

April 23, 1963

H. F. MOLDENHAUER
MOBILE SPRAYER APPARATUS

3,086,713

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5 Sheets-Sheet 1

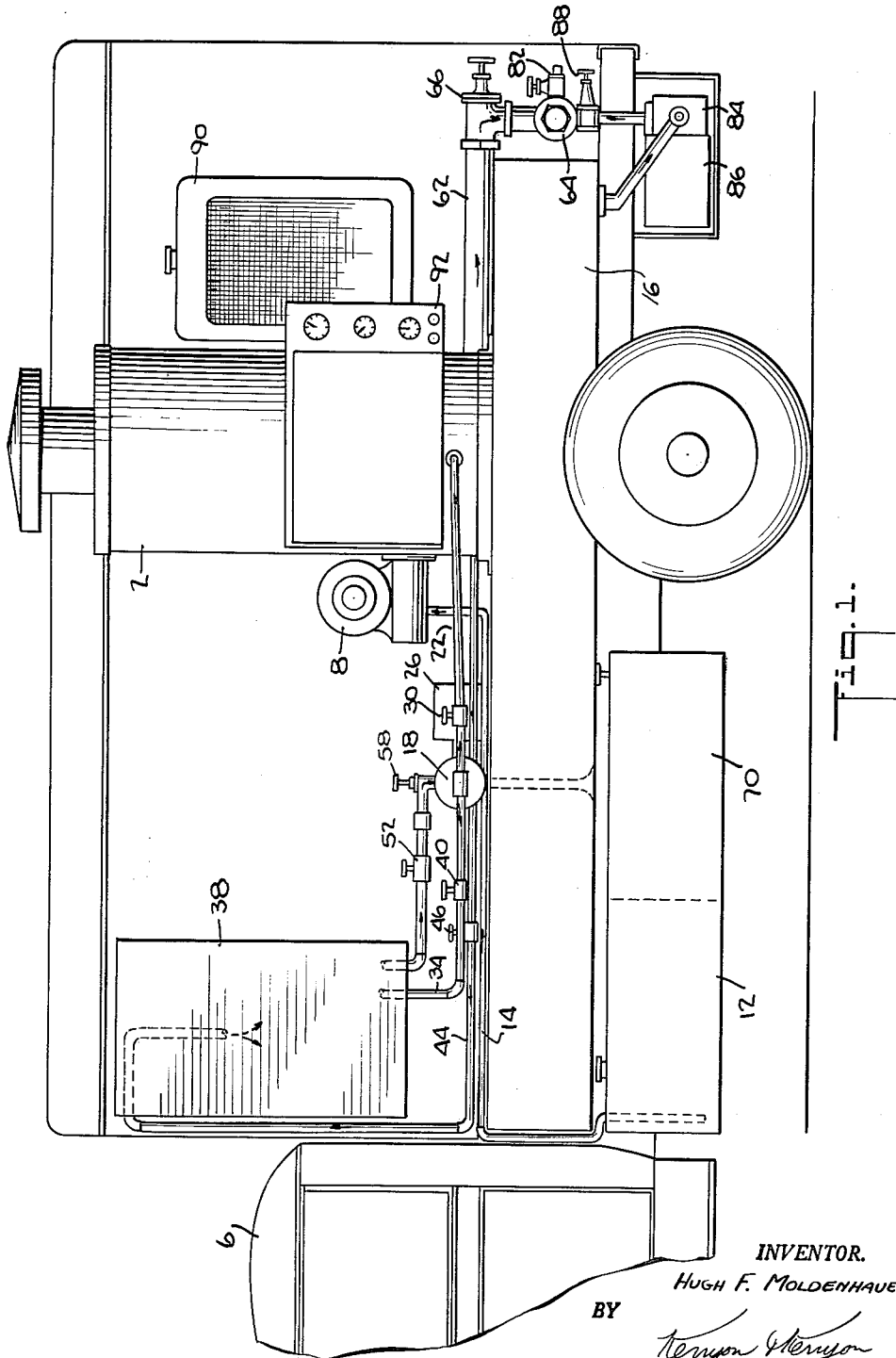


Fig. 1.

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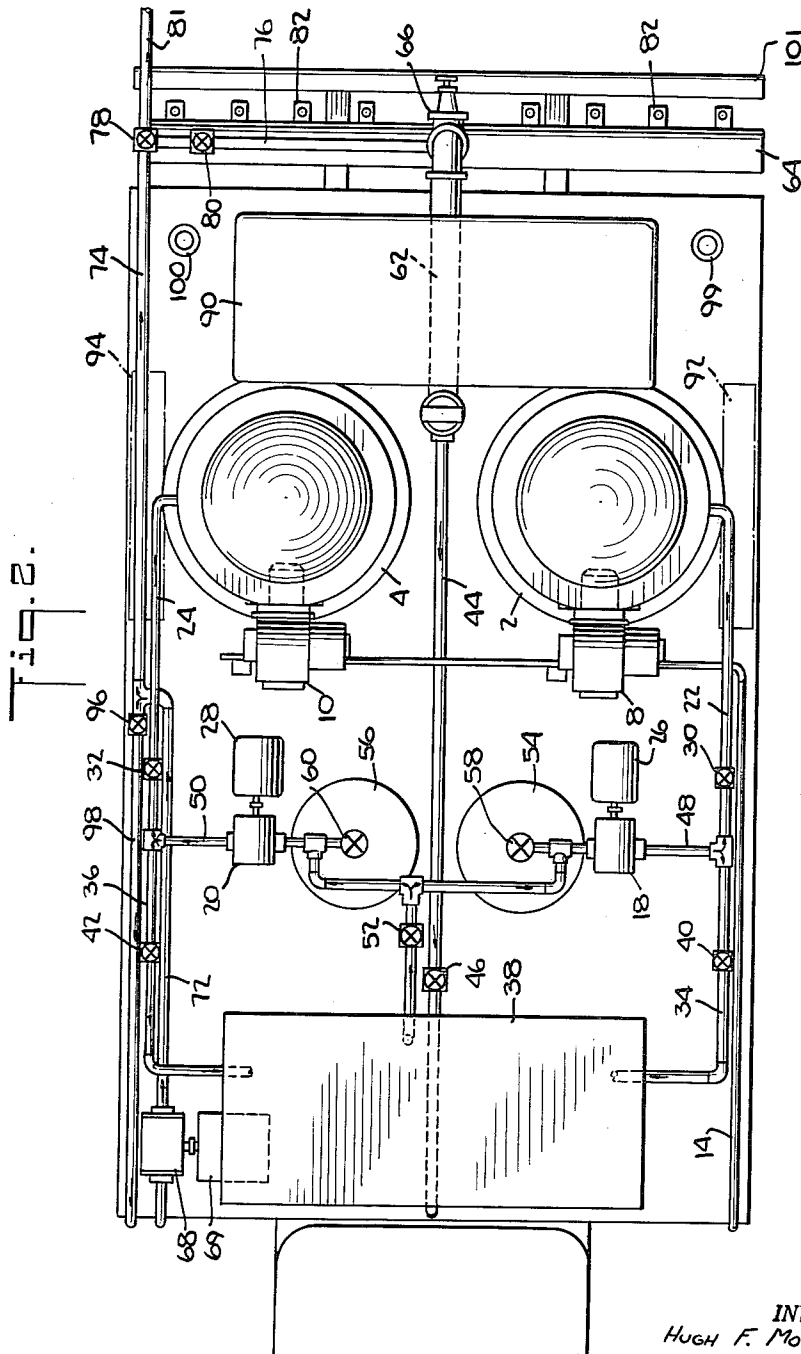


Fig. 2.

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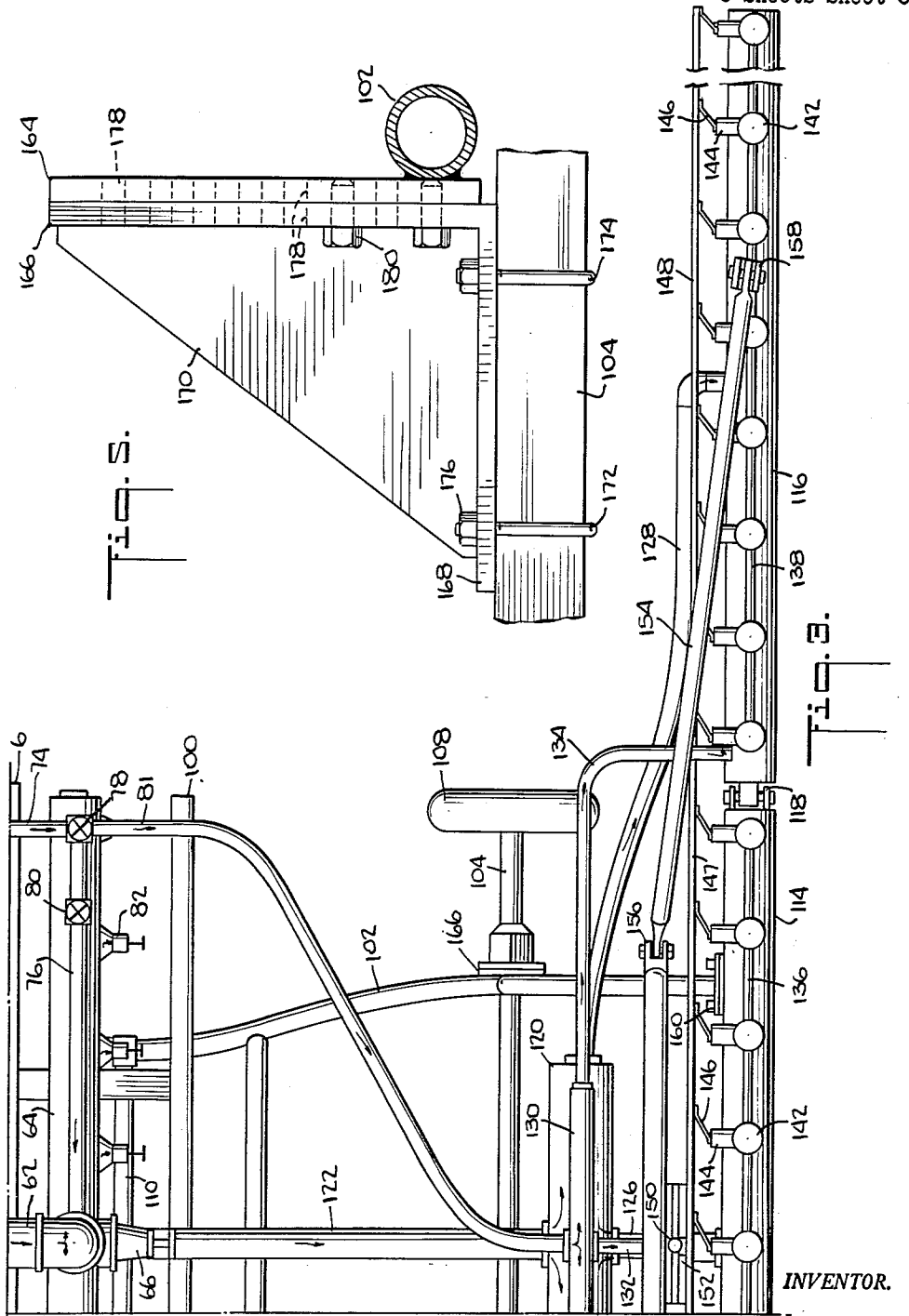
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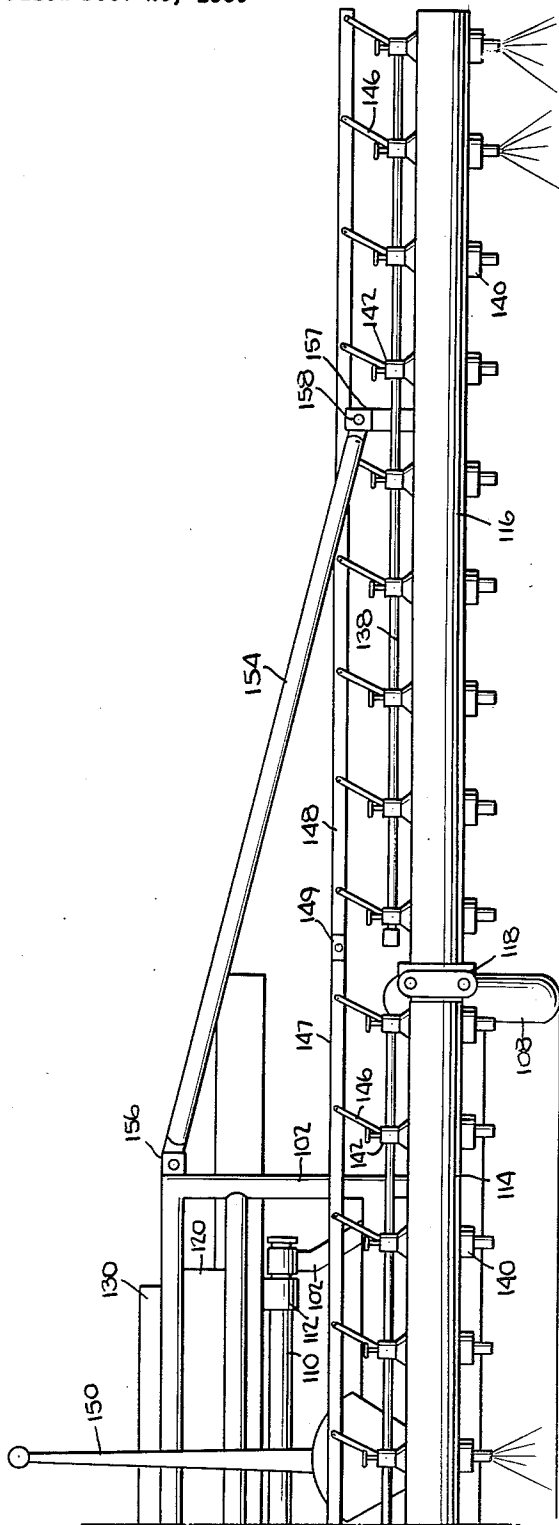


Fig. 4.

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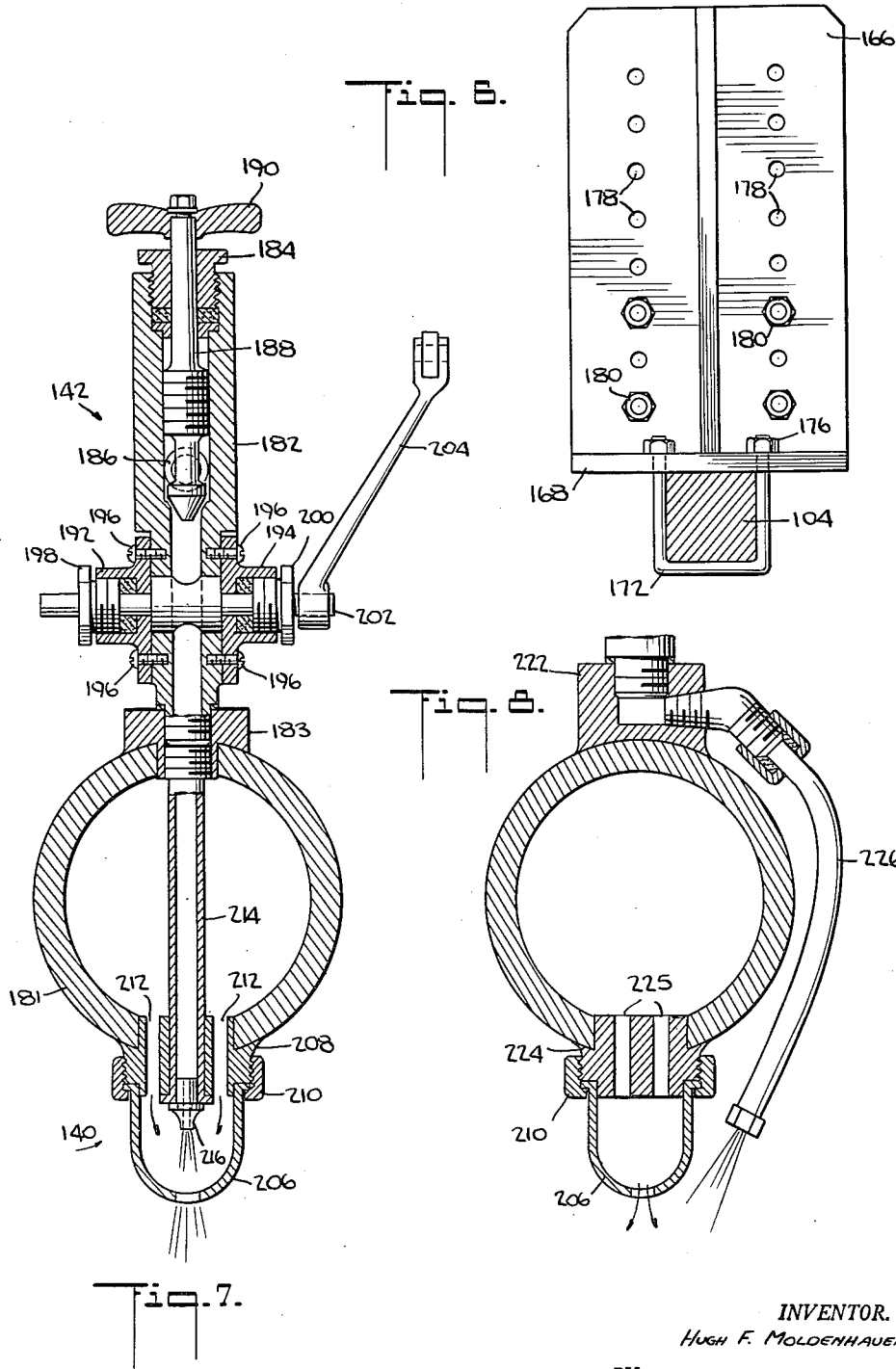
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5 Sheets-Sheet 5



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3,086,713

MOBILE SPRAYER APPARATUS

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6 Claims. (Cl. 239-136)

This invention relates to mobile sprayer apparatus and more particularly to mobile apparatus for providing water, steam or air separately or in combination with chemicals or detergents for application to surfaces or the like.

The present invention is designed to be used in industry and in the field of public service generally where it is necessary to apply a wide range of materials to various surfaces such as roads, parking areas, bridges, airport runways and aprons, shipyards, etc.

Water, steam, air, or other propellant separately or in combination with a wide variety of chemicals or detergents may be ejected onto the desired surface. By choice of the proper mixture the instant invention may be used for cleansing purposes, for the prevention of fire by application of foam to runways or other gas soaked areas, or for the spraying of insecticide or other materials on crops, grass or weeds.

By the use of a single compact unit the necessity of separate units for power, steam generation and materials storage is obviated by the present invention. Its compactness and self-contained character is such that it may be operated by a single unskilled workman who also can act as driver when moving from place to place. Thus, minimum cost in labor and materials is obtained without sacrifice of maximum efficiency.

Built into the control unit of the present invention are safety devices which will shut down operation when pressures become excessive or when fuel, water or chemicals run low. Through the use of a series of solenoid valves and thermostats the entire operation may be made automatic. The capacity of the spraying apparatus herein described is such that an entire day's operation may be completed without replenishing supplies. On the other hand, supply tanks may be refilled without stopping operation.

One object of this invention is to provide sprayer apparatus that is mobile and which may be operated by a single unskilled workman.

Another object of this invention is to provide sprayer apparatus that can apply steam, air or water separately or in combination with chemicals or detergents to a wide variety of surfaces from a single self-contained unit.

A further object of this invention is to provide mobile sprayer apparatus which can be made to operate completely automatically.

A still further object of this invention is to provide sprayer apparatus whose spraying element can cover a wide ground area and can be raised or lowered to suit the various materials used.

A still further object of this invention is to provide sprayer apparatus whose plurality of spraying units may be individually controlled as to the quantity and quality of mixture to be applied at a given point.

In general this invention utilizes a pair of steam generators mounted on a truck to create steam from water pumped from a water supply tank. The generators are heated by burners which are supplied fuel from a fuel supply tank. A portion of the steam is used to heat water in a water tank, said heated water being combined with the cold water supplied to the generator to preheat said cold water. Detergent or other chemical is combined with the steam from the generator in a plurality of spray nozzles which expel the mixture on the desired surface.

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In the accompanying drawings where like numerals refer to like elements:

FIG. 1 is a side elevation of a truck equipped with the spray apparatus of the instant invention;

5 FIG. 2 is a top plan view of the spray apparatus shown in FIG. 1;

FIG. 3 is a partial top plan view of a portable spraying unit that may be attached to the main spray apparatus;

FIG. 4 is a partial rear view of the portable spraying unit shown in FIG. 3;

FIG. 5 is a sectional side view of the adjustable support bracket;

FIG. 6 is a front view of the adjustable support bracket shown in FIG. 5;

FIG. 7 is an exploded cross-sectional view of an embodiment of valve and internal mixing spray nozzle assemblies; and

FIG. 8 is an exploded cross-sectional view of another embodiment of a spray nozzle assembly with external mixing.

More particularly now referring to FIGS. 1 and 2, there is provided a pair of steam generators 2 and 4 mounted on a truck 6 heated by burners 8 and 10. Fuel is supplied to burners 8 and 10 through supply line 14 from fuel tank 12. Water from a two-compartment water supply tank 16 is pumped by means of pumps 18 and 20 to generators 2 and 4 respectively through lines 22 and 24 respectively. Pumps 18 and 20 are driven by motors 26 and 28 respectively. Respective valves 30 and 32 control the supply of water to generators 2 and 4.

Water is also pumped through lines 34 and 36 to water tank 38. Respective valves 40 and 42 control water flowing through lines 34 and 36.

Steam from generators 2 and 4 is supplied under pressure to tank 38 through line 44, valve 46 controlling the quantity supplied. The steam heats the water in the tank and this hot water is mixed with the cold water being pumped from tank 16, in lines 48 and 50, with valve 52 controlling the supply of hot water from tank 38. The mixture of hot and cold water is fed to steam generators 2 and 4 and recirculated to tank 38.

Manholes 54 and 56 provide access to water supply tank 16 for cleaning and repair purposes.

Valves 58 and 60 control the supply of water from the two compartments of tank 16.

Steam from generators 2 and 4 is fed through steam line 62 to main distribution chamber 64. Valve 66 controls the supply of steam to chamber 64.

A pump 68 driven by motor 69 pumps detergent or other chemicals from tank 70 through lines 72, 74 and 76 to chamber 64 where it is mixed with steam. Control valve 78 is a three-way valve which allows detergents or other chemicals to flow either into line 76 or line 81 which supplies these materials to a portable spraying unit to be hereinafter described. Valve 80 controls the supply of detergent to main distribution chamber 64. A plurality of metering valves 82 control the spray of the steam-detergent or chemical mixture through flexible hoses (not shown) onto the surface to be treated.

A cold water pump 84 driven by motor 86 may be used to deliver water to chamber 64 instead of steam, there to be mixed with the desired chemical from tank 70 and emitted through valves 82. Valve 88 controls the supply of water fed to chamber 64.

Power generator 90 supplies the essential electric power for pump motors 26, 28, 69, 84, for burners 8 and 10 and for the various control functions of control units 92 and 94.

If a certain pressure is exceeded in detergent line 74, bypass valve 96 will be opened and detergent will be returned to tank 70 via line 98.

The two compartments of water tank 16 may be refilled by removing filler caps 99 and 100. Bumper 101 is provided on truck 6.

FIGS. 3 and 4 show a partial view of a portable spray unit comprising a main frame assembly 102 mounted on an axle 104 by means of adjustable support bracket 106. Axle 104 is provided with tire 108.

Tie rod 110 couples main frame assembly 102 of the spray unit to bracket 112 of truck 6.

Main frame assembly 102 supports a hollow center spray bar 114 to which is affixed a hollow end spray bar 116 by means of hinge assembly 118.

A steam service tank 120 is supplied steam from steam line 62 by means of steam feed line 122. Not shown is a valve on feed line 122 located just below main valve 66 which controls the quantity of steam supplied tank 120. Steam from service tank 120 is fed to spray bars 114 and 116 by steam supply lines 126 and 128.

A chemical service tank 130 mounted on steam service tank 120 is supplied chemical mixtures by chemical feed line 81. Chemical supply lines 132 and 134 supply chemical distribution lines 136 and 138.

A plurality of spray nozzle assemblies 140 are mounted on spray bars 114 and 116. A plurality of control valves 142 control the supply of detergent from lines 136 and 138 to be fed to nozzle assemblies 140.

Control valves 142 are equipped with on-off valves 144. Linkages 146 connect valves 144 to a tie bar comprising members 147 and 149 linked by hinge pin 149, said tie bar being connected to control lever 150 by means of linkage 152. This control lever 150 can turn all of the valves 142 on or off simultaneously.

A brace 154 is attached to main frame assembly 102 by means of hinge assembly 156 to bracket 157 on spray bar 116 by means of hinge assembly 158.

Coupling 160 secures center spray bar 114 to main frame assembly 102. The portion of the portable spray unit not shown is an identical duplicate of that shown.

Referring to FIGS. 5 and 6, adjustable support bracket 106 consists of plate 164 welded to frame assembly 102. Plates 166, 168 and 170 are welded together to form a single unitary construction secured to axle 104 by means of U-bolts 172 and 174 and nuts 176.

Plates 164 and 166 each contain two columns of equally spaced holes 172, the holes on each plate being aligned with one another. Cap screws 180 fasten plates 164 and 166 together.

Referring now to FIG. 7, spray bar 181 is mounted with control valve 142 and spray nozzle assembly 140. Valve 142 consists of a hollow member 182 screwed into weld plug 183 on bar 181. A plug 184 is screwed into the upper end of member 182. A port 186 in member 182 receives detergent or chemicals from distribution line 136 or 138 (shown in FIG. 4). A cock 188 with handle 190 mounted in plug 186 and member 182 controls the amount of chemical or detergent to be fed nozzle assembly 140.

Flanges 192 and 194 are bolted to member 182 by bolts 196. Plugs 198 and 200 are screwed into flanges 192 and 194 respectively. Valve 202 provided with lever 204 is mounted in plugs 198 and 200, flanges 192 and 194 and member 182 pass and are used to shut off the supply of chemical or detergent to nozzle assembly 140.

Nozzle assembly 140 consists of a nozzle 206 secured to weld plug 208 on bar 181 by means of lock ring 210. Weld plug 208 contains a plurality of passages 212 for passing steam, water or air to nozzle 206. Chemical or detergent is fed to nozzle 206 from member 182 by means of tube 214 through feed tip 216 mounted on tube 214.

FIG. 8 shows an external mixing arrangement comprising hollow spray bar 220, weld plugs 222 and 224 mounted thereon, nozzle 206 mounted on plug 224 by lock ring 210 and external tube 226 connected to the inner portion of weld plug 222. Valve assembly 142 (shown in FIG. 7) may be screwed into weld plug 222.

In operation, water from supply tank 16 is pumped to tank 38 and steam generators 2 and 4 by pumps 18 and 20. Generators 2 and 4 are heated by burners 8 and 10 which are supplied fuel from tank 12. Steam from generators 2 and 4 is fed back to tank 38 via line 44 to heat the water therein. This hot water is combined with the cold water from tank 16 in lines 48 and 50 to heat said cold water and the combined water is fed back to tank 38 and to generators 2 and 4.

It will be seen that soon after starting operation pre-heated water will be fed to generators 2 and 4 thus increasing their efficiency. The greater portion of the steam from generators 2 and 4 is fed to chamber 64 where it is mixed with detergent or chemicals pumped from tank 70 by pump 68 and may be applied to the desired surface through valve 82 by connections to flexible hoses (not shown).

As hereinabove described, cold water may also be mixed with the chemical or detergent and applied to the desired surface.

Alternately, where it is desired to cover a greater area than is possible using chamber 64 alone, a portable spray bar shown in FIGS. 3 and 4 may be coupled to the truck.

Spray bars 114 and 116 are fed steam from steam line 62 on truck 6 via line 122, service tank 120 and feed lines 126 and 128 respectively.

Detergent or other chemical is fed from truck 6 to nozzle assemblies 140 on bars 114 and 116 via feed line 81, service tank 130, lines 132 and 134, distribution lines 136 and 138 and valves 142 which control the quantity thereto. The steam and chemical are mixed in nozzle assemblies 140 and sprayed therefrom onto the desired surfaces.

The entire spray assembly may be raised or lowered by means of adjustable bracket 106 shown in detail in FIGS. 5 and 6. This allows tailoring of the cone of the spray and the area to be covered by each nozzle to the particular mixture being used. Further, the spray bars may be shielded to control the peripheral mist of the spray cones. Outboard bar 116 is hinged so that it may be folded up out of the way when not in use or when moving from one work area to the next.

By means of lever 150 all of the valves 142 may be opened or closed simultaneously, thus obviating the time consuming task of turning on each nozzle separately.

The operation of the valve and spray assemblies of FIGS. 7 and 8 is as follows: the quantity of chemical or detergent flowing to nozzle assembly 140 from port 186 is controlled by stop cock 188, and valve 200 is used to block or pass this quantity in its entirety. Steam from chamber 181 flows through passages 212 into the internal area of nozzle 206 where it mixes with chemical or detergent which has passed through tube 214 and feed tip 216. This mixture is sprayed from nozzle 206 onto the desired surface.

FIG. 8 is similar to FIG. 7 except that the chemical or detergent passes through external tube 226 and mixes with the steam ejected from nozzle 206 externally of the nozzle, this mixture being applied to the desired surface.

By control of the chemical or detergent supplied to each spray assembly, the quantity and quality of the mixture at a given point may be regulated.

If varying conditions necessitate it, a wide variety of feed tips and nozzles may be substituted for feed tip 216 and nozzle 206 shown. This may be done on the job in a matter of minutes since all that is necessary is removing lock ring 210, substituting the new tip and nozzle for tip 216 and nozzle 206 and replacing lock ring 210.

Thus the use of the portable spraying unit with its height adjustable spray bars, its individually controlled spray assemblies, its external or internal mixing arrangement and its interchangeable tips and nozzles provides great flexibility and versatility to the main spray unit. As indicated hereinabove water may be supplied in place

of steam to be mixed with the chemical or detergent in the portable spray assembly.

An air compressor unit may be mounted on truck 6 to supply compressed air to chamber 64 and spray bars 114 and 116 instead of steam or water. The air may 5 then be mixed with any suitable chemical and this mixture sprayed on the desired area.

Where steam is used it is preferable that the pressure be maintained at 125 to 350 p.s.i.g. per generator although this will vary depending on the chemical used and the 10 pressure required for a particular job.

It is understood that variations in or equivalents of the hereinabove described apparatus may be used by those skilled in the art without departing from the spirit and scope of this invention.

I claim:

1. Mobile spray apparatus including in combination a first container for storing a supply of water, a second container for storing a supply of chemicals, a steam generator, means for feeding water from said first container 20 to said steam generator, a water tank, means for feeding water from said first container to said water tank, means for feeding steam from said generator to said water tank to heat said water in said tank, means for mixing said 25 heated water from said water tank with the said water being fed from said first container to said steam generator thereby to preheat said water being fed to said steam generator, a mixing chamber, means for feeding steam from said generator to said chamber in controlled amounts, means for feeding chemicals from said second 30 container to said mixing chamber in controlled amounts there to be mixed with said steam, and a plurality of valves for expelling said mixture of steam and chemicals from said chamber in a plurality of sprays.

2. Mobile sprayer apparatus including in combination 35 a first container for storing a supply of water, a second container for storing a supply of chemicals, a plurality of steam generators, means for feeding water from said first container to said plurality of steam generators, means for preheating said water before it is fed to said plurality 40 of generators, a mixing chamber, means for feeding steam from said plurality of generators to said chamber in controlled amounts, means for feeding chemicals from said second container to said mixing chamber in controlled 45 amounts there to be mixed with said steam, and a plurality of valves for expelling said mixture of steam and chemicals from said chamber in a plurality of sprays.

3. Mobile sprayer apparatus as in claim 2 wherein said water preheating means comprises a water tank, means for feeding water from said first container to said 50 water tank, means for feeding steam from said plurality of generators to said water tank to heat said water in said tank, means for mixing said heated water from said water tank with the said water being fed from said first container to said plurality of steam generators thereby 55 to preheat said water being fed to said generators.

4. Spray apparatus comprising a vehicle, a first container for storing water mounted on said vehicle, a second container for storing chemicals mounted on said 60 vehicle, steam generating means mounted on said vehicle, means for feeding water from said first container to said generating means, means for preheating said water before it is fed to said generating means, a portable spray tank having a plurality of internal chambers cou-

pled to said vehicle, means for feeding steam from said generating means to said internal chambers, a plurality of spray nozzles in communion with the respective internal chambers of said spray tank, means for feeding 5 chemicals from said second container to said plurality of spray nozzles, a plurality of means, one for each spray nozzle, for controlling the quantity of chemicals fed to each of said nozzles so that steam and chemicals are mixed in said nozzles and ejected therefrom in a plu- 10 rality of individually regulated sprays.

5. Sprayer apparatus to be mounted on a vehicle including in combination a two compartment container for storing a supply of water, a second container for storing a supply of chemicals, a pair of steam generators, a water tank, means for feeding water from said first 15 container to said water tank, means for feeding water from each of the compartments of said first container to each of said steam generators respectively, means for feeding steam from said generators to said water tank to heat said water contained therein, means for mixing 20 said heated water from said tank with said water being fed from said first container to said generators thereby to preheat said water being fed to said generators, a three member portable spray bar, said first member and said 25 second member being hingedly connected at respective ends of said third member, each of said members having an internal chamber, respective means for feeding steam from said steam generators to the internal chambers of said members, a plurality of spray nozzles mounted on 30 each of said members and in communion with the respective internal chambers thereof, respective means for feeding chemicals from said second container to said plurality of spray nozzles, a plurality of means, one for 35 each spray nozzle, for controlling the quantity of chemicals fed to each of said nozzles so that steam and chemicals are mixed in said nozzles and ejected therefrom in a plurality of individually regulated sprays and means for adjusting the height of said spray bar relative to the 40 ground.

6. Spray apparatus comprising a vehicle, a first container for storing water mounted on said vehicle, a second container for storing chemicals mounted on said 45 vehicle, steam generating means mounted on said vehicle, means for feeding water from said first container to said generating means, means for preheating said water before it is fed to said generating means, a portable spray tank having a plurality of internal chambers cou- 50 pled to said vehicle, means for feeding steam from said generating means to said internal chambers, a plurality of spray nozzles in communion with the respective internal chambers of said spray tank, and means for feeding 55 chemicals from said second container in controlled quantities externally of said nozzles in such manner that the steam ejected from said nozzles and said chemicals are mixed externally of said nozzles.

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