

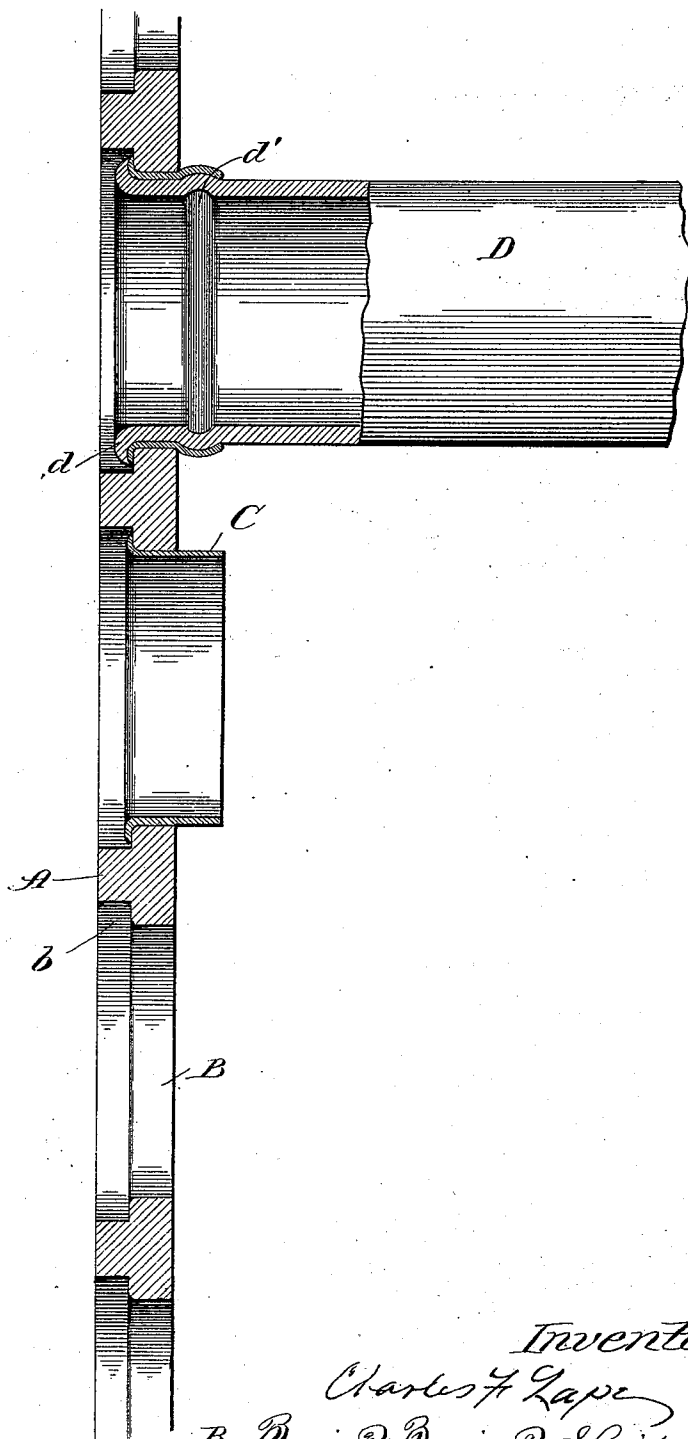
No. 695,614.

Patented Mar. 18, 1902.

C. F. LAPE.
BOILER.

(Application filed Aug. 10, 1899.)

(No Model.)



Witnesses:
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UNITED STATES PATENT OFFICE.

CHARLES F. LAPE, OF SAN BERNARDINO, CALIFORNIA.

BOILER.

SPECIFICATION forming part of Letters Patent No. 695,614, dated March 18, 1902.

Application filed August 10, 1899. Serial No. 726,776. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. LAPE, a citizen of the United States, residing at San Bernardino, in the county of San Bernardino and State of California, have invented certain new and useful Improvements in Boilers, of which the following is a specification.

My invention relates to that class of boilers known as "flue-boilers," in which tubes or flues are used for the purpose of conducting heat through a body of water and heating the same to such an extent as to form steam; and it relates particularly to the means by which the tubes are connected to the tube-sheets, all of which will more fully hereinafter appear.

The object of my invention is to provide a simple, economical, and efficient flue-boiler.

A further object is to provide means by which the tubes or flues and tube-sheets may be connected together, so as to minimize the dangerous and objectionable burning of the ends of the flues; and the invention consists in the features, combinations, and details of construction hereinafter described and claimed.

The accompanying drawing is substantially a full-sized view of a section of a tube-sheet, showing my improvements in engagement therewith.

In the art to which this invention relates it is well known that the tubes or flues in tube-sheets are connected together by having the ends of the tubes project from the tube-sheets and then roll over on the same and on the outside thereof. The projecting ends of these tubes or flues are liable to be burned by the intense heat of the gases and fuel, which at times reach almost to the point of incandescence. This burning takes place owing to the remoteness of the ends from the water, and before the heat is transmitted to the water the ends are liable to be burned. My invention therefore is intended, primarily, to remove these objections by providing a boiler in which the tube-sheets are countersunk and the ends of the tubes rolled over, so as to engage with the tube-sheet at a point beneath the face thereof and as close as possible to the water-chamber of the boiler, all of which will more fully hereinafter appear.

In constructing my improvements and using them in connection with the ordinary steam-boiler I provide a tube-sheet A with a plurality of perforations B of substantially

the same diameter as the tubes which are to be engaged therewith. These perforations are countersunk, as at *b*, on the outside of the sheet and for a depth of nearly half the thickness of a sheet. They are then provided with a thimble C, formed of soft copper, in which is inserted the tube or flue D, so that its end *d* may be rolled over and flanged to engage the tube-sheet and press the copper against the same to calk the space between the tube-sheet and the boiler-flue. The tube is then expanded in the usual manner, as at *d'*, so as to firmly "set" and fix the tube in its engagement with the tube-sheet. By this construction and arrangement it will be seen that the end of the tube is inserted below the face of the tube and in close proximity to the water-chamber of the boiler, so that whatever heat contacts the same may be quickly absorbed and transmitted or conducted to the water-chamber as efficiently as possible, thus minimizing the danger of burning the boiler-flues.

I claim—

In a steam-boiler, a tube-sheet provided with counterbored perforations, each perforation having its counterbore extended inward and decreasing the thickness of the tube-sheet around the perforation in combination with a tube for each perforation each tube having its end entered into and passing through the perforation to lie within the counterbore and within the plane of the outer face of the tube-sheet, a thimble of calking metal around the end of each tube, an outwardly-extending flange formed on the outer end of each tube and its surrounding thimble engaging the end face or wall of the counterbore, and a bead turned out from the body of the tube adjacent to the tube-sheet and engaging therewith for locking and securing the end of the tube in the tube-sheet with the extreme outer end in the space of the counterbore in close proximity to the interior of the boiler and the water therein to have this end of the tube protected in the counterbore against heat and subject to the cooling effect of the water against burning, substantially as described.

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