No. 611,959. Patented Oct. 4, 1898.

G. W. DUVALL.

BOILER TUBE FERRULE.

(Application filed Mar. 4, 1898.)

(No Model.)

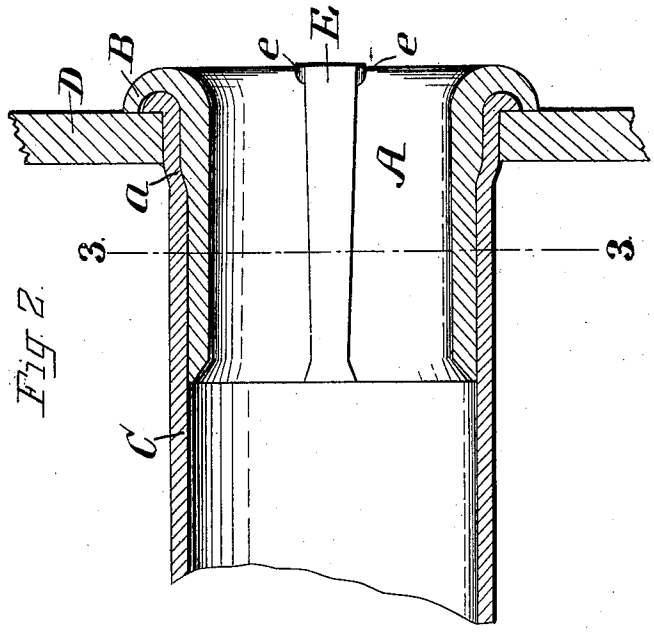


Fig. 2.

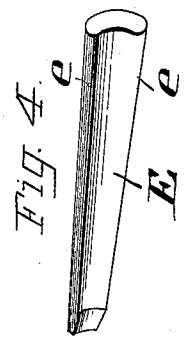


Fig. 4.

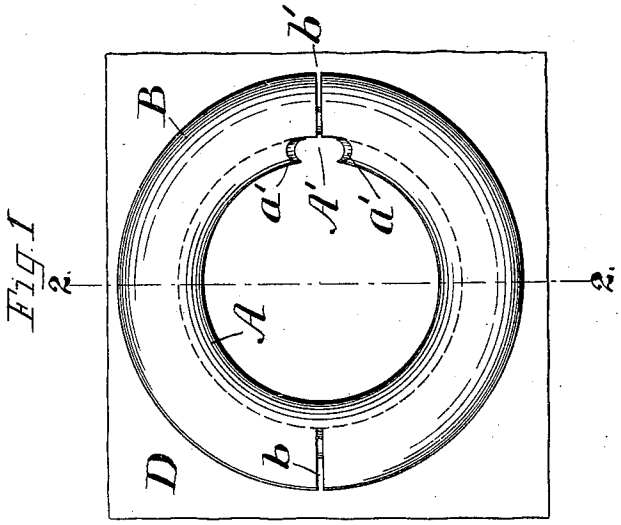


Fig. 1.

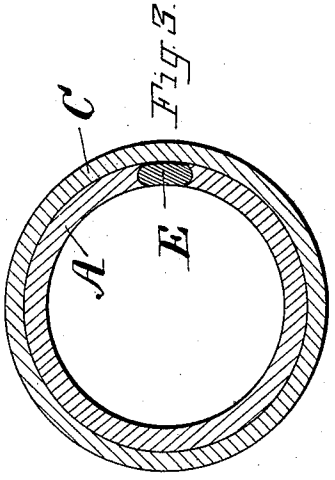


Fig. 3.

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UNITED STATES PATENT OFFICE.

GEORGE W. DUVALL, OF NORFOLK, VIRGINIA.

BOILER-TUBE FERRULE.

SPECIFICATION forming part of Letters Patent No. 611,959, dated October 4, 1898.

Application filed March 4, 1896. Serial No. 581,837. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. DUVALL, a citizen of the United States, residing at Norfolk, in the county of Norfolk and State of Virginia, have invented certain new and useful Improvements in Boiler-Tube Ferrules; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

The object of the present invention is to provide better means than have heretofore been employed for preventing boiler-tubes from leaking and for closing such leaks when they occur at the junction of the tubes with the tube-sheet, and it is particularly designed to be an improvement upon the ferrule and key for which Letters Patent of the United States No. 54,703 were issued to me May 15, 1866, and Letters Patent No. 240,818 May 3, 1881.

In the ferrules illustrated in both of the said patents it will be observed that the tube forms the backing for the key when it is driven in, and thus it exerts great pressure on the tube as well as on the split ferrule. Consequently on hard driving it is apt to split the tube. In the present case I overcome this defect by forming the ferrule and key with interfitting edges constituting guideways for the key-wedge. The key conforms in curvature to the cylindrical ferrule and forms a wedge-section thereof and by which it is supported and held. Thus the key is entirely free from the tube while it is being driven home, and though completing the circle of the ferrule and protecting any weak spot in the tube opposed thereto it cannot bind against the tube while it is being driven and split it. Then, again, as the key does not bind against the tube it allows a close fit of the ferrule to the tube. It is well known that when the end of a boiler-tube is attached to the flue-sheet it becomes larger from the action of the rolling-tool, and the ferrule is made with an enlargement of its diameter just below the flange to conform to the enlarged end of the flue.

In the drawings, Figure 1 is a face view of a ferrule fitted into a boiler-flue without the key. Fig. 2 is a longitudinal section on the line 2 2, the same showing the key in place. Fig. 3 is a transverse section through the tube, ferrule, and key on the line 3 3, Fig. 2; and Fig. 4 is a detached view of the key.

A is a tubular ferrule made with the curved flange B to fit over the beaded end of the tube C and against the face of the tube-sheet D, the said flange having one or more slots *b* in addition to the cut *b'*, contiguous to the key-seat A'. The ferrule is formed with the swell or enlargement at *a*, conforming to the expanded end of a tube C.

The key-wedge E is preferably curved to conform to the radius of the ferrule, and it has its side edges *e e* rounded, the same engaging with the grooved ways *a'* in the sides of the key-seat. The guideways *a'* being formed by grooving out the edges of the walls of the slot *b*, retaining lips or edges are produced, which hold the key in position within the guideways and prevent it from slipping out laterally. This is important, as it avoids any liability of the key being driven out of a straight course and coming in contact with the inner surface of the boiler-tube. By this construction of guideways it is manifest that the wedge-shaped key can only be inserted from the flange end of the ferrule. The grooved way is centrally located in the metal constituting the ferrule, so that when the key is entered therein it will not project beyond the edges of the key-seat, but will be flush therewith, so that it will not impinge against the inner wall of the tube while being driven in. I regard this as an important feature of my invention, as with my former construction the key came in contact with the inner wall of the tube, and in some instances where the tube was weak it was broken during the driving action. I experienced these difficulties with my former constructions, and as a result of considerable thought and experiment devised this improved construction. These guideways may of course be angular or otherwise formed, so that the key-wedge engages with and slides in the ferrule and is held by the same.

Upon an examination of Fig. 4 of the drawings it will be seen that the key has four

curved surfaces and two beveled surfaces, while in my former patents the key is merely wedge-shaped and has no curved surfaces. With my new construction of key and by providing the grooved ways in the ferrule for the key to slide in one blow has the effect of three blows on the old construction of key. The ways retain the key and guide it perfectly during the driving action, so that it cannot possibly come in contact with the inside of the tube.

To apply a ferrule to a boiler-tube, the ferrule is inserted into the end of the tube, after first applying thereto red lead or other suitable substance to the end of the tube, and the key is driven home, expanding the ferrule uniformly against the interior surface of the tube around the entire circumference without any binding or excess of pressure along the line of the key. Consequently not only the tube is not injured by the key, but it requires fewer blows to seat it.

What I claim is—

1. A split hollow-tube ferrule having a flange and provided with a longitudinally-arranged slot for the reception of a key, the walls of the slot being provided with longitudinal guideways, and a wedge-shaped key which is entered into the ways from the flange end of the ferrule and is confined and guided by said ways, the outer surface of the key when the key is in position within the slot, being flush with the outer surface of the ferrule, substantially as described.

2. A split hollow-tube ferrule having a flange provided with a curved under surface which receives the bead on the outer end of the boiler-tube, said ferrule being provided with a longitudinally-arranged slot for the reception of a key, the walls of the said slot being provided with longitudinal, grooved guideways, having retaining edges, and a wedge-shaped key which is curved in cross-section to conform to the curvature of the ferrule, which key is entered into the ways from the flange end of the ferrule and is retained and guided by said ways, the key being confined within the guideways so as not to project beyond the outer surface of the ferrule, substantially as described.

3. A split boiler-tube ferrule having a flange provided with a curved under surface which receives the bead of the outer end of the boiler-tube, said ferrule being thickened or enlarged all around at a point adjoining the flange, to conform to the expanded end of the boiler-tube, and also provided with a longitudinally-arranged slot, which extends through the flange of the ferrule for the reception of a key, the walls of the said slot being provided with longitudinal guideways and a wedge-shaped key which is entered into the ways from the flange end of the ferrule and is confined and guided by said ways, so as not to come in contact with the inner surface of the boiler-tube when being driven in, substantially as described.

4. A split hollow-tube ferrule having a flange provided with a longitudinally-arranged slot for the reception of a key, the walls of the slot being provided with longitudinal guideways, and a wedge-shaped key which is curved in cross-section to conform to the curvature of the ferrule, the said key being entered into the ways from the flange end of the ferrule and retained and guided by said ways, the key falling entirely within the metal constituting the ferrule so as not to project beyond the inner surface of the same and come in contact with the inner surface of the boiler-tube when being driven in, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE W. DUVALL.

Witnesses:

WILLIAM H. TABB,

JAMES M. ALEXANDER.