Aug. 20, 1935. K. BAUMANN 2,012,216

COILED TUBE STEAM BOILER

Filed Oct. 11, 1934 3 Sheets-Sheet 1

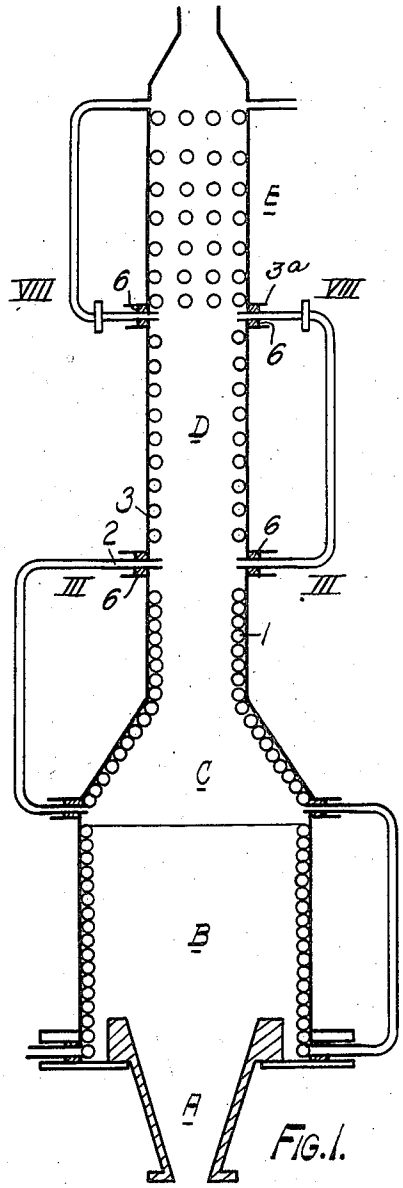

FIG. 1.

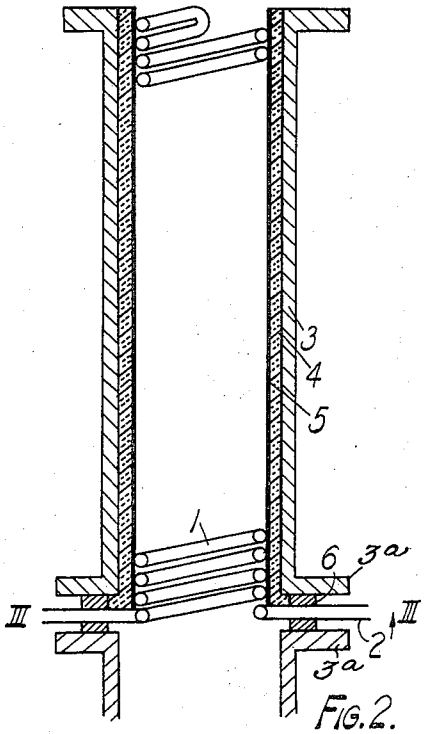

FIG. 2.

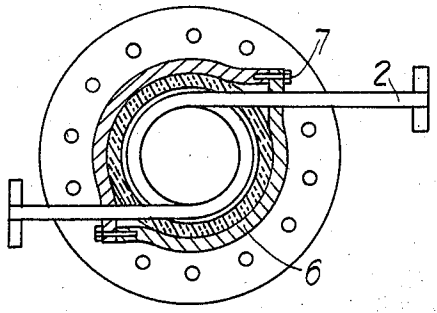

FIG. 3.

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COILED TUBE STEAM BOILER

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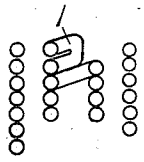

FIG. 6.

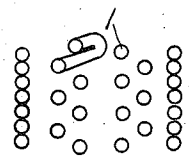

FIG. 7.

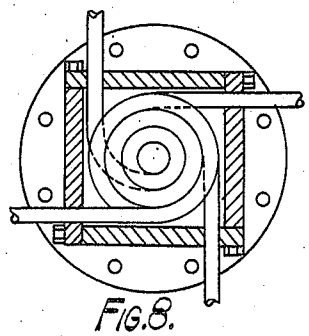

FIG. 8.

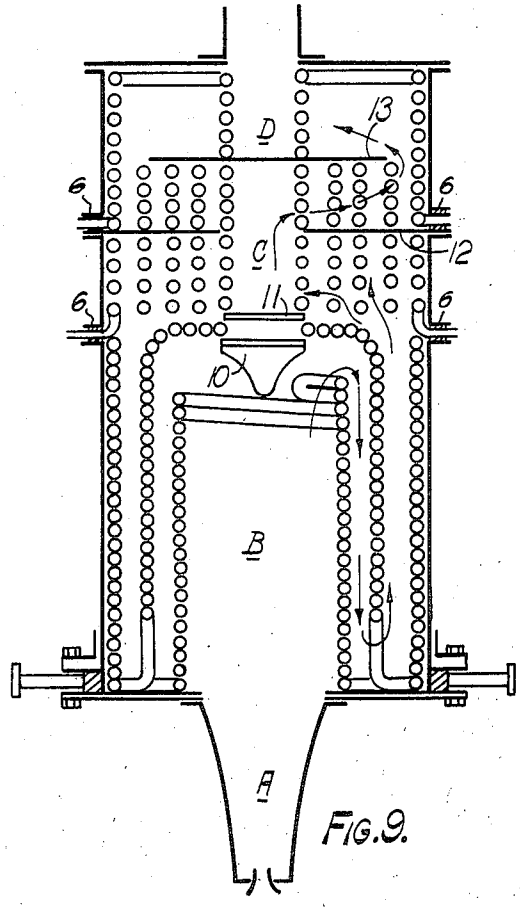

FIG. 9.

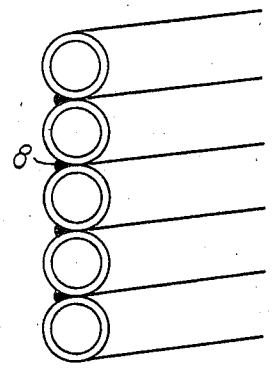

FIG. 4.

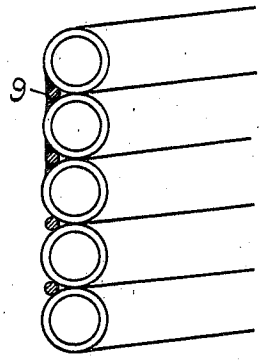

FIG. 5.

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COILED TUBE STEAM BOILER

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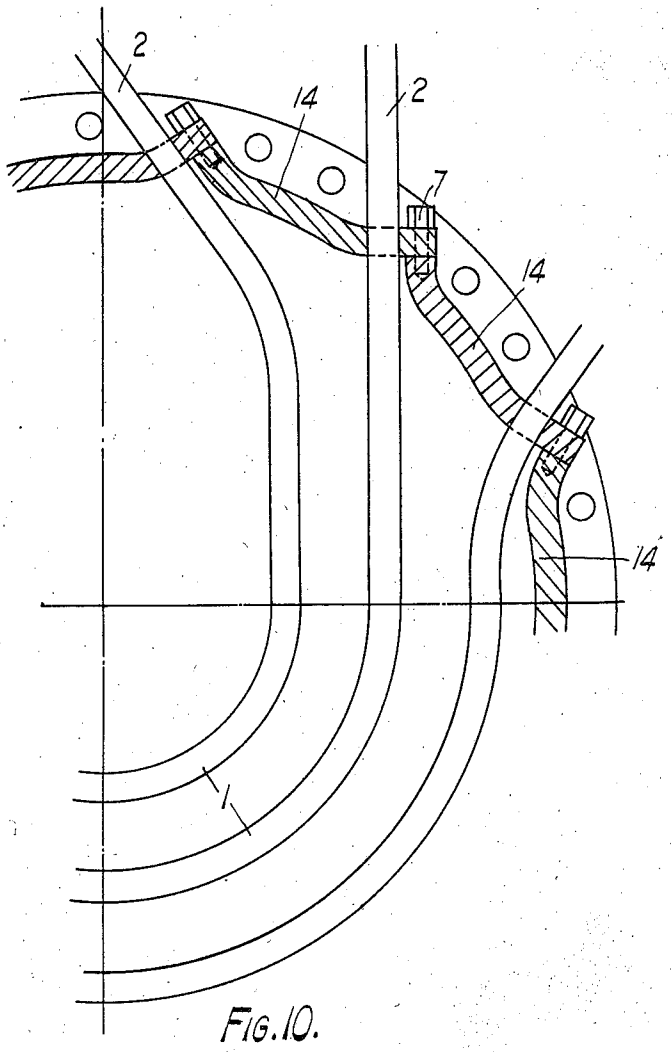

FIG. 10.

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Patented Aug. 20, 1935 2,012,216

UNITED STATES PATENT OFFICE

2,012,216

COILED TUBE STEAM BOILER

Karl Baumann, Wilmslow, England, assignor to Associated Electrical Industries Limited, London, England, a company of Great Britain

Application October 11, 1934, Serial No. 747,949
In Great Britain October 20, 1933

3 Claims. (Cl. 122—250)

The invention relates to steam boilers of the forced circulation type such as those known as the "once through", the "Benson", the "multiple superheater" and such like types, and has a particular, although by no means exclusive, application to boilers of this type which employ pressure combustion.

The main object of the invention is to provide an improved construction of steam and water tube for such boilers, and mounting means therefor, which parts are relatively simple to manufacture and erect and also to dismantle for inspection and replacement purposes. Another object is to provide tubes which may be incorporated in a new and improved form of generator which is particularly suitable for the regeneration of high pressure steam at high temperatures.

Although the invention is herein described as applied to a steam boiler or generator, it is to be understood that the boiler or generator according to the present invention may be employed for the evaporation of liquids of different kinds, and such will be included within the scope of the claims.

In order that the invention may be more clearly understood, reference will now be made to the accompanying drawings, wherein:

Figure 1 shows diagrammatically a vertical section of a preferred form of steam boiler embodying the invention.

Fig. 2 shows a vertical section of a casing structure for certain types of coils.

Fig. 3 is a horizontal section on the line III—III of Figs. 1 and 2.

Figs. 4 and 5 respectively show ways of connecting adjacent turns of a coil.

Figures 6 and 7 show arrangements for employing several coils concentrically disposed.

Fig. 8 is a section through VIII—VIII of Fig. 1.

Fig. 9 shows diagrammatically a vertical section of a modified form of boiler, and

Fig. 10 shows a manner of leading the coil ends through the boiler wall in the arrangement shown in Fig. 9.

In the arrangement shown in Fig. 1, A indicates a gas or oil burner, B the combustion chamber, whilst C, D, and E respectively indicate successive sections of the boiler which preferably constitute separate units.

The reference 1 indicates the coils, and 2 the coil ends.

Each coil is formed of a tube closely wound back upon itself so that both ends are disposed at one end of the coil and the return bend of the tube is located at the other end of the coil.

A steam generator may be constructed by assembling a plurality of said coils coaxially in alinement vertically or horizontally, the outlet end of the tube comprising one coil being connected to the inlet end of the tube comprising the next coil. Any desired number of individual sections each containing a coil of the type above described may be assembled together, each coil being encased within a flanged metal shell. Distance pieces are provided between the abutting flanges of adjacent metal shells, through which the inlet ends of the tubes comprising the coils are passed.

As shown in the drawings, the coils in the sections B, C and D line the walls of the sections and are exposed to the furnace heating on the internal side only, whilst the tubes in the section E are exposed to heating on both sides. A convenient construction of section for the former case is shown in Figures 2 and 3 in which the wall 3 of the section is provided with a lining 4 of heat insulating material. In such a case, sufficient clearance should be provided between the coil and the casing to permit the coil to unwind under the influence of the heating. Preferably a metal shield 5 is interposed between the coil and the casing to prevent wear of the latter when the coil unwinds.

By anchoring each coil at the end at which the inlet and outlet ends of the pipe are located and leaving the other end free the coils may be left free to expand in an axial direction; at the same time there will of course tend to be a certain amount of unwinding and increase of diameter.

In Fig. 3 the distance piece 6 between the flanges 3a of adjacent sections 3 is shown as formed of two parts secured together by bolts 7 and the coil ends 2 pass through the parts so that the coil is supported at these points.

The unwinding of the coils due to heating may be prevented to a large extent and their stability increased by welding adjacent turns of the coil together as indicated by the reference 8 in Fig. 4. The welding may extend only over part of the length of the coil or it may extend over the entire length and thus also provide a seal against leakage of flue gases between the turns of the coils. Alternatively, as indicated by the reference 9 in Fig. 5, a metal wire may be wound around the coil between successive turns, the wire being welded on either side to the turns.

In many cases it may be desirable to employ two or more coils arranged concentrically as shown in Fig. 6 in which figure the inner coil

is shown arranged on a single cylindrical surface or, alternatively, the downgoing half of the inner tube may be arranged on a different cylindrical surface concentric with the upgoing half and either inside it or outside it so as to form a double wound coil as indicated in Fig. 7.

Figure 8 shows in plan view an arrangement of a distance piece suitable in such a case according to which the distance piece is formed of four members bolted together in the form of a rectangle.

Figure 9 shows an arrangement in which concentrically arranged coils connected in series are employed, the turns of the coil in section B being wound closely together so as to co-operate with a refractory baffle 10 to cause the flue gases to follow a tortuous passage as indicated by the arrows. In the sections C and D the gases are further guided by the baffles 11, 12, and 13. In such cases the pipe ends may conveniently pass outward through distance pieces comprised of a number of short metal pieces 14 (Fig. 10) suitably bent so that their ends may be secured together as by bolts 7 to constitute a substantially circular or polysided annular member which may be accommodated between the abutting flanged ends of the adjacent section walls.

The arrangement employed enables any of the coils to be easily withdrawn from the shell of a section. Further the arrangement is particularly suited for high steam pressure.

It will be appreciated that where a number of coils are employed, as for instance in the above arrangement, some of the coils may constitute economizer units whilst others may constitute superheater units.

I claim:

1. In a steam generator of the kind described, fluid tubing arranged in a double coil, end portions to said tubing located at one end of said coil and a return bend located at the other end thereof, walling surrounding said tubing, said walling being divided into sections, a distance piece between a pair of adjacent sections, and means whereby said coil ends are anchored to said distance piece to support said coil.

2. In a steam generator of the kind described, fluid tubing arranged in a multiple coil, end portions to said coil and means for anchoring said tube end portions to support said coil, walling surrounding said coil a layer of heat insulating material to said walling and a metallic shield to said walling arranged to protect said walling against damage by said tubing.

3. In a steam generator of the kind described a plurality of concentrically arranged coils of fluid tubing, each of said coils comprising a double wound coil the tube ends to each of said coils located at one end thereof, a return bend to each of said coils located at the other end of said coil, a section of walling surrounding said tubing, a spacing member between said walling section and an adjacent walling section, a plurality of sections to said spacing member joined end to end and means whereby each tubing end passes through a separate section of said spacing member and is supported thereby.

KARL BAUMANN.