to slant downwardly, this arrangement providing a downwardly directed spray to effectively remove the grease and dirt from the main rods, guides, and the guide yoke on a locomotive. The next lower nozzles 166 on the pipe 33 are provided with two cuts arranged vertically and horizontally for providing a widely dispersed cloud-like spray for effectively penetrating and settling upon all of the various shaped surfaces around the running gear of a locomotive. This type of nozzle with the two right-angled saw cuts gives a widely dispersed cloud or spray both horizontally and vertically to effectively settle upon and wash down the sides of the boiler and parts adjacent thereto.

The nozzles 167 on the pipes 33 are arranged to have an angled cut slant downwardly to give a spray which effectively cleans the wheel hubs of the driving wheels and also the spokes and the driving mechanism associated with the wheels. The lower nozzles 168 are arranged with the double crossed cuts arranged at right angles for effectively washing the lowermost parts of the locomotive by providing a cloud or atmosphere which will penetrate through and settle upon the front fender or "cow catcher" of the locomotive and the other various parts adjacent the rails.

The central pipe section 32 preferably has the two upper nozzles 169 arranged with vertical saw cuts to provide a spray or mist which will thoroughly clean the curved tank, the domes and various curved parts adjacent the upper portions of a locomotive. Below these nozzles 169, the nozzle 171 is provided with an angularly arranged saw cut which is preferably arranged to slant in the direction of movement of the locomotive. This arrangement of saw cut for this nozzle gives an effective washing action upon the back of the locomotive and the tender, when they pass through the washer, in addition to giving a vertically dispersed cloud-like spray for the sides of the curved surfaces of the locomotive. The next lower nozzle 172 has an angular saw cut which slants downwardly to give an effective downwardly directed spray or mist for the running board of a locomotive to thereby penetrate and settle upon the various corners to remove the grease therefrom, and to also settle upon the upper curved surfaces of the cylinders for the driving pistons. Below the nozzle 172 the next adjacent nozzle 173 is arranged with the two angular saw cuts for giving a well dispersed spray both horizontally and vertically. Nozzle 174 is arranged with the angle saw cut slanting downwardly for effectively washing the lower step of the locomotive and also the upper portions of the main rods, guides and the wheels. The next lower nozzle 175 may have two saw cuts arranged at right angles to one another, and nozzle 176 a vertically arranged saw cut, for providing a widely dispersed vertical and horizontal spray for the driving mechanism generally.

It will be understood that the arrangement of the saw cuts as described may be widely varied to meet the various conditions in use. As is well known, the various locomotives being built today have the parts thereof arranged in different positions and it will be understood that the nozzles will be turned and arranged in proper position to thoroughly cleanse the type of locomotive to be washed.

The upper curved pipes 34, which are of smaller diameter than the pipes 32 to which they are attached, are preferably provided with two nozzles, one on the end thereof and one on the curved portion thereof, said nozzles having their saw cuts arranged vertically to provide a vertically dispersed fan spray for the uppermost portions of the locomotive. The spray from these nozzles is directed substantially downward to provide a substantially vertical cloud or atmosphere to settle upon the upper curved portions of the steam dome, whistle, and other various parts on the upper surface of a locomotive.

The washing station as just described may be arranged adjacent a round house or repair shop on a section of track which is frequently used. If rolling stock is using this track section and washing thereof is not required the electric switches will be opened. Since the rotatable pipe sections are normally moved away from the tracks to non-operative position, the pipes do not interfere with the passage of cars on the tracks, which can be used in the usual way.

In order that the washing solution may not remain in the exposed pipes when the apparatus is not in use, an automatic drain valve 60 is connected to pipe 40 in the pit 13 adjacent the sewer outlet 18. The drain valve 60 is solenoid operated as shown diagrammatically in Figure 4. This valve is closed by energization of winding 180 connected in shunt with windings 145 and 147 and is opened by spring action when winding 180 is deenergized by the opening of contact 129. It will accordingly be seen that valve 60 will be open to drain the washing system, except when washing operations are being carried out. Due to the fact that pipes 41 and 41a slope toward T 39, and pipe 40 slopes toward the drain 60, all washing solution will drain by gravity out of the pipes when valve 60 is open.

In some cases it is unnecessary to have the pipes movable toward and from the tracks, as for example when the washing station is positioned adjacent a track section used only for washing. In this case the installation is greatly simplified. As seen in Figure 5 the track relay 73 may directly control the solenoid windings 145, 147 and 180 to open and close the valves for the oil or solvent and water and draining. When the switch 142 is closed the entrance of a locomotive on the track section at once closes the drain valve opens the valves for washing flow which is arrested when the locomotive leaves the insulated track section.

An important feature of this invention resides in the washing medium supplied to the washing apparatus, composed of a special solvent mixed with hot water, although it is to be understood that any suitable washing solution may be utilized with my improved methods and apparatus.

As above pointed out it has heretofore been deemed necessary to use hand directed high velocity streams of water and air containing colloidally suspended light lubricating grade oil to clean locomotives. In many instances it has been found that a locomotive cleansed by these high velocity streams containing oil has a coating of oil left on the surfaces which is slippery and dangerous. Furthermore, locomotives cleaned as above described get dirty very quickly, due to the fact that the film of relatively heavy oil acts as an adhesive for dirt and soot.

I have discovered that an efficient and thorough cleaning of a vehicle, and even a locomotive covered with grime after a run, may be obtained simply by a flowing wash of hot water and a special solvent of the type used in the manufacture of rotogravure inks as a solvent for asphalt products, such as solvent naphtha, xylene, and like products. I have found a special petroleum distillate between gasoline and kerosene known as M & P Thinner, distilled from paraffin base oils to be particularly effective. These solvents are lighter than the lubricating oils heretofore used in the colloidal high velocity washing suspensions heretofore used, and dry rapidly leaving the desirable gloss of a rotogravure print and a fine protecting non-adhesive and smooth protecting coat on the surfaces of vehicles washed in accordance with my improved methods. My improved solvents are mixed with hot water during a locomotive washing operation in the proportions of approximately one part of oil to four hundred to six hundred parts of water. In this proportion they act as an excellent solvent for the grease and dirt, carrying the dirt off with the flowing wash of water. A thin glossy protecting film remains on the cleaned surfaces which dry rapidly without streaking. This coating gives the surfaces an excellent finish which compares favorably with a hand-rubbed polish and preserves the surfaces from rust. Furthermore the coating is not sticky or oily and therefore does not act as an adhesive for dirt.

One solvent which has been found to give excellent results has the following analysis:

	Per cent
Carbon	85.6
Hydrogen	12.4
Sulphur	0.4
Nitrogen	0.1
Oxygen (by difference)	1.4
Ash	0.1

This solvent oil is a petroleum product which is a distillate mixture of hydrocarbons, the formula being from $C_{13}H_{26}$ down to C_9H_{20}, and generally about $C_{12}H_{23}$.

It has the following physical characteristics:

Gravity	30.1° Baumé
Flash-open cup	285° F.
Fire-open cup	325° F.
Pour point	15° F.
Saybolt viscosity @	100° F. 54 seconds
Saybolt viscosity @	210° F. 35 seconds
Color (Astm)	5
Percent fatty oil	None
Percent free fatty acids	None

This solvent oil above described may be used directly with the hot water approximately in the proportions given, namely one part of the solvent to 400 to 600 parts of water. For the cleansing of locomotives it has been found that a mixture of this solvent, the chemical analysis and physical properties of which are given above, with gasoline or naphtha and wax or paraffin gives excellent results. These ingredients are mixed in approximately the following proportions:

3 gallons of the solvent
2 gallons of gasoline or naphtha
2 pounds of wax or paraffin

The additional quantity of gasoline or naphtha gives this mixture an additional cleansing action for quickly removing heavy and firmly adherent grime from the exposed surfaces, and the added quantity of wax or paraffin leaves a thin polished coating of light oil and wax on the surfaces.

Other solvents than that described may be used, it being essential, however, that there be no substantial quantities of non-volatile heavy oil or greases. For example, the solvent may be composed of gasoline, benzine, naphtha, or xylene containing a small quantity of light oil with a wax or paraffin suspended therein. As a specific example, five gallons of gasoline, benzine, naphtha or xylene with one pound of wax such as floor wax and one gallon of light oil gives an excellent solvent, but it will be understood that these proportions are by way of example only and are not limitations, since obviously the proportions may be varied to meet various washing problems.

When a vehicle such as a locomotive passes through a washer station operated as so far described all exposed surfaces are thoroughly cleansed of the grime thereon, the cloud or atmosphere of washing medium generated by the nozzles acting upon the exposed surfaces in a manner similar to an immersion or dipping of the vehicle in a solution of the washing fluid. The hot water solvent of the type described has been found to effectively cut all the grime and dirt from a vehicle in a very short period of time.

For example, it has been found that a locomotive which has come in from a run covered with grime may be thoroughly cleansed by passage through a washing station constructed in accordance with this invention in 30 seconds.

Although my novel washing method and apparatus as thus described has been shown in connection with, and described for use with rail vehicles, the invention is not limited thereto. My novel washing method is equally useful for washing automobiles, busses, motor coaches, rail cars, street railway cars and similar vehicles, the washing station being changed to accommodate the vehicle to be washed. The method of flowing over the vehicle a multiplicity of low velocity streams of washing solution having a solvent containing substantially no lubricating oils or greases therein is an efficient and expeditious way of cleaning all vehicles, and it will be understood therefore that the invention is not limited to rail vehicles.

In the embodiment of my invention as illustrated, the vertical pipe sections are designed especially for the cleansing of locomotives. However, it will be obvious that the heights and shapes of these pipes will be varied to wash various sizes and shapes of vehicles. For example, in cleaning tank cars it is desirable that the curved side portions thereof be clean and polished to clearly show the identifying or advertising lettering thereon. For washing tank cars therefore I contemplate using pipes the curvature of which will conform substantially to the exterior surface of the car.

In the cleansing of passenger vehicles such as railway coaches good results may be had by washing the same with an oil and water spray, followed by a spray of a weak solution of oxalic acid, and a final clear water spray. My arrangement of pipes and nozzles is admirably adapted for such use, wherein three separate sets of pipes would be provided, one set for the initial water and oil spray, one set for the oxalic acid spray, and one set for the final clear water spray. If desirable, a fourth set of pipes may be used for warm or hot air for quick drying of the vehicle.

It will be understood that the nozzle arrangement as previously disclosed will be used with these various washing and drying stations.

In washing automobiles and particularly busses, the drier pipes are desirable but not necessary, the vehicle first passing through the hot water and solvent oil pipe station and then to the drier station. However, if desirable a spraying with a weak oxalic acid solution may be interposed between the first spraying with water and solvent and the drier. The light coating of wax and light oil leave the automobile surfaces in excellent condition and the immediate drying operation serves to quickly carry off the volatile gasoline, naphtha or the like and also dry the excess water, leaving a surface which has the appearance of a hand polish.

Furthermore it has been proposed to cool the interior of passenger busses, coaches or trams of cars by subjecting them to a spray of cold water just prior to the vehicles entering a terminal for example to receive passengers. My arrangement of spray pipes serve this function excellently.

In all the various uses above suggested, my novel enveloping effect of sprays would give far superior results over the usual hand sprays or even sprays arranged vertically along the sides of the vehicles and over the tops thereof. By the use of my novel enveloping sprays, all parts of the vehicle are at once reached by the fluid in a most efficient manner, whether the fluid is plain water, hot or cold, water and oil or solvent, oxalic acid and water, or warm air. The arrangement of nozzles with the angular and vertical and horizontal slots gives an enveloping atmosphere of the fluid which cannot be attained by the usual forms of nozzles.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What I claim as new and desire to secure by United States Letters Patent is:—

1. Apparatus for the thorough cleaning of vehicles solely by spraying comprising a substantially vertical pipe, a plurality of nozzles on said pipe directed toward said vehicle, said nozzle having narrow slit-like openings therein for causing liquid passing therethrough to be widely dispersed in the form of a misty spray, certain of said nozzles being arranged with said slit-like openings disposed horizontally to give a horizontally dispersed spray and others with said slit-like openings disposed vertically to give a vertically dispersed spray, and means for supplying a washing medium to said pipe and nozzles.

2. An apparatus for the thorough cleansing of a vehicle solely by a spraying operation during passage of the vehicle through a washing station, comprising a plurality of substantially vertical pipes spaced from one another to define a passageway for a vehicle therebetween, means for supplying a washing liquid to said pipes, and a plurality of nozzles arranged at spaced intervals on each pipe and formed to provide fan-shaped sprays facing said passageway to define a relatively narrow washing zone, the nozzles on each pipe being arranged to project said sprays toward the vehicle with the planes of said sprays disposed in angular relation with respect to each other and which intersect on the vehicle side of said pipe to project the washing liquid in an enveloping curtain of a settling mist to simultaneously cover substantially all of the exterior of a vehicle within said washing zone by a plurality of streams that flow downwardly and remove the dirt thereby.

3. An automatic apparatus for the thorough cleansing of a vehicle solely by a spraying operation during passage of the vehicle through a washing station comprising a plurality of substantially vertical pipes spaced from one another to define a passageway for a vehicle, a plurality of nozzles on each pipe facing said passageway, means for supplying washing liquid to said pipes, means for supporting said pipes for movement into and away from operative washing position adjacent said passageway, an electric motor mechanically connected to said pipes for moving the same, and means dependent upon movement of a vehicle through said passageway for governing operation of said motor.

4. An automatic apparatus for the thorough cleansing of a vehicle solely by a spraying operation comprising two laterally spaced substantially vertical pipes defining a passageway therebetween, nozzles on each pipe, means for supplying

washing fluid to said pipes and nozzles, means for supporting said pipes for movement toward and away from each other to operative and inoperative positions, an electric motor connected to said pipes for moving the same, electric switch means for controlling said motor, and means operative by movement of a vehicle through said passageway for operating said electric switch means.

5. The invention as defined in claim 4 wherein a limit switch is operated by said motor simultaneously with movement of said pipes, said limit switch stopping said motor when the pipes reach their operative and inoperative positions.

6. The invention as defined in claim 4 comprising valve means to control the flow of the washing fluid in said pipes, said means operative by movement of a vehicle through said passageway operating said valve controlling means to supply washing fluid to said spray pipes when they are in operative position and to cut off the supply when the said spray pipes are in operative position.

7. The invention as defined in claim 4 wherein valve means is provided to control flow of the washing fluid in said pipes, an electric switch for controlling said valve means, said means operative by movement of a vehicle through said passageway operating said electric switch for controlling said valve means.

8. The invention as defined in claim 4 wherein braking mechanism is associated with said electric motor, and means for causing said braking mechanism to be applied when said pipes reach their operative and inoperative positions.

9. An automatic apparatus for the thorough cleansing of a rail vehicle on a track solely by a spraying operation comprising a washing station having two substantially vertical pipes rotatably mounted on opposite sides of said track, nozzles on said pipes, means for supplying washing fluid to said pipes, an electric motor mechanically connected to said pipes for rotating the same into a washing position facing the track and into a non-washing position away from the track, and electric control means operable by movement of a rail vehicle on the track for governing said motor.

10. The invention as defined in claim 9 wherein said electric control means includes means to cause said motor to rotate said pipes in washing position when a vehicle enters said washing station, and to rotate said pipes in non-washing position when the vehicle leaves said washing station.

11. In an apparatus for thorough cleaning of a vehicle by spraying, a substantially vertical pipe section, a plurality of nozzles thereon having dome-shaped ends, said ends having narrow slots thereacross, said slots in the direction of their lengths being disposed at angles with respect to each other to produce a widely dispersed spray, said nozzles being directed toward the vehicle.

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