

(No Model.)

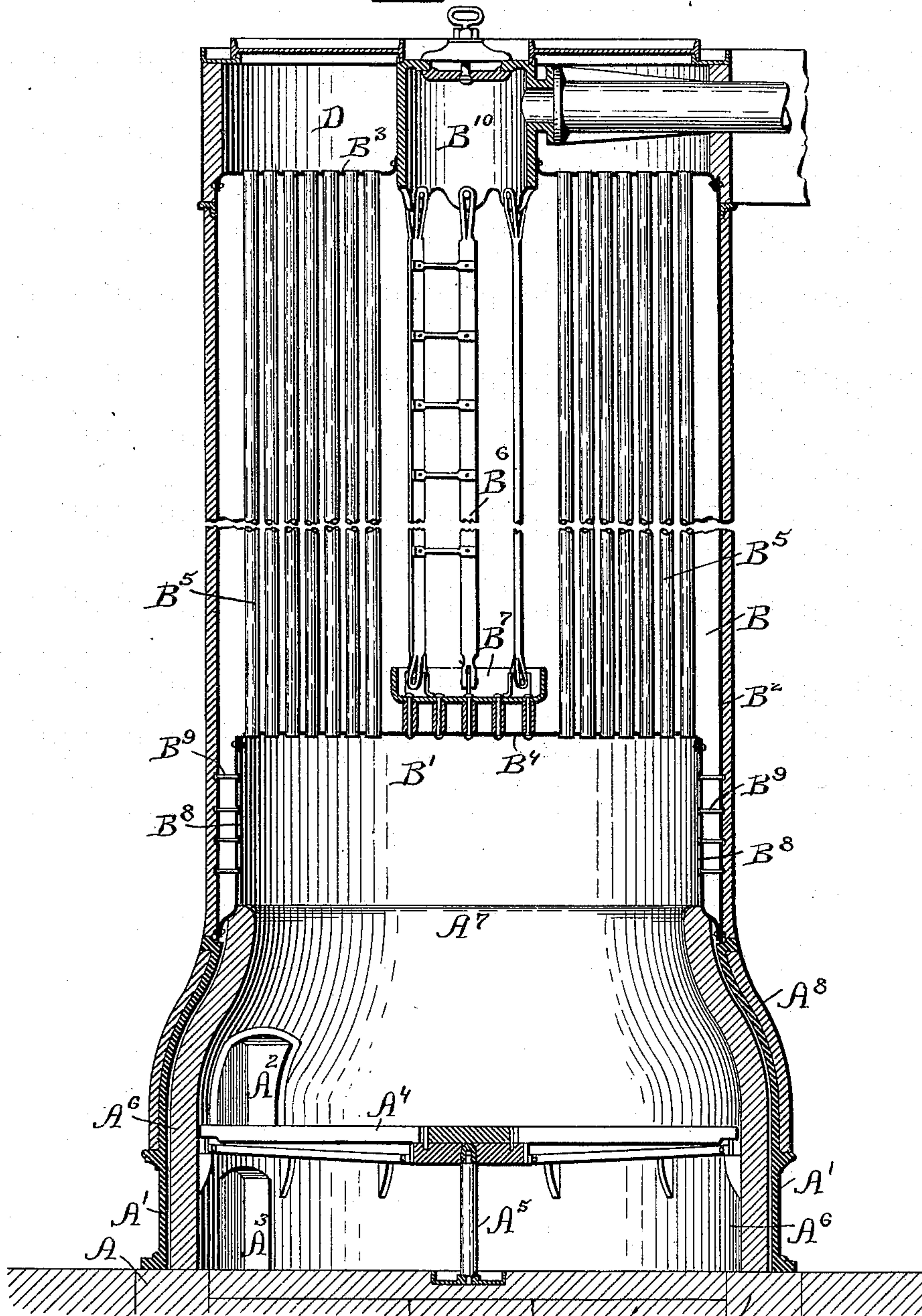
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D. M. THOMPSON.  
STEAM GENERATOR AND FURNACE.

No. 601,488.

Patented Mar. 29, 1898.

**Fig. 1.**



**WITNESSES:**

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(No Model.)

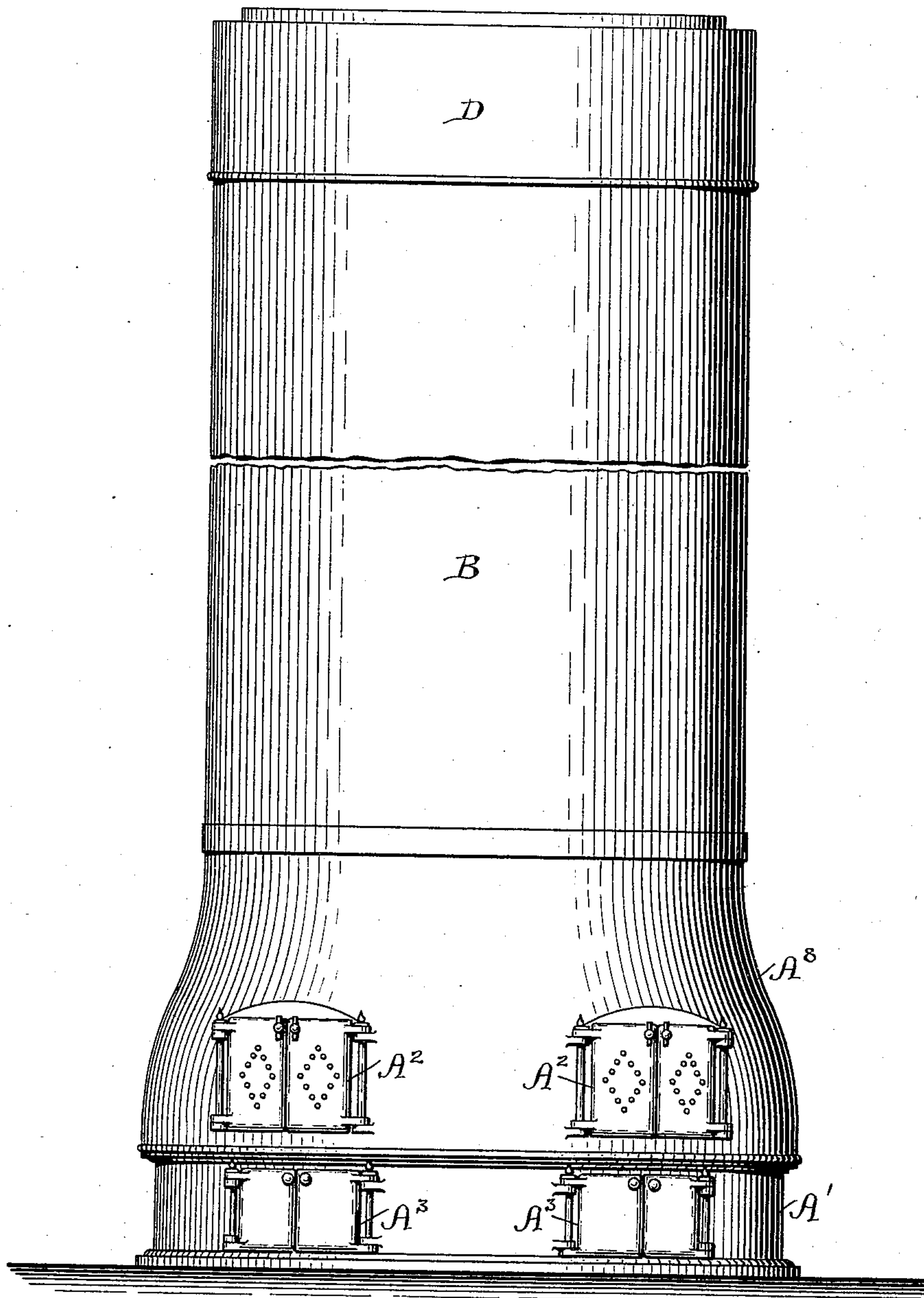
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Fig. 2.



**WITNESSES:**

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# UNITED STATES PATENT OFFICE.

DAVID M. THOMPSON, OF PROVIDENCE, RHODE ISLAND.

## STEAM-GENERATOR AND FURNACE.

SPECIFICATION forming part of Letters Patent No. 601,488, dated March 29, 1898.

Application filed July 23, 1897. Serial No. 645,712. (No model.)

*To all whom it may concern:*

Be it known that I, DAVID M. THOMPSON, of Providence, in the county of Providence and State of Rhode Island, have invented a new and useful Improvement in Steam-Generators and Furnaces for the Same; and I hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

The invention has reference to an improvement in the class of steam-generators known in the art as "vertical tubular steam-boilers."

In vertical tubular steam-boilers the lower tube-sheet extends over the fire and is subjected to the direct action of the most intense heat of the furnace. As the impurities in the water are retained in the steam-boiler when the water is evaporated, the lower tube-sheet forms the natural place of deposit of the precipitated scale-forming matter. Various devices have been used to prevent the deposit of impurities, the formation of scale, and the burning of the tube-sheet. The most common of these is the use of an annular space extending below the tube-sheet and inclosing the furnace, so as to form the fire-box for the boiler and a mud-collecting space usually below the fire-grate. Such fire-boxes had been provided with the firing-doors and were of difficult and costly construction. They limited the grate area and by absorbing the heat from the fire prevented the more perfect combustion of the fuel.

The object of this invention is to increase the efficiency of the vertical tubular steam-boiler by increasing the grate area of the furnace and utilizing the fire-box as a flame-chamber.

Another object of the invention is to protect the lower part of the fire-box against the corrosion and rotting to which it was exposed in the former construction.

Another object of the invention is to eliminate the firing-doors from the fire-box and to simplify the construction of the fire-box.

A further object of the invention is to secure the more perfect combustion of the fuel and greater economy.

To these ends the invention consists in the peculiar and novel construction of the ver-

tical tubular steam-boiler and its furnace, as will be more fully set forth hereinafter.

Figure 1 is a vertical sectional view of my improved steam-generator. A portion of the barrel of the generator is cut out, so as to show the essential parts more clearly within the required space. Fig. 2 is an external side view of the same.

In the drawings, A A indicate the foundation on which the steam-generator is supported; A', an annular, preferably cast-iron, support for the steam-boiler B. The base of the support A' is of considerably greater diameter than the diameter of the cylindrical shell of the steam-boiler. It extends vertically to about the level of the grate and then curves inward and upward to form a support for the lower end of the fire-box of the steam-boiler. The fire-doors A<sup>2</sup> and the ash-pit doors A<sup>3</sup> are pivotally connected and form part of the support A'. A<sup>4</sup> indicates the circular grate, and A<sup>5</sup> the central support for the grate. Within the annular support A' is built the wall A<sup>6</sup>, preferably of fire-brick. This wall curves inward and upward to form an annular dome-shaped furnace, the throat A<sup>7</sup> of which extends into the fire-box B' and above the bottom of the same. A layer of non-conducting material A<sup>8</sup> is placed over the support A' to prevent the radiation of heat.

The steam-boiler B consists of the cylindrical outer shell B<sup>2</sup>, the upper tube-sheet B<sup>3</sup>, the lower tube-sheet B<sup>4</sup>, the tubes B<sup>5</sup>, secured at the ends in the tube-sheets B<sup>3</sup> and B<sup>4</sup>, the central stays B<sup>6</sup>, the tray B<sup>7</sup>, the uptake D, and the annular sheet B<sup>8</sup>, flanged at the lower edge, where it is riveted to the outer shell B<sup>2</sup>, the stays B<sup>9</sup>, and the steam-dome B<sup>10</sup>. By this construction the steam-boiler rests around its whole periphery on a support having an extended base of larger diameter than the diameter of the steam-boiler. The lower end of the fire-box of the boiler is above the fire, but this lower end is protected against the action of the fire by the fire-brick lining of the furnace. The large area of the grate and the arched fire-brick lining facilitate the combustion of the fuel and the gaseous products, the contraction of the throat of the furnace facilitating the mixture of the gases and their perfect combustion in the flame-chamber of



the fire-box. The fire-box is of larger area than the throat of the furnace. The velocity of the gases is diminished to allow time for their combustion before they enter the tubes, so that little if any unconsumed carbon enters the tubes, and black smoke is avoided.

The cost of construction of the steam-boiler is much reduced by shortening the fire-box and placing the doors independent of and below the same. The durability of the steam-boiler is materially increased, because it is the lower part of the fire-box, when at or below the grate, that most rapidly deteriorates and is most costly to repair. The fire-brick lining used in the improved boiler sustains the greatest heat and wear and can be renewed at small cost. The efficiency is materially increased by reason of the increased grate area, which in the proportions shown in Fig. 1 is one-third greater than could be secured in the older construction of the furnace. Economy is secured by the more perfect combustion of the fuel.

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

1. In a steam-generator, the combination with a vertical tubular steam-generator and a fire-box extending below the lower tube-sheet and forming an annular water-leg, of a furnace having a grate of larger diameter than the interior diameter of the fire-box, the fire-brick lining of the furnace extending into the fire-box, whereby the lower end of the fire-box is protected against the direct action of the fire, as described.

2. In a steam-generator, the combination with a vertical steam-boiler, a fire-box extending below the lower tube-sheet to form an annular water-space and flame-chamber, of an annular support for the boiler having inwardly-inclined sides the base of which is of greater diameter than the cylindrical shell of the boiler and provided with a firing and

ash-pit door, a furnace the interior diameter of which is greater than the interior diameter of the fire-box, a wall of fire-resisting material inclosing the furnace, said wall curving inward and upward above the lower end of the fire-box, and a circular grate, whereby the products of combustion pass through the contracted throat of the furnace into the flame-chamber in the fire-box, as described.

3. In a steam-generator, the combination with a circular ash-pit and furnace, a circular grate, an annular metal casing extending inward and upward to form the support of the steam-boiler, ash-pit and fire doors supported on the casing, and a fire-brick lining on the inside of the casing extending inward and upward above the top of the casing, of a vertical tubular boiler, a fire-box extending below the lower tube-sheet and below the top of the fire-brick lining of the furnace and forming an annular water-space and a flame-chamber, as described.

4. In a steam-generator, in combination, the vertical steam-boiler B having the tubes B<sup>5</sup>, the uptake D and the fire-box B', the circular grate A<sup>4</sup> of greater diameter than the interior of the fire-box, the fire-brick wall A<sup>6</sup> curving inward and upward above the grate, the contracted throat A<sup>7</sup> of the furnace extending into the fire-box, the fire-door A<sup>2</sup> and ash-pit door A<sup>3</sup>, the annular cast-metal support A' and the lagging A<sup>8</sup>; whereby the fuel is burned in the furnace surrounded by fire-brick, discharged into the fire-box of larger area than the throat of the furnace and conveyed through the annular series of tubes, as described.

In witness whereof I have hereunto set my hand.

D. M. THOMPSON.

Witnesses:

JOSEPH A. MILLER,  
JOSEPH A. MILLER, Jr.