Feb. 11, 1930. S. A. WIER 1,746,624

SURFACE CLEANING APPARATUS

Filed March 16, 1928 4 Sheets-Sheet 1

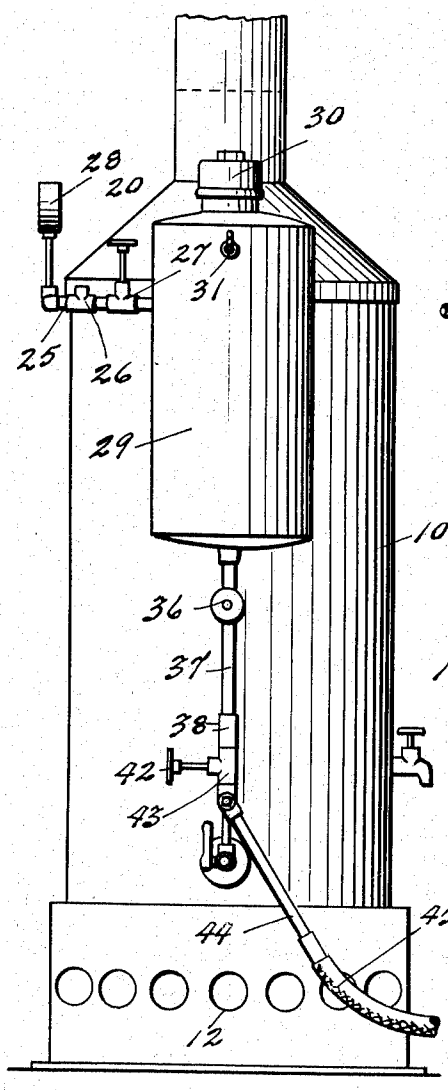


Fig. 2.

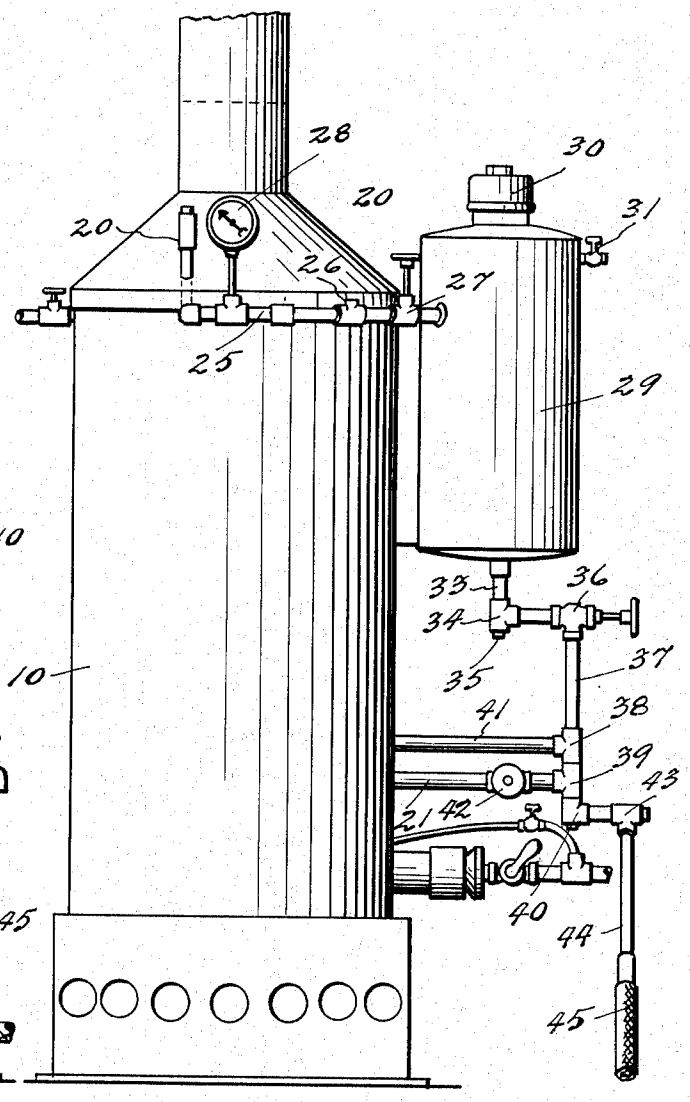


Fig. 1.

Inventor
S. A. Wier

By

Attorney

Feb. 11, 1930. S. A. WIER 1,746,624

SURFACE CLEANING APPARATUS

Filed March 16, 1928 4 Sheets-Sheet 2

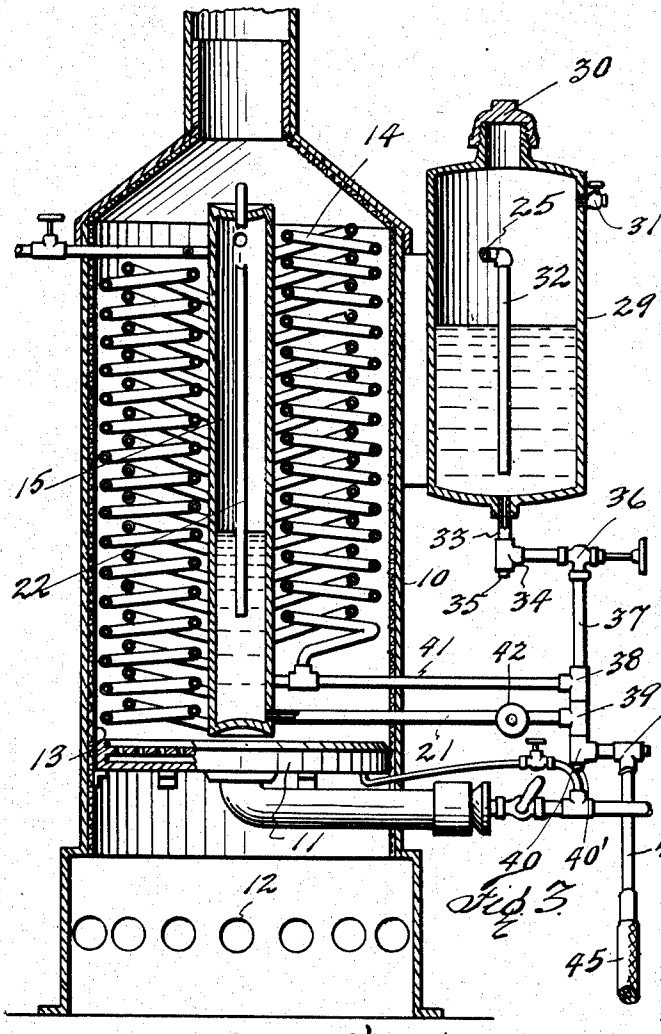


Fig. 3.

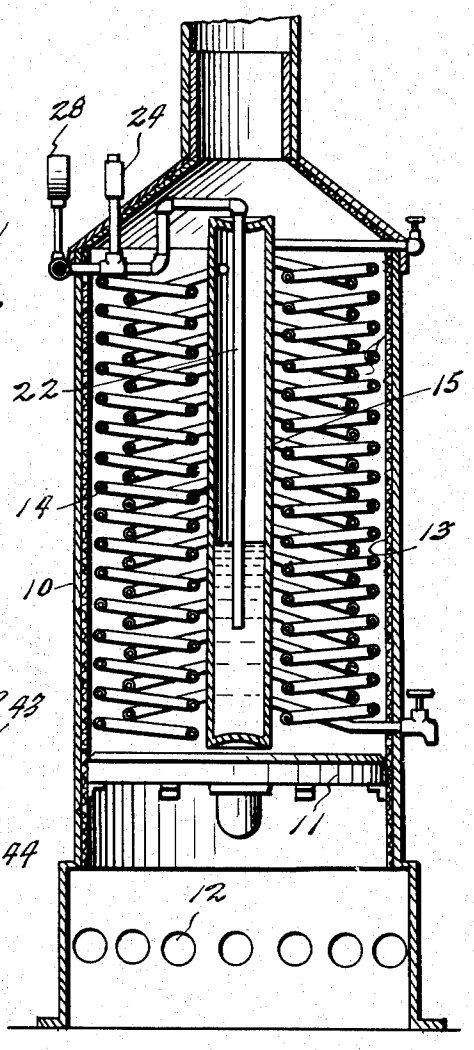


Fig. 4.

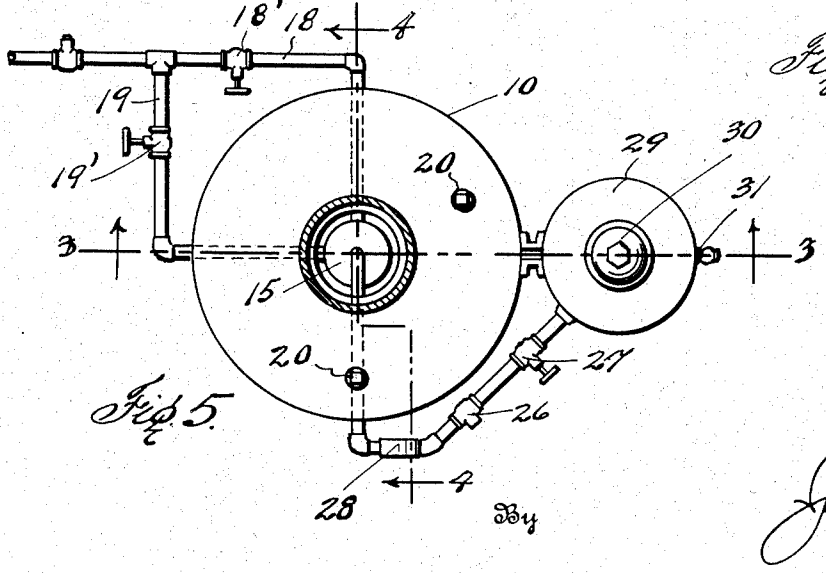


Fig. 5.

Inventor
S. A. Wier.

By Jack A. Ashley

Attorney

Feb. 11, 1930. S. A. WIER 1,746,624

SURFACE CLEANING APPARATUS

Filed March 16, 1928 4 Sheets-Sheet 3

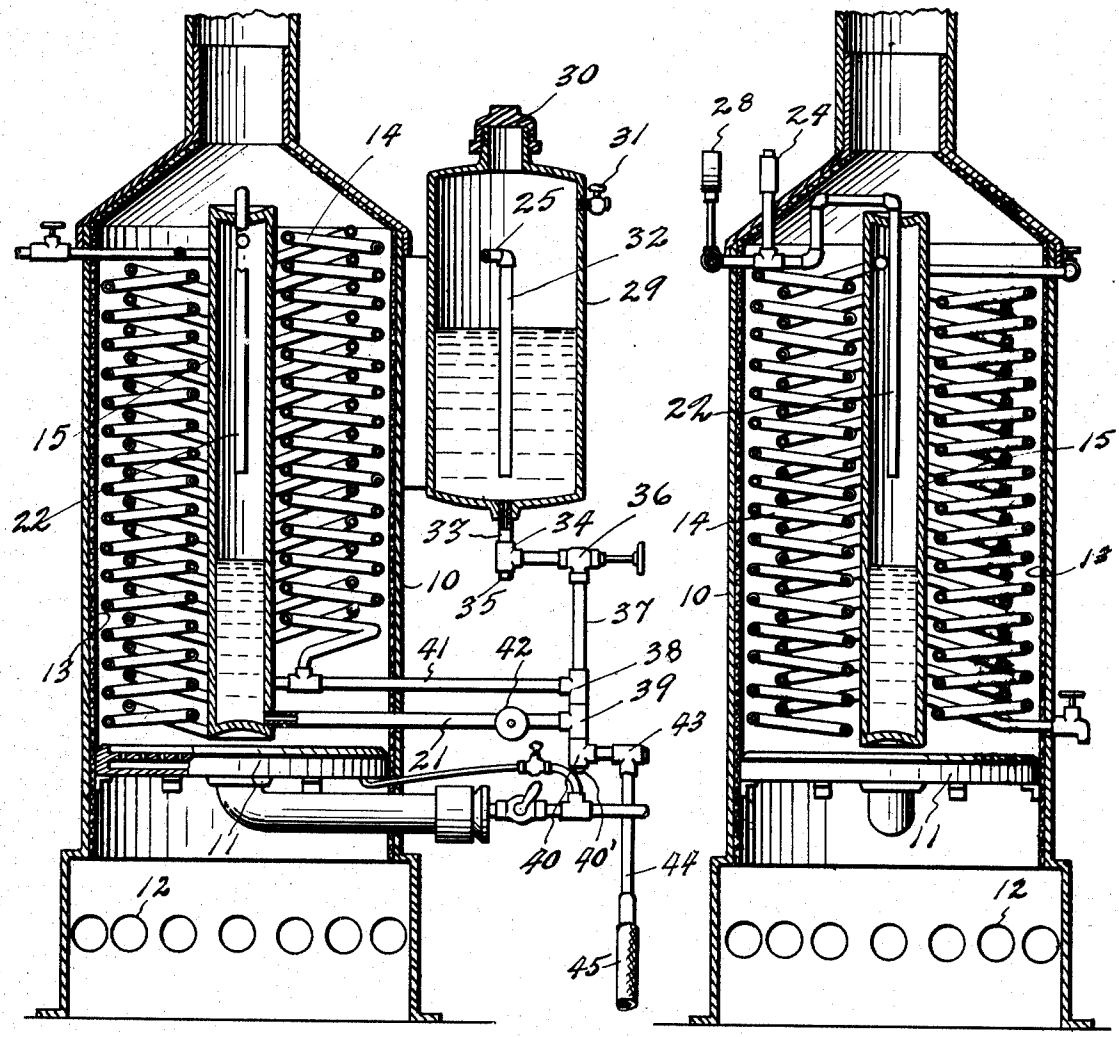
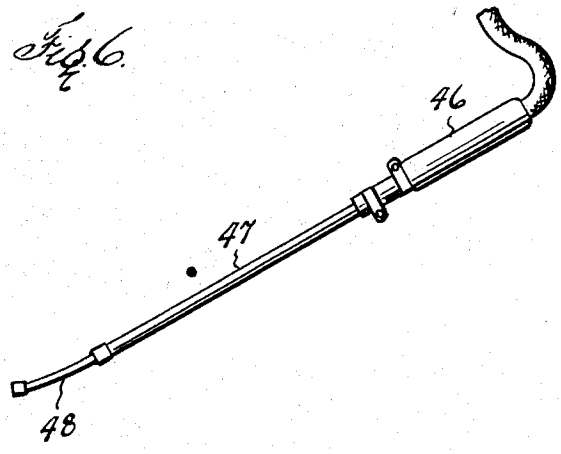


Fig. 6.

Fig. 7.



Inventor
S. A. Wier
By Jack A. Schley
Attorney

Feb. 11, 1930. S. A. WIER 1,746,624

SURFACE CLEANING APPARATUS

Filed March 16, 1928 4 Sheets-Sheet 4

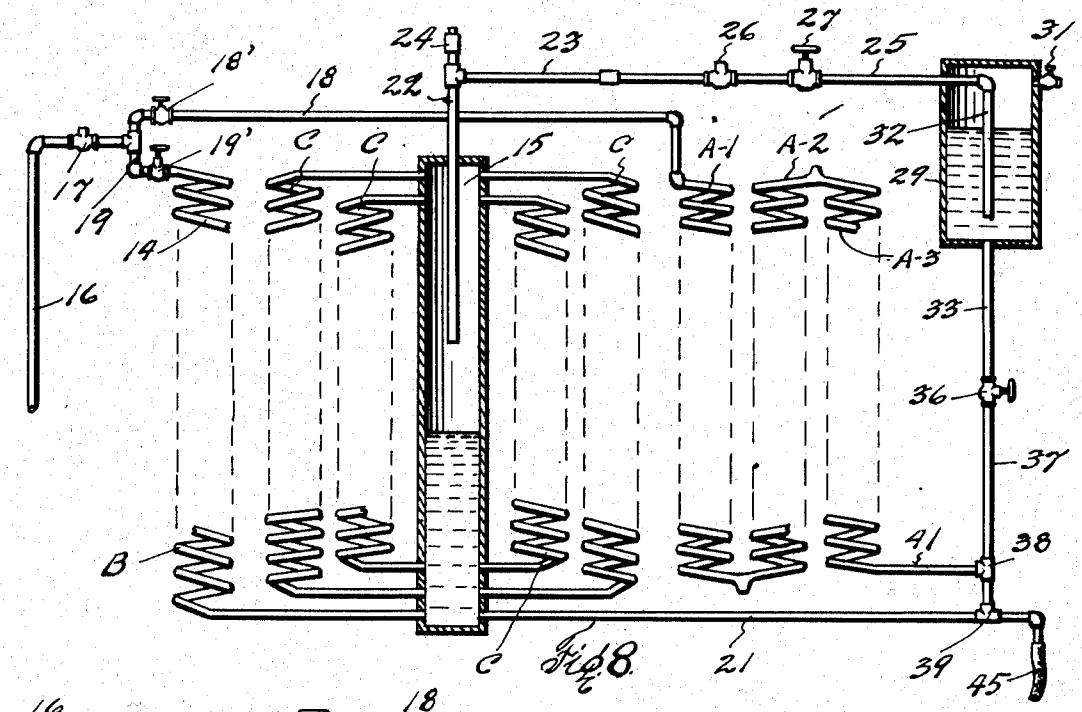


Fig. 8.

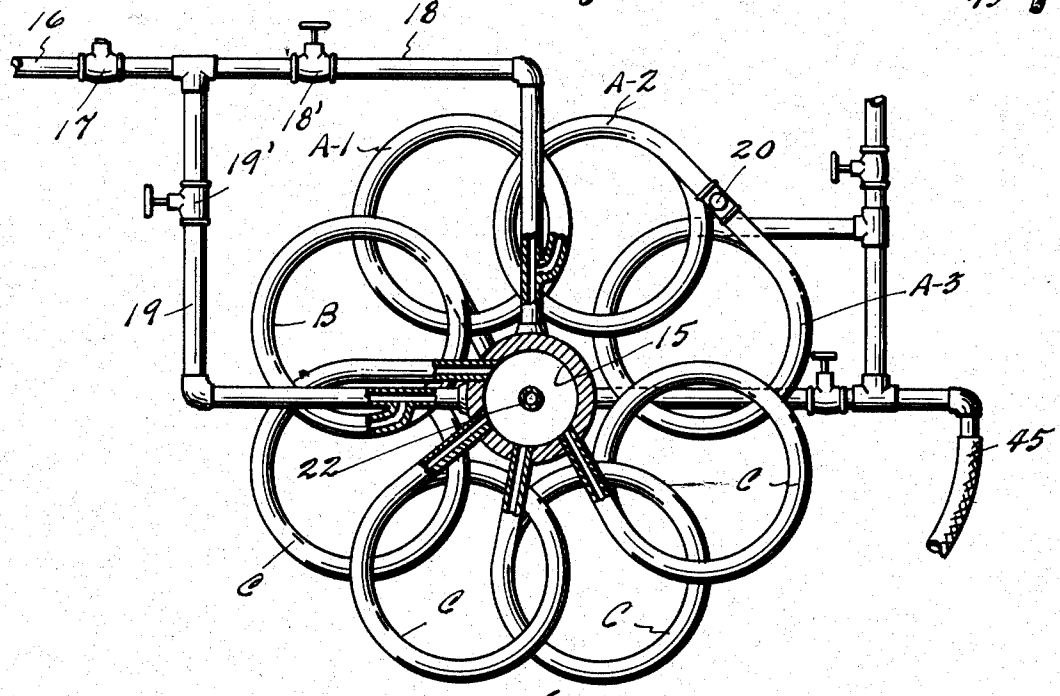


Fig. 9.

Inventor
S. A. Wier.
Jack A. Ashley
By
Attorney

Patented Feb. 11, 1930 1,746,624

UNITED STATES PATENT OFFICE

STUART A. WIER, OF DALLAS, TEXAS, ASSIGNOR TO TRIDEX CORPORATION, OF DALLAS, TEXAS, A CORPORATION OF TEXAS

SURFACE-CLEANING APPARATUS

Application filed March 16, 1928. Serial No. 262,176.

This invention relates to new and useful improvements in surface cleaning apparatuses.

In my Letters Patent No. 1,607,034, issued November 16, 1926, and in my co-pending application filed February 14, 1926, Serial No. 168,161, water is supplied from a single source to all the coils and the generated steam is divided, one portion being utilized to form a hot detergent solution and the other portion being super-heated to provide an impelling agent for spraying the hot detergent solution onto the surface to be treated. In the apparatus set forth in the pending application above referred to, provision is made for drawing off hot water from the generator to wash off the work after the steam and detergent solution are cut off. It is, of course, possible in the last named apparatus to utilize the hot water to dilute the detergent solution and to mix with the steam if desired.

One of the objects of the present invention is to supply water independently and separately to certain units of the generator, thus providing for a greater variation in the volume, quantity and temperature between the steam or warm or hot water used for making the detergent solution, as well as for rinsing on the one hand and the superheated steam on the other hand.

Another object of the invention is to provide two separate water feed lines, each including a valve so that a greater or lesser amount of water may be supplied to that portion of the apparatus which is to produce steam and warm or hot water for the detergent solution as well as for rinsing, and also whereby a greater or lesser amount of water can be supplied to that portion of the apparatus which is used for producing superheated steam.

The advantage of this improvement is that the volume of water supplied may be relatively increased, thus lowering the temperature of said water, although the fire for heating the generator is not changed. Further, if the supply of water to the steam generating section is increased in volume the pressure and velocity will be reduced so that the impelling force will likewise be reduced and a comparatively mild spray may be had. On the other hand, by cutting down the supply of water to the individual parts of the machine, a reverse result will be obtained.

Another object of the invention is to heat all the elements of the generator with a single fire, so that it is only necessary to manipulate the fluids and control the temperature of the same, thus obviating the necessity of varying the heat.

An important object of the invention is to provide means for preventing back-pressure and for equalizing the pressure throughout the generator and the individual supply pipes. It is obvious that a variation in pressure would prevent the proper flowing of the liquids.

A construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, in which an example of the invention is shown and wherein:

Fig. 1 is a front elevation of an apparatus constructed in accordance with the invention, a portion of the jacket being broken away to show the generator,

Fig. 2 is a side elevation of the same,

Fig. 3 is a vertical sectional view taken on the line 3—3 of Fig. 5,

Fig. 4 is a vertical sectional view taken on the line 4—4 of Fig. 5,

Fig. 5 is a plan view of the apparatus,

Fig. 6 is a vertical sectional view similar to Fig. 3 and showing another form.

Fig. 7 is a view similar to Fig. 4 and showing another form,

Fig. 8 is a diagrammatical view of the apparatus, and

Fig. 9 is an enlarged plan view of the generating unit, a portion being shown in section.

This application is filed as a continuation in part of my co-pending application Ser. No. 239,721.

In the drawings the numeral 10 designates a vertical cylindrical metal jacket of suitable construction and having a fluid fuel burner 11 supported in its lower portion and relatively

surrounded by draft openings or perforations 12 in the base of the jacket. Above the perforations the jacket has a heat insulating lining 13 of asbestos or equivalent material (Figs. 1, 3, 4, 5 and 6).

Within the jacket is disposed a coil steam generator unit 14. This unit includes a central vertical water column 15 closed at each end. A pipe 16 is connected with a source of water supply. For successful operation, water must be supplied under pressure, the usual city service pressure being amply sufficient. An ordinary check valve is connected in the pipe 16 for preventing back-pressure therein. The pipe 16 is connected to branch water feed pipes 18 and 19 respectively. A cutoff valve 18' is connected in the pipe 18 while a cutoff valve 19' is connected in the pipe 19, both of said valves being located exteriorly of the jacket 10, as is best shown in Fig. 5.

Referring to Figs. 5 and 9, it will be seen that the pipes 18 and 19 extend through the jacket and are rigidly attached at their inner ends to the column 15, but as is shown in Fig. 9 the inner end of each pipe is plugged and, therefore, does not supply water to the column. The generator includes a plurality of intermeshing coils surrounding the column and, as is shown in Fig. 8, these coils are segregated for the purposes hereinafter described.

For the purpose of clear description, I have designated three of the coils as A—1, A—2 and A—3, such series constituting the steam producing section of the generator. One of the coils is designated as B and the remaining four coils as C. The coil A—1 is connected at its top with the feed water pipe 18 and at its bottom with the coil A—2, which at its top is connected with the top of the coil A—3. A pop valve 20 is connected through the top of the jacket with the coils A—2 and A—3 so as to relieve any excessive pressure.

The upper end of the coil B is connected to the pipe 19, while the lower end of said coil is attached to the lower end of the column 15. The upper and lower ends of each coil C are connected respectively to the upper and lower ends of the column 15. It will be seen that the pipe 18 will supply water directly to the A series of coils in which steam is generated and whereby the production of steam may be controlled. The pipe 19 supplies water directly to the coil B. A discharge pipe 21 leads from the bottom of the column 15 and it will be seen that the water from the coil B may be discharged through the pipe 21 and by regulating the valve 19' the quality and temperature of this water may be controlled.

A vertical pipe 22 extends down into the column 15 but terminates short of the bottom coil connections. Sufficient water may be maintained in this column to keep the lower end of the pipe immersed, as is shown in Figs. 3 and 4, or the pipe 22 may terminate above the level of the water in said columns, as is shown in Figs. 6 and 7. This water is supplied from the coil 14 and is, of course, preheated, thereby supplying preheated water to the coils C while the generator is in operation. The water supplied to the coils C is discharged into the column 15 and is, of course, heated while circulating. The amount of water supplied to the coils B and C is controlled by the valve 19' and, of course, the temperature of the water in the column 15 is controlled by the manipulation of said valve.

When the generator is operating, there will be sufficient pressure to force hot water upward in the pipe 22 if said pipe is immersed. If the lower end of said pipe 22 is not immersed, saturated steam will enter the pipe instead of water. A discharge pipe 23 extends outward through the jacket 10 and for safety purposes a pop valve 24 is connected with the pipe 23. A pipe 25, including a check valve 26 and a hand valve 27 is connected with the pipe 23. A pressure gage 28 is also connected in the pipe 25. A detergent tank 29 is secured to the side of the jacket 10 and is provided with a suitable cap 30 on its top which may be removed for filling said tank, and is also provided with a pet cock 31 which may be opened to relieve the pressure within said tank.

The pipe 25 enters the upper portion of the tank and is connected with a depending pipe 32 terminating short of the bottom of said tank, as is shown in Figs. 3, 6 and 8. The tank is charged with soap or any other detergent which it is desired to use. A pipe 33 leads from the bottom of the tank and is connected with a T 34 having a plug 35 in its lower end, which may be removed for cleaning said tank. The T is connected by a pipe 35 with a hand valve 36. A discharge pipe 37 extends downwardly from the valve 36 and includes a T 38 and a T 39, which is connected with a T 40 having a plug 40' which may be removed for cleaning. A discharge pipe 41 leads from the lower end of the steam coil A—3 outward through the jacket and is connected with the T 38. The pipe 21 is connected with the T 39 and includes a hand valve 42. A swivel connection 43 is attached to the T 40 and also to a discharge pipe 44 which is connected with a hose 45. The hose is provided near its outer end with a handle 46 and is clamped to one end of a nozzle 47 having a spray head 48 on its outer end.

In opening the apparatus the valves 18' and 19' are opened while the valves 25, 36 and 42 are closed. This permits water to be supplied to all parts of the generator. The burner 11 is lighted and the generator heated to the proper temperature. Sufficient water may be supplied to keep the lower end of the pipe 22 immersed or not, according to the form used. It will be seen that when the pressure in the generator and the pipes 18 and 19

becomes greater than the water pressure in the pipe 16 the check valve 17 will be closed, thus maintaining said pressure within the generating unit unless it becomes excessive and is released through the pop valves 20 and 24. The water supplied through the coil B will be heated while passing through said coil and thus upon entering the column 15 will be pre-heated. This pre-heated water is circulated through the coils C and as the pressure is built up within the generator the warm water will be forced upward in the pipe 22 and thus supplied to the pipes 23 and 25. However, in the form shown in Figs. 6 and 7, saturated steam is generated in the column and coils C and is delivered to the pipe 22.

The detergent tank 29 having been supplied with soap or other suitable detergent will be filled with a hot fluid, either water or steam, when the valve 27 is opened. By regulating the valve 19′ and thus controlling the amount of water supplied, the character of the fluid which is discharged from the pipe 32 into the detergent tank will be controlled. If the valve 19 is wide open, thus delivering the maximum quantity of water, the fluid entering the detergent tank will merely be hot water, but if the valve is partially closed, thus reducing the supply of water, it is obvious that the fluid discharged into the detergent tank will either be a hot elastic fluid or saturated steam. The fluid upon entering the detergent tank dissolves the soap or other detergent, thus forming a hot detergent solution.

By regulating the valve 18′ the amount of water supplied to the steam coils A—1, A—2 and A—3 is controlled. By opening the valve 36 the hot detergent solution flows down through the pipes 33, 35 and 37 to the T 38 at which point it comes in contact with the steam discharged from the coil A—3 through the pipe 41. The steam will act as an impelling agent, but upon mixing with the hot solution will be more or less condensed, thus losing its heat. However, the velocity of the steam will be sufficient to expel the solution through the parts 39, 40, 43, 44 and 45 to the nozzle 47 on the end thereof. The spray head 48 on the end of the nozzle causes an atomization of the impelled solution. It is obvious that by closing the valve 36 and opening the valve 42 a generous supply of hot water will be had, particularly if the valves 18′ and 19′ are opened to the fullest extent.

It is pointed out that all the coils and the column 15 are heated by a common fire, so that the only difference in the temperature of the fluids contained in the same will result from the manual operation of the valves 18′ and 19′ and not from the manipulation of the fire. It is apparent that by introducing a greater amount of water through the coil B the temperature of the fluid discharged through the pipes 21 and 22 will be lowered. Also if the supply of water through the pipe 18 to the steam coils is increased the pressure and velocity of the steam discharged through the pipe 41 would be reduced. Conversely, if less water is allowed to pass through the pipe 19 the fluid discharged through the pipes 21 and 22 would be considerably hotter and also if less water is supplied to the steam coils the velocity and pressure of the steam is thereby increased.

From the foregoing it will be seen that by manipulating the valves 18′ and 19′ the character of the spray delivered by the machine can be very definitely controlled. Where the surface to be cleaned is very dirty, it is obvious that an increase in the velocity and pressure of the steam would be very desirable, thus producing a more forceful spray. On the other hand, if a highly finished surface which did not require very much cleaning is to be treated, then the pressure and velocity should be reduced so that a mild spray is obtained.

Of course it is necessary that the pressures be equalized within the apparatus. The check valve 26 is necessary to prevent back-pressure in the pipe 23 and to relieve any chance of the detergent solution being forced back into the column 15. It is obvious that back-pressure from the coil A—1 can act through the pipe 18 on the water passing into the coil B. There will, of course, have to be an equalization of the pressure in the pipes 23, 25 and 35, 37, otherwise the solution would not flow from the tank unless the pressure in the tank from the pipe 32 was greater, which is not probable.

While the apparatus disclosed in my Letters Patent and pending application herein referred to, has done and will do highly efficient work, it is believed that the apparatus disclosed herein permits greater individuality in treating the different characters or work encountered. The flexibility of water regulation gives a sensitive adjustment of the spray, whereby the character of the latter can be more definitely controlled relative to the work to be done.

Various changes in the size and shape of the different parts, as well as modifications and alterations, may be made within the scope of the appended claims.

What I claim, is:

1. In an apparatus of the character described, a generating unit comprising individual heating elements, a tank, a conductor for a heated fluid extending from one heating element of the generator to the tank, a fluid discharge conductor leading from the tank, a water conductor supplying the heating element for the tank, a separate water conductor for supplying another heating element of the generator, a conductor therefrom communicating with the tank discharge, and means

for individually controlling each of said water supplies.

2. In an apparatus of the character described, a generator including a hot fluid supply element and a steam generating element independent of the supply element, a separate water conductor leading to the hot fluid supply element of the generator, and a second separate water conductor leading to the steam generating element of the generator, means for individually controlling the supplies of water to each element, whereby the temperature of the hot fluid is regulated and whereby the pressure and velocity of the steam is controlled, a discharge pipe leading from the hot fluid of the generator element, a detergent container connected with said pipe for receiving said hot fluid, and an individual discharge pipe leading from the steam generating element to a discharge conduit from said container.

3. In an apparatus of the character described, a generator including a hot fluid supply element and a steam generating element independent of the supply element, a separate water pipe leading to the hot fluid supply element of the generator, a second separate water pipe leading to the steam generating element of the generator, valves for individually controlling the supply of water to each element of the generator, whereby the temperature of the hot fluid is regulated and whereby the pressure and velocity of the steam is controlled, a fluid discharge pipe leading from the hot fluid supply element, a detergent tank connected with said fluid discharge pipe for receiving said hot fluid, an individual steam discharge pipe leading from the steam generating element to a discharge conduit from said container, and a second hot fluid discharge pipe leading from the hot fluid supply element of the generator to said conduit.

4. As a sub-combination in an apparatus of the character described, a generator comprising a vetrical water column closed at its top and bottom, a plurality of steam coils included in said generator and free from communication with said column, a separate water supply pipe leading to said steam coils, a steam discharge pipe leading from said steam coils, a preheating coil included in said generator and connected with the bottom of said column, a second separate water supply pipe connected to said preheating coil, a plurality of circulating water heating coils connected at their ends with the upper and lower ends of the column and a common discharge pipe connected to the column and steam coils.

5. A system of generating fluids for cleaning surfaces which includes a generator having a steam generating element and a water heating element, means for separately supplying water to the steam generating element and the water heating element, a common heating means for said elements, indepdent means upon the separate water supplies for controlling the temperature of the hot water and also of the steam delivered by the generator by individually regulating the separate water supplies and a discharge pipe common to both the steam generating element and the water heating element.

6. In an apparatus of the character described, a central water column and a plurality of hot fluid and steam coils surrounding said column and comprising a generator, said steam coils having no communication with said column, a common water supply pipe including a check valve, a pair of feed water pipes leading from said water supply pipe and each including a cut-off valve, one of said feed water pipes being connected to the hot fluid coils of said generator and the other feed water pipe being directly connected to the steam coils of said generator, a container connected with the hot fluid coils of the generator, a steam discharge pipe for conducting steam from said steam coils, and a discharge conductor from the container connected with the steam discharge pipe whereby the solution from the container is impelled by the velocity of the steam and the latter regulated by the water feed to the steam coil.

7. In an apparatus of the character described, a central water column and plurality of hot fluid and steam coils surrounding said column and comprising a generator, said steam coils having no communication with said column, a common water supply pipe including a check valve, a pair of feed water pipes leading from said water supply pipe and each including a cut-off valve, one of said feed water pipes being connected to the hot fluid coils of said generator and the other feed water pipe being directly connected to the steam coils of said generator, a container connected with the hot fluid coils of the generator, a discharge pipe for conducting steam from said steam coils, a discharge conductor from the container connected with said steam discharge pipe, and a hot water discharge pipe leading from the water column of the generator and connected with the discharge conductor and including a cut-off valve, the supply of hot water being controlled by the valve in the feed water pipe leading to the hot fluid coils of said generator.

8. Means for cleaning surfaces comprising a fluid heating means, a common water supply, means for superheating steam having no communication with the fluid heating means, independent feed water pipes leading from the common water supply to the fluid heating means and the steam superheating means, means for individually controlling the feed of water to said parts, a tank, a pipe extending from the fluid heating means

to the tank for conducting a hot fluid thereto, a discharge conductor from said tank, and a pipe for conveying superheated steam from said superheating means and introducing it into the discharge conductor for impelling the discharge from the tank, whereby the feed to the tank is controlled by regulating the feed water supply to the fluid heating means, and the steam supply is individually controlled by regulating the feed water supply to the superheating means.

In testimony whereof I affix my signature.

STUART A. WIER.