

April 24, 1928.

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A. H. THOMPSON ET AL

APPARATUS FOR CLEANSING AND DISINFECTING

Filed Dec. 1, 1924

2 Sheets-Sheet 1

Fig. 1.

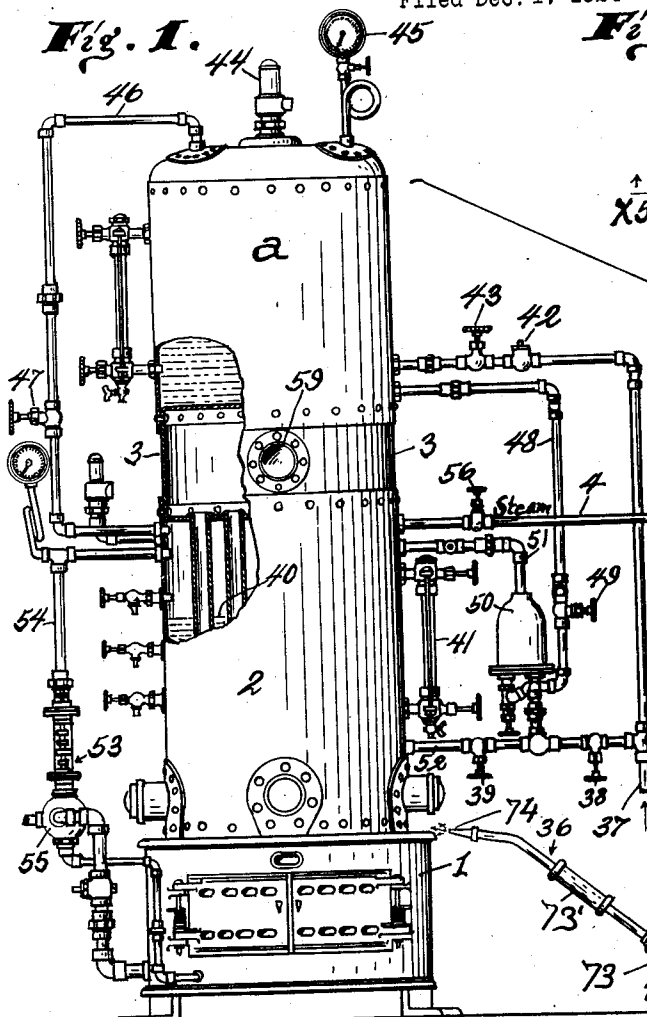


Fig. 2.

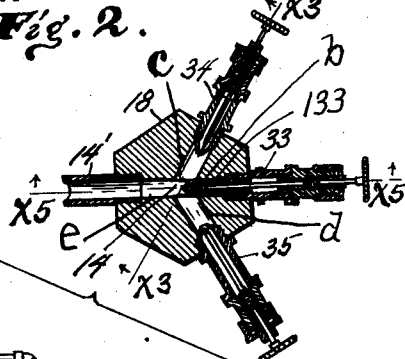


Fig. 3.

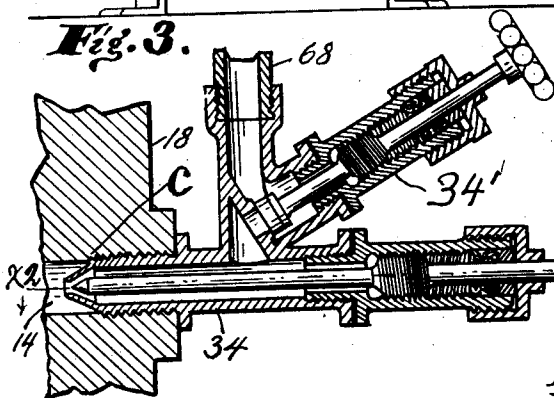
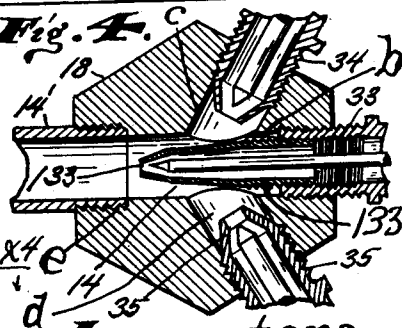


Fig. 4.



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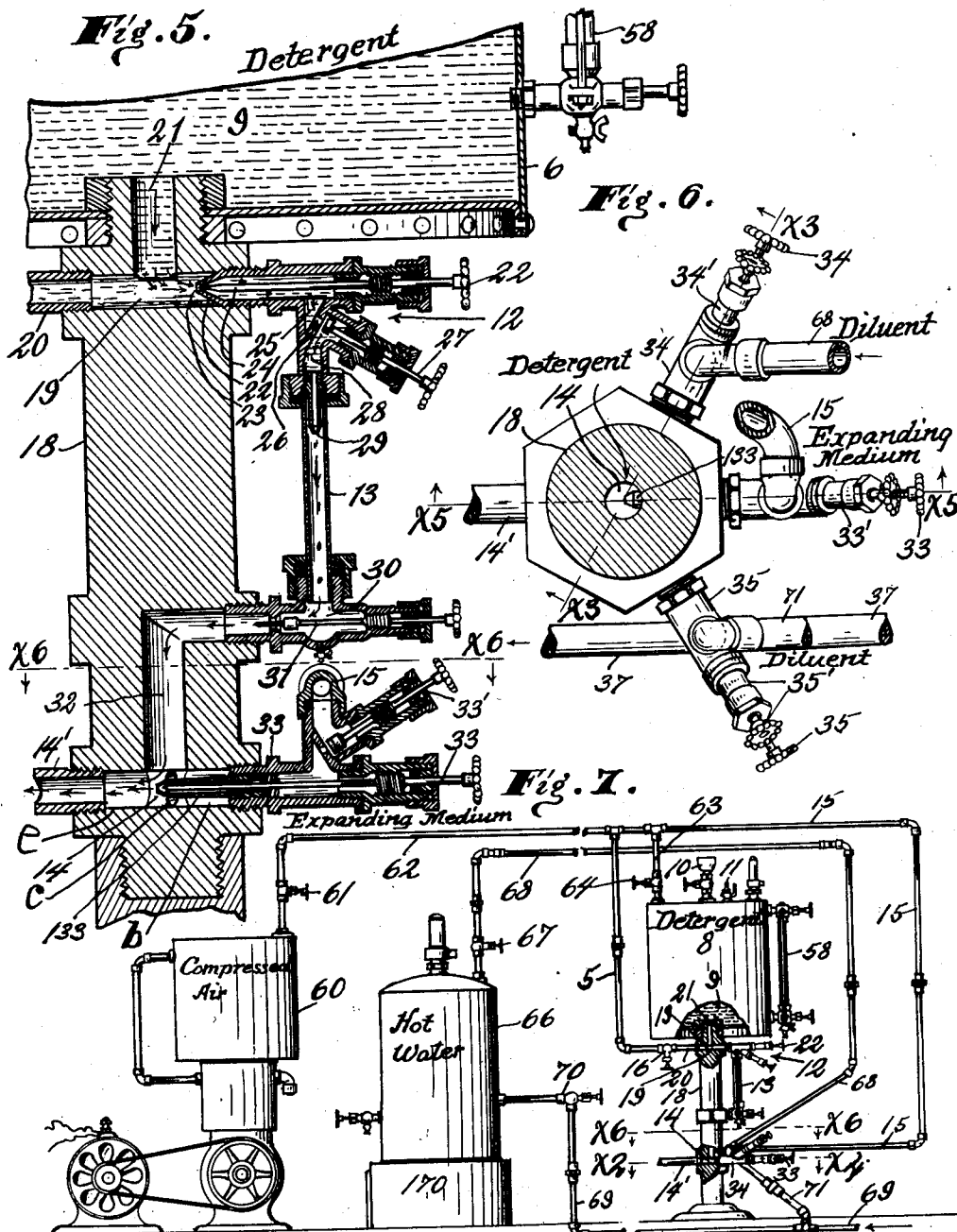
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APPARATUS FOR CLEANSING AND DISINFECTING

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2 Sheets-Sheet 2



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Patented Apr. 24, 1928.

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR CLEANSING AND DISINFECTING.

Application filed December 1, 1924. Serial No. 753,392.

This discovery and invention is applicable for cleaning and removing foreign matter such as dirt, mud, oil, grease, tar, ink, stains, paint, varnish and other undesired accumulations or applications from numerous articles and materials; also for disinfecting and destroying vegetable and animal life, and for cleaning and disinfecting rugs, furniture, walls, carpets, etc.; also for cleaning automobiles and the like, and the surfaces of buildings, stucco walls, and tunnel walls; also for destroying fungus growth in swimming pools, and drinking fountains, and for destroying bugs, roaches, flies and other vermin.

The apparatus is adapted for installation and use in rug factories, carpet works, dye shops, slaughter houses, meat markets, oil refineries, kitchens, restaurants, cafes, cafeterias, auto cleaning racks, garages, and other places, as will be understood from the description hereinafter set forth.

Heretofore it has been common to apply insecticides, disinfectants and cleansing agents through the medium of a suitable vehicle as water, which may hold the destructive or cleansing agent in solution; but such application has heretofore been accomplished by placing a quantity of the solution in a chamber and discharging such solution under pressure from such chamber through a suitable nozzle to the place of use.

We have discovered that with different classes of work, it is essential that different pressures, different temperatures, different mixtures and different densities be employed to accomplish certain results. An object is to facilitate such changes.

For convenience of description we shall hereinafter refer to the cleansing, disinfecting and organism destroying substance as a detergent; it being understood that the application of any of these agents is analogous to the others.

We have discovered that by delivering independently of each other to a narrow confined space having a restricted outlet, a supply of detergent or other active agent and a supply of water or other diluent, each of said supplies being under a pressure greater than atmospheric, and delivering to such agent and diluent in such space an expansive medium at a pressure that would cause such medium to expand in said space, and to thereby atomize or vaporize the detergent

and diluent and to mix in such space the product thus formed and drive through such outlet to the open air the resulting mixture and applying such mixture in a spray or fog to the surface, place or material to be cleansed or disinfected; the work of cleansing and disinfecting such surfaces or places can be performed more perfectly and more easily than heretofore; and also that the character of the disinfecting spray can be accurately predetermined by independently regulating the supplies of the active agent, the diluent and the expansive medium, respectively, and that the best results may be obtained by appropriate regulation of the detergent, the diluent and the expansive medium, respectively, to vary the proportions of the same going to make up the spray finally delivered from the nozzle to the surface, material or place to be cleansed or disinfected, at a predetermined strength.

An object is to provide novel apparatus for applying the mixture from the nozzle with a predetermined pressure, and at a predetermined strength and temperature of mixture.

An object of our invention is to provide means whereby any combination of different pressures, different temperatures, different mixtures and different densities can be produced to meet a demand that is now existing and not supplied except by this invention, so far as we are aware.

The invention is also adapted to be applied by substituting for steam apparatus, a compressed air apparatus connected to the supply chamber to supply a detergent or cleansing substance to a mixing chamber with a connection from the air pressure producing apparatus to said mixing chamber, and a hot water generator to supply hot water to said mixing chamber, and a mixture of the detergent or other substance, with air and hot water supplied through a nozzle in any given strength of such substance at any practical pressure, temperature and density that may be determined upon, and to discharge the same where desired.

An object is to enable the operator to safely clean surfaces or materials that would be damaged or spoiled by detergents of too rich or strong character, of too high temperature, or at too high pressure, or some combination of richness, temperature, pressure and density.

An object is to make it practical to use this apparatus with safety in locations such as in cleaning establishments, dye works, automobiles, garages, cleaning stations, oil refineries, etc., where it would be hazardous to operate the system with a heating element.

We have made provision whereby the steam generating element used in the steam cleaning system can be installed in a location protected from danger, and steam carried from the steam generator to the detergent chamber and also to the mixing and distributing apparatus located where the work is to be executed, or whereby different apparatuses may be installed in different locations, connected to the same steam generating apparatus.

It is not as practical to use a mixing and supply apparatus at any great distance from the work as it is near the same, due to the condensation and loss of pressure and temperature that occurs in the distributing line from the apparatus to the nozzle.

With this invention it is possible and practical to locate the steam generating apparatus in a safe and suitable location and connect steam to the apparatus or to apparatuses located in different locations and each unit will be independent of the other.

In some instances a hot water heating generator may be connected to the mixing chamber of the cleaning apparatus and hot water supplied to mixing and distributing chambers, and delivery made at the nozzle at different temperatures by a supply of compressed air to atomize the combination of water and detergent in a proper mixture, that may be regulated, and sufficient cutting force applied to remove the foreign matter from the material or place to be cleaned.

With a connection from a source of air supply, applied to the detergent chamber to create a pressure upon the detergent therein to deliver the detergent to the mixing chamber, and adding an expansive medium to perfect the mixture and to expel the same from the chamber, it is possible and practical to locate said air pressure producing apparatus in one location, the hot water heating apparatus in some other convenient and safe location, and the cleaning apparatus or apparatuses located near the work to be done, making it possible for the discovery and invention to be used with high efficiency without danger to life or limb from fire or explosion under any conditions likely to be encountered.

It is desirable in operating with a predetermined strength of detergent, to be able to stop the discharge of detergent while changing from one article to another and to be able to continue with the same strength of spray.

An object of the invention is to adapt the

same to intermittent use without changing the adjustment. For example; in cleaning rugs, it may be found desirable at the outset to apply detergent with steam or air with a liquid diluent as hot or cold water to a portion of the rug, and then to shut off the detergent and apply only steam, or steam and water, or only water; and then with the next rug it may be desirable to treat the rug with detergent, steam and water; and we have made provision whereby intermittent and varied use of the apparatus can be had and return to the exact predetermined proportions of the various agents and vehicles used; and this is effected by providing for each supply device, both a regulating valve and a control valve; the regulating valves being set to predetermine the maximum flow, and the control valves being adapted to turn on and cut off the flow through the regulating valve.

An object of the invention is to enable the operator to effect a mixture of the detergent, the diluent and the pressure medium or vehicle without retarding the flow of the diluent or the active cleansing agent, in case, from any cause, the spraying orifice produces a back pressure on those two supplies. This is effected by the addition of the expansive medium in the narrow passage to perfect the mixture and to eject the same from the passage toward the nozzle.

Other objects, advantages and features of invention and discovery may appear from the accompanying drawings, the subjoined detailed description and the appended claims.

The discovery and invention may be understood by reference to the accompanying drawings, which illustrate apparatus constructed in accordance with the invention.

Figure 1 is a fragmental elevation partly in vertical section, of a steam operated apparatus involving this invention, and discovery.

Fig. 2 is a horizontal section on line x^2-x^4 , Figs. 1, 3 and 7.

Fig. 3 is a vertical section in a larger scale, of the valve assembly on line x^3 , Figs. 2 and 6. The regulating valve is set and the control valve is closed.

Fig. 4 is an enlarged fragmental horizontal section on the plane indicated by line x^2-x^4 , Figs. 1, 3 and 7.

Fig. 5 is an enlarged vertical section on line indicated at x^5 , Fig. 6, for the use respectively of steam or air, hot water or cold water with a cleansing, disinfecting or other agent.

Fig. 6 is a fragmental plan view in section on line x^6 , Figs. 1 and 7.

Fig. 7 is an elevation of an apparatus constructed in accordance with this invention adapted for applying air pressure instead

of steam pressure with the use of a hot water heater.

Like reference characters in the several views indicate like parts.

In Fig. 1, the character 1 indicates a heating element for generating steam in a boiler 2, which is shown as a tubular boiler above which is a drum 3 to apply to the storage feedwater supply reservoir *a*, heat from the hot gases escaping from the boiler tubes. A steam pipe 4 connected to the boiler 2 delivers steam through a manifold 5, pressure valve 6, and pressure pipe 7, to the upper part of the detergent storage chamber 8, which is adapted to contain a detergent substance 9, preferably a solution.

The detergent storage chamber 8 is provided with filling means 10 and a vent cock 11. Pressure is applied from the steam generating apparatus to the detergent contents 9 of the detergent chamber through pipe 4, manifold 5, pressure valve 6 and pipe 7. 12 is a valve controlled connection from said chamber 8 through a glass sight feed supply tube 13, and onward to the mixing chamber 14.

We combine with the mixing chamber 14, means for supplying the detergent substance, and steam and a diluent as hot or cold water, to said mixing chamber 14 which has an outlet 14' for the delivery of the desired mixture under predetermined temperatures and pressures; the steam being delivered by the pipe line 4, 5 and 15 when the by-pass valve 16 is closed and the straight-away valve 17 is open.

18 is a solid column provided with a chamber 19 communicating with the valved by-pass pipe 20 and connected to the detergent chamber 8 by the passage 21 so that when the by-pass valve 16 is closed, the detergent 9 may flow into and fill the chamber 19.

22 is a valve to regulate flow of detergent from chamber 19; and the same is shown as provided with an orifice 23 of small diameter, and a needle 24 for regulating the same to predetermine the flow of the detergent liquid from the chamber 8 through the passage 21, chamber 19, valve chamber 25, valve 27, valve chamber 28, drip nozzle 29, and sight feed glass 13 from which the detergent may flow through a port 26, that may be closed by the valve 27, and when opened, allows the detergent liquid to drip into chamber 28, through the drip nozzle 29 to the sight feed tube 13 whence it flows to the valve chamber 30 through a controlling valve 31, that allows the detergent to flow through chamber 32 into mixing chamber 14.

Valve 33 is provided with an ejector shown as an adjustable nozzle 133 that can be moved toward and from the vertical axis of the cylindrical passage or chamber 32 so

that the discharge end of the nozzle can be arranged for the air or steam discharging therethrough to best act on the detergent falling from chamber 32 into the chamber 14 where the detergent will be subjected to the action of the mixing and delivery agents or vehicles, as water, steam or air admitted to the chamber through the valves 33, 34 and 35, which are shown as needle valves; the valve 33 being for delivery under pressure of a non-liquid fluid, such as air or steam, the valve 34 being a hot water delivery valve and valve 35 a cold water delivery valve.

The outlet 14' may be a hose provided with a nozzle 36.

37 indicates the valved feed water supply pipe leading from a service main or other source of supply through valves 38 and 39, and leading into boiler 2 to fill the same to the water line 40, which is determined by observation through the sight water glass 41. Said feed water supply pipe also leads through the check valve 42 and globe valve 43 into the feed water supply tank *a* which is provided with the manually operated vent valve 44 to allow the escape of air, or steam, and with the gage 45 to register the pressure.

When the boiler is filled to the water line 40 and the storage supply chamber *a* is filled to the vent 44, the valves 43 and 38 are closed by the operator.

46 is an equalizing pipe leading from the top of the boiler 2 to the top of the water storage reservoir *a*, and controlled by a globe valve 47 which is ordinarily left open during operation after the storage reservoir *a* has been filled as just described.

48 is a feed water supply pipe to supply feed water from the reservoir *a* to the boiler through the globe valve 49, the automatic water feed 50, which is connected with the top of the boiler through pipe 51 and with the boiler below the water line through the valve 39 and pipe 52.

Preferably the fire in the fire box 1 will be controlled automatically through a suitable controlling device 53 under boiler pressure through pipe 54 and gas valve 55.

56 is a valve controlling the steam pipe 4. In practical operation when the boiler 2 and reservoir *a* have been filled, the valves 38 and 43 are closed.

Valves 16 and 17 are closed and the detergent reservoir 8 is filled through the valve 10 which is then closed. The vent 11 is also closed. 57 is a safety valve on the detergent reservoir and 58 a sight glass for said reservoir.

59 is the smoke vent leading from the drum to a stack, not shown.

In Fig. 7, 60 is an air compressor supplying air through the valve 61 and compressed air pipe 62 to the pressure pipe 63 and valve 64 into the detergent chamber 8

and on through a supply regulating air pressure pipe 15 through valve 33 to supply air to the mixing chamber 14.

66 is a hot water generator connected to valve 34 through a valve 67 and pipe 68, to supply hot water to the mixing chamber 14 through the valve 34. See Fig. 6.

The air pressure from tank 60 is also applied through pipe 5, valve 16 and pipe 20 and passage 21 to the reservoir so that when valve 64 is closed and the valve 16 and vent 11 are open; the compressed air will cause an agitation of the contents of the reservoir 8, so that the mixture can be produced or maintained by closing the connections at the top of the reservoir 8 and opening valve 22. See Fig. 7.

The compressed air, (or steam) may operate to clear said valves and the succeeding valves, and to blow any sediment out through the nozzle 36.

The cold water main 69 leads through valve 70 into the water heater 66, which is provided with the heating element 170, and said cold water pipe 69 is connected by a branch 71 with the water valve 35 to supply cold water to the mixing chamber. See Fig. 6.

The operation of either apparatus is readily understood from the foregoing.

The operator observing the sight feed and manipulating the various valves may determine the exact proportions of detergent, hot water, cold water and steam or air from time to time as the work proceeds.

When desired, the detergent may be entirely cut off and the cleansed surface may be subjected to sprays of air and water, either hot or cold; or steam and water, or steam alone or air alone.

When the detergent reservoir 8 in Fig. 1, contains a charge of the detergent, and it is desired to stir up and agitate the contents of the reservoir 8, valves 6, and 17 are closed and vent 11 is opened. Then the valve 16 is turned on, allowing steam to agitate the mixture in chamber 8.

In Fig. 7 the agitation of the detergent may be effected in a similar manner.

There are provided for the regulating valves 33, 34 and 35 respectively, control valves 33', 34' and 35'. See Figs. 3, 5 and 6.

In practical operation the attendant will set the regulating valve 22 to allow a predetermined amount of detergent to flow from the chamber 19 to the control valve 27; the amount flowing through being sufficient to supply the sight glass 13 with required drops of detergent per second through the nozzle 29.

It is possible with an automatic gas fuel steam boiler manufactured by us in combination with this invention to use apparatus

for a long period without any attention; the length of time being controlled by the capacity of the feed water storage supply and detergent storage supply.

Also it is possible with an automatic gas water heater manufactured by us in combination with an air compressor, and this invention, to continue the operation of the apparatus for a long period without attention of the operator as to the storage supply of detergent; the length of time during which detergent may be discharged, being determined only by the capacity of the detergent chamber, and the delivery from such chamber.

The delivery of the mixture from chamber 14 is effected through a regulable nozzle so as to accommodate different pressures of the agents or vehicles employed; and this may be effected by supplying a hose adapted to serve as a nozzle of one diameter, and detachably securing thereonto a nozzle 36 having wooden or other non-heat conducting handles 73, 73' and a detachable nozzle tip 74 of successively less diameter so that the operator may employ a more or less restricted distributing outlet according to whether he uses the nozzle or tip, or the open pipe.

The modes of using the supply from the nozzle either formed by the end of a hose, a pipe or the nozzle tip may be numerous. For example, milk bottles, milk cans, or other vessels may be cleaned by putting the open mouth of such vessel in position to receive discharge from the pipe nozzle or tip, which may be stationary for the purpose; or the pipe 72 may be a flexible hose to be handled by the operator to direct the discharge of the mixture of the detergent and the expansive vehicle to any place desired; or as above indicated the nozzle may be supplied with a finer tip 74 to spray the expansive vehicle and the detergent mixed therewith in a finer spray.

The arrangement of the plurality of nozzles discharging into the mixing chamber 14 allows the detergent to be delivered at the pipe end or nozzle or the nozzle tip in any desired condition or character of spray and when the mixing nozzles 33, 34 and 35 have been set the mixture may be changed by closing any of the control valves 33', 34', or 35' without disturbing the adjustment of the mixing nozzle.

The ways *b*, *c*, *d* and *e* threaded to receive the connections 33, 34, 35 and 14' are angularly arranged to cause the mixture of detergent, expansive medium vehicle as steam or compressed air, and the diluent as hot or cold water to be well mixed on the way to the pipe end or nozzle.

One of the non-heat conducting handles, as handle 73 may be journalled on the rigid

nozzle 36 between the nuts 75 while the other handle 73' is fixed to such nozzle to facilitate handling such rigid nozzle.

By producing the mixture from a flow of the detergent and flow of steam coming together in the mixing chamber or passage 14 together with the diluent, the diluent, the detergent and the steam are amalgamated so that when the substance issues from the discharging nozzle 74 the diluent and the steam are evenly impregnated throughout and the spray is more thoroughly effective as a cleanser than under other conditions heretofore prevailing.

15 We claim:

1. A cleansing apparatus comprising a detergent chamber; a mixing chamber; means for delivering detergent from the detergent chamber to the mixing chamber; a steam generator; a source of cold water supply; a manifold connected to the steam generator and to the top of the detergent chamber; a valve in the manifold between the steam pipe and the top of the detergent chamber; a valved pipe between the manifold and the bottom of the detergent chamber; a bottom valved pipe from the manifold below the connection to the bottom of the detergent chamber; a nozzle connecting said bottom valved pipe from the manifold to the mixing chamber; means for supplying a regulated flow of detergent from the detergent chamber to the mixing chamber; means for supplying a regulated flow of cold water from the cold water supply to the mixing chamber; and means for discharging mixture from the mixing chamber.

2. A cleansing apparatus comprising a detergent chamber; a mixing chamber; means for delivering detergent from the detergent chamber to the mixing chamber; a steam generator; a steam pipe connected to the steam generator; a source of cold water supply; a manifold connected to the steam pipe, a valved pipe connecting the manifold with the top of the detergent

chamber; a valved pipe between the manifold and the bottom of the detergent chamber; a bottom valved pipe from the manifold; a nozzle connecting said bottom valved pipe from the manifold with the mixing chamber; means for supplying a regulated flow of detergent from the detergent chamber to the mixing chamber; means for supplying a regulated flow of cold water from the cold water supply to the mixing chamber; means for discharging mixture from the mixing chamber; and shut-off means respectively for the supply means independently of the regulating means.

3. A cleansing apparatus comprising a detergent chamber; a mixing chamber; means for delivering detergent from the detergent chamber to the mixing chamber; a steam generator; a source of cold water supply; a manifold connected to the steam generator and to the top of the detergent chamber; a valve in the manifold between the steam pipe and the top of the detergent chamber; a valved pipe between the manifold and the bottom of the detergent chamber; a bottom valved pipe from the manifold below the connection to the bottom of the detergent chamber; a nozzle connecting said bottom valved pipe from the manifold to the mixing chamber; means for supplying a regulated flow of detergent from the detergent chamber to the mixing chamber; means for supplying a regulated flow of cold water from the cold water supply to the mixing chamber; a hot water pipe; a nozzle for discharging hot water from said hot water pipe into the mixing chamber; means to regulate said nozzle; and means for discharging mixture from the mixing chamber.

In testimony whereof, we have hereunto set our hands at Los Angeles, California, this 21st day of November, 1924.

ALFRED H. THOMPSON.
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