E. H. FOSTER.

APPARATUS FOR EXPANDING SUPERHEATER TUBES.

APPLICATION FILED NOV. 20, 1918.

1,313,284. Patented Aug. 19, 1919.

Fig. 1.

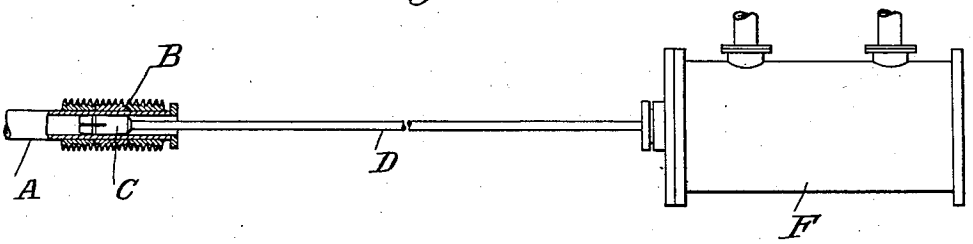


Fig. 2.

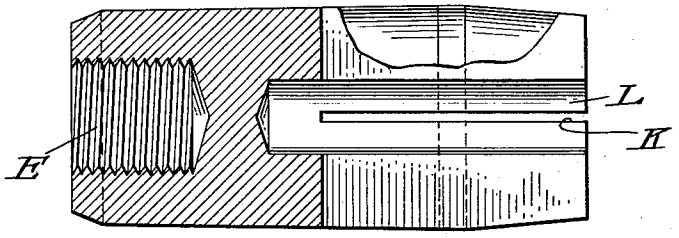
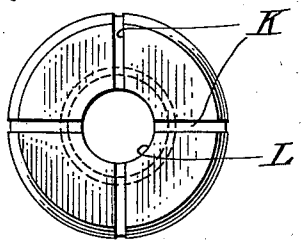


Fig. 3.



WITNESS:

Ernest H. Foster, INVENTOR.

BY

Kerr Page Cooper & Hayward

ATTORNEYS.

UNITED STATES PATENT OFFICE.

ERNEST H. FOSTER, OF DONGAN HILLS, NEW YORK.

APPARATUS FOR EXPANDING SUPERHEATER-TUBES.

1,313,284. Specification of Letters Patent. Patented Aug. 19, 1919.

Original application filed July 13, 1918, Serial No. 244,689. Divided and this application filed November 20, 1918. Serial No. 263,254.

To all whom it may concern:

Be it known that I, ERNEST H. FOSTER, a citizen of the United States, residing at Dongan Hills, Richmond county, and State of New York, have invented certain new and useful Improvements in Apparatus for Expanding Superheater-Tubes, of which the following is a full, clear, and exact description.

This invention is an improvement in apparatus for making the protected tubes of steam superheaters by which expression it is intended to define the now well-known form of superheater tube composed of a wrought steel foundation tube covered by a series of cast iron sections or rings, forming an external and generally corrugated surface exposed to the hot gases and flame of the boiler furnace.

In such devices it is desirable, if not essential, to effective and economic operation, that the contact between the foundation tube and its protective covering be very intimate, in order that the rate of heat transfer from the latter to the former shall be as high as possible, and heretofore various expedients have been adopted or proposed for securing this relation. For example, attempts have been made to cast the sections or rings of iron directly upon the wrought steel foundation tube; or the rings have been independently cast, heated and expanded and then shrunk onto the said tubes, or again, the rings have been cast with an internal diameter sufficient to permit them to be slipped over the wrought steel tube, and the latter by internal hydraulic pressure or by a rotary expander have been forced into close contact with said rings.

These methods while more or less practicable are not entirely free from objection mainly on the score of expense, and in efforts to improve upon them, mainly in this regard, I have devised the means upon which is based the present application. In carrying out this invention I cast the rings or sections of the external covering with sufficient internal diameter to be readily slipped over the foundation tube, and then employ a tapering steel plug of large enough diameter to expand the inner tube into intimate contact with the inclosing rings when it is forced through the full length of the tube.

This plug may be drawn or may be pushed through the wrought steel tube, or both, and in order to meet the variable conditions resulting from inequalities in the diameter or thickness of the steel tube, or in the internal diameter of the rings surrounding it, it is made with a certain capability of yielding so that it will be partially collapsed in its passage through the steel tube and while capable of expanding the same, the collapsing pressure is regulated to correspond to the amount of force necessary to completely expand the tube into its annular covering.

For purposes of more conveniently illustrating this invention I have added to this specification a drawing in which—

Figure 1 is a sectional diagrammatic view of a superheater tube undergoing expansion.

Fig. 2 is a part sectional view of the yielding expander plug used in carrying out such operation, and

Fig. 3 is an end view of the same.

The compound tube to be produced is supported in any convenient manner to resist longitudinal and other movement, and comprises an inner wrought steel tube A surrounded by freely fitting rings or sections of corrugated cast iron tube B, and the expander plug C is then forced through the same from end to end as by means of a plunger D operated as a hydraulic piston F or drawn through the tube by the plunger or any equivalent therefor.

The plug shown in Fig. 2 is made of hard steel or other like metal, and is slightly tapered at both ends if it is to be pushed instead of pulled, or both pushed and pulled, through the steel tube. In one end is a threaded socket E to receive a bolt for a chain or the plunger D and through which the necessary power may be applied to push or pull the plug through the tube from end to end of the latter. The portion of largest diameter of the plug is made of sufficient length to avoid the presence of a mere edge.

The expander portion of the plug, in order to exhibit a certain degree of resilience, is preferably formed, as by means of a saw, with two intersecting grooves K and bored out centrally as at L. The character of the material and the nature of the work which the plug is required to perform, will determine the width of the grooves and the diameter of the bore. From the position of the saw cuts with relation to the expanding portion of the plug it results that the collaps-

ing or contracting of the plug when pushed through the tube is effected by less force than when it is pulled through. For this reason, and particularly when operating on U-shaped tubes, it is desirable to apply both a pushing and a pulling force to the plug in order to completely effect the proper union with the covering rings.

The use in the manner described of this plug will expand a wrought steel foundation tube into the most intimate contact with its surrounding rings and produce a most efficient superheater tube, and this method of expanding a smaller into a larger tube and of forcing a tube into contact with a surrounding and protective covering I believe to be new.

What I claim is:—

1. An expanding plug adapted to be forced through a tube over which rings or sections of tubing are strung consisting of a body of steel provided with means for connecting it to devices for forcing it through the tube, and tapered from its portion of greatest diameter, and so formed that by the resilience of the metal of which it is composed, it is capable of collapsing at its enlarged portion under a pressure which is greater than that required for expanding the tube into intimate contact with the rings.

2. The tube expanding plug herein described consisting of a steel body with a threaded socket in one end and with a central bore and radial grooves or saw cuts in its other end to render it capable of yielding or collapsing under a pressure greater than that required for producing the necessary expansion and tapered from the portion of greatest diameter.

In testimony whereof I hereunto affix my signature.

ERNEST H. FOSTER.