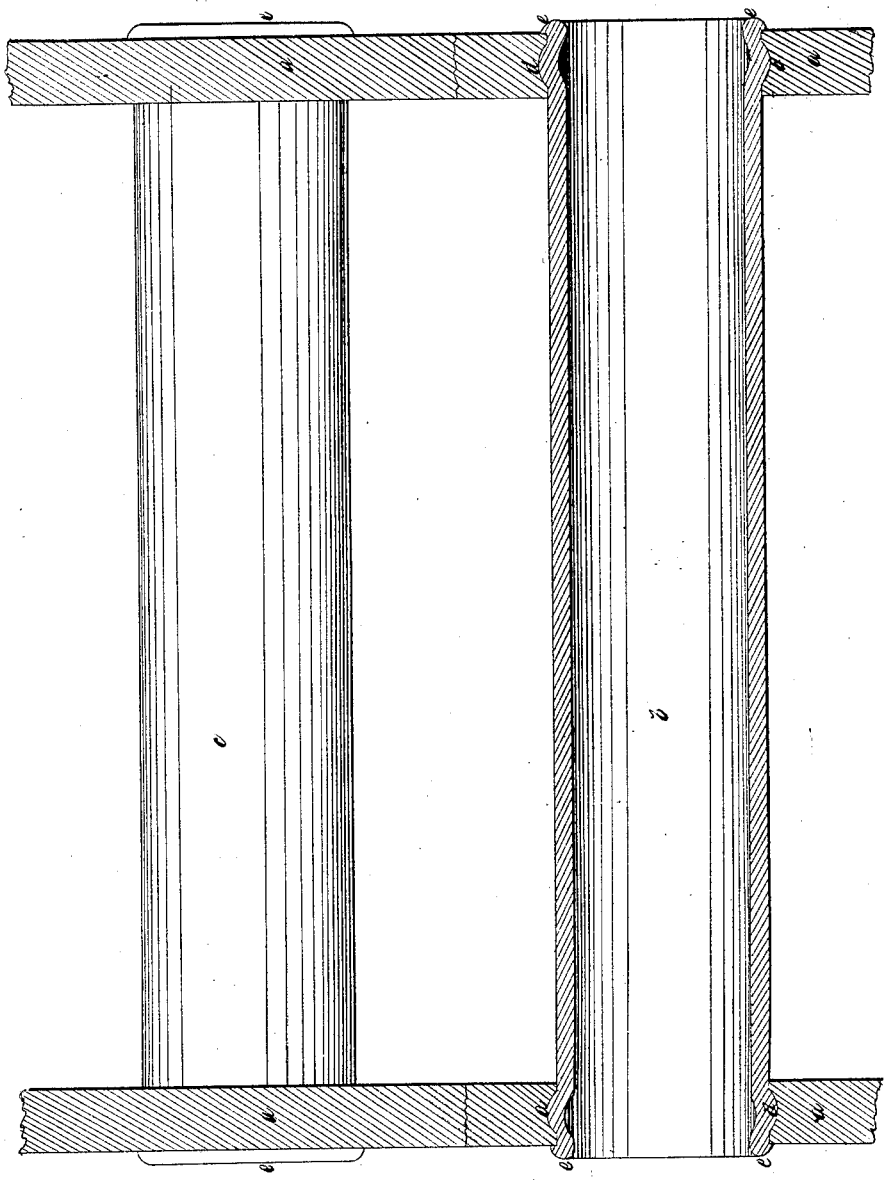
C. Harthorn,

Steam-Boiler Flue.

No. 45,494. Patented Dec. 20, 1864.



Witnesses.
Henry L Bartley
John M Nourse

Inventor.
Chas Harthorn
by his attorney
W. Bakewell

UNITED STATES PATENT OFFICE.

CHARLES HAWTHORN, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN TUBULAR BOILERS.

Specification forming part of Letters Patent No. **45,494**, dated December 20, 1864.

To all whom it may concern:

Be it known that I, CHARLES HAWTHORN, of the city of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Tubular Boilers; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification, which represent a side view of two flues in a tubular boiler with a portion of the boiler-head, one of the flues being shown in section.

The object of my invention is to prevent the loosening of the tubes or flues in the boiler-heads caused by the alternate heating and cooling of the boiler, which allows the escape of water and steam; and my invention consists in the improved mode hereinafter described of fastening the ends of the tubes or flues in the boiler-head.

The mode of attaching the extremities of flues to the boiler-head of tubular boilers now ordinarily practiced is to make the hole in the boiler-head into which the extremity of the flue is inserted of smaller diameter than that part of the flue which traverses the interior of the boiler, and to reduce correspondingly the end of the flue which is to pass through the hole, so as to make on the flue a shoulder which will rest against the inside of the boiler-head around the hole. The projecting extremity of the flue is then turned down and hammered around the hole on the outside of the boiler-head, which has the effect of drawing the shoulder on the flue close up to the inside of the boiler-head around the hole. This makes a very close and tight joint around the flue so long as the boiler remains cold, but when it is heated the expansion of the boiler head and flue and its subsequent cooling frequently repeated gradually loosen the flue, and a leak at the joint is the inevitable consequence.

In the drawing, *a* is the flue-head of the boiler, and *b c* are two flues inserted and attached in the manner which I have invented. The circular hole in the boiler-head designed to receive the flue is made in the first instance cylindical, and of the same diameter at the inner surface of the boiler as the flue to be inserted. In the face of the flue-hole a gutter, *d*, is then cut by a proper tool, the gutter being either curved or V-shaped, as may be preferred, and extending all around the circular hole. The gutter may either extend from edge to edge of the hole in the boiler-head plate, or it may be made narrower than the thickness of the boiler-head, so as to leave on either side of the gutter next to the outer and inner surface of the boiler-head a surface paralled to the axis of the flue to be inserted, as shown in the drawings. The tubular flue is not reduced in diameter at the extremity, nor is any shoulder formed upon it, but it is inserted into the guttered hole, the diameter of the flue corresponding with the smallest diameter of the hole, which is on the inner surface of the boiler-head. The diameter of the hole on the outer surface of the boiler-head may be somewhat larger than on the inner surface, or it may be the same; but the diameter of the hole midway between the two surfaces of the boiler-head plate is greater. The extremity of the flue is protruded through the hole sufficiently to allow the end of the flue to be upset as at *e* around the hole against the outside of the boiler-head in the usual manner. That portion of the flue which bridges the gutter in the hole in the boiler-head is then forced down into the gutter by means of expanding dies or other suitable tools until the flue is driven down into the gutter all around the hole in the manner shown in the drawings.

The advantages which I claim for my invention are great simplicity of construction, freedom from liability to loosen at the point of union between the flue and boiler head, and increased strength of boiler, owing to the additional hold which the enlarging of the diameter of the flue within the hole in the boiler-head gives to the flue, so that each flue serves more strongly to brace the boiler.

What I claim as my invention in the construction of tubular boilers is—

Making the holes in the heads of tubular boilers for the insertion of the flues with a gutter in the wall or sides of the flue-hole, and forcing the sides of that part of the flue which passes through the hole down into the gutter, so as to make the flue conform to the shape of the hole, substantially as and for the purposes hereinbefore described.

In testimony whereof, the said CHARLES HAWTHORN has hereunto set his hand in presence of us.

CHARLES HAWTHORN.

Witnesses:

A. S. NICHOLSON,

J. M. NEAL.