No. 669,187. Patented Mar. 5, 1901.

W. C. STEWART.

BOILER.

(Application filed Jan. 11, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

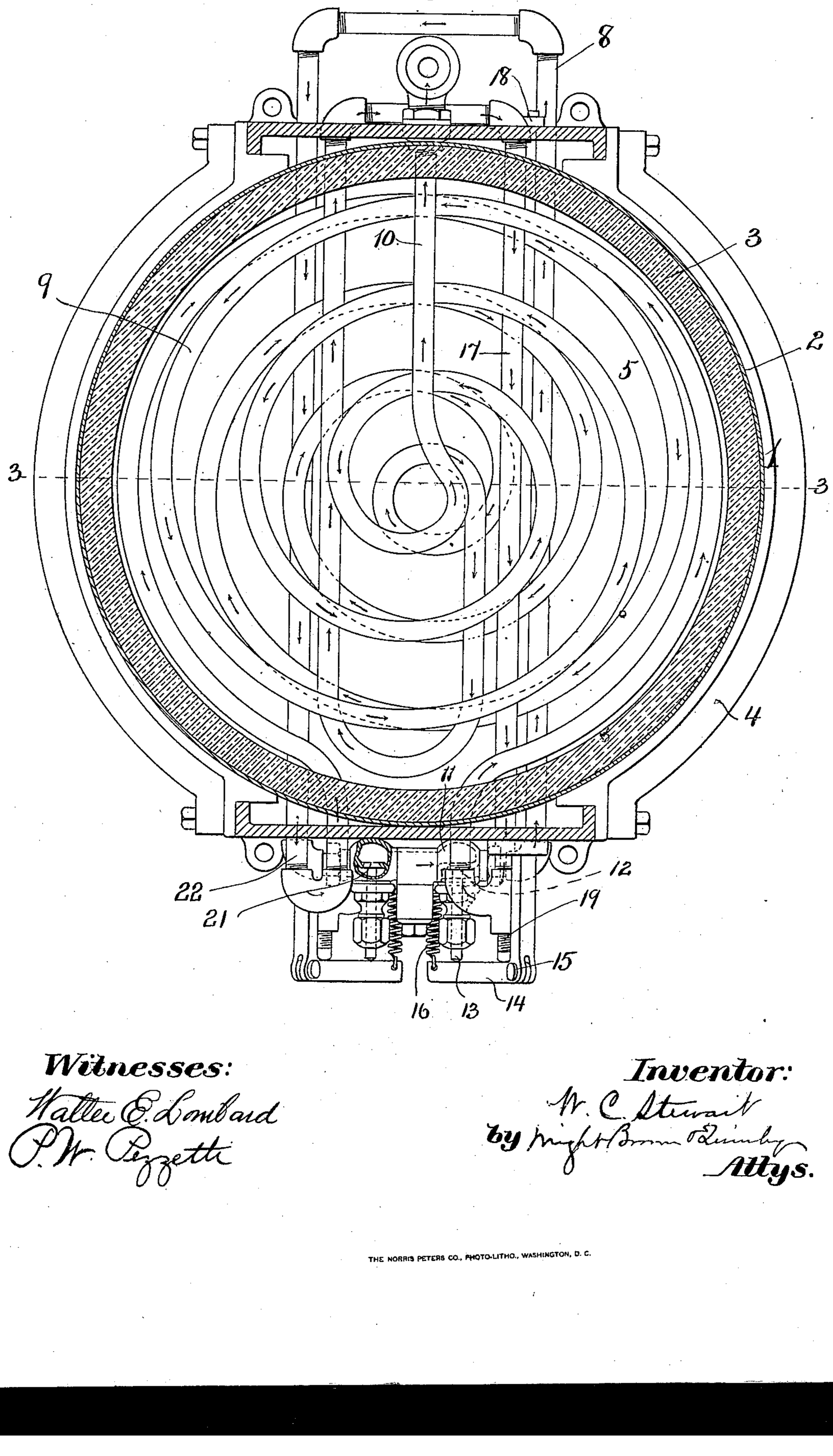

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Fig. 2.

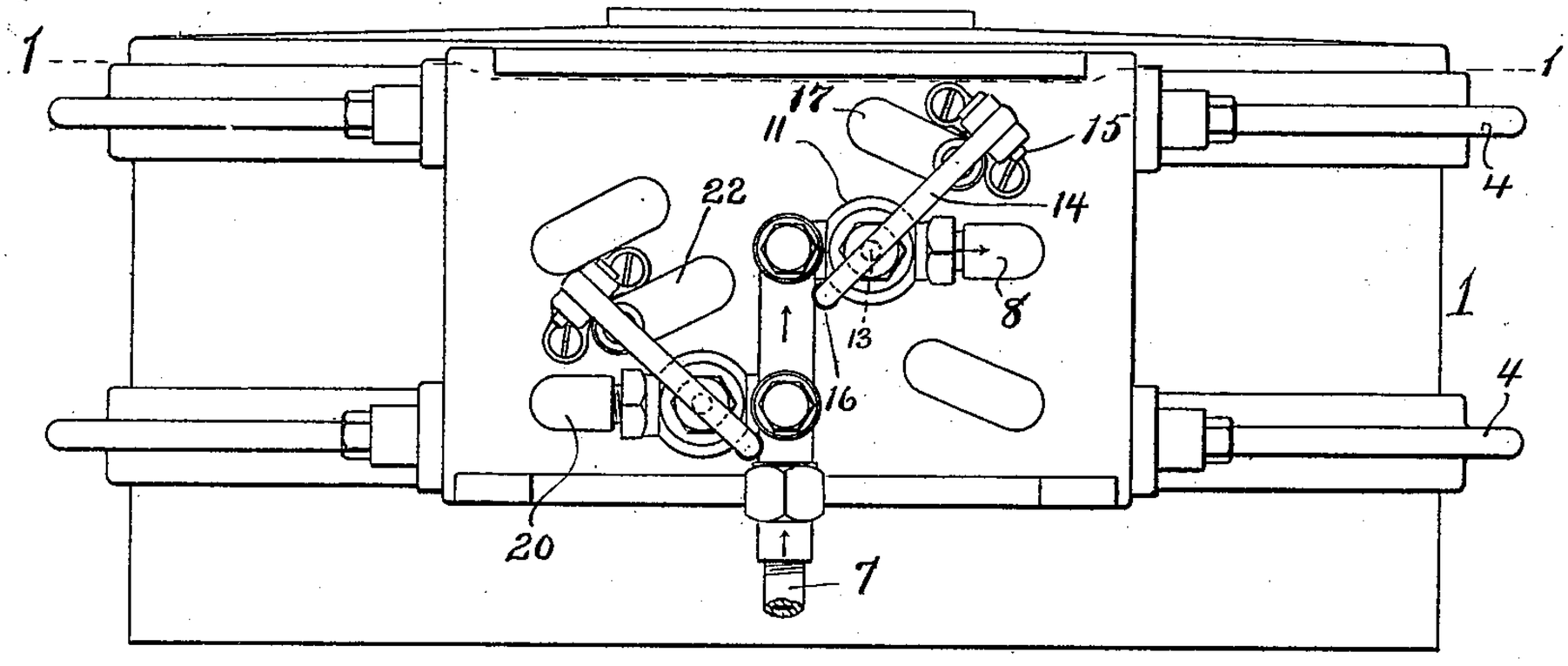
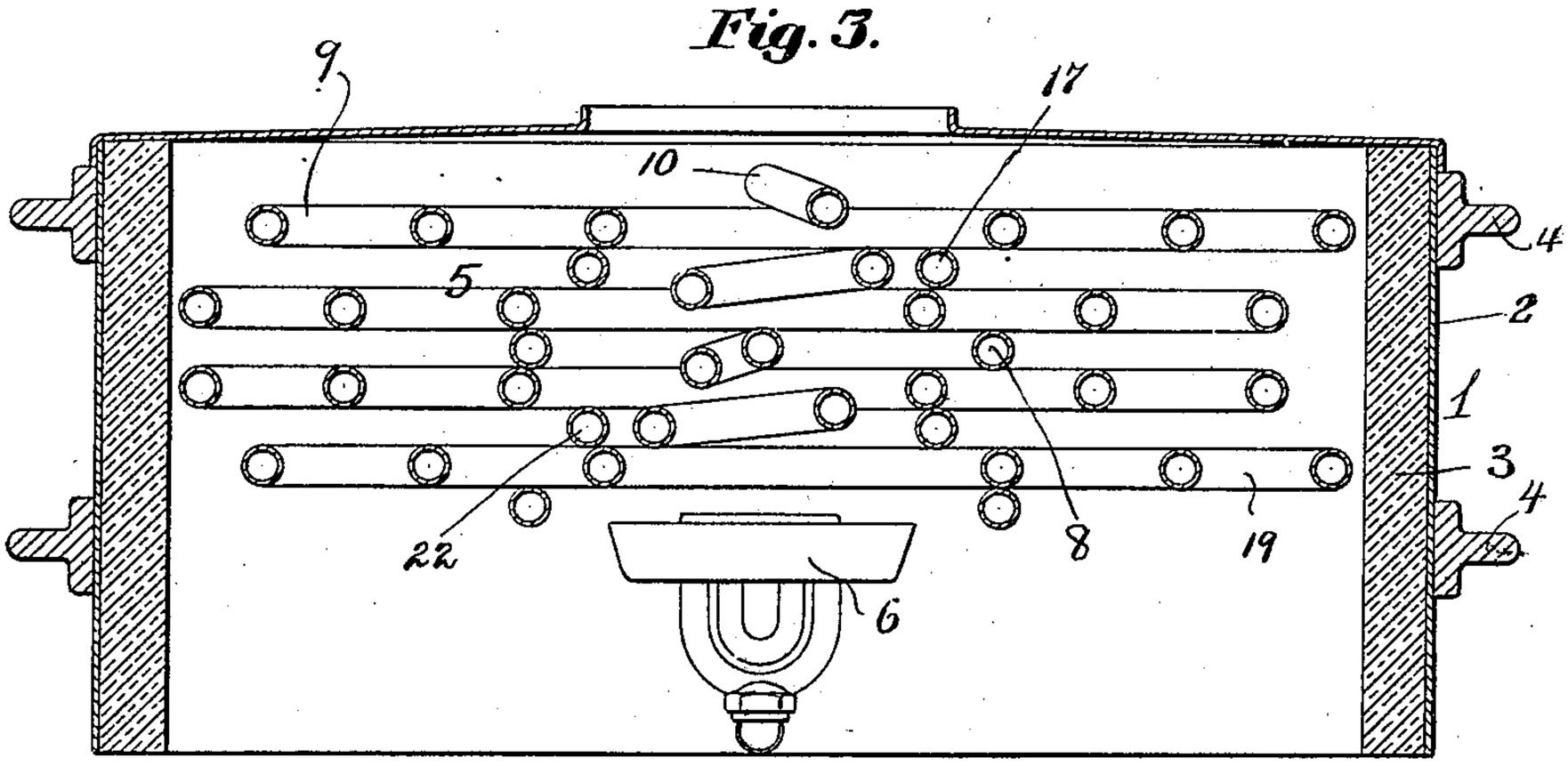


Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM C. STEWART, OF LYNN, MASSACHUSETTS.

BOILER.

SPECIFICATION forming part of Letters Patent No. 669,187, dated March 5, 1901.

Application filed January 11, 1900. Serial No. 1,101. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM C. STEWART, of Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Boilers, of which the following is a specification.

This invention relates to boilers or steam-generators; and it has for one object to provide improved automatic means for regulating the feed-water.

Another object is to constitute certain parts of the boiler as supports for other parts in an improved manner.

The invention consists in the novel features of construction and arrangement which I shall now proceed to describe and claim.

Of the accompanying drawings, Figure 1 represents a horizontal section through the casing of the boiler. Fig. 2 represents a front elevation. Fig. 3 represents a vertical section on the line 3 3 of Fig. 1.

The same reference characters indicate the same parts in all the figures.

Referring to the drawings, 1 designates a casing, permissibly cylindrical in form and having an outer thickness 2 of metal, such as sheet-iron, and an inner thickness 3 of heat-resisting material, such as asbestos, the structure being held together by means of suitable encircling bands 4 4.

Within the casing is a tubular steam-generating structure 5, which, as shown, consists of a single length of pipe coiled in such a form as to surround and cross and recross the cylindrical space within the casing 1. The plan view, Fig. 1, represents the upper half of the cylindrical structure 5, which is a repetition of the lower half wound in an opposite manner—that is, one half is wound "right hand," and the other half "left hand,"—the object being to efficiently distribute the products of combustion among the convolutions of the coil. Fig. 1 shows the feed-valves of both the upper and lower sections of the tubular structure.

Heat is applied to the structure 5 in any suitable manner, as by means of a hydrocarbon-burner 6.

7 is a feed-water pipe connected with a source of feed-water supply in which a pressure is maintained above the pressure carried by the boiler, so that when the feed-valves are opened water will be forced into the boiler. Said pipe 7 is connected at its upper end outside of the casing with the lowermost convolution 8 of the upper coil 9. The uppermost convolution 10 of the coil passes outside of the casing and connects with the steam-engine or other user of the steam supplied by the boiler.

In the end of the lower convolution 8 where it joins the feed-pipe 7 is a valve-casing 11, containing a valve 12, which is adapted to admit feed-water to the coil 9 and which when closed shuts off the supply of feed-water to said coil. The stem 13 of the valve 12 abuts against a lever 14, pivoted at 15 and connected with a spring 16, the tension of which is exerted to hold the valve to its seat against the pressure of the feed-water.

One of the middle convolutions or lengths 17 of the coil 9 is herein constituted as a thermostat, having its rear end fixed at 18 to the casing or an adjacent part and its front end provided with an abutment 19, adapted to bear on the inner side of the lever 14 near the pivot of the latter. Said abutment is here shown as an adjustable screw mounted in a bend of the pipe which passes outside of the casing.

The operation of this structure is as follows: The rear end of the pipe 17 being fixed and its front end free to move, the longitudinal expansion of said pipe when subjected to heat will move the screw 19 in the direction of the lever 14. The adjustment is made such that when a predetermined temperature of the pipe 17 has been attained its movement will have become sufficient to move the lever 14 against the tension of the spring 16 and permit the pressure of the feed-water to open the valve 12. In practice this degree of heat will be sufficient to vaporize the feed-water entering the coil. It is evident, then, that having ignited the burner 6 and brought the center of the coil 9 to a temperature to and beyond the temperature of vaporization of water and to the temperature at which the thermostat 17 is set to act the valve 12 will be opened and feed-water will enter the coil 9. Encountering the hot walls of the coil the water will be converted into steam and in so doing will have a tendency to cool down the coil and contract the thermostatic portion 17

thereof. This will have a tendency to close the valve and shut off the feed-water. If enough water is allowed to enter the coil to cool down the thermostat to or below the temperature at which it is set to operate, the valve will close entirely and no more feed-water will enter until opportunity has been afforded to again raise the temperature of the coil. The vaporization of the water in the coil and the withdrawal by the engine of the steam created permit the temperature of the coil to rise and produce an opening of the feed-valve. The action of the boiler is thus made automatic.

It will be seen that the lower convolution 8 and the middle convolution 17 of the coil 9 are made substantially straight and are caused to cross the interior of the casing 1 and to pass outside of said casing at either end. The side lengths of these convolutions rest upon the bottoms of the orifices in the casing through which they pass and are hence supported by the casing. The circular convolutions above these convolutions 8 17 are supported by the latter, thereby making a simple, inexpensive, and safe construction.

The lower portion of the tubular structure 5 is a coil 19, similar to the coil 9, its lower convolution 20 being connected with the feed-pipe 7 and equipped with a valve 21, similar to the valve 12 and actuated in like manner by a thermostat consisting of one of the middle convolutions 22 of the coil.

I claim—

1. In a steam-generator, a steam-generating course, a thermostat subject internally to the cooling effect of the fluid of vaporization and exposed externally to the heat of the fire, a source of combustion-heat arranged in direct external heating relation to the thermostat and adapted to vaporize the contents of the steam-generating course by conduction of heat through the walls of said course, and means controlled by said thermostat for admitting feed-water to said course.

2. In a boiler or steam-generator, the combination of a tubular steam-generating chamber constructed as a coil having a series of convolutions, one of which acts as a thermostat, and a device controlling the feed-water and governed by said thermostat.

3. In a boiler or steam-generator, the combination of a tubular steam-generating chamber constructed as a coil having a series of convolutions, one of which acts as a thermostat, a feed-water pipe connected with said coil, and a valve in said pipe controlled by the thermostat.

4. In a boiler or steam-generator, the combination of a tubular steam-generating chamber constructed as a coil having a series of convolutions, one of which acts as a thermostat having one portion fixed and another portion free, and a feed-water valve operated by the free portion.

5. In a boiler or steam-generator, the combination of a tubular steam-generating chamber constructed as a coil having a series of convolutions, one of which acts as a thermostat having one portion fixed and another portion free, and a feed-water valve operated by the free portion and arranged to open when the thermostat expands beyond a predetermined point, and to close when it contracts to said point.

In testimony whereof I have affixed my signature in presence of two witnesses.

WILLIAM C. STEWART.

Witnesses:
A. D. HARRISON,
C. F. BROWN.