F. L. DUTCHER.

STEAM GENERATOR AND HEATER.

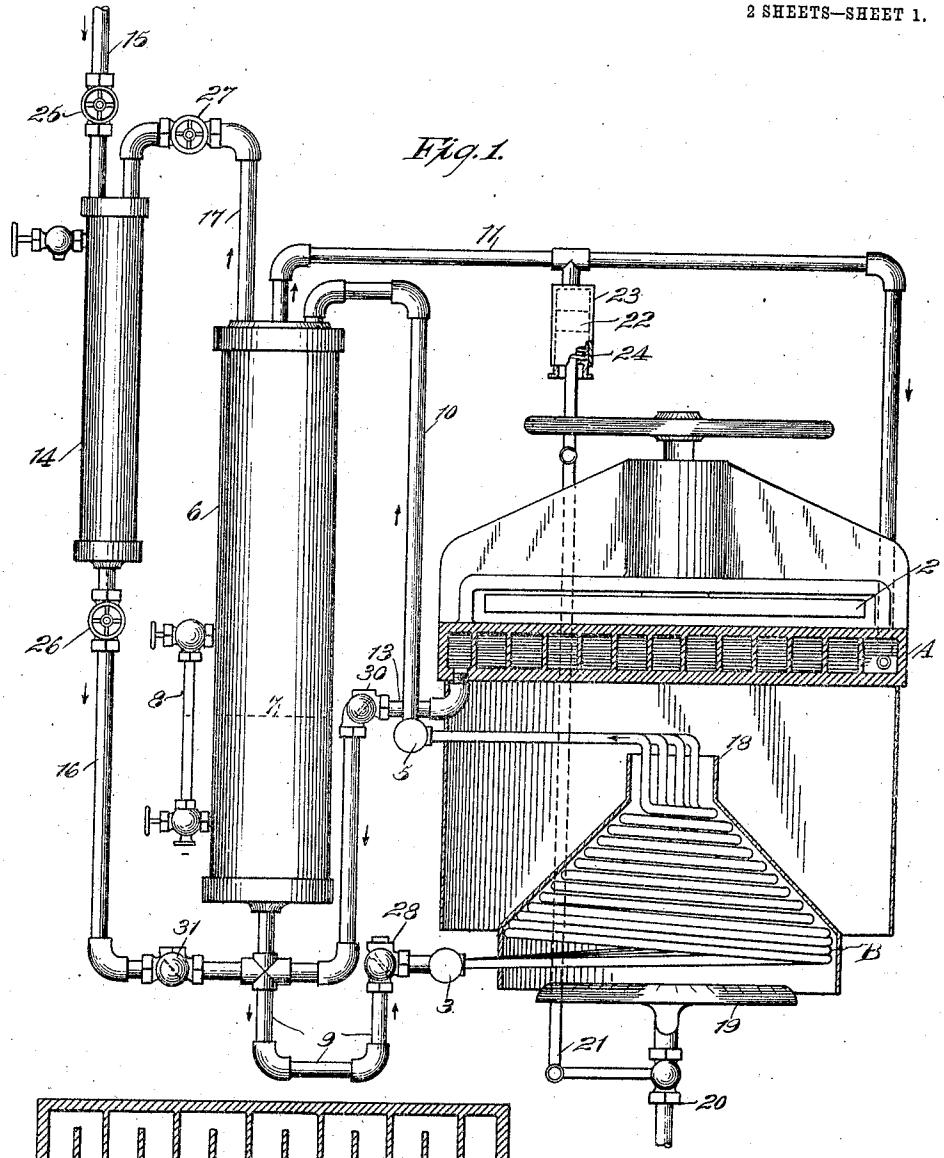
APPLICATION FILED APR. 3, 1908.

923,034.

Patented May 25, 1909.

2 SHEETS—SHEET 1.

Fig. 1.



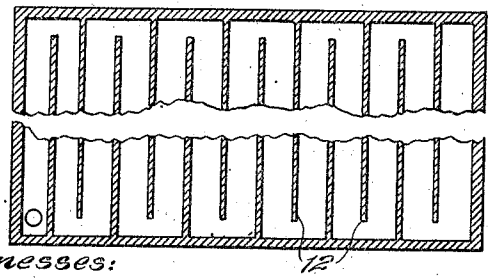


Fig. 2.

Witnesses:

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Charles A. Byfield

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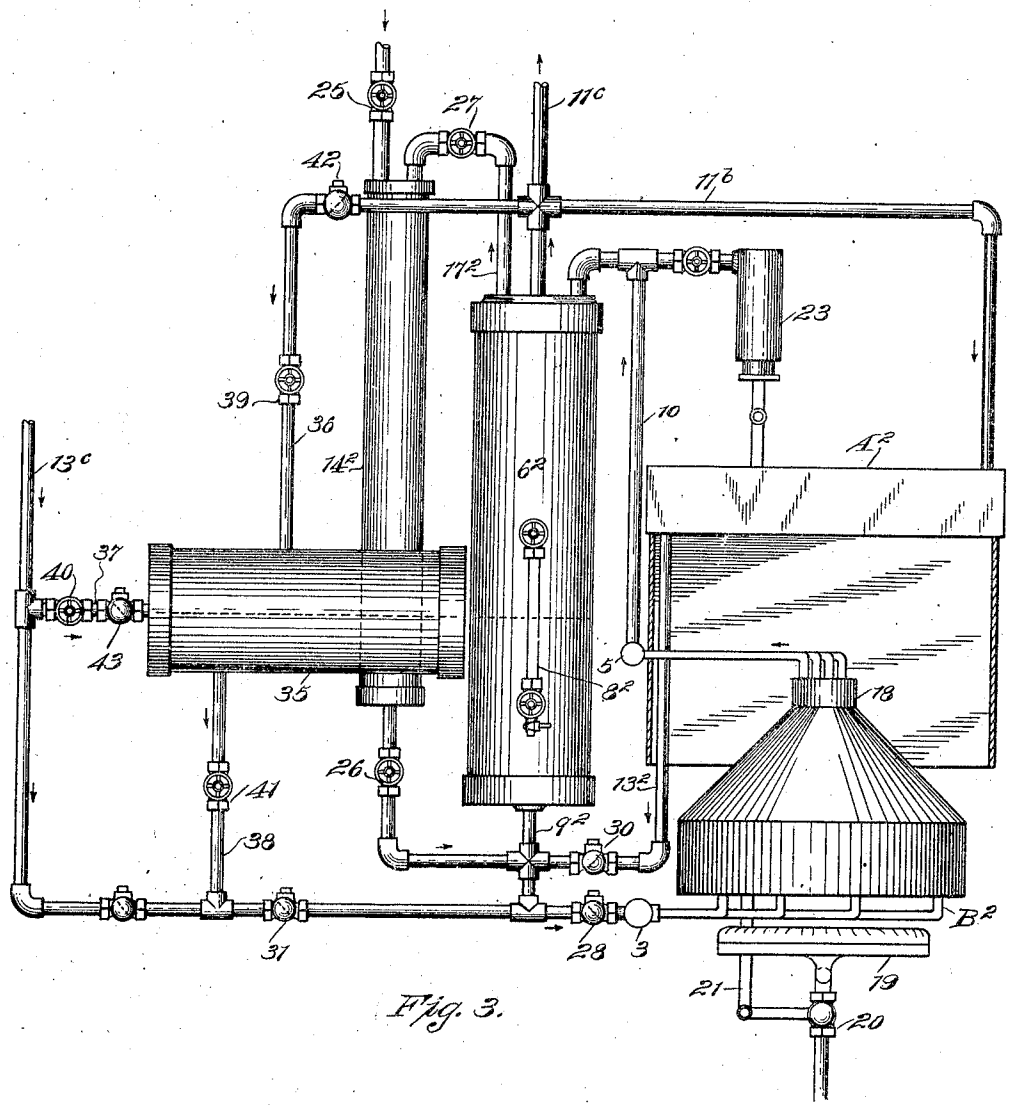


Fig. 3.

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UNITED STATES PATENT OFFICE.

FORREST L. DUTCHER, OF SAN FRANCISCO, CALIFORNIA.

STEAM GENERATOR AND HEATER.

No. 923,034. Specification of Letters Patent. Patented May 25, 1909.

Application filed April 3, 1908. Serial No. 424,879.

To all whom it may concern:

Be it known that I, FORREST L. DUTCHER, citizen of the United States, residing in the city and county of San Francisco and State of California, have invented new and useful Improvements in Steam Generators and Heaters, of which the following is a specification.

My invention relates to steam generators, and to a system of circulating the steam for heating purposes.

The object of the invention is to provide a simple, practical system for economically generating steam and for circulating the steam wherever needed for heating purposes of one sort or another.

The invention consists of the parts and the construction and combination of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is an elevation, some parts being in section. Fig. 2 is a horizontal section of the press table. Fig. 3 shows a modification.

The invention as embodied in Fig. 1, shows it as I have applied it in actual practice to use in a printing establishment, in which case A represents the hollow bed or table, and 2 the follower of a press such as is employed in making impressions for stereotyping. It will be manifest, however, that the invention is not limited to this particular use, but is applicable in hotels, restaurants and elsewhere wherever it is desired to heat water by steam or otherwise to provide a system of steam heating.

B represents a steam coil of any suitable description. It preferably comprises a plurality of tubes connected at one end to a header 3 outside the burner casing 4, and at the other end to a header 5.

6 is a boiler in which the water is maintained at any suitable level, as represented, for instance, by the dotted line 7; the water level being indicated by the gage glass 8. The lower end of the boiler 6 connects by a U 9 through the header 3 with the lower end of the coil B, while the steam generated in the coil B is conveyed through header 5 and pipe 10 into the top of the boiler 6.

Dry steam from the top of the boiler is taken off through the service pipe 11, which leads wherever desired. As here shown, the pipe 11 connects with one end of the hollow bed-plate A, which latter is provided with the staggered baffles 12, between and around which the steam circulates to the drainage pipe 13 at the opposite end of the bed-plate. Through pipe 13 the drainage water passes down and connects with the pipe 9 and the boiler.

14 is a feed-water drum, preferably placed close to the boiler so as to receive the benefit of the radiated heat from the latter, and preliminarily heat the water that is to be fed to the boiler. This drum 14 connects through a pipe 15 with the city main, or any other suitable source of water supply. Feed-water is admitted at intervals from the drum 14 to the boiler through the pipe 16. 17 is a steam injector pipe connecting the top of the boiler with the drum 14. The various fluid connections are provided with suitable valves.

The steam generator coil B is preferably made cone-shape, and housed in the casing 4, with the top of the casing open, as represented at 18, so that all the waste heat arising from the gas burner 19 may pass outward and directly impinge on the under side of the bed-plate A, and so assist the steam in heating up this bed-plate, or such other receptacle as might be placed above the generator.

The supply of gas to the burner is controlled by a valve 20, and preferably some suitable arrangement is had whereby the burner flame will be regulated in accordance with the steam pressure. That is to say, as the steam pressure increases above a certain predetermined point, it is desirable to cut down the amount of fuel consumed; and conversely, as the steam pressure lowers, it is desirable to increase the flame so as to maintain the steam pressure at as near a uniform mark as possible.

A suitable means for effecting the coordinate regulation of the heat and steam is represented in the drawings, in which the stem of valve 20 is connected by a link 21 with the stem of a piston valve 22 operating in a fluid cylinder 23. The top of the cylinder 23 is in communication with the steam

pressure in pipe 11, and as this pressure increases it pushes down on the piston valve 22 and cuts off the gas at the valve 20. As the steam pressure lowers, a spring 24 operates to move the piston valve upward and open valve 20 again.

In operation, assuming the boiler to be suitably filled with water, the respective valves 25—26 in pipes 15—16, and valve 27 in pipe 17, are closed. When the burner is lighted and the coil heated up, the generated steam passes through pipe 10 to the top of the boiler. This creates a pressure in the boiler which becomes equalized through pipe 9 and the generator coil, so that the water is made to circulate therethrough as needed. A check valve 28 interposed in pipe 9 prevents the back flow of the steam which might be generated, and necessitates the steam passing in the proper direction always to the boiler. From the top of the dome the steam is taken by pipe 11 to the table A, and as condensation therein takes place the condensed moisture is reconveyed to pipe 9 and the boiler through the drainage canal 16. The check valve 30 in pipe 13 prevents any back flow of fluid therethrough. A check valve 31 is also interposed in the pipe 16.

By the arrangement and connections here shown and described, it is manifest that a continuous circulation of heating fluid takes place through the apparatus.

If the water in the boiler falls below a desired level, all that is necessary is to close valve 25 in the supply pipe 15, open the feed-water valve 26, and open the steam injector valve 27; whereupon an equalization of pressure takes place in the drum 14 and boiler 6, allowing the water to flow by gravity from the drum 14 into the boiler, the water level in the drum being normally higher than the normal water level in the boiler.

It is manifest that the invention is capable of embodiment in a variety of forms, according to the particular use for which it is to be adapted.

In Fig. 3, I have shown a modification, in which the system is adapted for heating large buildings. In this case the generator coil B^2 is connected with the steam column or boiler 6^2. Fresh supplies of water are let into the boiler as needed through the water reservoir 14^2 which is suitably connected with the main, and which has also a steam connection 17^2 with the boiler. A^2 is a receptacle placed over the flame of the burner and getting the benefits of the heat passing off therefrom. A steam pipe 11^b is adapted to convey steam from the top of the steam column 6^2 to and through the receptacle A^2; the return circulation being through pipe 13^2 back to water pipe 9^2. In all general particulars this portion of the apparatus in Fig. 3 is substantially like that of Fig. 1. 11^c is a service pipe leading from the top of the steam dome or boiler 6^2 and conveying steam throughout the building, as desired; the return of the circulation to the system being through the pipe 13^c.

In order to economically operate a system of this sort, both as to the amount of fuel and volume of water required, it is necessary when the generator is first started to supply thereto for a time, and until steam is got up and circulation established, a larger volume of water than is necessary for continuing the system in operation after steam is got up. Therefore, in conjunction with the boiler 6^2 I employ an auxiliary water tank or drum 35, which has a steam connection 36, with the top of the boiler 6^2, and water connection 37—38 with the return 13^c. The pipes 36—37—38 are provided with respective regulating valves 39—40—41, and pipes 36—37 have respective check valves 42—43, which prevent back flow through either of those pipes from tank 35. Tank 35 is preferably arranged so that its top and bottom will be substantially coincident with the top and bottom of the gage glass 8^2, and the water level in the boiler and auxiliary tank 35 will always stand at the same level. By means of the valves 40—41 the supply of water in the auxiliary can be cut into or cut out of the system, according to the load or requirements of the generator.

When the system is started up, the valves 39—40—41 are opened, which releases the water in the auxiliary tank and establishes a balance between it and the boiler. When the fires are lighted, and the generation of steam has commenced, this steam is circulated off through the pipes 11^c and throughout the building, condensation returning through 13^c. (Of course, a certain amount of the steam circulates through the pipe 11^b and receptacle A^2, condensation returning through 13^2.) The continued generation of steam drains the water from the tank and boiler, until such time as a complete circulation of steam through the system is established.

When the pipes become thoroughly heated, the tank 35 and boiler will again begin to fill, since less water is needed to maintain the system in operation when thoroughly started, than during the preliminary heating up of the system. When the gage glass on the boiler indicates a practically stable water level, the valves 40—41 are closed, thus cutting out the excess water. Thus, it is manifest that when a large volume of water is needed, there are both the boiler and the auxiliary tank to draw on; and when the need for this large supply of water is over, the excess is returned to the auxiliary and cut out from the boiler, so that it enables a smaller boiler to be used, and avoids the

necessity of maintaining a large body of water at boiling point, when it is really not needed.

The use of the auxiliary reservoir 35 obviates the necessity of using a large boiler, and the only alternative for the use of either a large boiler or the auxiliary 35 is to turn in cold, fresh water from the fresh water supply tank 14^2 during the preliminary heating up stages, and then when the boiler becomes too full, by the return condensation, to draw off some of the water.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. A steam generating and heating system comprising in combination an inclosed generator coil, a burner for heating the same, a boiler not subjected to the direct heat of said burner, the top of the coil connected with the top of the boiler and the bottom of the coil connected with the bottom of the boiler, through which a free fluid circulation continually through the boiler and upward through the coil is permitted, water connections for feeding water to the boiler but said water connections normally being interrupted so that only the water in the boiler and coils and the steam generated therefrom circulates through the system, and a steam service pipe leading off from the dry steam portion of the boiler with a suitable heating receptacle connected with the service pipe, and the latter and said receptacle having a drainage pipe for condensation leading back into the boiler.

2. A steam generating and heating system comprising in combination a generator coil, a boiler, the top of the coil connected with the top of the boiler and the bottom of the coil connected with the bottom of the boiler, the latter and the coil being so arranged that circulation takes place by gravity, the top of the boiler providing a steam space, and a service pipe leading off from this steam space and having a return connection with the bottom of the boiler, an auxiliary reservoir having steam connections with the top of the boiler and water connections with the lower end of the boiler, said reservoir and said boiler being so positioned that water may flow by gravity from one to the other on an equalization of pressures in the reservoir and boiler, and fluid connections for feeding water when desired into the auxiliary reservoir.

3. A steam generating and heating system comprising in combination a generator coil, a boiler, the top of the coil connected with the top of the boiler and the bottom of the coil connected with the bottom of the boiler, the latter and the coil being so arranged that circulation takes place by gravity, the top of the boiler providing a steam space, and a service pipe leading off from this steam space and having a return connection with the bottom of the boiler, an auxiliary reservoir having steam connections with the top of the boiler and water connections with the lower end of the boiler, said reservoir and said boiler being so positioned that water may flow by gravity from one to the other on an equalization of pressures in the reservoir and boiler, and fluid connections for feeding water when desired into the auxiliary reservoir, said steam and water connections between the auxiliary reservoir and the boiler having respective valves whereby the boiler and reservoir may be disconnected after circulation through the system has been established; said auxiliary reservoir and its connections being effective to provide an excess of water to the boiler and generator coils when the system is started up, the excess being withdrawn into and stored within the reservoir when the necessity for the excess has passed.

4. A steam generating and heating apparatus comprising a generator coil, a boiler connected at one end with one end of the generator coil, and the other end of the boiler connected with the other end of the generator coil, a service pipe connected with the steam space in the boiler, said service pipe having fluid connections with the opposite end of the boiler and a hollow bed or table disposed over the generator coil and connected with the service pipe.

5. A steam generating and heating apparatus comprising a generator coil, a boiler connected at one end with one end of the generator coil, and the other end of the boiler connected with the other end of the generator coil, a service pipe connected with the steam space in the boiler, said service pipe having fluid connections with the opposite end of the boiler, a feed-water supply drum connected with the boiler and adapted to feed thereinto by gravity, and means for equalizing the pressures in said drum and boiler.

6. A steam generating and heating apparatus comprising a generator coil, a boiler connected at one end with one end of the generator coil, and the other end of the boiler connected with the other end of the generator coil, a service pipe connected with the steam space in the boiler, said service pipe having fluid connections with the opposite end of the boiler, a feed-water supply drum connected with the boiler and adapted to feed thereinto by gravity, and a steam pipe connecting the drum and boiler.

7. In a steam generating and heating system, the combination with a generator coil, of a boiler connected thereto, a source of fresh water supply connected with the boiler, a service pipe leading from the boiler and a return connecting with the boiler and with the generator, and an auxiliary reservoir having steam connections with the boiler and

having water connections with said return and with the boiler, said auxiliary so positioned with respect to the boiler, and said connections having valves, whereby the contents of the auxiliary may be added to or withdrawn from the circulating fluid of the system.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FORREST L. DUTCHER.

Witnesses:
GUSTAV. A. AICHER,
FRANCES B. DUTCHER.