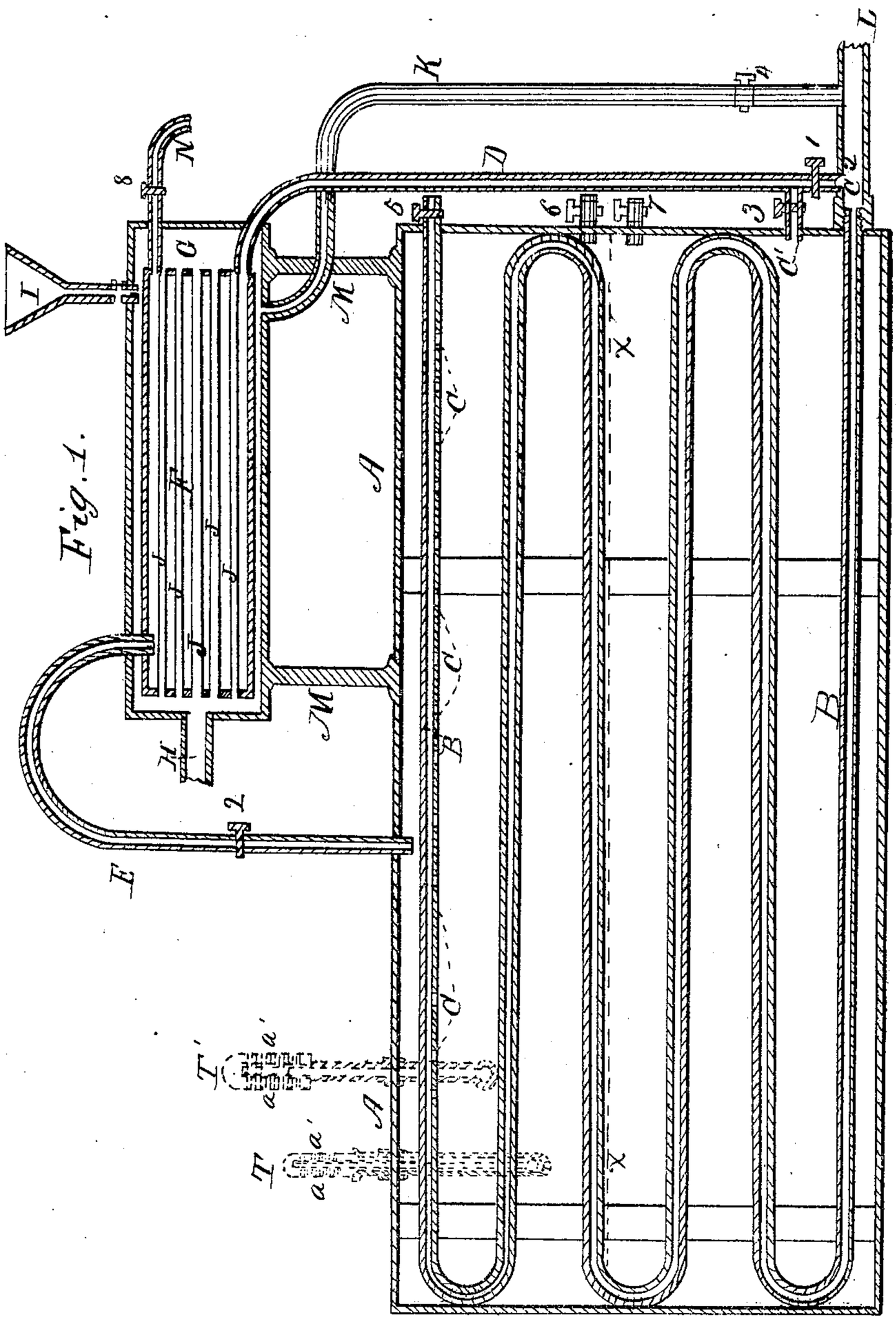
J. F. Boynton.

Steam Generators.

No. 68,598. Patented Sep. 10. 1867.



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JOHN F. BOYNTON, OF SYRACUSE, NEW YORK.

IMPROVEMENT IN STEAM-GENERATORS.

Specification forming part of Letters Patent No. **68,598,** dated September 10, 1867; antedated July 19, 1867.

To all whom it may concern:

Be it known that I, JOHN F. BOYNTON, of Syracuse, in the county of Onondaga and State of New York, have invented certain new and useful Improvements in Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings and letters of reference marked thereon.

The first part of my invention relates to a method of preventing steam-boilers from bursting; and consists in means for equalizing the temperature in all parts of the boiler.

It is a well-known fact that steam, like air or gases, is a poor conductor of heat, so that steam in the upper or outer portion of a tube or steam-chamber may be heated much higher than the steam in the boiler; and in the same manner a stratum of steam in the upper portion of the steam-space in the boiler may become much hotter than the lower portion of the steam, which lies in contact with the water. Again, it is known that steam and gas will not convey heat downward as readily as upward, as the heat conveyed downward is by radiation, while that conveyed upward is by translation of particles. As in the case of water, steam is a poor conductor of heat by radiation, but a rapid diffuser by translation of its atoms. I am satisfied that explosions of steam-boilers often occur from the steam in the upper portion of the steam-space becoming much hotter than that in the lower portion. It is not, however, my object here to explain the theory upon which this inequality of temperature tends to produce explosions, but to describe the means of obviating such inequality.

The accompanying drawing represents a vertical section of a steam-boiler with internal pipes, and of an automatic heater and feeder attached thereto.

A is the outer wall of the boiler; B B, water and steam pipe, running through the boiler from bottom to top; C, openings or jets in the upper portion of the pipe, for the passage of steam or water. C^1 is the induction-pipe for introducing feed-water into the boiler, and C^2 the induction-pipe for introducing water into the tube B. Dotted line *x x* shows the water-line in the boiler.

The water being forced into the tube B, through induction-pipe C^2, while passing through said tube B, will be increasing in temperature until it passes the water-line, where it will begin to expand into steam, and will finally be discharged in steam-jets through the openings C into the upper stratum of steam in the boiler, thus securing an equilibrium of temperature in the steam throughout the boiler.

The second part of my invention relates to an automatic heater and feeder, which I will now proceed to describe: F is a reservoir, in which water is first heated by the exhaust-steam, and from which it is automatically fed to the boiler. E is a steam-pipe for equalizing the pressure in the boiler and the automatic reservoir F. H is the induction-pipe for the exhaust-steam; G, a chamber surrounding the automatic reservoir, for heating the feed-water and condensing the escaped steam. I is the exit for uncondensed exhaust-steam; J, flues in the reservoir for the passage of escaped steam; D, a pipe for the passage of the water by its own gravity from the reservoir F to the boiler or the tube B; K, a pipe for conveying the water of the condensed steam to the force-pump; L, point for attaching force-pump; N, feed-pipe for supplying reservoir from a hydrant or from a cistern, automatically, by means of the vacuum formed by condensing steam when cocks Nos. 1, 2, and 3 are closed and No. 8 open; and M M are supports for the automatic feeder. When cock 2 is opened the pressure of the steam in the boiler and in the automatic reservoir will be equalized, and the water in the reservoir will flow by its own gravity into the boiler through pipe D, if cock 3 be opened, or into the tube B if cock 1 be opened. When cock 4 in pipe K is opened, the water of the condensed steam will flow down to the force-pump. It will be observed that when cock No. 1 is closed and cocks 2 and 3 open, the water from the reservoir will pass directly into the boiler without traversing the tube B; when cock 3 is closed and 1 and 2 open, the water will pass into the tube B only; but when cocks 1, 2, and 3 are all open, the water will pass from the reservoir into the boiler directly, and into the tube B at the same time. Before passing to the boiler or the tube B, the

water in the reservoir will be well heated by means of the exhaust-steam.

The third part of my invention relates to applying to a steam-boiler a thermometer to indicate the temperature of the steam, and thereby show its pressure in the boiler.

As there is a uniform relation between the temperature of steam in a boiler and its expansive power, I make my thermometer with a double-registering scale, one side showing the degrees of temperature, and the opposite side showing the number of pounds pressure to the square inch incident to each degree of temperature. For instance, steam of the temperature of 213.1° Fahrenheit will give a pressure of fifteen pounds to the inch; a temperature of 228° gives a pressure of twenty pounds; a temperature of 250.4° gives a pressure of thirty pounds; a temperature of 267.3° gives a pressure of forty pounds, and so on. It is manifest, therefore, that by constructing the scale so that exactly opposite the figures indicating the degrees of temperature will be placed figures indicating the pressure due to the given temperature, I enable the engineer at all times to ascertain the pressure of steam in the boiler by simply glancing at the thermometer.

In the drawing I have represented two modes of applying the thermometer to the boiler. T represents a glass thermometer set in a tube with its lower end closed, forming a socket-seat or pocket for the thermometer. A little mercury or alloy should be placed in this tube or socket before inserting the thermometer. T′ represents a metal tube fixed tightly in the boiler, with bulb at its lower end to contain mercury. A glass tube and registering-scale are mounted on the upper end. In each case one side of the scale, *a*, is to be marked with figures indicating the degrees of temperature, and the other side, *a′*, with figures indicating the pressure. When a metal tube and bulb are employed, as shown at T′, in arranging the scale, due allowance must be made for the difference in expansibility between metal and glass.

Two thermometers may be applied to the same boiler, one sinking lower into the boiler than the other, to show the difference in temperature of the upper and lower strata of steam.

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

1. The perforated tube B within the boiler, or its equivalent, for equalizing the temperature of the steam in the boiler, as described.

2. In combination with a steam-boiler, the automatic heater and feeder, when constructed, arranged, and operating substantially as described.

3. In combination with a steam-boiler, a double-registering thermometer to indicate the temperature, and thereby show the pressure of the steam in the boiler, substantially as described.

4. In combination with a steam-boiler, a thermometer of metal suspended in the boiler, as shown at T′ in the drawing, and mounted with a glass tube, to exhibit the columns of mercury, as described.

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Witnesses:
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