No. 727,770. PATENTED MAY 12, 1903.

E. ESTABLIE.

VERTICAL STEAM GENERATOR.

APPLICATION FILED DEC. 13, 1902.

NO MODEL

FIG. 1.

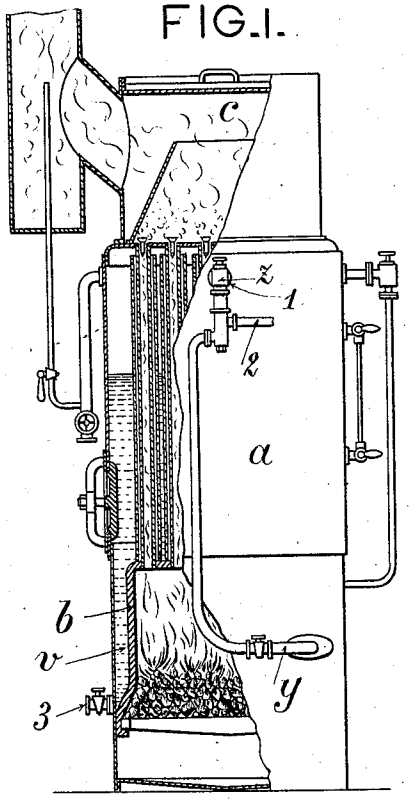


FIG. 3.

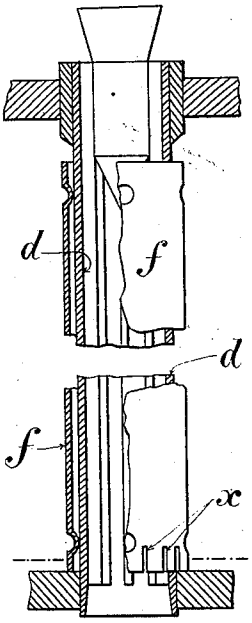


FIG. 2.

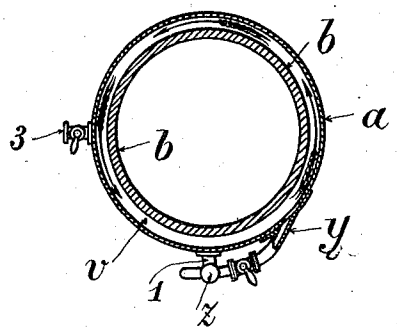
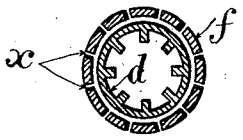


FIG. 4.



Witnesses
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Emile Establie.
Inventor.

By his Attorney,
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No. 727,770. Patented May 12, 1903.

UNITED STATES PATENT OFFICE.

EMILE ESTABLIE, OF PARIS, FRANCE.

VERTICAL STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 727,770, dated May 12, 1903.

Application filed December 13, 1902. Serial No. 135,041. (No model.)

To all whom it may concern:

Be it known that I, EMILE ESTABLIE, civil engineer, a citizen of the Republic of France, and a resident of 11–13 Quai Valmy, Paris, in the Republic of France, have invented certain new and useful Improvements in Vertical Steam-Generators, of which the following is a specification.

This invention relates to improvements in vertical steam-generators having a fire-box with metallic walls surrounded by the water and boiler-tubes extending vertically from the fire-box through the mass of water. The object of these improvements is to provide in that class of steam-generators means for thoroughly cleaning the walls of the fire-box by preventing the mud contained in the water from leaving deposits on said walls.

The improvements consist in surrounding the boiler-tubes by jacket-tubes, which extend upward beyond the highest water-level, which rest by their lower edge on the top of the fire-box, and which are provided at their lower end with very thin slots extending through the whole thickness and to a small height of said tubes. They further consist in supplying the boiler with a water-injection tangential to the cylindrical fire-box and leading to the annular portion between the fire-box and the outer wall of the boiler. By the combination of these two arrangements the thorough cleaning of the walls of the fire-box is assured. In fact, the water can only enter the space provided between the boiler-tubes and their jackets by passing through the thin slots of said jackets, which slots, besides, stop the mud. The small quantity of water which passes thus by the slots of each jacket is vaporized instantaneously as it arrives in contact with the boiler-tube, which is continuously kept at a very high temperature. This sudden vaporization acts like a small explosion and increases during a very short time the pressure at the base of the jacket-tube, which pressure produces steam-jets from inside the tube to outside through the slots of said tube and assures thus a horizontal chase, which forces laterally the mud which has not been free to pass through these slots and prevents it from being deposited at the top of the fire-box. This mud falls into the annular portion of the boiler which surrounds the fire-box and is carried away by the continuous rotary motion of the water produced in this portion by the tangential supply of water, which has for result to prevent said mud from leaving deposits on the side walls of the fire-box. The mud is thus continuously moved and is gathered while it continues turning at the bottom of the annular space, from where it can be evacuated when desired by means of a discharge-valve.

In the accompanying drawings, Figure 1 is a sectional view of a boiler incorporating my invention. Fig. 2 is a cross-section through the fire-box. Figs. 3 and 4 show an elevation and a horizontal section of a boiler-tube and its jacket-tube.

The boiler comprises, essentially, a cylindrical exterior shell *a*, a concentric fire-box *b* with metallic walls, a group of tubes, a smoke-box *c*, and a water-supply system. The group of tubes is formed of boiler-tubes *d* with internal wings and jacket-tubes *f*. These jacket-tubes extend upward beyond the water-level and rest by their smooth lower edge on the top of the fire-box. They are provided around their periphery, from their lower end to a small distance above, with saw-notches or very thin slots *x*, through which the water can penetrate into the annular spaces existing between the tubes and their jackets. The water will enter by intermittence, because each entrance causes a sudden vaporization which produces a thrust from inside to outside, as it has been explained.

The water-feeding system of the boiler comprises, essentially, a feeding-pipe *y*, which leads tangentially to the fire-box in the annular space *v*, surrounding said fire-box. The movement of the water in this pipe is assured by the injector *z*, to which leads the steam-pipe 1 and the water-suction conduit 2. This tangential feeding carries away the mud, as already explained, by a continuous rotary motion in the space *v* until it is evacuated by the discharge-valve 3.

With this class of boiler no deposit can ever be left on the walls of the fire-box, and all the disadvantages arising from said deposits are obviated.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

A vertical boiler comprising a cylindrical metallic outer shell *a* in combination with a concentric fire-box *b* with metallic walls, a group of vertical boiler-tubes *d*, jacket-tubes *f* surrounding each boiler-tube, extending upward beyond the highest water-level of the boiler and resting at their lower end by their smooth edge on the top of the fire-box, very thin slots *x* provided for radially in the thickness of the jacket-tubes from the bottom to a short distance above, a water-supply pipe *y* secured to the cylindrical outer shell *a* and leading to the annular space between the outer shell and the fire-box according to a direction tangential with the fire-box, substantially as and for the purpose set forth.

In witness whereof I have hereunto set my hand in presence of two witnesses.

EMILE ESTABLIE.

Witnesses:
ANTOINE LAVOIX,
AUGUSTUS E. INGRAM.