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METHOD AND APPARATUS FOR TREATING SURFACES

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Fig. 1.

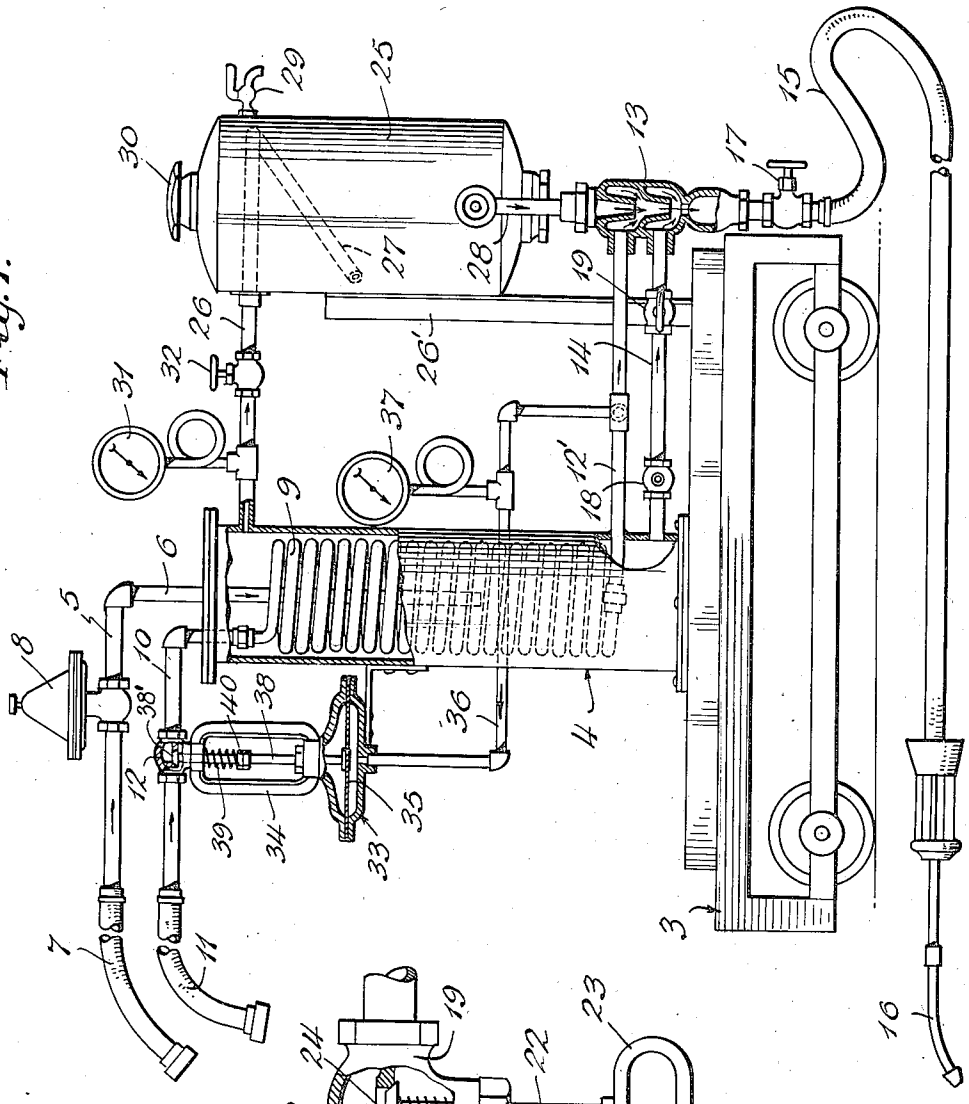
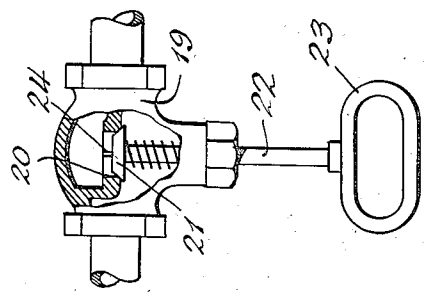


Fig. 2.



INVENTOR.
CLAYTON H. ALVORD
BY Mueller & Rubl
ATTORNEYS.

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METHOD AND APPARATUS FOR TREATING SURFACES

Clayton H. Alvord, Hastings, N. Y., assignor to Tridex Machine Corporation, New York, N. Y., a corporation of New York

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5 Claims. (Cl. 299—84)

This invention relates to improvements in methods and apparatus for producing surface-treating streams and has particular reference to a system wherein a cleansing solution is generated and employed as a surface-cleansing agent.

In systems of this character, as exemplified in my co-pending application filed on an even date herewith and bearing Serial Number 713,295, it has been the practice to generate superheated steam and heat a liquid through the use of a heating unit forming part of the apparatus, and to combine said steam and heated liquid to form a heated cleansing solution under pressure, with the superheated steam being employed as an impelling agent to discharge said solution in the form of an atomized spray.

According to the present invention, it is proposed to utilize high pressure steam, derived from a suitable source such as a steam boiler, as the heating agent for a fluid which subsequently forms a part of the cleansing solution, and to thereafter effect the initial admixture of said steam with the heated fluid to provide an impelling agent for the solution. In other words, the heated steam performs the dual function of heating the fluid and acting as an impelling agent therefor when in solution. Further, the present invention contemplates the control of the supply of high pressure steam as the heating agent in such a manner that said supply will be varied in accordance with fluctuations in the pressure and temperature of the cleansing solution of which the steam ultimately forms a part.

The inventive idea involved is capable of receiving a variety of expressions, one of which, for purposes of illustration, is shown in the accompanying drawing, wherein:

Figure 1 is a side elevation, partly broken away and shown in section, of an apparatus constructed in accordance with the invention, and

Figure 2 is an elevation, partly in section, of a valve device employed in connection with the invention.

The present apparatus is especially adapted for use in buildings and other establishments where a suitable source of steam supply, with sufficient pressure, is available for connection to the apparatus and the latter is preferably, though not necessarily, made portable so that it may be readily transported to various points for connection to said steam supply. To the end that the apparatus be made portable, it is shown as comprising a base 3 in the nature of a wheeled truck which is designed to support the entire apparatus. Mounted upon the truck 3 is a vertically disposed heating chamber 4 to which water under pressure is supplied through a pipe 5 one end 6 of which extends downwardly through the top of the chamber 4 so as to be immersed in the water therein and the other end of which is provided with a flexible hose 7 adapted for connection to a source of supply in which the pressure is preferably at least 70 pounds. A standard type of pressure-reducing valve conventionally shown at 8 is connected to the pipe 5 between the source of supply and the heating chamber 4 and is adapted to be regulated so that the pressure of the water in the system will be maintained at about 65 pounds.

The water in the chamber 4 is adapted to be heated to form the fluid or fluids which are subsequently used in making a hot cleansing solution which is adapted to be discharged from the apparatus. The heating of this water is accomplished by means of a coil 9 disposed within the chamber 4 and extending the major portion of its length and entirely immersed in the water within the chamber so as to thoroughly heat the same. The upper end of the coil is connected to one end of a feed line 10 the other end of which carries a hose 11 for connection to a source of steam preferably having a pressure of at least 70 pounds. A reducing valve 12 is interposed in the feed line 10 for the purpose of maintaining the high pressure steam within the system at a pressure slightly below that of the water therein, and said valve is also automatically controlled, as will appear in the course of the description, to maintain said pressure constant irrespective of any possible variations in the pressure and temperature of the solution being discharged from the apparatus. The lower end of the coil 9, through which the high pressure steam flows when heating the water within the chamber 4, is connected to a pipe 12' leading to an atomizer generally indicated by the numeral 13. This atomizer is of the type shown in United States Letters Patent 1,784,222, issued to C. S. Crickmer, on December 9, 1930, and reference is made to said patent for a complete understanding of the construction and operation of this atomizer. Thus, after heating the water within the chamber 4, the steam will pass directly to the atomizer 13 where it will be mixed with a portion of the heated fluid generated within the chamber 4, which portion is led from the lower end of said chamber to the atomizer through a pipe 14. In mixing with this heated fluid, the steam combines therewith to form a hot cleansing liquid and acts as an impelling agent therefor so as to

cause atomization of the liquid within the atomizer and then conveys said liquid in the hose 15 and to the nozzle 16 where the liquid is emitted in the form of a spray. The flow of the cleansing liquid through the hose 15 is controlled by a valve 17 at the lower end of the atomizer. In the pipe 14 there is provided a check valve 18 located adjacent the chamber 4 and adapted to prevent back pressure from entering said chamber. Between said valve 18 and the atomizer 13 there is also provided in the pipe 14 a control valve 19 shown in detail in Figure 2. This valve comprises a casing in which the valve seat 20 is normally engaged by the spring-pressed valve 21 the stem 22 of which has a handle 23 adapted to be pulled outwardly to unseat the valve 21 when flushing out the system. The valve seat 20 is provided with a small orifice 24 which always remains open, even when the valve 21 is seated, so that a certain quantity of the heated fluid flowing through the pipe 14 will enter the atomizer 13. The valve 21 is only unseated when it is desired to clean out the orifice 24 or flush the detergent from the hose 15. This is usually accomplished at the conclusion of the operation of the machine and when the valve 21 is opened, an excessive amount of water will flow through the valve 19 to the atomizer, and thence outwardly through said hose to remove any accumulation therefrom.

For the usual cleansing operations, a detergent is mixed with the liquid in the atomizer 13 and, for this purpose, a detergent-containing tank 25 is secured to a standard 26 mounted upon the truck 3. This tank is connected to the upper end of the chamber 4 through a pipe 26 for conveying to said tank the other portion of the heated fluid within said chamber, this latter portion being of higher temperature than that which flows from the pipe 6 to the bottom of said chamber and into the pipe 14. The end 27 of the pipe 26 within the tank 25 is extended diagonally downward into said tank so as to impart a swirling action to the fluid entering the same to more effectively generate a detergent solution which is fed from the bottom of the tank through a valved pipe 28 extending into the upper end of the atomizer 13. A petcock 29 is provided at the upper end of the tank 25 for relieving pressure within said tank when an additional supply of detergent is put therein through the filler opening which is normally closed by the removable plug 30 at the top of the tank. A pressure gauge 31 is connected to the pipe 26 for indicating the pressure of the fluid flowing through said pipe. Said pipe is also provided with a globe check valve 32 of standard construction utilized to control the flow of heated fluid to the tank 25 and to also prevent any back pressure in said tank from returning into the chamber 4.

In order that the reducing valve 12 may be automatically controlled and made responsive to any fluctuations in the pressure and temperature of the cleansing solution which may occur through a rise or fall of the pressure within the system, there is provided a regulating device consisting of the casing 33 connected to the valve 12 by a yoke 34 and supported upon the chamber 4. A diaphragm 35 disposed in said casing is responsive to pressure within a pipe 36 one end of which is connected to the bottom of said casing and the other end to the pipe 12' between the casing 4 and atomizer 13, there being a gauge 37 joined to said pipe 36 for indicating the pressure within the system. By connecting the pipe 36 to the pipe 12' which is, in turn, connected to the pipe 14 at the atomizer 13, it will be apparent that any variation in the combined pressure of the heated fluid and the high pressure steam at said atomizer will be transmitted to and through said pipe 36. Extending from the diaphragm 35 is the valve stem 38 carrying the valve 38' in the valve body 12 and influenced by a coil spring 39 the tension of which may be adjusted by the nuts 40, this adjustment being made at the beginning of the operation of the apparatus so as to properly position the valve within the body 12 to allow the required amount of high pressure steam to enter the coil 9 and thereby attain the desired pressure within the system. Thus, with this pressure at about 65 pounds for example, should there be an increase thereof in the system, with a consequent increase in the pressure and temperature of the cleansing solution being discharged, the diaphragm 35 will, by reason of the pressure in pipe 36, be immediately responsive to such increase and operate to move the valve within the body 12 toward its closed position to reduce the quantity of steam entering the coil 9 and thus correspondingly reducing the pressure and temperature within the system. On the other hand, should there be a decrease in pressure, the spring 39 will operate against the diaphragm 35 to force the valve stem 38 downwardly and thus permit an added amount of steam to flow into the coil 9 to build up the pressure to the desired point.

In the operation of the device, the water is first permitted to flow into the system with the valve 17 almost closed and the valve 32 completely closed. Water entering the chamber 4 will pass into the pipe 14 and through the small orifice 24 in the valve 19 and from thence into the atomizer. The constriction of the valve 19 causes pressure to be built up on the gauge 31 and the valve 8 is regulated so that said pressure will be maintained constant. When the desired pressure of water is attained the flow entering the hose 7, and controlled by a valve (not shown) in the main supply line, may be temporarily shut off, whereupon the steam pressure is turned on. Steam now enters the coil 9 and if the water in the chamber is cold, the steam is condensed and flows into the pipe 12' and from thence through the orifice in the atomizer. However, as the water in the chamber becomes heated by the coil 9 to a temperature just below the boiling point, it will permit steam to enter the atomizer through the pipe 12', and as soon as the volume of steam reaching said atomizer is great enough a pressure will be built up due to the constricted orifice in said atomizer. The pressure will be recorded on the gauge 37 and when it has reached the desired point at about sixty-five pounds, the flow of water is again turned on and the valve 17 opened. Also, if it is desired to form the detergent solution, the valve 32 is opened and a portion of the water in the chamber 4 is thus allowed to flow into the tank 25. The system is now working at normal operating conditions and the heating of the water in the chamber 4 now proceeds by reason of the passage of the steam through the coil 9 where said steam acts as the heating agent. The hotter fluid in the chamber 4 rises in said chamber and passes into the pipe 26, while the cooler fluid enters the pipe 14 from the bottom of said chamber. At the same time the steam passes from the coil 9 into the pipe 12' and to the atomizer 13 where said steam is initially mixed with the fluid flowing into the atomizer through the pipe

14. From this point the steam acts as an impelling agent for the solution which comprises the fluids flowing from said pipes 12' and 14 and the liquid detergent from tank 25, the cleansing liquid may be a clear one if the valve in the pipe 28 is closed to prevent entry of the detergent solution from the tank 25 into the atomizer. However, when it is desired to mix the detergent solution with that formed by the heated fluid and steam, the valve in said pipe 28 is opened and the solution from the tank 25 thereupon flows downwardly into the atomizer through the upper jet therein where it first comes in contact with the high pressure steam entering the chamber formed by said jet. After this mixture passes through the lower jet of the atomizer it mixes with the heated fluid entering the latter through the pipe 14. Subsequently the cleansing solution is atomized in the manner described in the above-mentioned patent to Crickmer, and is thereupon discharged through the hose 15 under the influence of the steam impelling agent. Should there be any variation of pressure in the steam pipe 12' caused by a change in the volume or temperature of the water flowing into the system, or that of the cleansing substance in the atomizer, such variation is transmitted through the pipes 12' and 36 to the regulating device which will operate the valve 12 to admit more or less steam in accordance with the amount of decrease or increase in said pressure or temperature. When a clear solution is desired for flushing purposes, as previously suggested, the valve in the pipe 28 may be closed to stop the further flow of the detergent solution, and the valve 19 is then fully opened to permit an increased supply of the fluid through the pipe 14 and into the atomizer.

What is claimed is:

1. The method of producing a surface treating stream which comprises heating a fluid by passing steam therethrough without admixture, dissolving a soluble detergent with a portion of said heated fluid of one temperature to form a detergent solution, utilizing said steam as an impelling agent for said solution, and mixing the other portion of said heated fluid having a different temperature with said agent and solution.

2. The method of producing a surface treating stream which comprises utilizing a heated fluid under pressure to heat a second fluid, dissolving a detergent with a portion of said second fluid of one temperature to form a detergent solution, mixing the other portion of said second fluid at a lower temperature with said solution, and employing the first-named fluid as an impelling agent for said mixture.

3. In a surface treating apparatus, a generator comprising a chamber in which a fluid is to be heated, a steam coil immersed in the fluid within said chamber, means to supply steam to said coil to heat said fluid, separate outlets from said chamber through which pass different portions of the heated fluid at different temperatures, a mixing device connected to one of said outlets and to said coil, and a detergent tank connected to the other outlet and to said mixing device.

4. In a surface treating apparatus, a generator comprising a chamber in which a fluid is to be heated, a steam coil immersed in the fluid within said chamber, means to supply steam to said coil to heat said fluid, separate outlets from said chamber through which pass different portions of the heated fluid at different temperatures, a mixing device connected to one of said outlets and to said coil, a detergent tank connected to the other outlet and to said mixing device, and a regulator connecting said mixing device with said steam supply means and responsive to variations in pressure in said device for controlling the flow of steam to said coil.

5. In a surface treating system, a generator, means to heat a fluid therein, means to supply a heating fluid having variable pressures to said heating means, a device connected to said generator and said heating means for receiving said fluids therefrom and having means to initially mix the same, and means responsive to variations in pressure of said heating fluid to alter the supply thereof to said heating means.

CLAYTON H. ALVORD.