March 13, 1934. R. A. SHARP 1,950,756

STEAM GENERATING BOILER

Filed Oct. 5, 1931 2 Sheets-Sheet 1

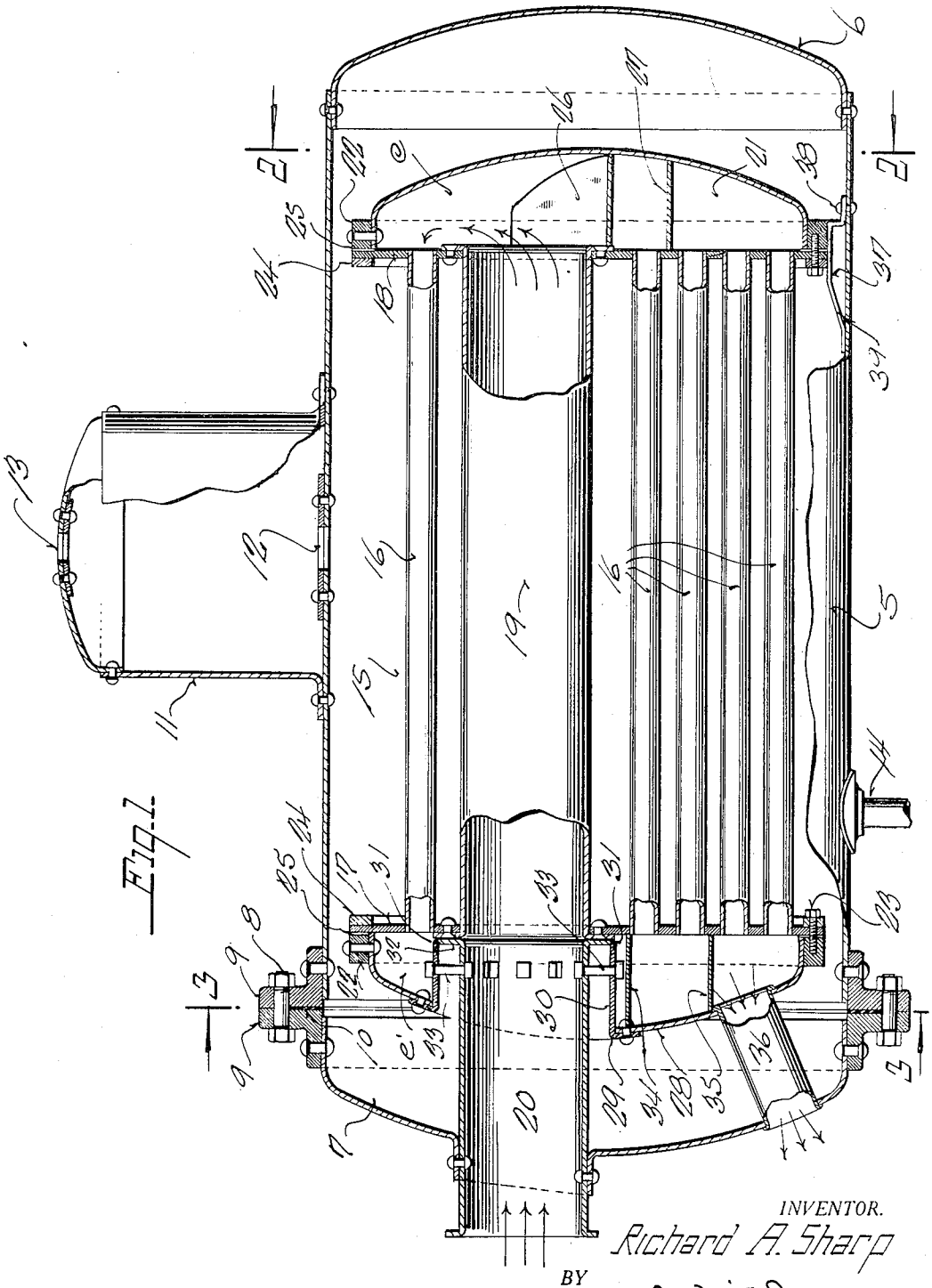


Fig. 1.

INVENTOR.
Richard A. Sharp
BY
ATTORNEY.

March 13, 1934. R. A. SHARP 1,950,756

STEAM GENERATING BOILER

Filed Oct. 5, 1931 2 Sheets-Sheet 2

Fig. 1.

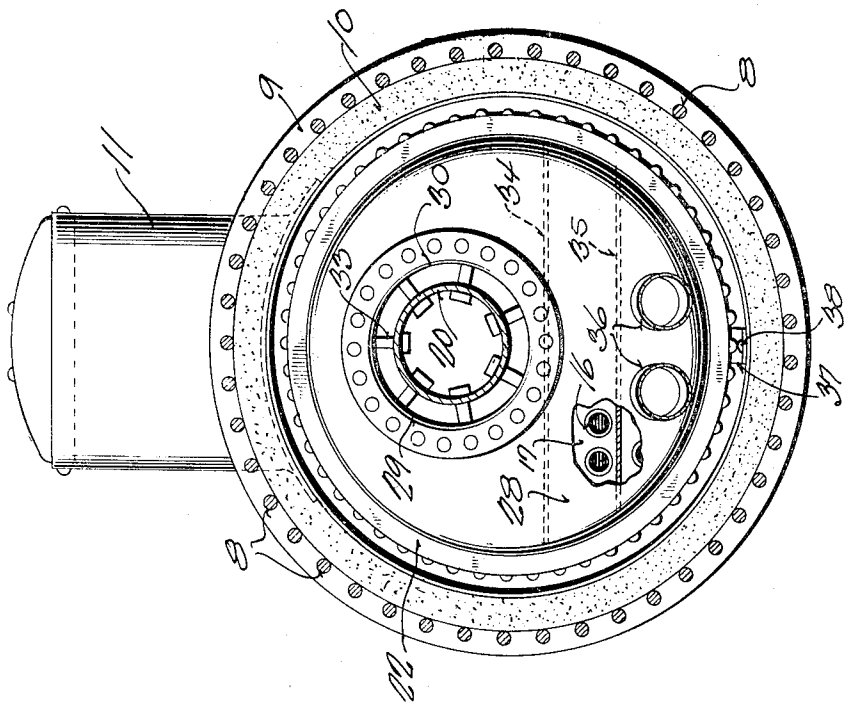
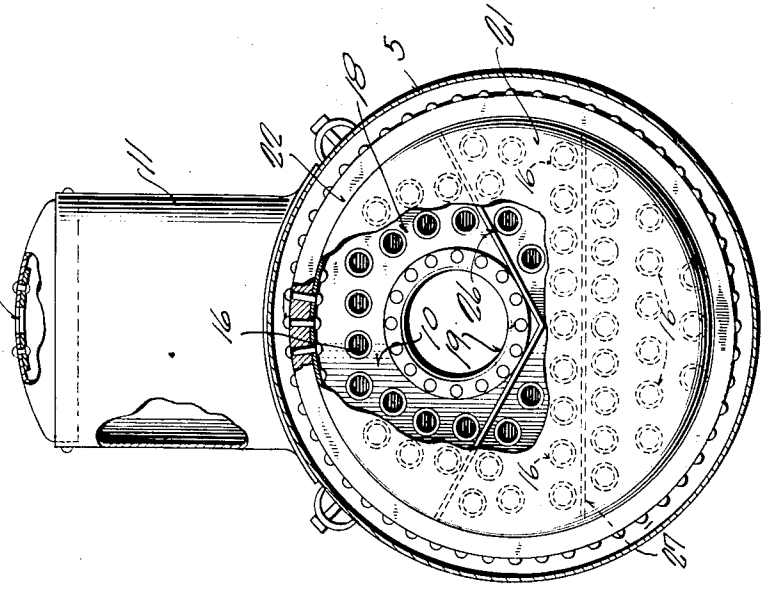


Fig. 2.



INVENTOR.
Richard A. Sharp
BY
Ira Milton Jones
ATTORNEY.

Patented Mar. 13, 1934

1,950,756

UNITED STATES PATENT OFFICE

1,950,756

STEAM GENERATING BOILER

Richard A. Sharp, Milwaukee, Wis., assignor to Milwaukee Reliance Boiler Works, Milwaukee, Wis., a corporation of Wisconsin

Application October 5, 1931, Serial No. 566,970

3 Claims. (Cl. 122—149)

This invention relates to certain new and useful improvements in steam generating devices or boilers, and refers more particularly to boilers of the portable type.

Boilers of this character necessarily must be of compact construction, and to obtain the desired high efficiency and still maintain compactness, heretofore required a construction involving many gasket joints, which in many instances were inaccessible. This condition not only is bad design, but does not pass government inspection.

It is therefore an object of this invention to provide a boiler of the character described, which if of novel construction to reduce the number of gasket joints to a minimum and in which these joints may be readily inspected.

Another object of this invention is to provide a boiler of comparatively small dimensions, but which is so constructed as to utilize every bit of heat and thereby insure maximum efficiency.

Another object of this invention resides in provision of a boiler in which the entire heating element is removable as a unit.

Another object of this invention is to provide a boiler of the tubular design, in which the tubes and their associated headers are rigidly attached to one of the end plates of the boiler to be removable with the end plate.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

In the accompanying drawings one complete example of the physical embodiment of this invention is illustrated constructed according to the best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a transverse section view taken through a boiler embodying this invention;

Figure 2 is a cross section view taken through Figure 1 on the plane of the line 2—2; and

Figure 3 is a cross section view taken through Figure 1 on the line 3—3.

Referring now more particularly to the accompanying drawings in which like numerals indicate like parts throughout the several views, the numeral 5 represents a cylindrical shell having an end plate 6 fixed thereto to permanently close one of its ends. The other open end of the shell is closed by an end plate 7 which is secured to the shell by a series of bolts 8 connecting flanges 9 riveted to the adjacent end portions of the shell and the head 7. The joint between the flanges 9 is made fluid tight by interposing a gasket 10 between their meeting faces.

Secured to the top of the shell 5 is a steam dome 11 which has communication with the shell through an opening 12 and which is provided with an outlet opening 13 with which the steam line, not shown, is connected to receive the steam generated by the boiler.

A port 14 at the bottom of the shell provides means through which the boiler may be filled with water.

Within the shell is a heating element indicated generally by the numeral 15 and comprising a plurality of tubes 16 whose ends are secured to header plates 17 and 18. The tubes 16 are arranged about a comparatively large diameter tube 19 disposed above the major axis of the boiler and secured to the header plates 17 and 18 in alignment with a tube 20 fixed in an opening in the end plate 7.

The tube 20 extends from the end plate 7 to the adjacent header plate 17 and its outer end forms an inlet through which a heating unit such as an oil burner, not shown, directs a flame into the heating element. The flame and hot gases travel inwardly through the tube 19 into a chamber C provided by the space between the header plate 18 and a dished plate 21, and with which all of the tubes 16 communicate.

The dished plate 21 has its peripheral edge turned inwardly toward the header plate 18 and has a re-inforcing ring 22 secured thereto by a series of rivets. Bolts 23 passing through aligned openings in a reinforcing ring 24 engaging the inner surface of the plate 18, and through the plate 18, are threaded into the reinforcing ring 22 to secure the dished plate 22 to the header plate 18, a gasket 25 being interposed between the plate 18 and the ring 22 to provide a fluid tight joint.

Disposed within the space C are two baffle plates 26 and 27 which direct the hot gases, as will be later described. The plate 26 is V shaped and is positioned beneath the tube 19 so that the gases issuing therefrom are caused to return forwardly through those tubes 16 which communicate with the chamber C above the baffle 26. The hot gases thus directed, return

through these upper tubes 16 to a second chamber C' formed by the space between the header plate 17 and a second dished plate 28.

The dished plate 28 like the plate 21 has its peripheral edge directed inwardly to be secured to the header plate 17 in the same manner as the plate 21 is secured to the header plate 18. This plate 28, however, has an opening 29 to accommodate the tube 20. The opening 29 is of larger diameter than the tube 20 and receives a sleeve 30 which has one end secured to the peripheral edge of the opening 29 and extends inwardly parallel with the tube 20 to the header plate 17 where it is welded, as at 31, to a lateral flange 32 on the innermost end of the tube 20.

The space between the tube 20 and the sleeve 30 enables all portions of the tube 20 to contact with the water in the boiler, and a plurality of stay bolts 33 extending across this space serve to reinforce the structure at this point.

It is observed that the annular flange 32 abuts the flange of the tube 19 which is secured to the header plate 17, and to preclude leakage of gases from the tubes 19, 20 into the space C', the joint between the flange 32 and the flange of the tube 19 is preferably cemented.

The gases entering the chamber C' through the uppermost tubes 16 are re-conducted back into the chamber C through those tubes 16 beneath the baffle 26 and above a baffle 34 disposed in the chamber C'. Upon being returned to the chamber C the gases are between the two baffle plates 26 and 27 and are directed forwardly by the plate 27 to return to the chamber C' above a second baffle plate 35 therein. From this portion of the chamber C' the gases are re-conducted to the chamber C beneath the baffle plate 27 and then again forwardly to the chamber C' beneath the baffle plate 35.

It is thus observed that the hot gases are passed through the tubes six times so that practically every bit of heat is taken therefrom.

From the chamber C' beneath the baffle plate 35 the gases are conducted from the boiler through a pair of exhaust ports 36 formed by tubes having their ends secured in openings formed in the end plate 7 and the dished plate 28.

It is observed that the entire heating element is rigidly connected with the end plate 7 through the tube 20 and the exhaust ports 36 and that no other connection whatsoever is afforded between the heating unit, which comprises the series of pipes 16 and the tube 19, and the boiler shell, except that a support 37 is provided for the extreme inner end of the heating element. This support, however, has no connection to the heating unit, but merely supports the same. The support 37 preferably comprises a plate fixed to the bottom of the cylindrical shell as at 38 and having its forward portion inclined as at 39 to guide the end of the heating element into position as it is inserted into the shell.

It is further observed that there are in all, but three gasket joints in the entire boiler construction: one, between the flanges 9 which serve to hold the end plate 7 to the shell; and one each at the attachment of the dished plates 21 and 28 with the header plates 17 and 18 respectively. The main joint, which is that between the flanges 9, is readily visible at all times and the other two joints may be readily exposed to view for inspection by merely loosening the bolts 8 and withdrawing the entire heating unit. The removability of the heating element obviously has many advantages, for not only does it facilitate removal and inspection of all parts thereof, but it permits the ready replacement of defective heating elements.

Another important feature of this invention is the fact that by dishing the plates 21 and 28, the chambers C and C' are formed by but two connected elements necessitating but one gasket joint. The dished shape of the plates 21 and 28 also entirely eleminates stay bolts and provides a structure of great rigidity.

As will be readily apparent to those skilled in the art to which this invention appertains, the boiler may be provided with such other appliances as blow-off valves, pressure gages and the like which form no part of this invention and therefore have not been shown; and if desired, the boiler may be used as a stationary unit, but is particularly well adapted to a mobile mounting. This mounting may comprise a chassis supported by automobile wheels and the chassis may also carry the burner fuel and water supply tanks. These elements however, form no part of the invention and are therefore not shown.

The device of this invention also lends itself readily for use as a heating retort for asphalt and similar bituminous material, and when used for this purpose, the material to be heated is pumped from the tank cars or other containers in which it is received and circulated through the shell to contact with the heating element in place of the water.

What I claim as my invention is:

1. A boiler of the character described, comprising a container, a heating element within the container comprising a plurality of tubes, header plates to which the ends of the tubes are secured, dished plate members connected at their peripheral edges with the header plates to, with the header plates, provide spaced chamber communicated through the tubes, the header plate and dished plate member of one of the chambers having aligned openings with the opening in the dished plate member of larger diameter than that in the header plate, a cylindrical sleeve contacting the peripheral edge portion of the opening in the dished plate member and engaging the header plate to maintain the chamber closed and provide an opening entirely therethrough, a tube having one end communicated with the other chamber and extending through the opening in the first mentioned chamber to the exterior of the container and connected to said header plates to provide means through which a heating medium may be injected into the chambers and their communicating tubes, and an exhaust flue communicating one of the chambers with the exterior of the container.

2. In a boiler, a closed fluid-tight container having a removable end wall, a heating unit within the container and removable therefrom with said end wall, said heating unit comprising a plurality of tubes, a pair of header plates to which the opposite ends of all of the tubes are permanently secured, dished walls detachably connected at their peripheries with the header plates to define closed chambers at the ends of the tubes, said chambers cooperating with the tubes to form a closed system for the circulation of a heating medium, the dished wall adjacent the removable end wall having an opening in line with the adjacent end of one of the tubes and being of greater diameter than said tube, a

cylindrical wall permanently connected at one end to the peripheral edge portion of said opening and having its opposite end in engagement with the adjacent header plate, an inlet tube extending through the removable end wall and telescoped within the cylindrical wall in spaced relation thereto, with its inner end directly at the mouth of the adjacent tube and a permanent fluid-tight connection between said inner end of the inlet tube and the cylindrical wall at the header plate, whereby the inlet tube together with the cylindrical wall and the attached dished wall are separable from the adjacent header plate as a unit, upon the release of only the connection between the dished wall and said header plate.

3. In a boiler, a closed fluid-tight container having a removable end wall, a heating unit within the container and removable therefrom with said end wall, said heating unit comprising, a plurality of tubes, a pair of header plates to which the opposite ends of all of the tubes are permanently secured, dished walls detachably connected at their peripheries with the header plates to define closed chambers at the ends of the tubes, said chambers cooperating with the tubes to form a closed system for the circulation of a heating medium, an inlet tube extending through aligned openings in the removable end wall and the adjacent dished wall with its inner end contacting the adjacent header plate in line with one of said tubes, the opening in the dished wall being of greater diameter than said inlet tube, and an annular wall permanently connecting the inner end of the inlet tube with the dished wall at the periphery of the opening therein.

RICHARD A. SHARP.