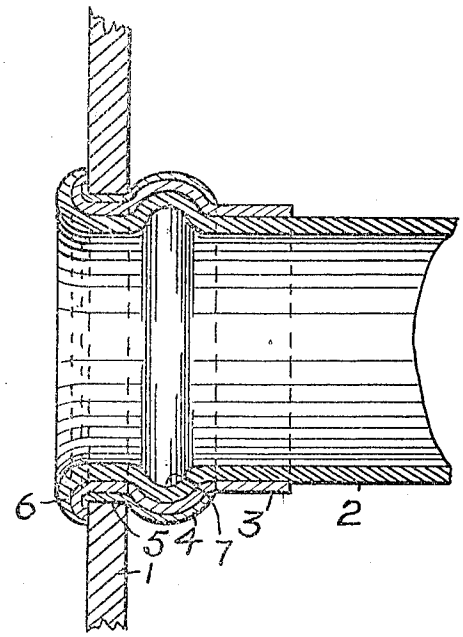
J. McPHAIL.

STEAM BOILER.

APPLICATION FILED FEB. 28, 1918.

1,291,578. Patented Jan. 14, 1919.



WITNESS

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JAMES McPHAIL, OF LOWELLVILLE, OHIO.

STEAM-BOILER.

1,291,578. Specification of Letters Patent. Patented Jan. 14, 1919.

Application filed February 28, 1918. Serial No. 219,695.

To all whom it may concern:

Be it known that I, JAMES McPHAIL, a citizen of the United States, residing at Lowellville, in the county of Mahoning and State of Ohio, have invented new and useful Improvements in Steam-Boilers, of which the following is a specification.

My invention relates to steam boilers of the fire-tube type.

The object of the present invention is to protect the fire-tubes close to the tube-sheets of the boiler. The parts of the fire-tubes surrounded by the tube-sheets not being in contact with water become very hot and if no adequate means is provided to conduct away the heat at these parts, the tubes soon burn through. Another difficulty often presents itself also, namely, that the parts of the fire-tubes near the inner faces of the tube-sheets become incrusted with scale, which being a nonconductor of heat allows the tubes to be burned through. It is my object to provide means for rapidly conducting the heat from those portions of the fire-tubes that are in the tube-sheets and to prevent the formation of scale on those portions of the fire-tubes near the tube-sheets.

Referring to the accompanying drawing, the figure shows a portion of a tube-sheet and a fire-tube in section, the section being taken longitudinally and centrally through the fire-tube and through a pair of ferrules between the tube-sheet and the fire-tube.

On the drawing, 1 designates one of the metal tube-sheets common to the well known steam boilers used for the generation of steam for power purposes. In such boilers there is a large number of parallel fire-tubes having their opposite ends secured in holes in opposing tube-sheets. I have shown only a single fire-tube and only one tube-sheet, the complete construction being well known.

2 is a metal fire-tube, through which fire and heat from the fire-box travel to heat water surrounding the tube. 3 is a ferrule composed of aluminum surrounding that portion of the tube which is surrounded by the tube-sheet. The ferrule 3 extends into the boiler a short distance, preferably the distance shown on the scale adopted on the drawing. Preferably a shorter ferrule 4 composed of copper surrounds the fire-tube at the portion within the tube-sheet opening 5. The ferrule 4 preferably has only from one-third to one-fourth the length of th aluminum ferrule, and it may be omitted, if desired. The ferrules are heated and shrunk upon the fire-tube in an obvious manner. The fire-tube with the ferrules thereon is secured in the opening 5 in the tube-sheet in any preferred manner, as by heading the outer end at 6 and by rolling a bead 7 just inside the tube-sheet.

The aluminum ferrule is a very good heat-conductor. It takes up the heat conducted to it through the fire-tube and rapidly conducts it to the water whose currents quickly remove the heat therefrom. At the same time the aluminum prevents the formation of scale on its surface, so that the heat traversing the aluminum has uninterrupted access to the water surrounding the ferrule. Copper does not have the property of preventing the formation of scale on its surface, though it is a good conductor of heat. So, if a copper ferrule is used, it should be quite short and thin, as shown. The copper aids to support the aluminum ferrule and prevent the separation of the aluminum from the tube during the formation of the bead 7.

I claim—

1. In a fire-tube boiler, a tube-sheet having an opening therein, a fire-tube in the opening, and an aluminum ferrule between the fire-tube and the tube-sheet.

2. In a fire-tube boiler, a tube-sheet having an opening therein, a fire-tube in the opening, and an aluminum ferrule between the fire-tube and the tube-sheet, the ferrule extending beyond the inner face of the tube-sheet.

3. In a fire-tube boiler, a tube-sheet having an opening therein, a fire-tube in the opening, and an aluminum ferrule and a copper ferrule between the fire-tube and the tube-sheet, the copper ferrule surrounding the aluminum ferrule.

4. In a fire-tube boiler, a tube-sheet having an opening therein, a fire-tube in the opening, and an aluminum ferrule between the fire-tube and the tube-sheet, the copper ferrule being relatively thin and covering only a small portion of the aluminum ferrule.

Signed at Lowellville, Ohio, this 25th day of February, 1918.

JAMES McPHAIL.