C. S. COLEMAN.

BOILER TUBE END SECTION.

APPLICATION FILED FEB. 12, 1917.

1,339,739. Patented May 11, 1920.

Fig. 1.

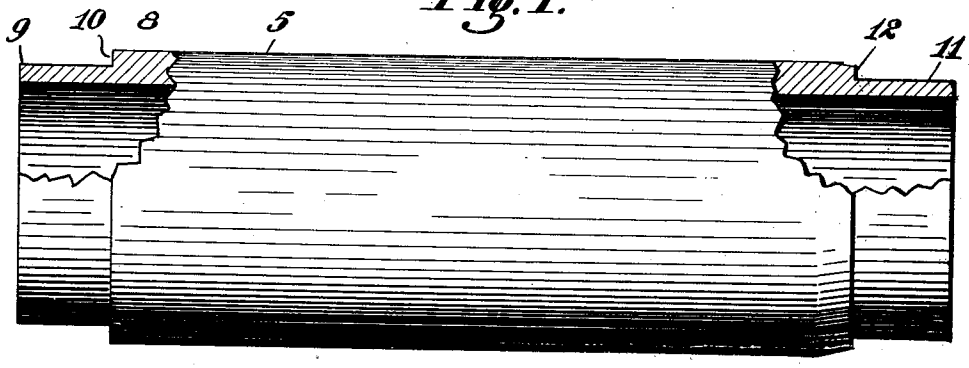


Fig. 2.

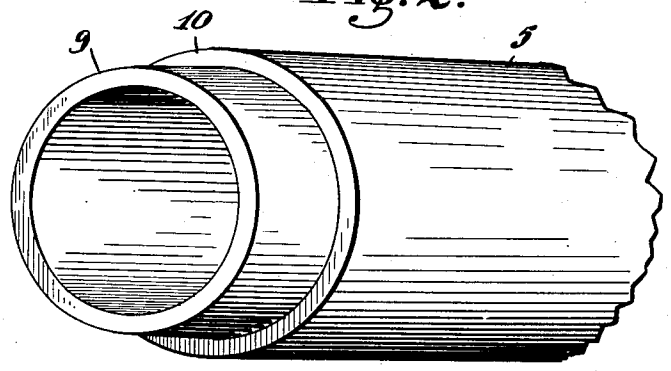


Fig. 3.

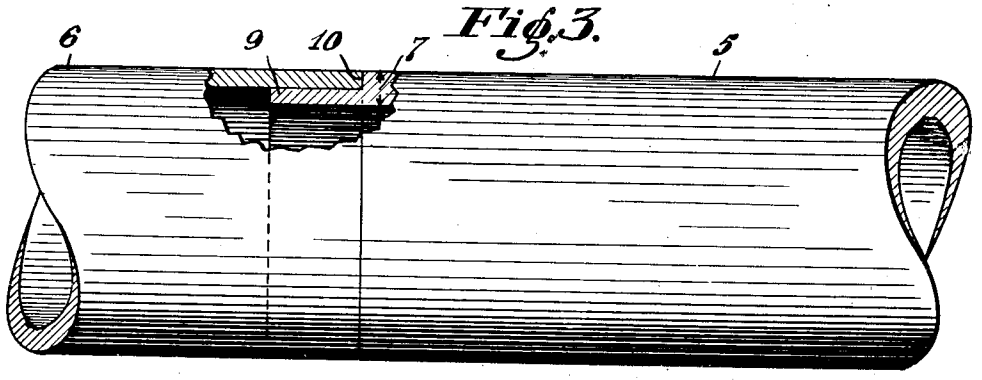
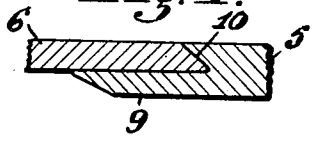


Fig. 4.



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BOILER-TUBE END SECTION.

1,339,739. Specification of Letters Patent. **Patented May 11, 1920.**

Application filed February 12, 1917. Serial No. 148,105.

To all whom it may concern:

Be it known that I, CHARLES S. COLEMAN, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Boiler-Tube End Section, of which the following is a specification.

This invention relates to a means for repairing boiler tubes and particularly pertains to a boiler tube end section for connecting the ends of boiler tubes to a boiler end plate.

Much difficulty has heretofore been encountered in effectively repairing a boiler tube by removing a damaged portion of the tube and replacing it with a new section, because of imperfections in the joint. This is particularly true where, as commonly practised, the added section is formed with an inside diameter corresponding to the outside diameter of the tube and the ends of the tube and section joined by inserting the end of the tube in the section a short distance and welding the pieces together, or where the tube and end section are substantially of the same size and one end of either is reduced and inserted and expanded in the other with a weld joint.

This construction has proven objectionable as a shoulder or channel is formed on the exterior of the tube at the joint which collects sediment and where the section is enlarged additional water space is taken up in fire tube boilers by the enlarged section. Furthermore it has been found that the straight or tapered joint thus formed is not always perfect and when subjected to the strains occasioned by expansion and contraction of the tube with its added section, both longitudinally and diametrically or circumferentially, the joint is weakened with the result that leakage and consequent corrosion will occur at the joint. The failure of the joint between the tube and end section and between the end section and the boiler end plate constitutes one of the greatest sources of trouble and expense in locomotive operation and repair, records and reports on engine upkeep showing that locomotives are out of service about one tenth of their period of use because of leaky flues and that about one tenth of their earnings is expended in repair of leaky flues.

By my invention the foregoing objectionable features are obviated and a joint formed by which the tube and its added section will extend flush on their exterior surfaces so as not to take up space, in which a broken joint is formed which does not tend to pull apart on expansion of the tube and section and in which an increased wall thickness is provided between the tube end and the boiler end plate, thus rendering the connection between the tube and the boiler end plate strong and durable.

The invention is illustrated in the accompanying drawings, in which:

Figure 1 is a view in side elevation of the tube section with parts broken away.

Fig. 2 is a perspective view of the end of the section.

Fig. 3 is a view in side elevation with parts broken away illustrating the manner of connecting the ends of the tube and section.

Fig. 4 is a detail of a modified form of the joint.

In carrying out the invention I employ a tube section 5 of an outside diameter corresponding to that of the tube 6, to which it is to be attached, but which has a wall thickness 7 approximately double that of the tube, thus forming the section with an inside diameter less than that of the tube proper, but which inside diameter substantially corresponds to that of the tube when swaged down at its ends where connected to the end plates as commonly practised in boiler construction. My section therefor does not restrict the opening to the flue any more than does the usual swaging down. However, the tubes may be swaged out to increase the outside diameter at the ends and in this event the inside diameter of the section may be made to substantially correspond to that of the tube.

The end 8 of the section is reduced in outside diameter forming an annular flange 9 terminating at its base in a shoulder 10. This shoulder may be formed at right angles to the surface of the section or it may be beveled inwardly or undercut as shown in Fig. 4 to form a channel in the shoulder adjacent the flange.

The outside diameter of the flange is such that when the end of the tube 6 is heated and expanded thereby, the flange may be inserted in the end of the tube with a tight fit.

In joining the tube and section, the flange is introduced into the tube such distance that

the end of the tube will abut tight against the shoulder; the tube end being shaped to conform to the shoulder.

The overlapping joint thus formed is then subjected to a welding temperature and the contacting surfaces of the tube and section are welded together by hammering the joint on a mandrel in the usual manner.

A double thickness of metal is formed at the joint to give the desired strength, but the added thickness comes interiorly of the tube and not exteriorly thereof so that the joined tube and section present flush outer surfaces, giving a neat finish and not taking up water space in the boiler. No projecting shoulder is formed around which sediment may collect and cause corrosion of the joint.

The end of the tube in abutting against the shoulder 10 relieves the joint of strain caused by the longitudinal expansion of the tube and obviates tendency of separation of the joint by shearing from this cause.

By employing the overlapping end joint shown in Fig. 4 unequal diametrical expansion or contraction of the tube and section will not tend to separate the joint.

The joint thus formed is not continuous, but is broken or bent at the juncture of the shoulder 10 with the internal flange, which renders the joint superior to the ordinary lap joint and materially decreases the possibility of leakage.

The section 5 is most commonly employed where the tube is to be joined to the boiler end wall and the outer end of the section is therefore formed to fit the tube opening in the end wall according to the construction set forth in an application on a tube and plate connection filed coincidently herewith.

To accommodate the section to my improved boiler end plate construction, it is formed with a reduced end outer portion or internal annular flange 11, substantially corresponding to the flange 10, terminating at its inner end in a shoulder 12.

By forming the tube section with a wall of greater thickness than that of the boiler tube to the end of which it is attached, a reinforcement is obtained in the connection between the tube and boiler end plate greatly strengthening the point where failure of tubes most frequently occurs. The increased wall thickness of the connection is further advantageous in that it serves to protect the tube end against the direct action of heat from the fire box as the heat on entering the tube through the firebox wall first impinges on the thickened end section which will endure and hold up under the heat action better than the thin wall of the boiler tube or the usual tube end.

I claim:

1. The combination of a boiler tube, and a tube end section comprising an integral cylindrical tube having an intermediate wall portion of a thickness greater than that of the boiler tube and having an end portion of reduced outside diameter said end portions being of equal diameter and wall thickness throughout and inserted in the end of the boiler tube and on which the tube is shrunk and welded.

2. A boiler tube end section comprising in combination with a boiler tube, an integral cylindrical tubular section of equal inside diameter throughout and having an intermediate outside diameter substantially corresponding to that of the boiler tube, said tube section formed with a wall thickness greater than that of the boiler tube and having both its ends reduced in outside diameter, said reduced ends being of equal outside diameter throughout, one of said ends insertible in the end of the boiler tube and welded thereto, said tube section forming a reinforced extension on the tube having an inside diameter less than that of the tube and providing a thickened connection between the tube and a boiler end plate.

3. A boiler tube end section comprising an integral cylindrical tube of equal inside diameter throughout and having both ends reduced in outside diameter said reduced ends being of equal outside diameter throughout.

4. A boiler tube end section comprising an integral cylindrical tube having a uniformly thickened intermediate portion and terminating at each of its ends in end portions of reduced outside diameter having smooth outer surfaces, said end portions being adapted to be inserted lengthwise into a boiler tube and into a tube opening in a boiler end-wall.

CHARLES S. COLEMAN.