





# United States Patent Office.

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## IMPROVEMENT IN STEAM-GENERATORS.

The Schedule referred to in these Letters Patent and making part of the same.

*To all whom it may concern :*

Be it known that I, FRANCIS B. DUNN, of the city, county, and State of New York, have invented certain new and useful Improvements in "Steam-Generators;" and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing, making part of this specification, and in which—

Figure 1 represents a side elevation of a steam-generator, with feed or supply-apparatus and steam-drum attached;

Figure 2, a vertical longitudinal section, taken centrally through the same; and

Figure 3, an inside view of the feed-head of the generator.

The same letters indicate like parts in all the figures.

In all pipe or tube-generators in which the heat is applied outside of the tubes, and the water or other fluid occupying their interior, as contradistinguished from tubular boilers, in which the tubes form flues for the passage of the products of combustion through the body of such fluid, there is a strong tendency, owing to the small quantity of water contained in the tubes, to which great intensity of heat is applied, to force the water out of the tubes into the steam-drum, by the rapid evolution of steam in said pipes or tubes.

To provide against this evil is the object of my present invention, which consists—

First, in the arrangement of means for keeping up a forced circulation of the fluid over the heating-surface until the whole is converted into steam, by which the accumulation of water in the steam-drum is drawn off continually, and reforced through the pipes.

Secondly, in the construction of the feed-head to the generator with a series of collars arranged to correspond with the tubes, and fitted closely against the tube-sheet, leaving a water-space between and around said collars, each of which is perforated with a small aperture, to admit an equal quantity of water to each tube; the sum of the areas of these apertures being equal to the area of the supply-pipe, or thereabouts, will cause the most effective operation.

For the practical application of my invention, I will describe it, by referring to the drawings, in which—

A represents the pumping or donkey-engine, and B, the feed-pump, both of which being of ordinary construction, need no further description here.

C is a series of tubes, arranged horizontally, or inclined at a suitable angle, and which is connected in any convenient manner with the tube-sheets D D' at either end.

To the outside of these tube-sheets are secured hollow covers E E', forming chambers connecting with all the tubes C. The one E, which is the feed-head, has a series of collars or rings, F, connected

with it, which is so arranged as to fit against and form connection with each of the tubes C, while the cover E' forms one open chamber connecting all the tubes.

G represents the steam-drum or chamber, which receives steam from the cover or head E' through the tube H, and is provided with a pipe, I, connecting its lower portion with the feed-pump B, and a pipe, J, through which the steam is passed to the engine or elsewhere, as desired.

The pipe K connects the feed-pump with the feed-head or cover of the generator.

An apparatus thus constructed will operate as follows:

The feed-pump B being put in motion, forces water into the cavity of the head E, between the rings or collars F, each of which has a small aperture in through its upper side, which admits a proportional quantity of the supply of water to each of the tubes C, which, in its passage therethrough, is converted into steam, by the heat applied to the outer side of said tubes, and passes off, through the head or cover E' and tube H, into the steam-drum G.

In case of forcing the apparatus by great heat and over-supply of water, the steam, generated rapidly in the tubes, will carry forward with it into the steam-drum a portion of the water, which would, in time, result in filling said drum with water instead of steam.

To remedy this I connect the lower portion of the said drum by a pipe, I, with the valve-chest of the feed-pump, provided with suitably-arranged valves, so as to draw off the water thus carried over and repass it through the tubes C; the resistance of the pressure in the drum through the pipe I and of the water in the heater through the pipe K being equal, the accumulated water in the drum G will return to the pump by its own gravity, through its ingress-valves, and be thereby reforced, as before described, while an additional quantity of water is obtained to supply the waste from any other convenient source.

Having thus described my invention,

What I claim as new, and desire to secure by Letters Patent, is—

1. The arrangement of the feed-pump B, steam-generating tubes C, and steam-drum G, provided with connecting-pipe I, substantially as set forth.

2. The arrangement of the collars F within the feed-head E opposite, or in line with the tubes C; and each provided with a small orifice *m*, for the equal distribution of water or other fluid to said tubes, substantially as specified.

FRANCIS B. DUNN.

Witnesses:

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HENRY WELSH.