April 14, 1925.

1,533,268

T. A. REID

ELECTRIC STEAM BOILER

Filed Sept. 8, 1922

Fig. 1.

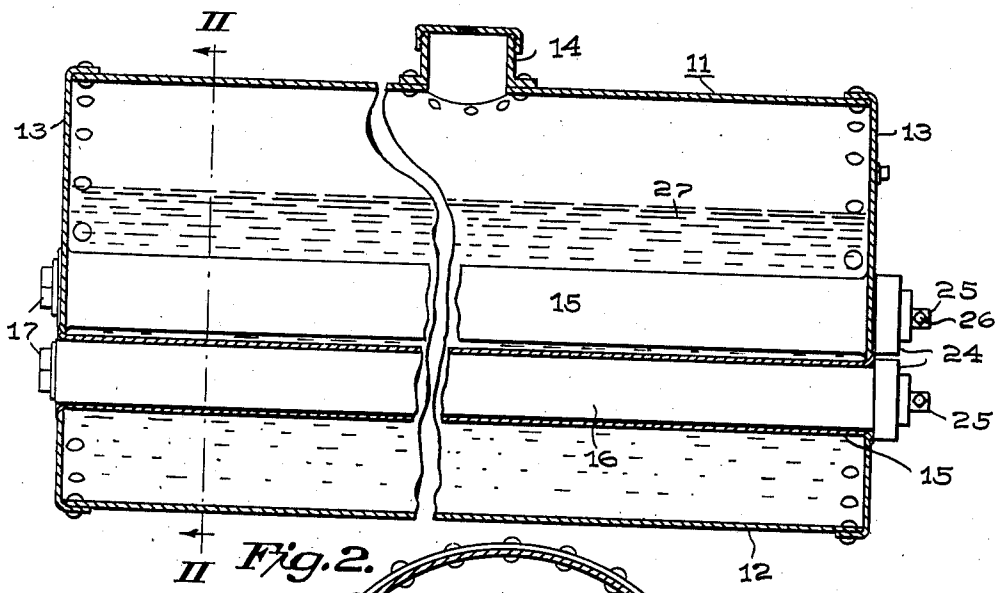


Fig. 2.

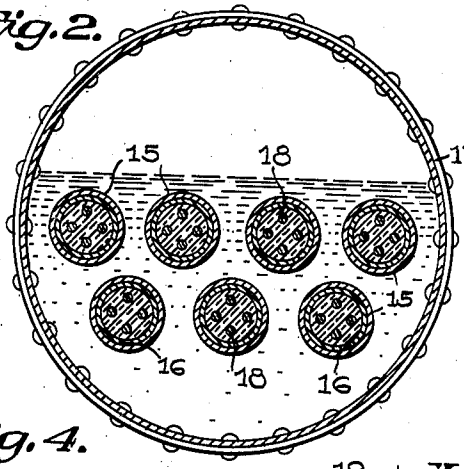


Fig. 3.

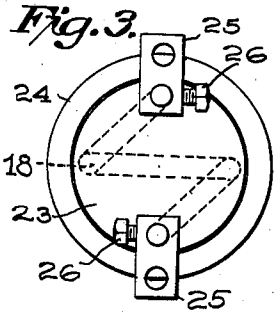


Fig. 5.

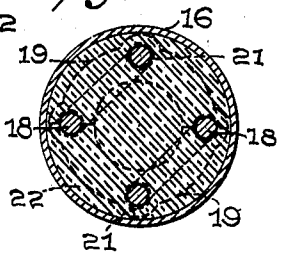
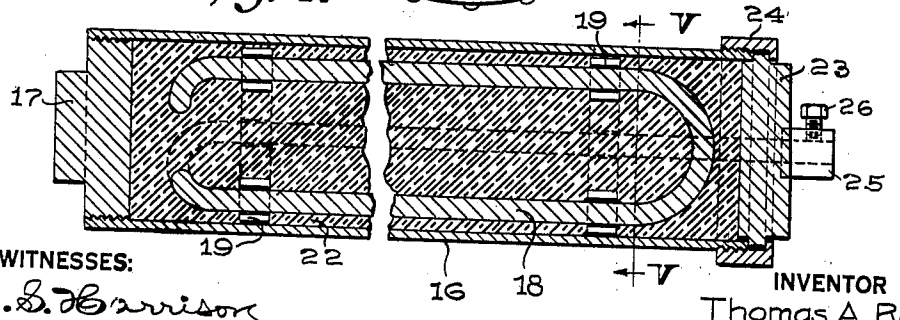


Fig. 4.



WITNESSES:

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Patented Apr. 14, 1925. 1,533,268

UNITED STATES PATENT OFFICE.

THOMAS A. REID, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

ELECTRIC STEAM BOILER.

Application filed September 2, 1922. Serial No. 585,389.

To all whom it may concern:

Be it known that I, THOMAS A. REID, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Electric Steam Boilers, of which the following is a specification.

My invention relates to electrically-heated devices and particularly to electrically-heated steam boilers.

The object of my invention is to provide a relatively simple, compact and rugged heating element for electrically-heated steam boilers.

In practicing my invention, I provide a relatively heavy resistor member performed to comprise a plurality of integral, end-connected, and parallel-extending convolutions located in a metal tube which is placed in the fire tube of a steam boiler. Refractory members located in spaced relation serve to hold the convolutions in proper operative positions relatively to each other and in the enclosing tube.

I provide a granular electric-resisting and heat-conducting material in the tube, and enclosing cap members, one of which supports the terminal members of the resistor.

In the single sheet of drawings,

Figure 1 is a view, in vertical longitudinal section, of a steam boiler comprising the device embodying my invention;

Fig. 2 is a view thereof, in vertical lateral section, taken on the line II—II of Fig. 1;

Fig. 3 is an end view of a heating element embodying my invention;

Fig. 4 is a view, in longitudinal section, of a heating element embodying my invention; and

Fig. 5 is a view, in cross-section thereof, taken on the line V—V of Fig. 4.

A fire tube boiler, designated generally by the numeral 11, comprises a substantially cylindrical shell 12 and end members 13 suitably riveted thereto. A steam dome 14 is suitably secured to a portion of the shell or drum 12, in a manner well known in the art. The boiler 11 is provided with a plurality of fire tubes 15, extending longitudinally therethrough. While I have shown a substantially horizontal boiler of cylindrical contour, it is to be understood that this is for the purpose of illustration only, and the device embodying my invention, to be described hereinafter more in detail, may be employed with any type of construction of fire tube boiler.

A removable heating element adapted to be placed within each of the fire tubes 15 comprises an elongated metallic tubular member 16 which is provided with a metallic cap or end member 17 having screw-threaded engagement therewith at one end thereof. A resistor member 18, located within the tubular member 16, comprises a bar or rod of relatively heavy resistance material which is preformed to comprise a plurality of integral, end-connected, and parallelly-extending convolutions, the end-connections being such that the distance between the straight convolutions is relatively small, to permit of placing within the metallic tubes 16 a relatively great length of resistor members. In order to bring both ends of the resistor member at one end of the tube 16, I prefer to employ an even number of convolutions, although this is not essential to my invention.

In order to maintain the convolutions in proper operative positions relatively to each other and spaced apart from the interior surface of the tubular member 16, I provide a plurality of two-part refractory members 19, each of substantially semi-annular shape. Each member of substantially semi-annular shape is provided at substantially the middle of its length with an opening 21 extending therethrough, through which one convolution of the resistor member may extend. Each end of each of the members 19 is provided with a substantially semi-circular groove or depression so that when the two halves are located in proper operative positions relatively to each other a substantially cylindrical opening 21 is provided. As illustrated in the drawings, I provide four straight convolutions, and the members 19 are therefore provided with a total of four openings therethrough. The openings 21 located at substantially the middle of each of the semi-annular members may be slipped over the convolutions of the resistor member which extend outwardly of the tube 16.

In order to provide means for conducting the heat generated in the resistor member 18 to the tubular member 16, I place within the otherwise unoccupied space in the tubular member 16 a quantity 22 of a suitable electrical-insulating and heat-conducting

material, such as alundum. The hereinbefore described construction of the members 19 permits of filling the tube 16 with alundum after the resistor member 18 and the spacing members 19 have been placed within the tube.

An insulating end cap 23, of a suitable refractory material, may be located at the other end of the tubular member 16 and be held in place by a metallic screw cap 24, suitable provision being made on the members 23 and 24 to permit of the cap suitably clamping the insulating member 23 in its proper operative position against the end of the tubular member 16. Terminal blocks 25 may be secured to the ends of the resistor member 16 by suitable screws 26 to permit of electrical connection being made to the resistor member.

The length of the tubular member 16 will be substantially equal to that of the fire tubes 15 and after the heating element has been constructed as hereinbefore described, it may be easily and quickly placed in its proper operative position within one of the tubes 15, after which the resistor members 18 may be electrically connected together and to a suitable source of electric energy.

The use of the device embodying my invention permits of employing electric energy in place of the heating gases previously employed to vaporize a quantity 27 of water, which is placed within the boiler 12.

The device embodying my invention permits of the easy and quick insertion of assembled heating elements into the fire tubes of a boiler and also provides a relatively small, compact and efficient heating unit for such purposes.

Various modifications may be made in my invention without departing from the spirit and scope thereof, and I desire, therefore, to be limited only by the scope of the appended claims.

I claim as my invention:—

1. In a heating unit for an electrically-heated boiler, in combination, a metal tube, a preformed relatively heavy resistor member in said tube, a plurality of spaced refractory members in said tube for holding integral and parallel-extending portions of said resistor member in proper operative positions therein, and a filling of granular electric-insulating and heat-conducting material in said tube.

2. In a heating unit for an electrically-heated boiler, in combination, a metal tube, a relatively heavy resistor member preformed to comprise a plurality of straight integral, end-connected, and substantially parallel-extending convolutions, said convolutions extending longitudinally of said tube, a plurality of spaced refractory members in said tube for maintaining said convolutions in proper operative positions relatively to each other and to said tube, and a filling of granular electric-insulating and heat-conducting material in said tube.

3. In a heating unit for an electrically-heated boiler, in combination, a metal tube, a relatively heavy resistor member preformed to comprise a plurality of straight integral, end-connected and substantially parallel-extending convolutions, a plurality of spaced refractory members in said tube for maintaining said convolutions in proper operative positions relatively to each other and to said tube, a granular electric-insulating and heat-conducting material in said tube, and a combined terminal-supporting and plug member at one end of said tube.

4. In a heating unit for an electrically-heated boiler, in combination, a metal tube, a relatively heavy resistor member preformed to comprise a plurality of straight integral, end-connected and substantially parallel-extending convolutions, a plurality of spaced refractory members in said tube for maintaining said convolutions in proper operative positions relatively to each other and to said tube, a granular electric-insulating and heat-conducting material in said tube, a refractory combined terminal-supporting and plug member at one end of said tube and means for securing said refractory member in its proper operative position relatively to said tube.

In testimony whereof, I have hereunto subscribed my name this 22nd day of August 1922.

THOMAS A. REID.