Aug. 30, 1932. S. N. COATES 1,874,244

ELECTRIC STEAM BOILER

Filed Aug. 16, 1928 2 Sheets-Sheet 1

FIG. 1

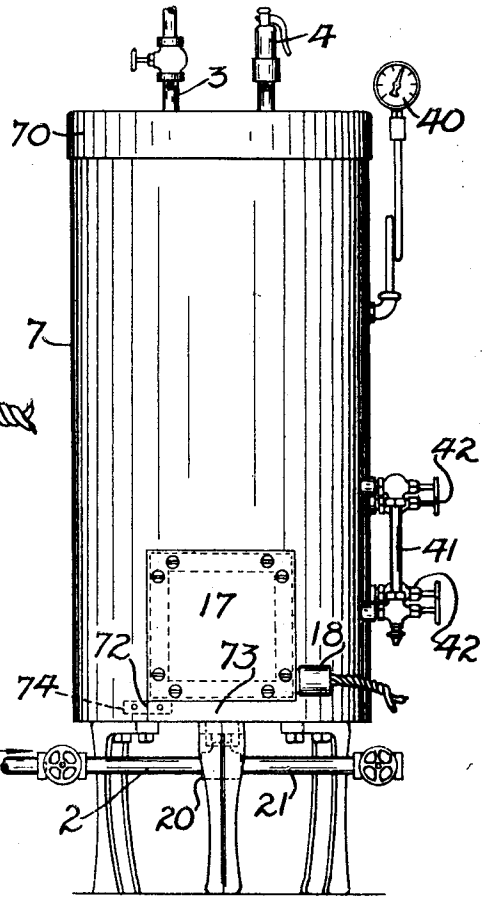


FIG. 4

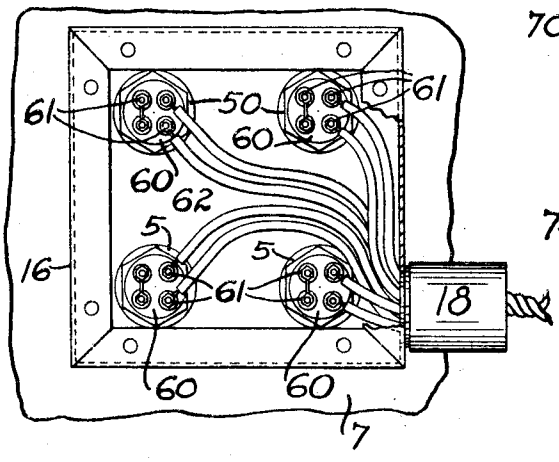
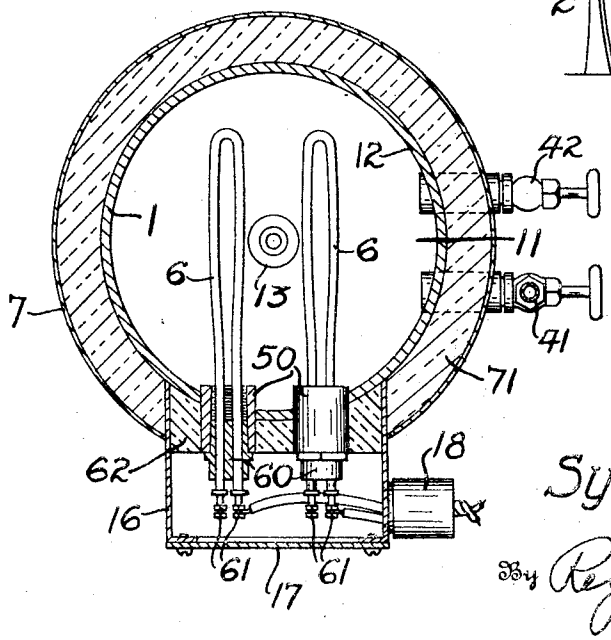


FIG. 3



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Filed Aug. 16, 1928 2 Sheets-Sheet 2

Fig. 2

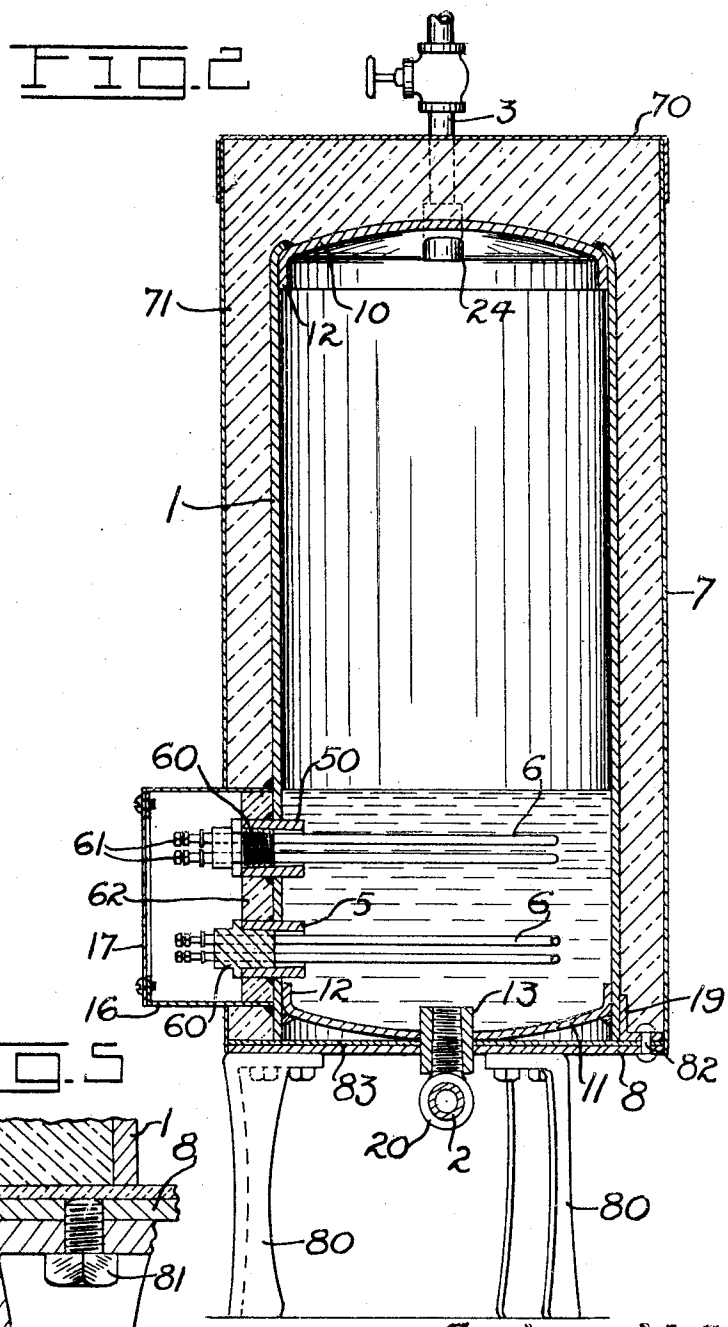
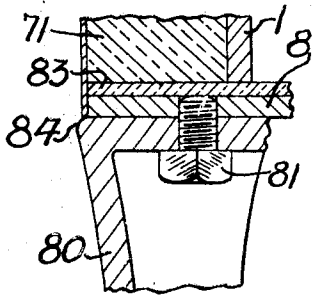


Fig. 5



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UNITED STATES PATENT OFFICE

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ELECTRIC STEAM BOILER

Application filed August 16, 1928. Serial No. 299,962.

My invention relates to an improvement in that type of small steam boilers which is designed to produce a considerable quantity of steam for instant use, or a lesser quantity for continuous use. For example such a boiler may serve the purposes of a tailor in connection with a clothes pressing machine, where the boiler may be called upon frequently, but intermittently, for some little quantity of steam, or in a bakery, where the air is to be moistened during a period of some length.

It is necessary in such boilers that means be provided for heating the water rapidly to a temperature sufficient to make steam at the pressure desired, usually not in excess of 95 pounds per square inch, to the end that a sufficient quantity of steam of the desired temperature may be kept available. This, then, is the primary object of my invention;—to produce a boiler having a small but sufficient capacity, and the ability to produce steam rapidly. Also, it is an object to produce such a boiler, wherein electricity may be employed as the source of power, and wherein the efficiency of the boiler approaches 100%.

It is a further object to provide a means in such a boiler whereby the electric heating element may quickly and easily be replaced when burned out, and installed in such a manner that it is not necessary to dismantle any portion of the boiler, and so that the quantity of water in the boiler may be kept at a minimum to permit its heating most rapidly. It is also an object so to install the electric heating elements that they will have the longest life, and be least subject to loss of efficiency and to burning out from the collection of scale.

It is a further object to provide a boiler of the type described, which is simple in its construction, and yet complete and sturdy enough for long continued service; in other words, a boiler which combines simplicity and efficiency.

It is also an object to provide in such a boiler a means for utilizing the tendency to deposit scale as a means for better insulating the boiler, and especially portions which are not easily insulated otherwise, and to decrease the dead water space within the boiler.

Other objects will be ascertained from a study of the specification and drawings forming a part thereof.

My invention comprises the novel parts and the novel combination thereof, all as shown in the accompanying drawings, described in the specification, and particularly defined by the claims terminating the same.

In the accompanying drawings I have shown my invention in a form which is now preferred by me, it being understood that other forms may be adopted, within the claims, and that the boiler may be made in various capacities, and that its design will necessarily change somewhat with the change in capacity.

Figure 1 is a general front elevation of my boiler.

Figure 2 is a general axial section through the boiler.

Figure 3 is a transverse section through the boiler on the plane of the heating element.

Figure 4 is an elevation of the casing through which the heating elements are inserted and in which are contained the electrical connections.

Figure 5 is a detail section on an enlarged scale of the construction and support of the lower end of the boiler casing.

The boiler is preferably of the upright type, comprising a cylinder 1 having dished heads 10 and 11, constructed according to the requirements of the A. S. M. E. boiler code. This includes flanges 12 at the peripheries of the two heads, by means of which the heads are welded or similarly secured to the cylindrical shell 1. Such an upright boiler provides a water space in its lower part, and as much of the upper portion as may be required forms the steam dome, or space from which the steam is withdrawn. Water is supplied through a valved connection 2, a T-fitting 20, and a nipple 13, secured in the dished bottom head 11 of the shell and projecting slightly into the water space, the T-fitting 20, or a nipple secured thereto, being screwed within the nipple 13. A second con-

nection 21 to the T-fitting 20 provides a valved blow-off pipe, as is required by the boiler code.

Steam may be withdrawn through a valved connection 3, secured within a nipple 24 in the dished upper head 10 of the boiler shell. The nipple 24 should extend as little within the shell as is possible, so as to take off steam at approximately the highest point.

To comply with code requirements, or for the convenience of the operator, such devices as the safety valve 4, the gage 40, the water glass 41, and the try-cocks 42, may be employed, and are suitably connected to the boiler shell 1, or to its heads 10 or 11, as may be suitable.

At a point as near the bottom of the boiler shell as may be feasible, nipples 5 are secured in apertures in the shell 1. This point would ordinarily be at the upper termination of the flanges 12 of the bottom 11. The axes of these nipples are substantially horizontal, and as many as may be necessary are placed at the level indicated. Of course, it may not be feasible to place all that may be desired at this level, and consequently others, as are indicated at 50, may be placed above the nipples 5, the nipples 5 and 50 being identical except in location. However, the nipples 50 should not be placed far above the nipples 5, and should always be below the level of water to be maintained in the boiler. The heating elements, generally designated by the numeral 6, are received in these nipples 5 and 50, and by thus positioning these heating elements as nearly as may be at the bottom of the boiler, the amount of dead space below them is kept at a minimum, and the level of the water need only be sufficient to cover them. Thus, with the minimum quantity of water in the boiler, that quantity can be heated the more rapidly.

The heating elements 6 may be of any suitable form, but I prefer that they be made in the form of bent tubes, as best shown in Figure 3, with the coiled resistance wire enclosed and insulated therein, these tubes being received in plugs 60, which will thread into the nipples 50, and the elements being connected with binding posts 61, outside of the plugs 60.

There is an advantage inherent in positioning the heating elements horizontally, other than that of keeping a low water level, as has been explained. These heating elements are in direct contact with the water, obviating heating a shell or tube externally, and thus increasing the efficiency of the boiler over those heated by a flame, or by induction, but this causes ebullition to occur at the elements themselves, and the deposition of scale occurs at this point, the hottest within the boiler. With an element vertically disposed, whether with the plug 60 up (which is impractical) or with the plug down, the heat will be most intense at the highest point of the element, and here will be the greatest ebullition, and the greatest formation of scale. Scale will adhere to the tip of the element, if that be uppermost, and will progress downward and build up in thickness, and in a comparatively short time will so insulate the element that it will fuse, or burn out. With the element horizontal the intense heat is distributed over a far greater area, making the average temperature lower, and such scale as collects is distributed more evenly; but most important of all, it will collect only upon the upper side of the element, and the lower side will always remain free from scale, and in intimate contact with the water. Experience has shown that the life of heating elements horizontally disposed is far longer than that of like elements vertically disposed.

To insulate the shell adjacent the heating element or elements, it is desirable to enclose the ends of the elements within a junction box, as is indicated at 16. This box may be connected to the shell 1, and may be closed by a cover plate 17, to completely surround the projecting ends of the elements and to keep them in a dead air space. In addition, the bottom of this box 16 may be insulated by filling in the chamber and the interstices between the nipples 5 and 50 with an insulating cement, as is indicated at 62, whereby the shell is prevented from losing heat by radiation, and to a large extent, by conduction. The electrical connections, as will be understood, are taken off through a suitable aperture connecting to an outlet box 18 (see Figures 1 and 4).

It is necessary that such boilers as this be constructed cheaply, yet that they be held together to permit the transportation of the boiler, and to make the boiler sturdy and durable. It is also necessary that the shell be properly insulated, therefore I have shown a casing 7 in cylindrical form, surrounding the shell 1. This casing also has a cover 70, which may be fitted on over the upper end of the cylindrical casing 7, to cover the top of the boiler, and the space between the casing 7 and the shell 1, and between the cover 70 and the top 10 of the boiler shell, may be filled in with insulation, as is indicated at 71 in Figure 2. This may conveniently be such material as rock wool, which forms a good insulation for such purposes as this.

It will be noted that it is necessary to cut out the casing 7 to permit the passage of the casing downwardly over the projecting box 16. The casing 7 may be suitably apertured to fit the box 16, and may then be slit as is indicated at 72, and the band 73 turned backwardly, in which position the casing 7 may be fitted over the shell 1 and the box 16, whereupon the strip 73 may be returned into the cylindrical shape beneath the bottom of the

box 16, and secured by a strip 74, which may be riveted or otherwise secured in place, connected to the casing 7, as is best seen in Figure 1.

It is desirable that the boiler and its casing be supported above the floor, as otherwise there is a possibility of damage to woodwork. Also with the boiler elevated, it is possible to make and control the underneath connections, such as the water supply 2 and the blow-off 21. Therefore, I provide a platform or table 8, supported on legs 80, which may be secured thereto by some such means as the stove bolts or cap screws 81, and this table 8 is made of a diameter so that it will include the shell 1, but will fit just inside of the casing 7. The shell 1 may be secured thereto by such means as the brackets 19 and bolts 82 (see Figure 2).

The boiler is manufactured by first assembling the shell and the casing 16 complete, and then supporting the same upon the table 8, securing the shell in place by the brackets 19 and bolts 82, as has been described. It will be noted that the end of the cylindrical shell 1 extends downwardly just sufficient to rest on the table 8, and to lie in at least the same plane, and not above the plane, of the lowermost point of the dished bottom 11. Thus the shell 1 bears the entire, or the major portion, of the weight of the boiler supported upon the table 8. A pad 83 of insulation may be coextensive with the plate 8. The casing 7 is now slipped into place, and it will rest temporarily upon projecting corners 84 of the legs 8, as is seen in Figure 5. This supports the casing 7 in position relative to the boiler shell 1, for the casing extends outside of the plate 8, as will be seen in Figure 5, and while in this condition the insulation 71 may be put into place.

Now the various fittings are secured through the casing 7 into the shell 1 and its ends, and after these are in place it will be evident that the casing cannot be displaced. The boiler thus is in condition for handling.

The heating elements, all being maintained low in the shell, will need but a slight amount of water, as proportioned to the entire capacity of the boiler shell, and this small capacity of water is quickly heated. Also, it will be noted that the nipple 13 in the bottom 11 extends upwardly somewhat, and as all space below the lowermost heating element 6 is dead space, the nipple 13 may extend well upwardly towards this lowermost heating element. In this position, it forms a dead space around it in the dished portion of the bottom, which, in a short time, fills with scale. This scale forms an excellent insulating material, and assists in preventing loss of heat through the bottom 11 and plate 8, where it is not feasible to insert insulation, owing to the fact that the shell must be fitted tightly and properly in place upon the plate 8 before any insulation is inserted. This provision, then, further reduces the dead water space in the boiler.

What I claim as my invention is:

1. In a boiler, the combination with an upright shell having its side wall apertured, a threaded nipple secured in each of said apertures, with their axes substantially horizontal and projecting outwardly of the shell, a box surrounding the projecting ends of the several nipples, cementitious insulation filling the inner end of said box and the interstices between said nipples, and a heating element threaded into each of said nipples, and projecting within the water space of the boiler.

2. In a boiler, in combination, an upright cylindrical shell, a circular supporting table, means for securing said shell to the table, a plurality of legs supporting the table, and projecting slightly beyond the edge of the table, a cylindrical casing enclosing the shell, and resting upon the projections of said legs, and fittings extending through the side walls of said casing and shell to retain the former in place.

3. In a boiler, in combination, an upright shell having a box secured thereto near its bottom and projecting laterally therefrom, an enclosing casing fitting over the shell and cut away to receive said box, the portion of the casing beneath said box being flexibly connected to the remainder, to be swung back to permit passage of the box, and means securing said flexibly connected portion in the general contour of the casing, beneath the box.

4. In a boiler, in combination, an upright shell having a box secured thereto near its bottom and projecting laterally therefrom, an enclosing casing fitting over the shell and cut away to receive said box, the portion of the casing beneath said box being flexibly connected to the remainder, to be swung back to permit passage of the box, means securing said flexibly connected portion in the general contour of the casing, beneath the box, a cover fitting over the upper end of said casing, a table fitting within its lower end, means securing said shell to said table, and external connections to said shell passing through the casing, cover, and table, to fix the latter relative to each other and to the shell.

5. In a boiler, the combination with a shell having its side wall apertured near its bottom, a heating element secured in said aperture and projecting laterally within the shell, a blow-off connection to the bottom of said shell, and extending upward above the bottom thereof, adjacent but terminating below the heating element.

6. In a boiler, the combination with a shell having its side wall apertured near its bottom, a heating element received in said aperture and projecting laterally within the

boiler shell, a table, means securing the boiler shell in upright position resting upon said table, a casing spaced from the sides and top of the shell, the space between being filled with insulating material, and a blow-off connection to the bottom of the shell, through said table, and extending upwardly within the shell to a level adjacent the heating element, whereby an insulating layer of scale is permitted to form in the bottom of the shell.

7. In a boiler, a shell having its side wall apertured near its bottom, a nipple received in said aperture and projecting laterally within the shell, a heating element received in said nipple, an insulating casing surrounding said shell, except about said aperture and heating element, a box projecting from the shell about the aperture and heating element, a removable cover closing said box to form a dead insulating space therein, and a cementitious insulation filling the bottom of said box about the nipple, to induce the deposit of scale upon the shell's bottom.

Signed at Seattle, King County, State of Washington, this 9th day of August, 1928.

SYDNEY N. COATES.