

No. 685,867.

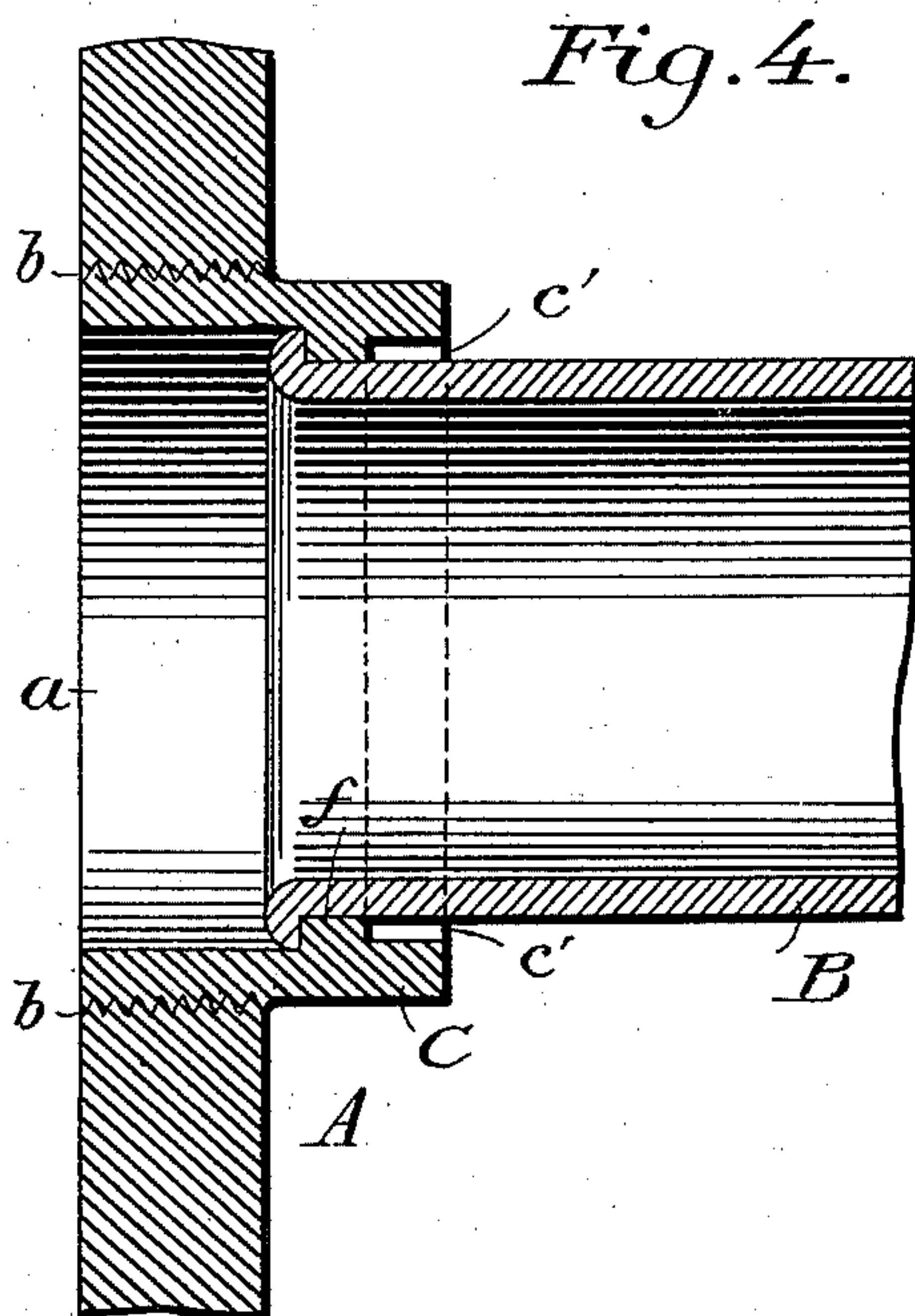
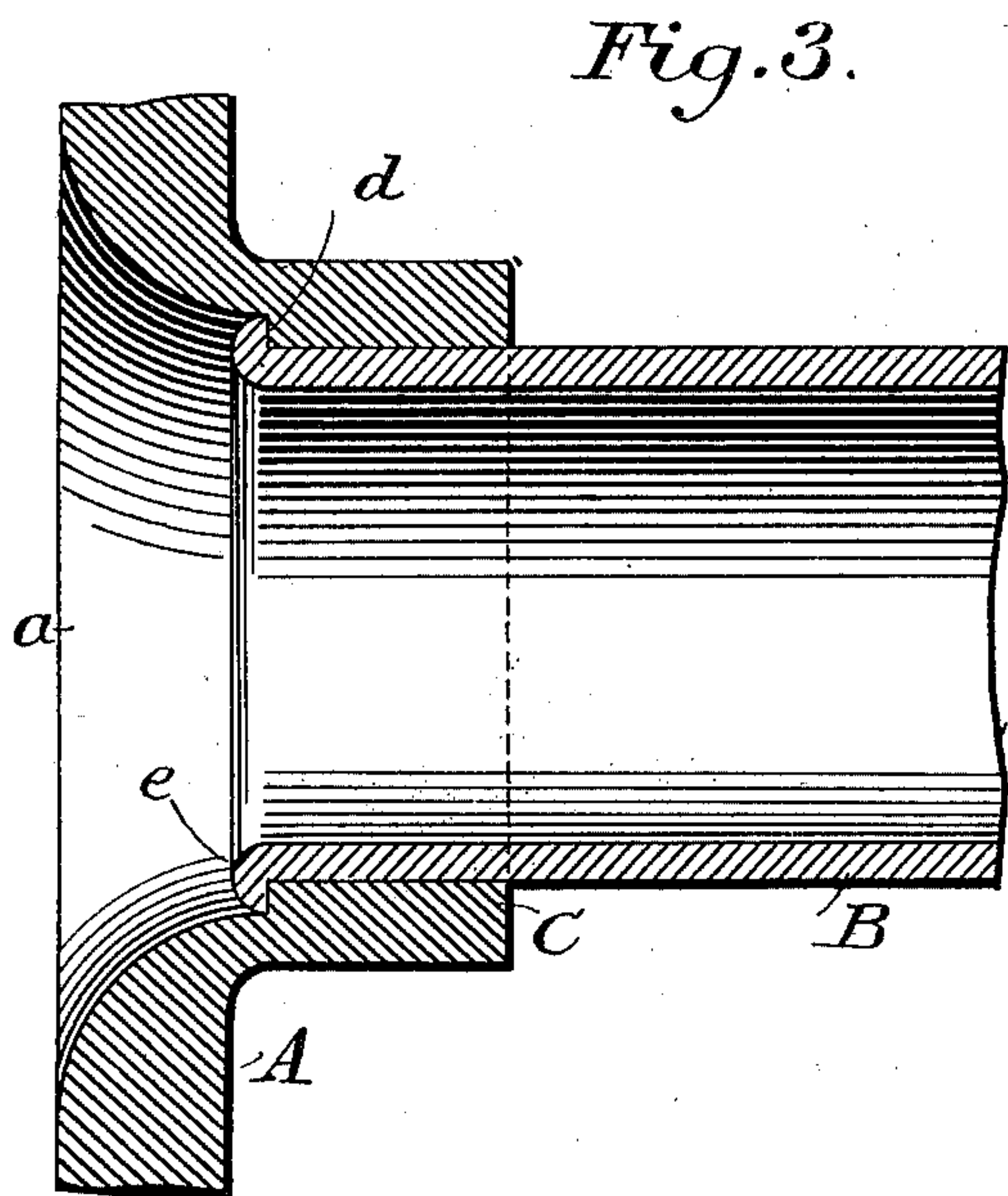
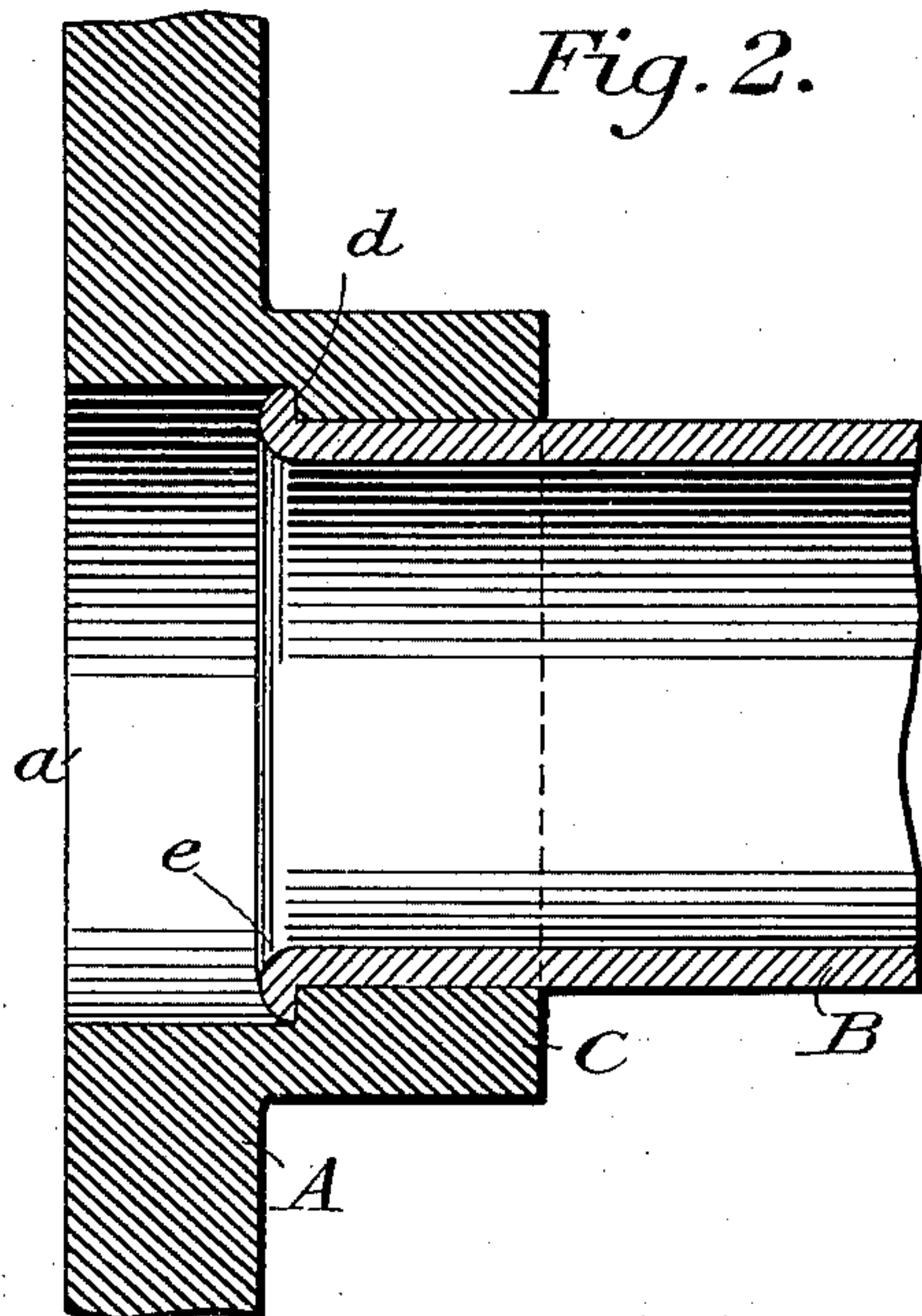
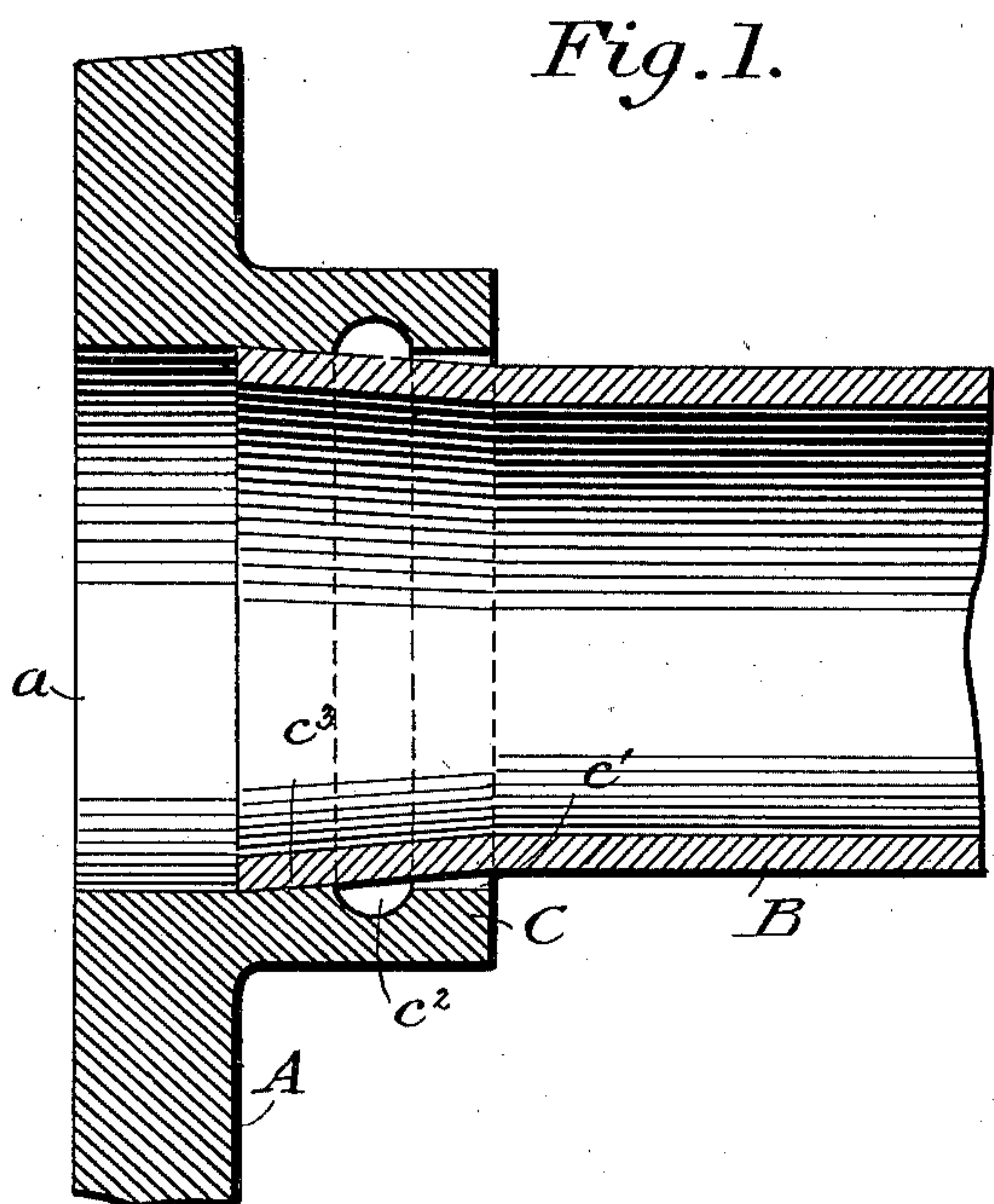
Patented Nov. 5, 1901.

D. A. REAGAN.

DEVICE FOR SECURING TUBES TO TUBE SHEETS.

(Application filed Oct. 15, 1900.)

(No Model.)



Witnesses
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UNITED STATES PATENT OFFICE.

DOMINICK A. REAGAN, OF ALTOONA, PENNSYLVANIA, ASSIGNOR OF ONE-THIRD TO THOMAS K. MAHER AND PATRICK H. WALLS, OF PHILADELPHIA, PENNSYLVANIA.

DEVICE FOR SECURING TUBES TO TUBE-SHEETS.

SPECIFICATION forming part of Letters Patent No. 685,867, dated November 5, 1901.

Application filed October 15, 1900. Serial No. 33,161. (No model.)

To all whom it may concern:

Be it known that I, DOMINICK A. REAGAN, a citizen of the United States, residing at Altoona, in the county of Blair and State of Pennsylvania, have invented certain new and useful Improvements in Devices for Securing Tubes to Tube-Sheets; and I do 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.

My invention relates generally to steam-boilers, and particularly to improvements in the means for connecting the fire-tubes with the tube-sheet. As such boilers are ordinarily constructed the tube-sheets are formed with openings for the tubes, and the latter are expanded therein to form steam-tight joints, and the exposed ends of the tubes are headed or beaded over the edges of the openings. In this form of connection the end of the tube is exposed to the direct action of the flame in the fire-box, and the portion of the tube thus exposed, as well as that portion thereof lying in the opening, not being in contact with the water is highly heated and is rapidly burned out.

The main object of my invention is to prevent the rapid burning out of the ends of the tubes, and this I accomplish by providing what I term a "tube-splice" on the water side of the tube-sheet to which the tubes are secured, so that the tube ends are brought close to the water.

In the accompanying drawings, Figure 1 is a vertical section through a portion of a tube-sheet and tube; and Figs. 2, 3, and 4 are similar views of similar parts, showing different forms of my invention.

Similar letters refer to similar parts throughout all the views.

Referring to the drawings, A represents a portion of a tube-sheet, which is formed with the opening *a*, through which the gases from the fire-box enter the tube B. Surrounding each of the openings *a* and projecting from the water side of the tube-sheet are the cylindrical tube-splices C, which, as shown in Figs. 1, 2, and 3, are preferably formed inte-

gral with the tube-sheet and of the same thickness, but they may be of less thickness, if desired, and of a size adapted to receive the ends of the tubes B therein.

While it is preferred to form the tube-splice integral with the tube-sheet, such construction is not essential, as it may be secured thereto in any suitable manner, and all that is required is that it be secured firmly and rigidly to the tube-sheet, and this may be accomplished in various ways—as, for instance, by forming the tube-splice as a separate tube, with external screw-threads *b* thereon, and screwing it into the openings *a*, which are made of greater diameter than ordinarily and formed with screw-threads, as shown in Fig. 4.

The tube-splice supports the fire-tube and serves to connect it with the tube-sheet. The tube may be secured in the tube-splice in any desired manner, and in Fig. 1 I show it expanded in the splice, the opening through which is partly tapered, as at *c*³, the larger end of the tapered portion being on the fire side of the tube-sheet. The end of the fire-tube is expanded, so as to bear on said tapered portion, and forms a steam-tight joint. The fire-tube should be so located in this and in the other forms of the device that it does not extend beyond said plane; but the end may be located farther within the boiler, if found desirable.

In Figs. 2 and 3 the opening through the tube-splice is formed cylindrical and of the same diameter throughout its length and of less diameter than the opening *a* of the tube-sheet, thereby providing an offset *d*, over which the end of the tube is beaded, as at *e*, after having been expanded within the tube-splice.

In Fig. 4 I show the tube-splice formed with an annular offset *f*, within which the tube is expanded and over the edge of which it is beaded.

In Fig. 1 the tube-splice opening is shown with a straight portion *c*¹ of greater diameter than the tube, so as to provide a space around the tube, which terminates in a groove *c*², into which sediment of a calcareous nature

finds its way from the water in the boiler and is collected and hardens to form a tight joint.

While the groove c^2 provides better for the retention of the sediment, its employment is not absolutely necessary, as the space surrounding the tube may be left plain or ungrooved, as shown in Fig. 4, and good results obtained in the matter of collecting the sediment.

10 The opening a , as shown in Fig. 3, at a' may be made flaring, if desired.

It will be readily seen that the tube-splice adds to the strength of the tube-sheet and that by its use the extension of the tubes into the fire-box, as is usual, is avoided, and since the portion of the tube-splice which surrounds the fire-tube is in contact with the water in the boiler the inclosed portion of the fire-tube is kept cooler and burning is avoided.

20 The operation of expanding the tube in the tube-splice causes the latter to yield somewhat, and as this operation is performed while the parts are cold they will adjust themselves to expansion and contraction, due to the changes in temperature.

While my invention is especially intended for use in tubular cylindrical boilers, it also may be applied to any boiler in which the tubes or flues extend into the water-space.

30 Having thus described my invention, what

I claim as new, and desire to secure by Letters Patent, is—

1. In a boiler, the combination of a tube-sheet, a tubular tube-splice connected to the tube-sheet and projecting into the water-space of the boiler, an annular offset formed within said tubular tube-splice, and a fire-tube having its end expanded in and upset against said offset. 35

2. In a boiler, the combination of a tube-sheet, tubular tube-splices connected to said sheet and projecting into the water-space of the boiler, fire-tubes secured to said tubular tube-splices and forming therewith a receptacle for the collection of sediment from the water in the boiler. 45

3. In a boiler, the combination of a tube-sheet, a tubular tube-splice having a groove therein for the reception of sediment from the water in the boiler, said tube-splice being connected to the tube-sheet and extending into the water-space of the boiler, and a fire-tube secured to said tube-splice. 50

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

DOMINICK A. REAGAN.

Witnesses:

W. D. COUCH,
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