Nov. 19, 1929. S. LÖFFLER 1,736,610

METHOD OF MANUFACTURING HIGH PRESSURE BOILERS

Filed March 28, 1925

Fig. 1.

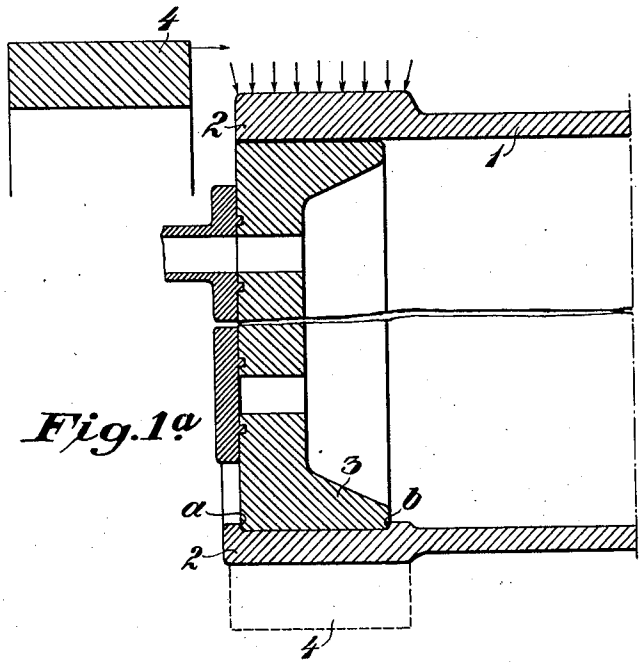


Fig. 1a

Fig. 2.

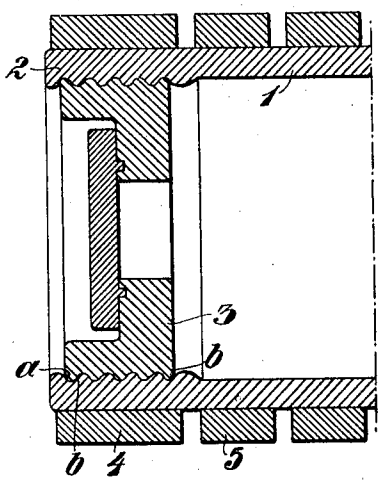
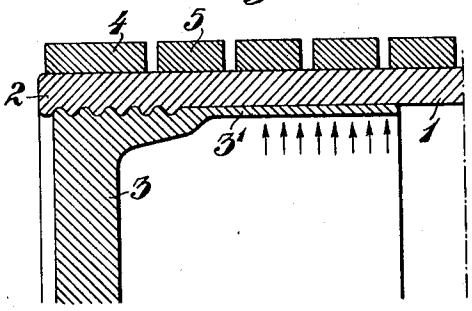


Fig. 3.



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Patented Nov. 19, 1929 1,736,610

UNITED STATES PATENT OFFICE

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METHOD OF MANUFACTURING HIGH-PRESSURE BOILERS

Application filed March 28, 1925, Serial No. 19,174, and in Germany April 11, 1924.

My invention relates to high-pressure steam boilers; more especially it relates to a method of manufacturing them, and still more especially this method concerns the fastening of the frontal walls or boiler ends to and in the shell of the boiler. The invention is illustrated diagrammatically and by way of example in the accompanying drawing, in which Figure 1 is an axial section through the upper half of an end of a high-pressure boiler constructed and manufactured according to this invention, the figure showing one phase of the method; Figure 1ª is a similar view of the lower half of the same end of a high-pressure boiler after the second phase of my improved method has been completed; Figure 2 is a sectional view through a high-pressure boiler showing a modification; and Figure 3 shows another modification, all figures, as well as the phases or stages of the method, being fully described hereinafter.

Referring to Fig. 1, 1 denotes the appropriately thick shell of the boiler which may be manufactured either by bending round a boiler plate and welding the joint, or by pressing a block into tubular shape. In either case a re-inforced rim or end 2 is provided (the upper half of this ring being shown in Fig. 1) which is, however, flattened down later on, as is shown in Figure 1ª. This is effected only after the boiler end 3 has been introduced into the shell, but prior thereto the end 2 is strongly heated so that it expands, the boiler end being, however, inserted in a cold state so that it is clamped fast in the shell by this latter itself, i. e. by its rim 2 when the rom cools down, contracts, and shrinks. But prior to the cooling down, the contracting and the shrinking of the rim, and immediately after the boiler end has been inserted, the rim is flattened down mechanically by hammering, rolling, forging, or the like, in such a manner, that the material forming the rim, or, more precisely, the respective end of the shell 1, is deformed to the shape shown in Figure 1ª, there existing now an inner shoulder *b* and an outer shoulder *a*, the two shoulders holding the boiler end 3 very securely between them. This operation is carried through quickly enough that the material does not cool and shrink perceptibly during that time; only when the shoulders *a* and *b* have been formed, the shrinking proper ensues, whereby the boiler end 3 is secured to the shell 1 so firmly that the boiler is able to stand the highest pressures proposed of late.

The boiler end is provided, of course, with the necessary bores or passages and fittings prior to its insertion into the shell.

If desired, a shrunk ring 4 (Fig. 1) may be shoved upon the end 2 of the shell or boiler after the deformed rim of the shell has completely cooled down. In Fig. 1 a part of the shrunk ring is shown still separate from the boiler; in Figure 1ª that ring (indicated here only in dotted lines) is in its ultimate place.

In the modification illustrated in Fig. 2 the circumferential surface of the boiler end is undulated in axial direction and the material of the rim 2 is pressed into the troughs of the undulations whereby there is formed a plurality of shoulders *a* and *b*. Fig. 2 shows the boiler, i. e. the end or part illustrated, in finished state. The several stages, or phases of manufacture, are practically the same as described with regard to Fig. 1. Another difference with respect to Fig. 1 consists, however, in the feature that, besides the shrunk ring 4, several similar rings 5 have been shoved also over and upon the shell 1.

This is the case also in the other modification shown in Fig. 3 which differs from Fig. 2 chiefly by the feature that the boiler end 3 is provided with a tubular extension 3′ contacting closely with the shell. The close contact is due to, and maintained by, the shrunk rings, but also to the high internal pressure when the boiler is in operation.

I wish it to be understood that I do not

limit myself to the modifications shown in the drawings in which only a few examples have been illustrated. It will be obvious to every expert of the art to which this invention pertains that further modifications of the method, as well as of the product, the high-pressure steam boiler, are possible without departing from the gist of the invention.

To give an example: The undulations or parallel wave crests and wave troughs extending around the peripheral surfaces of the boiler ends may pass over into one another in such a way as to form a continuous thread like that of a screw.

I claim:

1. A method of manufacturing high pressure steam boilers consisting in heating the end portions of a boiler shell to expand the same, inserting the boiler ends in cold state into said heated end portions of the boiler shell, forging the heated end portions of the boiler shell about said boiler ends, causing the end portions of the boiler shell to shrink onto the boiler ends, applying heat expanded bands over the shrunk end portions of the boiler shell, and causing said bands to shrink onto said end portions of the boiler shell.

2. A method of manufacturing high pressure steam boilers consisting in upsetting the end portions of a boiler shell, heating the upset end portions of said boiler shell to expand the same, inserting the boiler ends in cold state into said heated end portions of the boiler shell, forging the upset heated end portions of the boiler shell about said boiler ends, causing the forged end portions of the boiler shell to shrink onto the boiler ends, applying heat expanded bands over the shrunk end portions of the boiler shell, and causing said bands to shrink onto said end portions of the boiler shell.

3. A method of manufacturing high pressure steam boilers consisting in upsetting the end portions of a boiler shell, heating the upset end portions of said boiler shell, forming grooves upon the marginal surfaces of the boiler ends, inserting said boiler ends in cold state into the heated end portions of said boiler, forging the upset heated end portions of the boiler shell about said boiler ends and into the grooves thereof, causing the forged end portions of the boiler shell to shrink onto the boiler ends, applying heat expanded bands over the shrunk end portions of the boiler shell, and causing said bands to shrink onto said end portions of the boiler shell.

4. A method of manufacturing high pressure steam boilers consisting in upsetting the end portions of a boiler shell, heating the upset end portions of said boiler shell, forming grooves upon the marginal surfaces of the boiler ends and providing the same with an extended lateral projection, inserting said boiler ends in cold state into said heated end portions of the boiler shell with its extended lateral projection in engagement with the adjacent inner surfaces of the boiler shell, forging the upset heated end portions of the boiler shell about said boiler ends and into the grooves thereof, causing the forged end portions of the boiler shell to shrink onto the boiler ends, applying heat expanded bands over the shrunk end portions of the boiler shell, and causing said bands to shrink onto said end portions of the boiler shell.

In testimony whereof I have affixed my signature.

STEPHAN LÖFFLER.