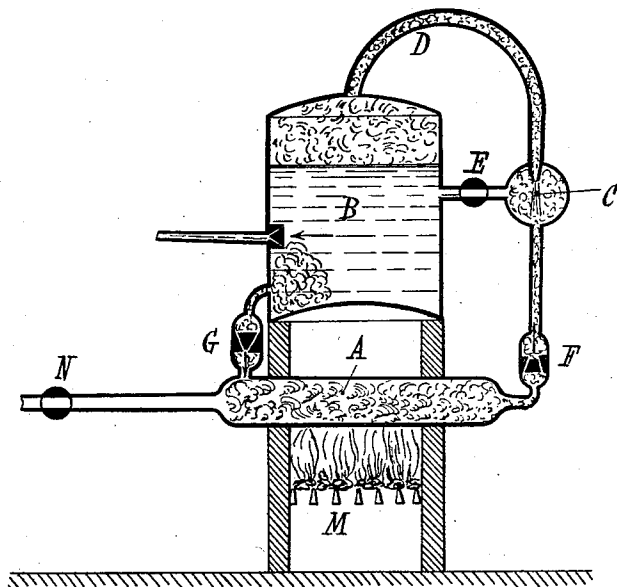


(No Model.)

L. E. SOLIGNAC.
STEAM GENERATOR.

No. 532,831.

Patented Jan. 22, 1895.



Witnesses;
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UNITED STATES PATENT OFFICE.

LOUIS EDMOND SOLIGNAC, OF PARIS, FRANCE.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 532,831, dated January 22, 1895.

Application filed July 12, 1894. Serial No. 517,302. (No model.)

To all whom it may concern:

Be it known that I, LOUIS EDMOND SOLIGNAC, of the city of Paris, France, have invented Improvements in Instantaneous Steam-Generators, of which the following is a full, clear, and exact description.

This invention relates to improvements in instantaneous steam generators, by which is meant a generator in which the water is injected in small quantities at a time proportionally to the consumption of steam so that the heating surface is never covered with water and evaporation goes on to dryness so as to superheat the steam. To obtain this result it is necessary to separate the vaporizing vessel from the bulk of the water, either by means of a length of tubing as in ordinary superheaters or by automatic check valves isolating the vaporizer during the superheating and only admitting the water in successive fractional quantities. It has been found from experience that the first plan was open to the objection that when the supply of steam to the engine is shut off, the superheater is exposed to the full heat of the fire without any circulation of steam, since as soon as the steam valve is closed the steam confined in the superheating vaporizer rising in temperature and expanding closes the admission valve, the continually increasing pressure leading to the bursting of the vessel, especially as it soon becomes red hot in consequence of not being cooled by fresh supplies of water and steam.

The object of the present invention is to obviate the above objection which exists in all superheaters even when they are not provided with regulating injection valves, by modifying the apparatus in the manner hereinafter described.

As the water injected should be proportionate to the work to be done by the boiler, it is indispensable to vary the quantity injected, and for this purpose I provide upon the pipe by which the steam is conveyed from the dome an injector connected with the water space of the boiler whereby to afford means of regulating the hygrometric condition of this steam. The water thus injected should not however exceed the weight of the water to be evaporated in order that the steam issuing from the vaporizer may always be dry and not a mixture of water and steam, this being

an indispensable condition for directly utilizing the steam in ordinary engines even when superheated more or less according to requirements. To obtain these results I construct what I term a mixed boiler illustrated in vertical section in the accompanying drawing which has the following distinctive characteristics.

A is a tube or series of tubes forming an instantaneous generator exposed to the direct heat of the furnace.

B is the supply space which may be arranged as a second heating surface or even be placed outside the furnace at a higher level than the point at which the steam is introduced into the instantaneous generator.

C is a chamber on the steam pipe D connected by a branch pipe E with the water space of the boiler vessel B, for introducing water therefrom for the purpose of moistening the steam. It does not however act as an injector but as an atomizer of the water as it passes out of pipe E into chamber C and there met and atomized by the steam from pipe D. The pipe E is provided with a cock for regulating the admission of water either by hand or by means of an automatic apparatus whose action is dependent on the temperature of the steam issuing from the vaporizer A according to the degree to which the steam is to be superheated.

F is a valve which cuts off the supply to the generator A when the pressure in the latter becomes higher than that in the reservoir B.

G is another valve acting in the reverse direction, which on a rise of pressure in generator A allows the steam to pass therefrom into reservoir B.

N is the steam cock controlling the passage of steam to the engine or other machine. The boiler B is supplied by means of an injector, pump or other means ordinarily employed.

The action of my improved generator is as follows: At starting, the boiler B is filled with water to above the level of the branch pipe E, the valve F being open under the action of gravity and valves G and N being closed and the water filling the generator A and chamber C by its natural flow. The fire M being then lighted the water in the passages

F, C, E, expands freely under the action of heat, the boiler B serving simply as an expansion vessel. On the pressure rising steam is produced in generator A which closes valve F, opens valve G and condenses in boiler B, the pressure in which rises until the whole of the water contained in generator A is evaporated, the latter thus becoming an instantaneous steam producer. The discharge of the steam into reservoir B continues until equilibrium of pressure in B and A is established, whereupon valve F opens by gravity and under the pressure of the column of water E, F and admits into generator A a small quantity of water which is instantaneously vaporized producing a fresh quantity of steam which opens valve G and closes valve F, the admission of water being repeated when equilibrium is again established between the two reservoirs and so on. The cycle being thus established, the steam valve N can be opened. The periodical opening and closing of valve F then becomes more frequent, since the consumption of steam by the engine tends to continually destroy the equilibrium between the two vessels A and B.

If in consequence of a sudden stoppage of the engine, or a temporary fall in the amount of steam consumed, the pressure in A exceeds that in B the excess pressure passes through valve G into said reservoir B wherein a rise of temperature and consequently of pressure takes place and the latter being indicated by the pressure gage and escaping at the safety valves gives notice that the fire should be moderated. The flow through cock E is reduced either by hand or otherwise, and the action is the same as that of an ordinary steam generator, but no change takes place in the equilibrium between the two valves F, G, the one continuing to regulate the supply and the other the super-production of steam.

Instead of check valves, I may use cocks controlled by pistons whose opposite faces are open to the pressure of the generator A and feed reservoir B respectively, the arrangement being such that the cock which replaces valve F opens when there is equilibrium of pressure while the cock which takes the place of valve G opens when the pressure in B is below that in the generator A. Under these conditions, at the moment the water is introduced the pressure in B is always higher than that in

generator A at the same moment while the pressure in generator A should be greater than that in generator B a few moments before the introduction of the water through valve F, in order to enable the steam to enter the reservoir B.

It will thus be seen that the production of steam in generator A may be represented by a wavy curve which approaches the nearer to a straight line the less the difference between the faces of the valve F and the quicker it beats, with the result that without having a continuous production of steam I have a steam generator suited for all kinds of industrial applications.

I claim—

1. In an instantaneous steam generator the combination of a flasher producing a series of steam emissions in quick succession, feed boiler placed at a higher level than the flasher and supplying the same with fluid, in combination with a steam atomizer so regulated as to introduce into the flasher in the form of spray a quantity of water and steam for each emission, substantially as described.

2. An instantaneous steam generator, adapted to atomize water and inject it by the steam used to atomize it into a flasher, in quantities regulated automatically by the demand, combined with means for supplying water and steam thereto from a supply boiler the overflow or steam from the outlet of the generator being adapted to maintain the equilibrium of pressure and to heat the supply boiler and means for automatically opening and closing the steam and overflow valves, substantially as described.

3. In a steam generator the combination of a liquid reservoir, a flasher, automatic means of supplying the flasher with liquid from the reservoir, the same consisting of a pressure operated valve, an atomizing chamber and steam and water supply pipes leading thereto; and an automatic valve for passing excess of steam from the flasher to the reservoir, substantially as described.

The foregoing specification of my improvements in instantaneous steam generators signed by me this 29th day of June, 1894.

LOUIS EDMOND SOLIGNAC.

Witnesses:

EDWARD P. MACLEAN,
ALBERT MOREAU.