(No Model.)

F. LINDRUM.

TUBE FOR STEAM BOILERS.

No. 406,359. Patented July 2, 1889.

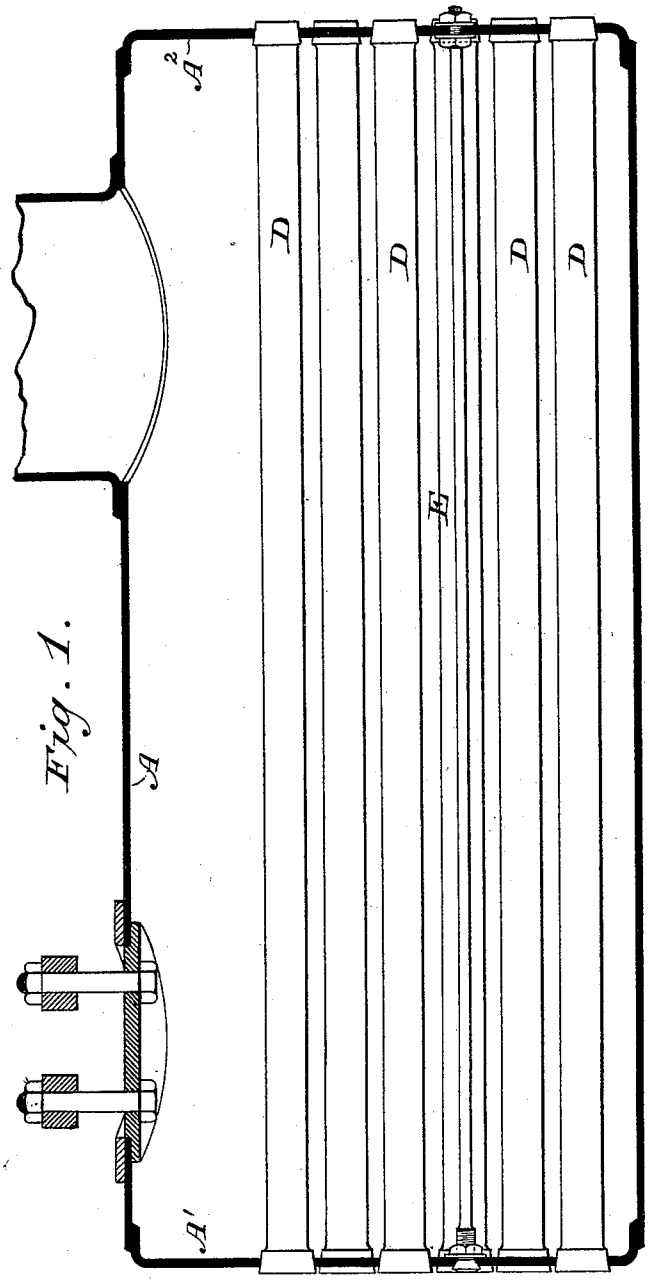


Fig. 1.

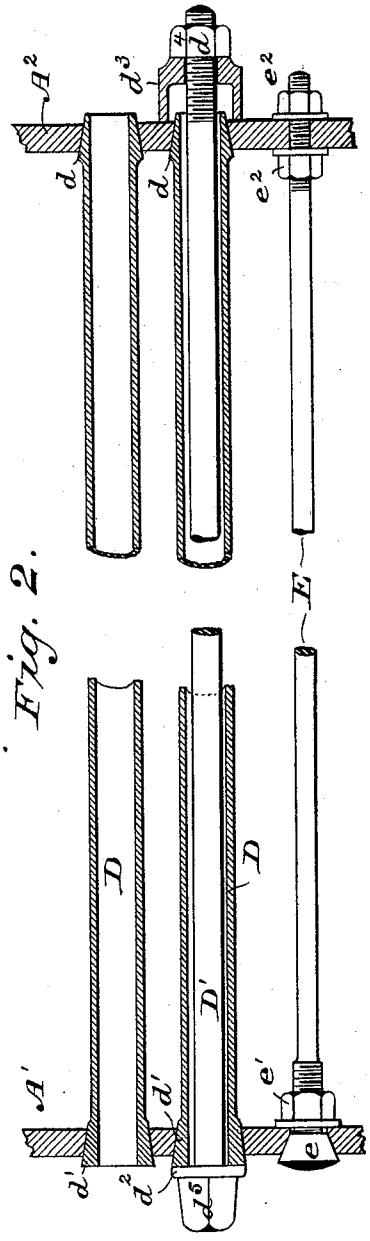


Fig. 2.

Witnesses
Wm A Skinkle
Chas E Gorton

Inventor
Friederick Lindrum
By his Attorney
W. H. Chadney

N. PETERS. Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

FRIEDERICK LINDRUM, OF CHICAGO, ILLINOIS.

TUBE FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 406,359, dated July 2, 1889.

Application filed July 27, 1888. Serial No. 281,216. (No model.)

To all whom it may concern:

Be it known that I, FRIEDERICK LINDRUM, a citizen of Prussia, residing at Chicago, in the county of Cook and State of Illinois, have invented certain Improvements in Securing the Tubes in Boilers, as hereinafter specifically described, and set forth in the claims at the end of the specification.

It has for its object the means for readily inserting and removing boiler-tubes with respect to the boiler-heads or tube-sheets and for the proper staying of the tube-sheets, whereby single tubes may be inserted or removed without disturbing the adjoining tubes.

Figure 1 is a vertical longitudinal section of a tubular boiler, showing several tubes and a stay-bolt of the particular construction invented by me secured in the boiler-heads. Fig. 2 is a longitudinal section, on an enlarged scale, through two of the tubes, showing the details of their construction and the means of inserting and securing them in position in the boiler, and showing also the details of my stay-bolts and the manner of attachment to the boiler-heads.

Like letters of reference refer to like parts throughout the specification and drawings.

In securing the tubes in the heads of boilers it has heretofore been the practice to pass the tubes through snugly-fitting apertures in the heads and expand them by a proper tool in the well-known manner at each side of the heads to a diameter slightly greater than the apertures. This has made a very secure and satisfactorily tight joint, but the process requires very nice workmanship, and when the tube is once in place it cannot be removed without destroying its ends and frequently damaging the aperture from which it is withdrawn.

Another form, and one with which my improvement has connection, is illustrated in detail in Fig. 2 of the drawings.

Each tube D is provided at each of its ends with tapering collars, the smallest diameter of the collar d' being slightly greater than the largest diameter of the collar d.

The heads of the boiler are perforated with apertures, which taper to correspond with the angle of the collar, the apertures in the head A′ being of greater diameter than those in the head A^2. The tubes are inserted through the larger apertures and are made of just proper length to have the cones or tapering collars at each end fit snugly in their respective apertures. The tapering ends of the tube are then forced firmly into their sockets, making joints that will be steam-tight, and also hold the heads from slipping off the cones when subjected to the outward pressure of the steam. It will be seen that the friction of the cones of the tubes holds the tubes in the tube-sheets; but should it be desirable to remove one or more of the tubes the blow from the hammer in driving the tube would have the tendency to cause the tube at its other end to carry the tube-sheet with it for a short distance before breaking the joint, which would loosen the adjoining tubes. To overcome this defect, I have inserted a stay-bolt of peculiar construction among the tubes for staying the tube-sheets and preventing them moving when inserting or withdrawing the tubes. The staying of the tube-sheets is not required where the tubes are expanded, as in that instance each tube forms a stay in itself. After the tube is in place I insert the draw-bolt D′, which is longer than the tube. At one end it is provided with an annular collar d^2, which bears against the end of the tube, while upon the other end is slipped a cupped washer d^3, which bears against the head all around the tube-aperture. This end of the bolt is screw-threaded for the reception of a clamping-nut d^4, which, when screwed down hard upon the cup, forces the head firmly upon the taper end of the tube, the squared shank d^5 at the other end of the bolt being held by a wrench to prevent the bolt from turning while the nut is being screwed up.

When it is desired to remove a tube, it may be driven out of the sockets by blows upon the smaller end of the head A^2 without injury to the tube or the aperture from which it is withdrawn.

To stay the tube-sheets, I employ the stay-bolts E, which extend through the boiler from one head to another. One of these bolts is shown in enlarged detail in Fig. 2. The bolt has a conical head e, which fits into a corresponding shaped aperture in the boiler-head A′. For a short distance from this head the body of the bolt is enlarged and screw-threaded to receive a washer and clamping-nut e', by

means of which the cone is drawn tightly into its socket and a tight joint made. At its other extremity the bolt is screw-threaded and provided with clamping-nuts e^2 and washers, which, embracing the head A^2 on both sides, make a tight joint, the screw permitting of the adjustment of the distance between the boiler-heads.

Having thus described my invention, what I claim as new and useful, and desire to secure by Letters Patent, is—

1. The combination of boiler-tubes having conical collars at each end with boiler-heads having tapered apertures to receive the conical collars, and stay-bolts between the tubes connecting the boiler-heads, substantially as and for the purpose hereinbefore set forth.

2. The combination of the tube-sheets with the stay-bolts, consisting of tapered head at one end, a threaded portion beneath said head provided with a nut, and a threaded outer end provided with two nuts, one for the outside and one for the inside of the tube-sheet, whereby the tube-sheets are held rigid.

3. The combination of the stay-bolt with its conical head and screw-threaded shank, and the clamping-nut and washer upon this shank, the long body of the bolt smaller in diameter than the shank, screw-threaded at its end and provided with clamping-nuts and washers, with the boiler-heads A' A^2, one of which has a tapering aperture to receive the conical bolt-head and the other a plain aperture for the end of the bolt, all assembled and operating substantially as shown, and in the manner hereinbefore set forth.

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

FRIEDERICK LINDRUM.

Witnesses:

CHARLES WESTON,

HERMON REINHOLD.