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1,670,437

ELECTRICALLY HEATED STEAM BOILER

Filed April 8, 1926

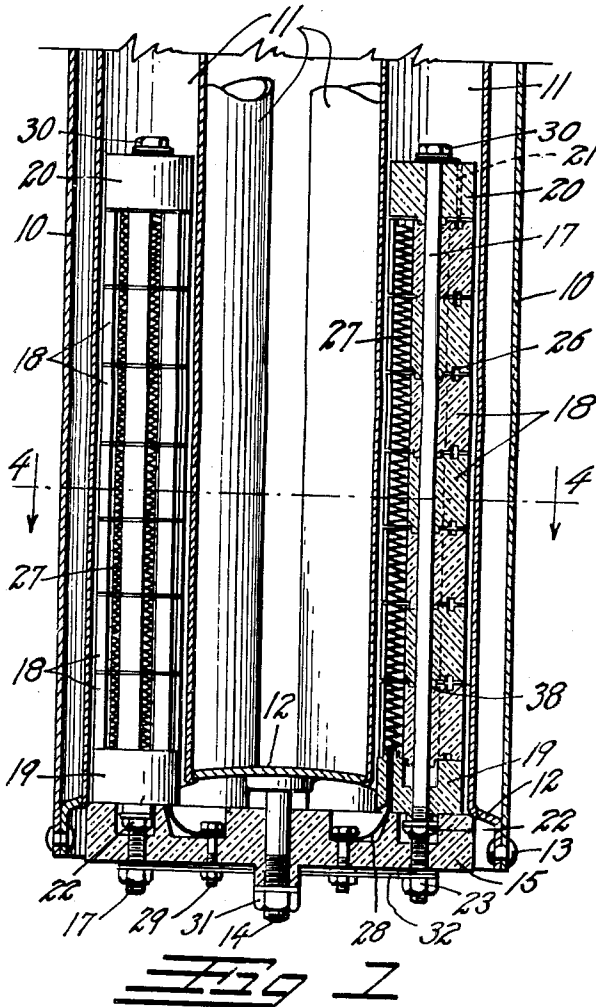
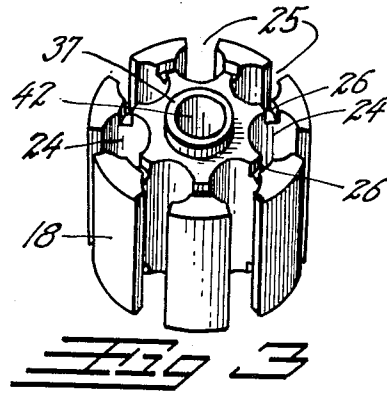
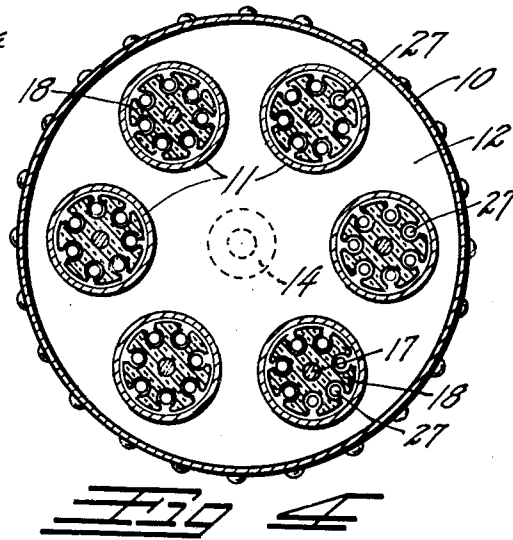
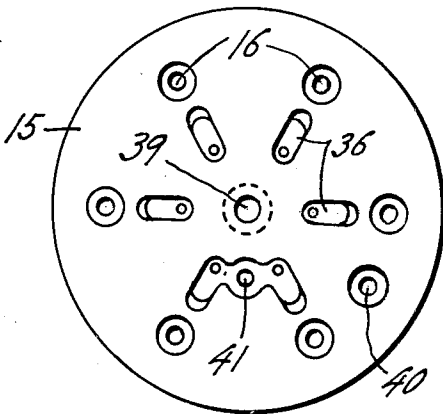
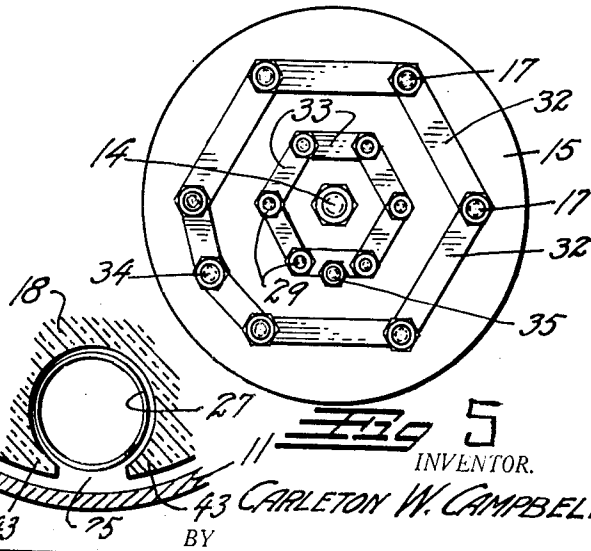


Fig 2

Fig 6

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ELECTRICALLY-HEATED STEAM BOILER.

Application filed April 8, 1926. Serial No. 100,548.

This invention relates to an electrically heated steam boiler, more particularly of the type described in the applicant's Patent No. 1,564,322, issued December 8, 1925, and has for its principal object, the provision of a heating element, for insertion in the tubes of the boiler, which will be economical to manufacture, efficient in operation, long wearing, and easy to install.

Another object of the invention is to so construct the heating element that it will bring the heating coil into close proximity with the water surface of the boiler without intervening material of any nature, so that the heat will be quickly transferred to the water with little loss and yet the coil will be prevented from contacting with the tube.

A further object is to construct the supporting frame of the heating element in a plurality of co-acting sections, so that it will withstand the expansion, contraction and distortion due to the heating.

A still further object is to secure all of the tube heating elements to a common base held in place by a single nut, so that they may all be removed simultaneously.

Other objects and advantages reside in the detail construction of the invention which is designed for economy, simplicity and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention, reference is had to the accompanying drawing which forms a part hereof. Like numerals refer to like parts in all views of the drawing and throughout the description.

In the drawing:

Fig. 1 is a vertical section through the lower portion of a boiler showing the invention in place therein. In this view, two of the boiler tubes are cut by the section; in the left one, the heating element is shown in elevation and, in the right one, in longitudinal section.

Fig. 2 is a plan view of the base member used to support the heating elements.

Fig. 3 is a perspective view of one of the heating element units.

Fig. 4 is a cross section through the boiler, taken on the line 4—4, Fig. 1.

Fig. 5 is a bottom view, looking upward, of the base member and its connections.

Fig. 6 is an enlarged detail section through one of the heating coils.

The boiler is illustrated at 10, provided with a plurality of longitudinal boiler tubes 11, which are swedged into a head 12, riveted to the boiler, as shown at 13. Welded to the center of the head 12, is a stud bolt 14 for supporting the entire heating device.

The heating device comprises a base 15, provided with a series of countersunk openings 16 corresponding in spacing and number to the boiler tubes 11. Longitudinal bolts 17 pass through these openings 16 and clamp a series of units 18 to the base 15; there being concentric holes 42 formed in the units for the passage of the bolts 17. An opening 39 is formed in the base for the reception of the stud 14 which carries a nut 31 for clamping the base 15 to the boiler head 12. At the bottom of the series of units 18, a base unit 19 is placed having a projecting flange around its central opening which extends within the countersink of an opening 16. At the top of the series of units, a cap unit 20 is placed provided with a passage 21 for one terminal of the heating coil. All of the units and base 15 are formed of porcelain or similar heat resisting and electrical insulating material. The bolt 17 is clamped to the series of units by means of a nut 22 before being clamped to the base member 15 by means of a second nut 23.

One of the units 18 are illustrated in detail in Fig. 3. Each of these units comprise an odd number of longitudinal passages 24, opening to the exterior of the unit through slots 25, along the side of which retaining flanges 43 are formed. The partitions between the passages 24 are notched at top and bottom as shown at 26 so as to allow the heating coil wire to pass from one passage to the next at the extremities of the series.

The heating coils are formed of any suitable resistance wire and are illustrated at 27, there being a single length of coil in each series of units. One extremity of the coil passes through the bottom member 19, as shown at 28, to a terminal bolt 29. The coil then passes upwardly in one of the passages 24 through the topmost notch 26 to the next adjacent passage 24, thence downwardly. In this manner, the entire series of units is completely surrounded by a series of longitudinal heating coils, the last coil terminating at the top of the series through

the passage 21 to a connection under the head 30 of the bolt 17. The bolt thus serves as an electrical conductor to return the current to the bottom of the base plate 15.

- 5 At the bottom of the base 15, all of the bolts 17 are connected together by means of bus bars 32 and all of the terminal bolts 29 are connected together by means of bus bars 33. The bus bars 32 receive current from
10 a common binding post 34, carried in an opening 40 in the base, and the bus bars 33 receive current from a similar binding post 35, carried in an opening 41 in the base. This method of connecting places the heating coils in parallel so that the failure of one coil does not affect the remaining coils.

- The heads of the terminal bolts 29 are carried in depressions 36 in the base plate which are of a sufficient length to pass
20 under the base unit 19 to receive the terminal of the heating coil. Each of the units 18, the bottom member 19 and the top member 20 are provided with projecting flanges 37 at one end and a countersink 38 at the other so that they are self-aligning,
25 when placed in a contacting series.

- It is desired to call attention to Fig. 6, where it will be noted that substantially the full heating coil is directly exposed to the
30 surface of the boiler tube 11, without intervening insulating material. The sides of the passages 24 project only sufficiently over the coil to maintain it in place and prevent accidental contact with the boiler tube.

- 35 While a specific form of the improvement has been described and illustrated herein, it is desired to be understood that the same may be varied within the scope of the appended claims, without departing
40 from the spirit of the invention.

Having thus described the invention, what I claim and desire secured by Letters Patent is:—

- 45 1. An electrical heating element for steam boilers having fire tubes opening to one ex-

tremity of said boiler comprising a base of insulating material; a plurality of standards each composed of a series of insulating units projecting from said base and maintained in spaced relation thereby, said relation coinciding with the spaced relation of said fire tubes; heating coils carried by said standards; and means for securing said base in position against said boiler with said standards extending within said heating
55 tubes.

2. In a heating element having a series of insulating units secured together by means of a concentric bolt, said units being provided with a series of longitudinal
60 grooves opening to their exterior; means for allowing communication between said grooves comprising a concentric series of notches in the end of each of said units, each of said notches communicating between two
65 of said grooves.

3. An electrical heating element for steam boilers having fire tubes opening to one extremity of said boiler comprising a base of insulating material; a plurality of stand-
70 ards each composed of a series of insulating units projecting from said base and maintained in spaced relation thereby, said relation coinciding with the spaced relation of said fire tubes; heating coils carried by
75 said standards; and means for securing said base in position against said boiler with said standards extending within said heating tubes, said means comprising a stud secured to and projecting from one extremity
80 from said boiler and adapted to pass through said base of insulating material and a nut adapted to be threaded on said stud so as to draw said base toward said boiler and maintain said standards within
85 said tubes.

In testimony whereof, I affix my signature.

CARLETON W. CAMPBELL.