

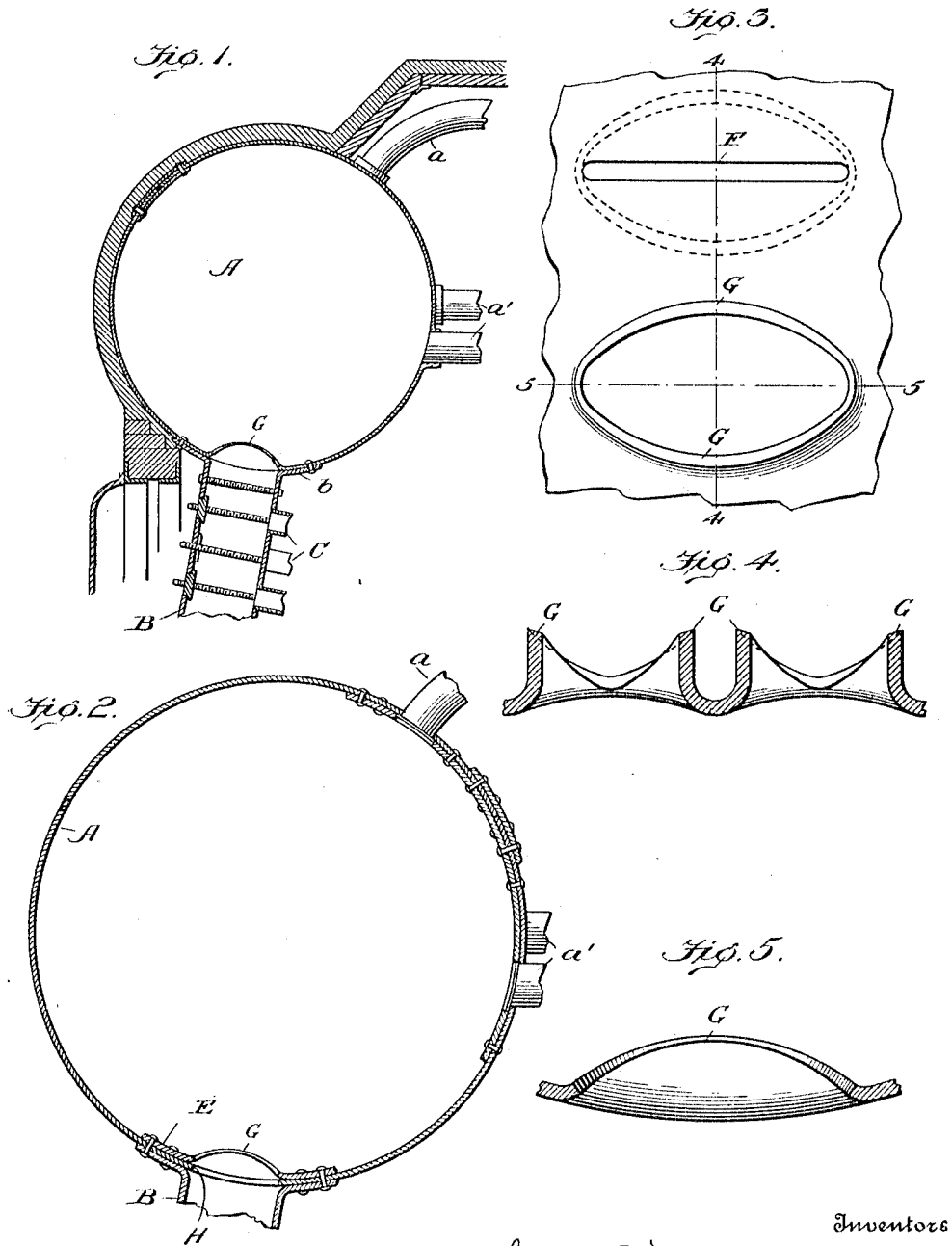
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STEAM BOILER CONSTRUCTION.

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1,120,071.

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UNITED STATES PATENT OFFICE.

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STEAM-BOILER CONSTRUCTION.

1,120,071.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, JOHN W. F. MACDONALD, a subject of the King of England, residing at South Framingham, in the county of Middlesex and State of Massachusetts, and DAVID W. ROBB, a subject of the King of England, residing at Amherst, Nova Scotia, Dominion of Canada, have invented certain new and useful Improvements in Steam-Boiler Construction; and we do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the figures and letters of reference marked thereon.

This invention relates to improvements in steam boiler construction and more especially to improvements in that type of steam boilers wherein circulating ducts, tubes or flanges are used in connection with steam or water drums, the invention having to do primarily with the construction of that portion of the boiler where the drum connects with the circulating ducts, tubes or headers, the objects being to so reinforce or strengthen the wall of the drum at the points where apertures are formed therein that danger of failure at these points under high pressure will be greatly reduced.

Referring to the accompanying drawings—Figure 1 is a sectional view of the front upper end of a tubular boiler and drum embodying the present improvements. Fig. 2 is a section on an enlarged scale of the drum, showing one of the header connections and preferred reinforced construction. Fig. 3 is a plan view of a plate showing two apertures for establishing communication with the circulating ducts or headers, one of said apertures being in full lines and the other in dotted lines, but with the opening formed in the plate preliminary to the flanging of the metal in the formation of the reinforced aperture. Fig. 4 is a section on the line 4—4 of Fig. 3, and Fig. 5 is a section on the line 5—5 of Fig. 3.

Like letters of reference in the several figures indicate the same parts.

The type of boiler adopted for illustrating the invention embodies a water and steam drum A which is usually located at the front end of the boiler and is connected with a rear drum by steam and water pipes *a* and *a'* respectively. Extending down-

wardly from the drum or attached to the underside of the drum are a series of headers B, to which the rearwardly extending and downwardly inclined tubes C are connected in the usual way. The tubes C overlie the furnace and bridge wall, as usual and as these features, together with the particular construction of the header, are immaterial, further description of the same is unnecessary.

The drum is usually of cylindrical section or at least the portion of its wall where the headers connect therewith is cylindrical or curved and the headers are usually and preferably attached to the outer face of the wall of the drum by means of flanges *b* and rivets indicated diagrammatically in the drawings.

When constructed as just described, it is found that under high pressure there is a tendency of the wall of the drum at the point where it is weakened by the apertures therethrough or in line with the headers, to flatten or straighten out, thereby causing the boiler to fail at this point. In accordance with the present invention, and in order to provide an effectual reinforce for this portion of the drum, or in fact for any portion of a drum where similar conditions exist, the wall of the drum around the aperture with which the headers communicate is strengthened by inwardly projecting flanges, said flanges being preferably so formed as to constitute braces which will maintain the curvature of the wall of the drum and being wider at the sides and narrower at the ends of the apertures.

In forming the reinforcing flanges, it is designed to retain practically the entire metal which would be ordinarily removed in the formation of the aperture and in order to accomplish this it will be seen from Fig. 3 that there is preliminarily formed in the plate a long slit F which slit is only slightly shorter than the length of the aperture to be formed. In forming the aperture, the side walls of the slit are bent upwardly to form the flanges G, as shown in full lines in Figs. 3 and 4, and inasmuch as the apertures to be formed are usually oval in shape, the flanges will be wider at the sides of the aperture than at the ends and will constitute most effectual reinforcing means for preventing the straightening or bending of a curved plate, such as shown for instance in

Fig. 5. The edges of the sides of the flange are arched or curved in the opposite direction from the curvature of the plate itself and, therefore, the flanges and the portions of the plate between the apertures mutually brace each other and form an exceedingly stiff and rigid structure.

The plate having the flanges formed integral therewith may obviously constitute the wall of the drum itself, but in the preferred construction a plate having the flanges formed thereon is located on the inner face of the wall of the drum, as shown at E in Fig. 2, said plate being firmly clamped and fastened to the wall of the drum by rivets or other fastening means so as to in effect become an integral part thereof. With this construction of course the wall of the drum has a corresponding aperture H therein, but the walls of the aperture H will be strengthened and reinforced by the flange G which latter forms in effect an inwardly projecting continuation of the wall.

Obviously, the reinforcing means employed in connection with the headers may be utilized in connection with other circulating ducts connected with the drum and hence we do not wish to be limited to the particular application of the invention illustrated, nor to the particular type of boiler adopted for such illustration.

It will be especially noted in carrying the present invention into practice that the effect of the flanging operation is to retain practically all of the metal in the plate so that the strength of the plate to resist internal pressure is reduced but very slightly, if at all, and the flanges in effect form trusses to maintain the drum in proper circular form.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent of the United States, is:—

1. In steam boiler construction, a drum having a wall of cylindrical section with an aperture therethrough, a circulation duct communicating with said aperture and a reinforce for the wall consisting of an inwardly projecting flange around the aperture.

2. In steam boiler construction, a drum having a wall of cylindrical section with an aperture therethrough, a circulation duct having its end connected with the outer face of the wall of the drum in which the aperture is formed and a reinforce consisting of an inwardly projecting flange around the aperture, the edge of the flange being curved in an opposite direction to the curve of the wall of the drum.

3. In steam boiler construction, a drum

and a circulating duct connected with and opening into the drum through an opening in the wall of the drum and a reinforce for the wall surrounding the opening embodying an inwardly extending curved flange having its edge arched from one end of the opening to the other.

4. In steam boiler construction, a cylindrical drum having an elongated aperture therein with its major axis in the direction of the curve of the wall of the drum, a circulation duct with which the aperture communicates, and a reinforce for the wall around the aperture embodying an inwardly extending flange around the aperture, said flange having its edge curved in an opposite direction to the curve of the wall of the drum.

5. A curved plate for steam boiler walls having an aperture therein with the metal displaced to form the aperture bent inwardly and forming a reinforcing flange around the aperture without reducing the sectional area of the metal, whereby the tensile strength of the plate is not impaired.

6. A steam boiler embodying a drum having a curved wall with an aperture therein, a circulation duct opening into the drum through the aperture and a plate secured to the inner face of the wall and having a reinforcing flange around the aperture for holding the wall in its curved condition under the influence of pressure tending to straighten the same.

7. A steam boiler embodying a drum having a curved wall with an aperture therein, a circulation duct secured to the wall to communicate with the drum through the aperture and a plate secured to the inner face of the wall and having an inwardly projecting reinforcing flange around the aperture.

8. A steam boiler embodying a drum having a curved wall with an aperture therein, elongated in the direction of the curve of the wall, a circulation duct secured to the outer face of the wall around the aperture, a plate secured to the inner face of the wall and having an inwardly projecting reinforcing flange around the aperture, said flange being wide at the sides and narrow at the ends of the aperture whereby the wall is reinforced.

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