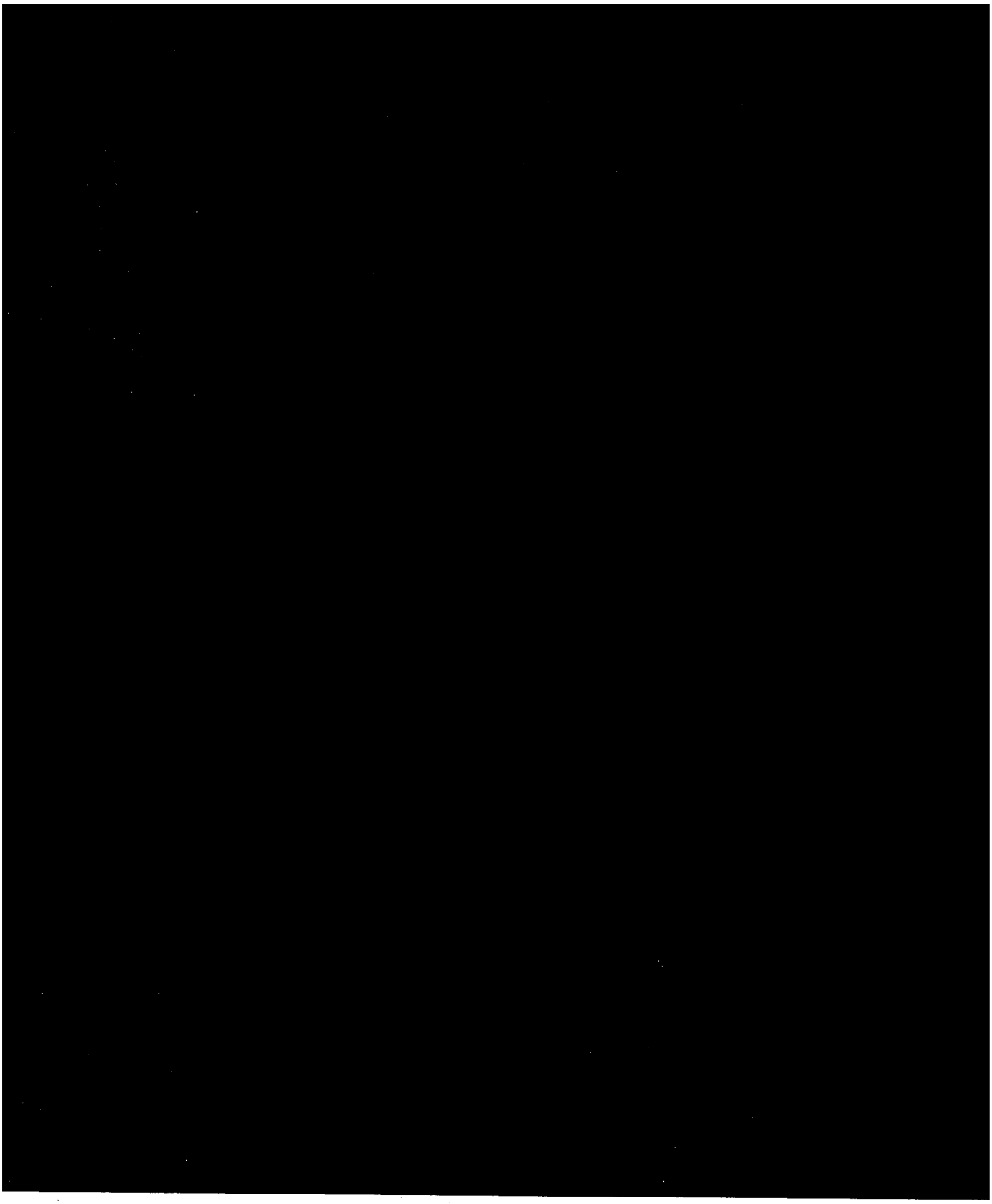

L. W. G. FLYNT.

STEAM BOILER.

APPLICATION FILED NOV. 4, 1910.

1,037,884.

Patented Sept. 10, 1912.

3 SHEETS—SHEET 1.

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3 SHEETS—SHEET 2.

Fig. 2.

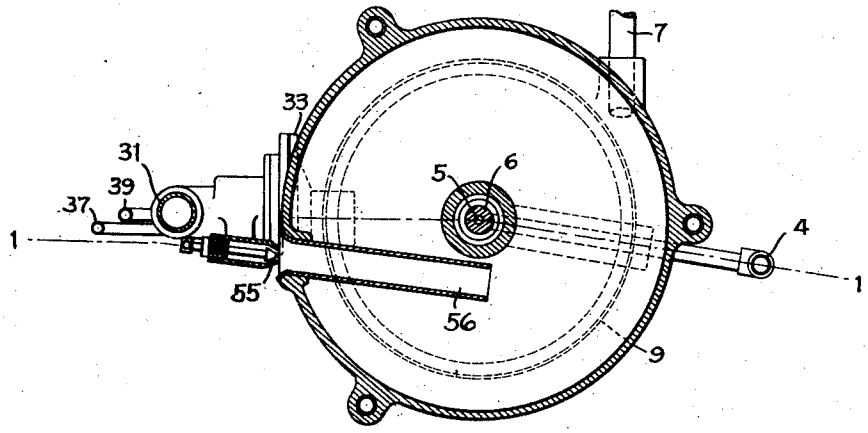


Fig. 3.

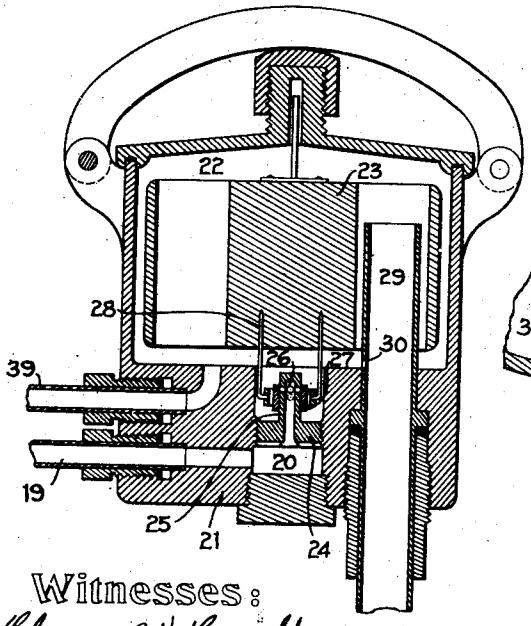
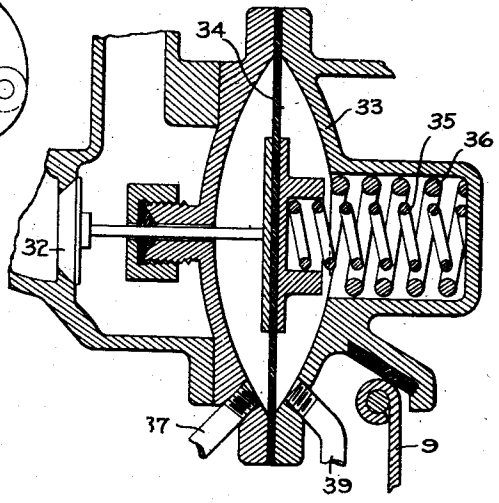


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

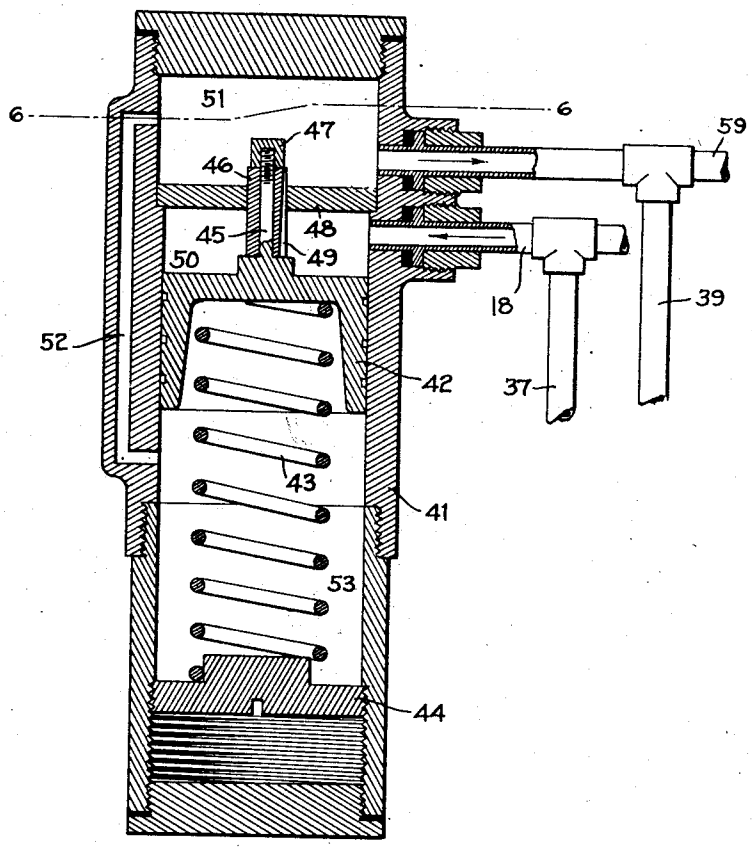
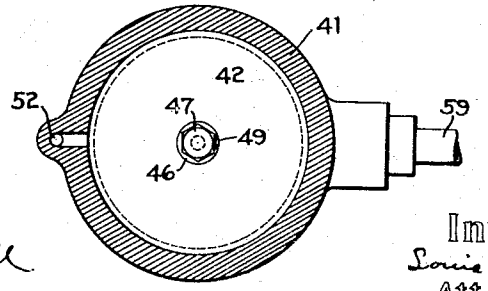


Fig. 6.



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UNITED STATES PATENT OFFICE.

LOUIS W. G. FLYNT, OF ROCHESTER, NEW YORK, ASSIGNOR TO DOMESTIC APPLIANCES COMPANY, A CORPORATION OF NEW YORK.

STEAM-BOILER.

1,037,884. Specification of Letters Patent. Patented Sept. 10, 1912.

Application filed November 4, 1910. Serial No. 590,703.

To all whom it may concern:

Be it known that I, LOUIS W. G. FLYNT, a subject of the King of Great Britain, and resident of Rochester, in the county of Monroe and State of New York, United States of America, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification.

This invention, while applicable in its broadest aspects, to steam generators of various types, relates particularly to generators of the continuous-flow type.

The object of the invention, broadly stated, is to produce a generator of the type above referred to which shall be particularly adapted for use in connection with a source of supply of water under pressure, such, for example, as the ordinary water main or service-pipe of a city water-supply.

Continuous-flow generators have been proposed heretofore in which the water is fed into the generator from a source of supply under pressure, the water-pressure alone being depended upon for this purpose, without the use of pumps or other devices for forcing the water into the generator. It is obvious that in such an arrangement the working pressure of the generator is limited at all times by the pressure in the water-supply, as a higher working pressure would at once interrupt the flow of feed-water. In such an arrangement, therefore, in the absence of automatic regulating devices, it is necessary, in order to insure continuous operation, that the burner or other device by which the generator is heated, shall be so adjusted as never to produce an excessive working pressure with relation to the water-pressure. In the ordinary water-supply main the pressure fluctuates considerably, and this adjustment must obviously be regulated in accordance with the minimum water-pressure likely to be encountered. From this fact two serious disadvantages arise; in the first place, the efficiency of the generator is always at the low level determined by the minimum water-pressure, and, in the second place, when the water-pressure rises to its maximum it may so increase the flow of feed-water as to flood the generator and result in incomplete vaporization of the water.

In accordance with the present invention the disadvantages just pointed out are diminished or avoided by the use of automatic means by which the operation of the gas-burner or other heating device is regulated in accordance with the difference between the steam pressure and water pressure. When this difference increases the heating effect is increased, and vice-versa, and two important results are thus secured. In the first place, if the water-pressure rises the temperature may be increased in proportion, thereby increasing the steam-pressure, so that the working pressure is not fixed at a minimum but rises and falls, being at all times as high as is consistent with a continuous water-feed. In the second place, flooding of the generator is prevented, as will presently be described.

In connection with the automatic device just described, it is possible to use, owing to the second advantage referred to, feed-controlling means adapted to supply feed-water varying in volume with the water-pressure, and my invention embraces the use of such means. In some cases, however, I have found it simpler and preferable to employ means for producing a constant and uniform flow of feed-water. In such an arrangement the variations in working pressure, coinciding with the variations in water-pressure, result not in changes in the volume of water vaporized but in variations in the degree of superheating of the steam produced from a constant volume of water, the flow of water being adjusted to a minimum which is susceptible of being completely vaporized even when the burner is regulated in accordance with the minimum water-pressure. A novel device for securing such a uniform flow of feed-water constitutes a feature of the invention and is disclosed hereinafter.

This invention is applicable to generators in which the feed-water is injected continuously into the boiler and is converted continuously into steam, and such boilers may be either of the flash-type, that is, in which the water is instantaneously vaporized, or of the continuous-flow type in which evaporation is progressive. In generators of the kind in question it is necessary ordinarily to provide for variation in the quantity of water supplied to the boiler, as well as for variations in the heat applied to the boiler, since the steam consumption varies with varying demands. Where the generator is used as in the illustrated embodiment of this invention, however, it is practicable to

maintain a uniform water feed to the boiler, and to regulate the steam-pressure solely by regulation of the fuel supply, because in this case the steam escapes from the generator through an orifice of constant capacity and against a substantially constant resistance.

When the valve that controls the admission of fuel to the burner is placed under the joint influence of the water-pressure and the steam-pressure, in the manner described, and provision is made for superheating the steam at maximum pressure, the capacity for work will vary with the water pressure, but whatever that capacity may be it will remain constant while the water-pressure remains constant. When a predetermined yielding resistance, such as that of a spring, is employed to coöperate with the steam-pressure to close the fuel-valve against the resistance of the water-pressure, the steam-pressure cannot at any time rise higher than the difference between the force exerted by the water to open the valve and the force exerted by the spring to close it.

A more specific object of the invention is to produce a steam generator which is adapted to be thrown into automatic operation by simple and convenient means, and particularly by means operated at a distance from the generator. To this end, I provide my generator with a gas-burner or other heating device which is so connected with the water-supply pipe that when water under pressure is introduced into the latter, as by the operation of a manually-controlled valve, the water-pressure in the supply-pipe acts to throw the burner into operation, and thus the feed of water to the generator, and the heating of the generator are simultaneously controlled by a single manually-operated device.

In the drawings:—Figure 1 is a vertical section of a vacuum-cleaning apparatus embodying the invention in question, on the line 1—1 in Fig. 2; Fig. 2 is a section on the line 2—2 of Fig. 1; Fig. 3 is a vertical section of the valve-chamber shown in full in Fig. 1; Fig. 4 is an enlarged view of a detail of Fig. 1; Fig. 5 is a vertical section of a modified form of the controller for the feed-water; and Fig. 6 is a section on the line 6—6 in Fig. 5, looking downward.

In the illustrated embodiment of the invention the generator is provided with a flash boiler 2 inclosed in a casing 1 which is lined with nonconducting material 3. The lower end of the boiler is connected, by a pipe 4, with a steam-nozzle 5, and the latter discharges upwardly through a draft tube 6 which, in conjunction with the steam-nozzle, constitutes an air-ejector. A vacuum service-main 7 discharges air and dust into a settling-chamber 8, from which the air and the finer solid material are discharged by the air-ejector. The lower portion of the settling-chamber consists in a removable pan 9.

The steam discharged from the nozzle 5, together with the air and dust withdrawn by the air-ejector, are conducted, by a flue 10, into the upper part of the casing 1 whence, after mingling with the products of combustion from the burner, they pass off, with the latter, through a flue 11, to a chimney, or directly into the atmosphere. The flue 10 is protected from the flame of the burner, and the hot gases that arise from it, by nonconducting material 12, and the heat of the products of combustion serves to incinerate the dust discharged by the air-ejector after it leaves the flue 10 and enters the upper part of the casing.

Brackets 13 and 14, supported on the flue 10, serve in turn to support the coils of the boiler, and a gas-burner 15 serves to heat the boiler.

The water is taken from a service-pipe 16, and, in the construction shown, is conducted through a passage 17 surrounding the gas-burner, in order that the burner may be cooled by the water to reduce the danger of back-firing. The heat so absorbed is economically employed as it serves to raise the temperature of the feed-water before it enters the coils of the boiler. The temperature of the water is further raised, in the construction shown, before it reaches the boiler-coils, by carrying it up through a pipe 18 to a heating coil 19 located in the upper part of the casing 1. From the heating coil the water passes into a chamber 20 in the casing 21 of a feed-regulating device. The chamber 20 communicates with a float-chamber 22. The flow of water from the former to the latter is controlled by a valve that is operated by a float 23, so that water is maintained at a uniform height within the float-chamber. The valve shown in the drawings for that purpose comprises a plug 24, that is screwed into the casing 21, and has a hollow neck 25. Through transverse perforations 26 in the neck, the water flows into the float-chamber 22. Coöperating with the neck 25 is a sleeve 27 that is adapted to slide up and down thereon, thereby closing or opening the perforations 26. The sleeve 27 is attached to the float 23 by rods 28, and is so adjusted, with respect to the float, as to maintain the water constantly at a predetermined height. This head of water in the float-chamber is utilized to produce a uniform feed of water to the boiler-coils 2, by carrying the upper end 29 of the boiler up into the float-chamber, above the level of the water, and perforating this with a hole 30 of suitable size, located below the predetermined level of the water.

The gas-burner 15 is fed by a gas-main 31, and the flow of gas is automatically con-

trolled by a regulating device comprising a casing 33, a diaphragm 34 in the casing, a valve 32 connected with the diaphragm, and springs 35 and 36 that provide yielding resistance to the movements of the diaphragm and valve. On the side of the diaphragm opposite the springs a water-pipe 37 enters the casing, and this pipe leads to the service-main, so that when the water is turned on, at a cock 38, the pressure of the water opens the valve 32 against the resistance of the springs. On the same side of the diaphragm as the springs another pipe 39 enters the casing, and this pipe leads from the float-chamber 22. This pipe 39 is always full of water, received from the float-chamber, so that when steam is generated in the coils 2 and enters the float-chamber through the pipe 29 it subjects the column of water in the pipe 39 to pressure, which is communicated to the diaphragm 34 and added to the force of the springs 35 and 36, thus tending to close the valve 32 and so reduce the flow of gas. The pressure of the steam upon the water in the float-chamber does not increase the flow of water through the hole 30, since the same pressure prevails within the tube 29.

As shown in the drawings, the valve 32 can open some distance without compressing the spring 36. The spring 35 is normally alone in operation, the force of this spring being such as to counteract the predetermined constant difference in pressure between the water and the steam. When the generator is first thrown into operation, however, it is necessary that the valve 32 should open to a maximum in order to throw the burner into full operation and heat the coils rapidly, so that the water admitted to them will be converted into steam before it reaches the open steam-nozzle. This result is secured automatically, since the water-pressure on the diaphragm is not opposed, initially, by any steam-pressure. At this time, therefore, the spring 36 is put under compression, thereby allowing the gas-valve 32 to open fully until steam has been generated. As the steam-pressure rises the gas-valve is gradually moved from its fully-open position, until finally the spring 36 is disengaged when working-pressure is reached. Whenever, through any temporary cause, the steam-pressure completely overcomes the water-pressure and closes the valve 32, the flame is maintained by a pilot light 40 until the steam-pressure falls off and the valve reopens. The coils will retain sufficient heat, after the burner has been extinguished and the water shut off by closing the cock 38, to evaporate the water contained in the float-chamber, which continues to flow to the coils 2 till exhausted.

From the foregoing description of the operation of the apparatus, it is obvious that the steam-pressure may rise and fall with fluctuations in the water-pressure, but that it can never remain above the water-pressure and so stop the flow of water to the generator, for whenever the steam-pressure rises within a predetermined margin below the pressure of the water, it increases the pressure on the water in the pipe 39 and the diaphragm-chamber, and closes the gas-valve.

An advantage of the organization is that the boiler acts correctly although the pressure in the water service pipe may fluctuate. Assume that the apparatus is in operation and that there should be a sudden diminution in the water pressure owing to the opening of cocks in other parts of the house. This diminution of water pressure would be followed by two results, namely, (1) the gas supply valve 32 would be closed, thus preventing the further production of steam: and (2) before the steam pressure could be reduced by the cessation of the supply of fuel, the steam pressure within the boiler would cause the water in the float chamber 22, to flow backwardly into the supply pipe 19, thereby emptying or partially emptying the water in the float chamber, and hence lowering the float and opening wide the valve ports 26. This backing of the water into the water supply pipe is advantageous because it stops the flow of water from the float chamber into the boiler after the gas supply has been cut off. Just as soon, however, as the water pressure is resumed in the water service pipe, the gas is turned full head on, and water floods into the float chamber through the wide open feed water valve; so that operative conditions are quickly restored. This rise and fall of the feed water valve is thus dependent upon the opposed pressures of water in the water-service pipe and of the steam in the boiler; and, therefore, the feed water valve operates automatically under the steam pressure of the boiler to increase the area of said passageway as the steam pressure increases with reference to the pressure of the source of supply of water. Again, assume that there is a pressure of forty pounds in the water-service pipe and a steam pressure of twenty-five pounds in the float chamber 22, above the water therein. Then the water will enter the float chamber under a head of fifteen pounds. If this head is inadequate to supply water to the feed chamber in quantities sufficient to replace the water constantly flowing out of it into the boiler, then the float falls and increases the area of the water passageway into the float chamber from the water-service pipe. Another advantage of utilizing the pressure of the water-main for opening the gas-valve is that thereby the gas can be turned on readily at a distance from the place where the apparatus is located, as, for example,

from another part of the house, by merely carrying the service-pipe 16 and the valve 38 to the desired point.

Figs. 5 and 6 show a modified form of water-feed controller, in which the pressure of the water is balanced against a spring that is aided by the steam to control the position of a feed-controlling valve. The device has a cylindrical casing 41, in which is a piston 42, that is normally pressed upward by a spring 43, the spring resting at its lower end upon an adjusting nut 44. On the upper end of the piston 42 is a stud 45, upon which a sleeve 46 is held by a nut 47. This sleeve extends through an aperture in a partition 48, and fits it water-tight, although slidable with the piston 42. In one side of the sleeve 46 is a tapered groove 49, the larger part of the groove being at the lower end of the sleeve. The groove constitutes a communicating passage between the chambers 50 and 51. The piping connections to this form of controller are numbered in the drawings in correspondence with the analogous parts shown in the preceding figures. The pipe 18 from the feed-water main enters the chamber 50, and has a branch 37 that is connected to the gas-valve side of the diaphragm 34 as before. The pipe 59 that is shown as communicating with the chamber 51, is connected to the top of the boiler-coils 2, and the branch 39 extends to the spring side of the diaphragm 34.

The operation of the controller is as follows: Water entering the chamber 50 from the main 18 forces the piston 42 and the sleeve 46 downward against the action of the spring 43. The water escapes in a small stream through the groove 49 into the chamber 51, and trickles down through the pipe 39 into the boiler-coils. As soon as steam-pressure accumulates in the boiler the pressure is communicated through a by-passage 52 to the chamber 53 in which is the spring 43. This pressure tends to carry the piston 42 upward against the water-pressure in the chamber 50, so as to move the piston upward, and bring a wider portion of the groove 49 into the partition 48, thereby counteracting the effect of the steam-pressure against the water-pressure. At the same time, the excess of steam-pressure acts as before on the diaphragm 34 and cuts off the fuel supply to some extent. If the water-pressure suddenly rises the piston 42 is moved downward, which brings the narrowest part of the groove 49 into the partition 48, and increase in the flow of water is prevented. Simultaneously, the excess of water-pressure on the diaphragm 34 opens the fuel-valve farther, and the steam-pressure quickly rises, thereby supplementing the spring 43 and moving the piston 42 back to its original position. By making the groove 49 of parabolic form the device can be adjusted to produce a constant feed under all of the conditions of operation.

I have found that the usual pressures in city gas-supply systems are not sufficient to secure the best operation of a large burner of the Bunsen type. For this reason the illustrated generator is provided with means for securing the forcible introduction of gas and air to the burner. To this end the gas is admitted through a nozzle 55, and concentric with this gas nozzle is a steam nozzle 57 fed by a pipe 58 from the boiler tube. The steam-jet from the nozzle 57 produces a powerful current of gas through the nozzle 55. The combined currents of gas and steam enter the burner through a draft-tube 56 (Fig. 2) and air is thereby drawn in through the open outer end of the draft-tube. This tube is arranged off-center so as to produce a whirling motion, whereby the gas and air are uniformly mixed and distributed in the burner.

The general arrangement of the boiler, the air-injector and the burner of the generator disclosed in this application, is similar to that disclosed in my copending application filed August 9, 1909, Serial No. 512,095, and is not, therefore, claimed herein.

I claim:—

1. A vacuum creating steam-generator for domestic use comprising an air-suction passage, a continuous flow boiler having a water inlet and a permanently open discharge orifice of fixed size, a gas burner for heating said boiler adapted to be connected with the gas service-pipe of the building in which the generator is installed, a valve for the supply of gas to the burner, and a pilot light adapted to receive gas from the gas service-pipe and in operative position with respect to said burner, in combination with an automatic water valve adapted to produce normally a continuous flow of substantially fixed quantity to said boiler inlet from a water service-pipe of said building, an automatic actuator for said gas supply valve, which is subject to the opposed pressures of the water in the water service-pipe and of the steam in the boiler, being moved to open said valve by the pressure of the water in the water service-pipe and to hold said valve open against steam pressure in the boiler at a predetermined pressure that is less than the water pressure, and being moved to close said valve when the steam pressure approaches the water pressure, and a single hand-manipulated valve controlling the admission of water from the water service-pipe.

2. A vacuum creating steam-generator for domestic use comprising an air-suction passage, a continuous flow boiler having a water inlet and a permanently open discharge ori-

fice of fixed size, a gas burner for heating said boiler adapted to be connected with the gas service-pipe of the building in which the generator is installed, and a valve for the supply of gas to the burner, in combination with an automatic water valve adapted to produce normally a continuous flow of substantially fixed quantity to said boiler inlet from a water service-pipe of said building, and an automatic actuator for said gas supply valve, which is subject to the opposed pressures of the water in the water service-pipe and of the steam in the boiler, being moved to open said valve by the pressure of the water in the water service-pipe, and to hold said valve open against steam pressure in the boiler at a predetermined pressure less than the water pressure, and being moved to close said valve when the steam pressure approaches the water pressure.

3. A steam-generator for domestic use comprising a continuous flow boiler having a water inlet and a permanently open discharge orifice of fixed size for the free discharge of steam under all conditions, a gas burner for heating said boiler adapted to be connected with the gas service-pipe of the building in which the generator is installed, a valve for the supply of gas to the burner, in combination with an automatic water valve adapted to produce normally a continuous flow of substantially fixed quantity to said boiler inlet from a water service-pipe of said building, and an automatic actuator for said gas supply valve which is subject to the oppsed pressures of the water in the water service-pipe and of the steam in the boiler, being moved to open said valve by the pressure of the water in the water service-pipe and to hold said valve open against steam pressure in the boiler at a predetermined pressure that is less than the water pressure, and being moved to close said valve when the steam pressure approaches the water pressure.

4. A steam-generator comprising, in combination, a continuous flow boiler having a water inlet and a permanently open discharge orifice of fixed size for the free discharge of steam under all conditions, a gas burner for heating the boiler adapted to be connected with the gas service-pipe of the building in which the generator is installed, a valve for the supply of gas to the burner, a water valve adapted to control the admission of feed-water and adapted to produce normally a continuous flow of substantially fixed quantity to said boiler inlet from a water service-pipe, which is open when the generator is idle and which is normally open when the generator is in use, and an automatic actuator for said gas supply valve which is subject to the opposed pressures of the water in the water service-pipe and of the steam in the boiler, being moved to open said valve by the pressure of the water in the water service-pipe and to hold said valve open against steam pressure in the boiler at a predetermined pressure that is less than the water pressure, and being moved to close said valve when the steam pressure approaches the water pressure.

5. A steam-generator comprising, in combination, a continuous flow boiler having a water inlet and a permanently open discharge orifice of fixed size for the free discharge of steam under all conditions, heat-producing means for heating the boiler, an automatic water valve adapted to regulate the supply of water to said boiler inlet from a water service-pipe, which is open when the generator is idle and which is normally open when the generator is in use, and an automatic regulator for the heat-producing means adapted to reduce the heat-producing effect of the latter whenever the steam pressure approaches the water pressure.

6. A steam-generator comprising, in combination, a continuous flow flash-boiler having a water inlet and a permanently open discharge orifice of fixed size for the free discharge of steam under all conditions, means operating automatically to control the admission of feed-water and adapted to produce normally a continuous flow of substantially fixed quantity to the boiler inlet, a burner for heating the boiler, and means for admitting fuel to the burner from a source of fuel supply under pressure adapted to be subjected to and operated by the pressure of the water supply against both an established, yielding resistance and the variable steam pressure of the boiler, whereby the steam pressure is caused to rise with the pressure of the water supply.

7. A steam-generator comprising, in combination, a continuous flow flash-boiler having a water inlet and a permanently open discharge orifice of fixed size for the free discharge of steam under all conditions, means operating automatically to control the admission of feed-water and adapted to produce normally a continuous flow of substantially fixed quantity to the boiler inlet, a burner for heating the boiler, and means adapted to operate under the joint control and opposing action of the water pressure in a source of supply of water under pressure and the steam pressure in the boiler to regulate the burner in accordance with the difference in said pressures.

8. A steam-generator comprising, in combination, a boiler having a water inlet, means operating automatically to control the admission of feed-water and adapted to restrict the flow of water to the boiler inlet, heat-producing means for heating the boiler, and means adapted to operate under the joint control and opposing action of a variable water pressure in the water supply

and the steam pressure in the boiler to regulate the heat-producing means.

9. A steam-generator comprising, in combination, a boiler having a water inlet, means operating automatically to control the admission of feed-water and adapted to restrict the flow of water to the boiler inlet, heat-producing means for heating the boiler, and means for admitting fuel to the heat-producing means from a source of fuel supply under pressure, adapted to operate automatically under a variable water pressure in the water supply, to cause the steam pressure to rise and fall in correspondence with the pressure of the water supply.

10. A steam-generator comprising, in combination, a boiler having a water inlet, means operating automatically to control the admission of feed-water and adapted to restrict the flow of water to the boiler inlet, heat-producing means for heating the boiler, and means for regulating the heat-producing means adapted to operate automatically at a predetermined difference between the pressure of the water supply and the steam pressure in the boiler to maintain the steam pressure in the boiler at a lower degree than the pressure of the water supply.

11. A steam-generator comprising, in combination, a boiler having a water inlet, a water-feed valve adapted to restrict the admission of feed-water to the boiler inlet from a source of supply under pressure, heat-producing means for heating the boiler, a regulator for the heat-producing means adapted to be operated by the pressure of the water supply, and a manually-operated valve by means of which water under the pressure of the source of supply is admitted both to the water-feed valve and the regulator for the heat-producing means.

12. In a steam-generator, the combination, with a source of supply of water under pressure and a source of fuel supply, of a boiler, connections between the boiler and the source of supply of water including a feed-water valve for restricting the flow of water, a burner for heating the boiler, connections between the burner and the source of fuel supply including a fuel-valve for controlling the admission of fuel to the burner, a valve-actuator subjected to the water pressure in the source of supply for opening the fuel-valve to admit fuel to the burner, and a manually-operated valve for controlling both the admission of water to the feed-water valve and the admission of water under the pressure of the source of supply to the valve actuator.

13. In a steam-generator, the combination, of a continuous flow boiler, a source of supply of water under pressure, a water passageway connecting the boiler with the source of supply of water, and a feed-water valve controlling said passageway and governed in its position by the feed water and operating automatically under the steam pressure of the boiler to increase the area of said passageway as the steam pressure increases with reference to the pressure of the source of supply of water and to reduce the area of said passageway as the steam pressure falls with reference to the pressure of the source of supply of water, whereby a constant and uniform flow of water is had to the boiler.

14. In a steam-generator, the combination, with a source of supply of water under pressure, of a continuous flow flash-boiler fed from said source, and means for controlling the admission of feed-water, said means comprising a water chamber communicating with the boiler through a normally open, elevated, restricted passage, and a float-valve in said chamber for admitting water from said source of supply to said chamber and maintaining in the chamber a constant head above said passage, whereby water is fed continuously in the same quantity to the boiler when in use.

15. In a steam-generator, the combination, with a source of supply of water under variable pressure, of a continuous flow flash-boiler fed from said source, the boiler having a permanently-open discharge orifice of fixed size for the free discharge of steam under all conditions, means for controlling the admission of feed-water including a normally open, automatic feed-valve, said means being adapted to produce a continuous flow thereof under constant head, said means having an orifice of fixed size through which the feed-water flows under such head, a burner for heating the boiler, and means subjected to the steam-pressure in the boiler for regulating the burner automatically to maintain the steam pressure at a lower degree than the pressure in the source of supply of water.

16. In a steam-generator, the combination, with a source of supply of water under pressure and a source of fuel supply, of a boiler, connections between the boiler and the source of supply of water, including means for admitting water automatically to maintain a constant head and an orifice of fixed size through which water is delivered under said head into the boiler, a burner for heating the boiler, connections between the burner and the source of supply of fuel, including a fuel-valve for controlling the admission of fuel to the burner, a valve-actuator connected with, and controlling, the fuel-valve, means to close said valve, and connections between the valve-actuator and the source of supply of water, whereby the valve-actuator is subjected to the pressure in said source of water supply so as to be affected by variations therein and produce

corresponding variations in the steam-pressure of the boiler, and the amount of fuel applied to the burner is varied in accordance with variations in the water supply.

17. A continuous flow flash-boiler having, in combination, a permanently open discharge orifice of fixed size for the free discharge of steam under all conditions; a float chamber; a pipe communicating with the steam generating space of the boiler and extending within said float chamber and opening into said float chamber above the maximum water level therein; a water port at the bottom of said float chamber through which the water flows therefrom to said steam space; a water feed passage in communication with the water service-pipe of the building in which the boiler is located, and supplying water to the bottom of said float chamber; a valve governing the discharge of water from said passage to said float chamber; and a float within said chamber connected with said valve, said passage being open when the float is down, and being restricted when the float rises.

18. A boiler having, in combination, a permanently open discharge orifice of fixed size for the free discharge of steam under all conditions; a float chamber communicating with the steam generating space of the boiler above the maximum water level therein; a water port below the water level of said float chamber through which the water flows therefrom to said steam space; a water feed passage supplying water to said float chamber; a valve governing the discharge of water from said passage to said float chamber; and a float within said chamber connected with said valve, said passage being open when the float is down and being restricted when the float rises.

LOUIS W. G. FLYNT.

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