

No. 676,113.

Patented June 11, 1901.

J. B. BENDER.

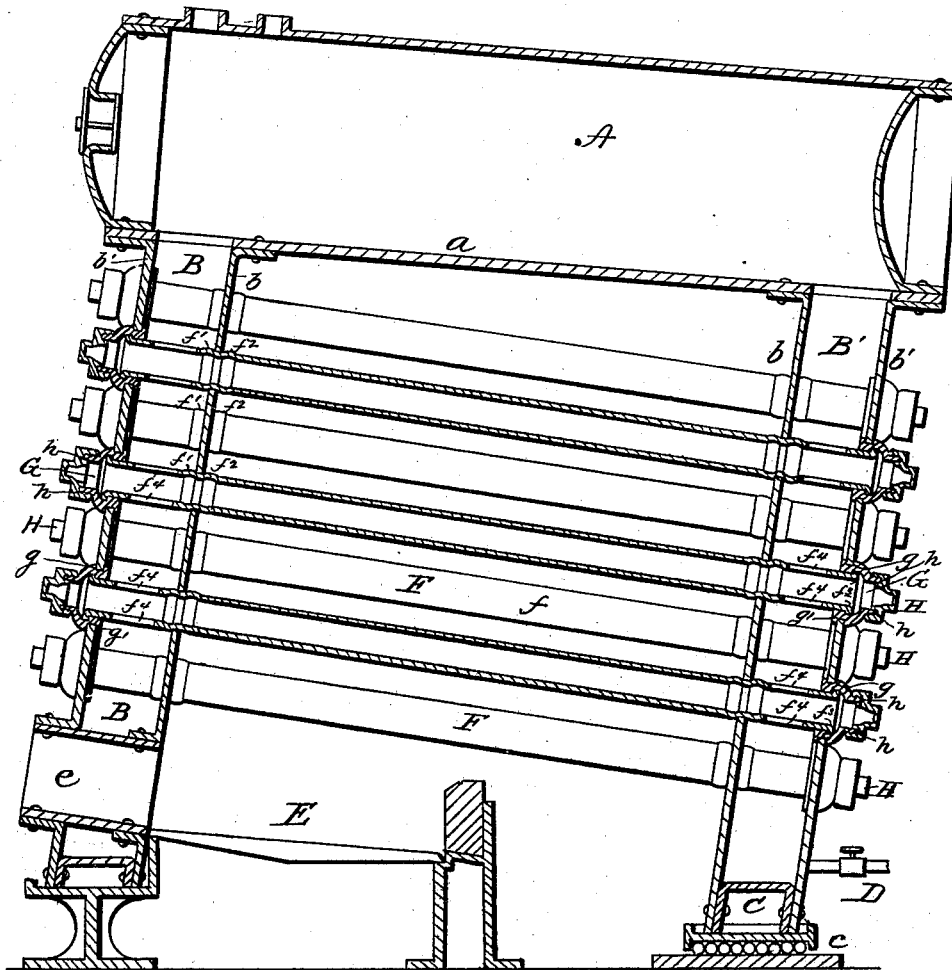
STEAM BOILER.

(Application filed May 2, 1900.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.



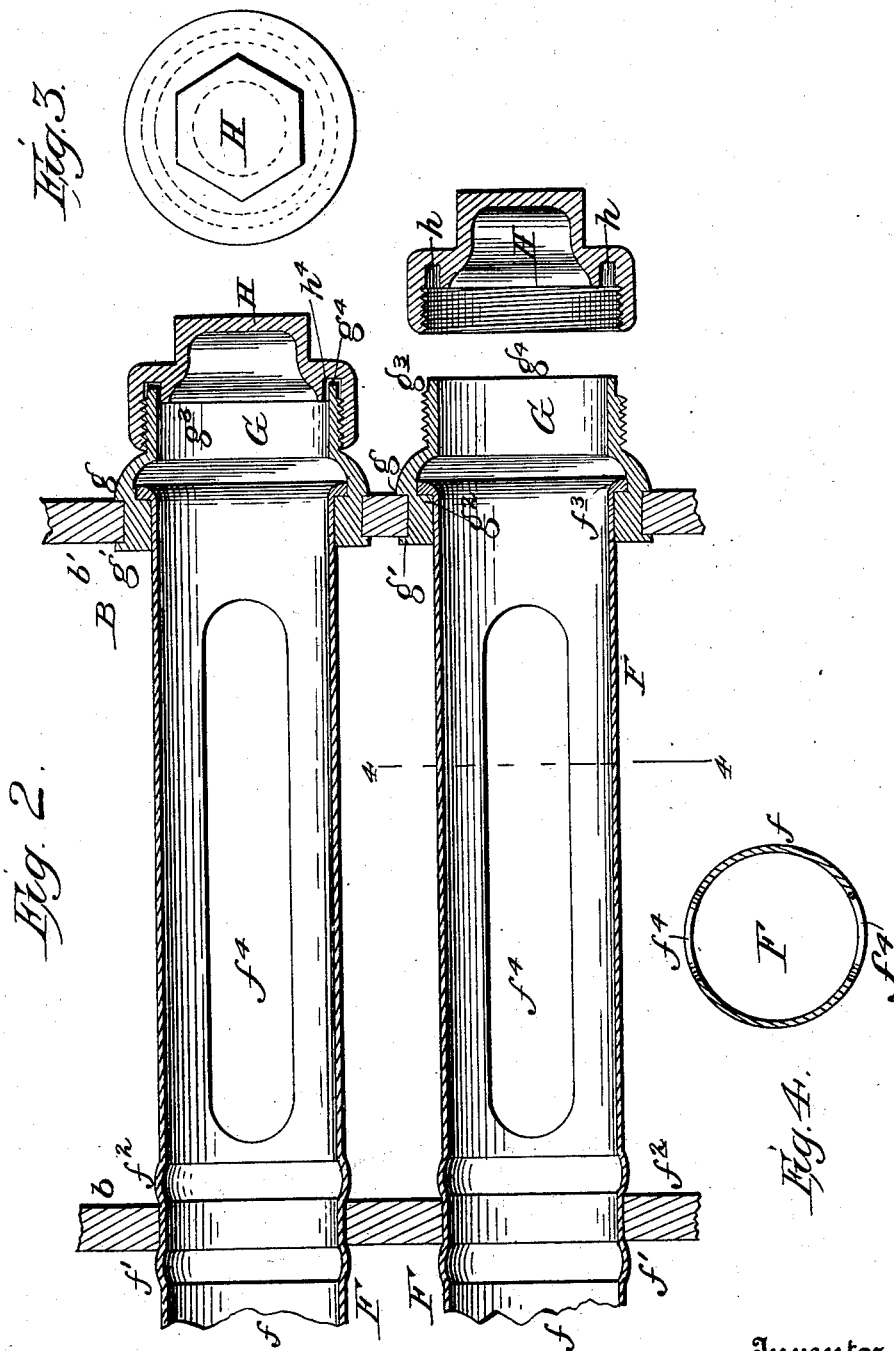
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(No Model.)

2 Sheets—Sheet 2.



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UNITED STATES PATENT OFFICE.

JOHN BARNERD BENDER, OF TOLEDO, OHIO.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 676,113, dated June 11, 1901.

Application filed May 2, 1900. Serial No. 15,229. (No model.)

To all whom it may concern:

Be it known that I, JOHN BARNERD BENDER, residing at Evesham avenue, Toledo, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in Straight-Tube Water-Tube Boilers; and I do hereby 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.

This invention relates to a new and useful improvement in water-tube boilers.

The object of the present invention is to produce a boiler which while only using features essential to its construction as a boiler shall be as strong as though auxiliary strengthening devices were applied.

To accomplish this object, the invention consists in the construction hereinafter pointed out.

In the annexed drawings, Figure 1 is a vertical longitudinal section of a water-tube boiler provided with the invention. Fig. 2 is an enlarged vertical longitudinal section of a portion of a water-leg and the ends of tubes therein. Fig. 3 is an end view of the end nut. Fig. 4 is a transverse section on line 4 4, Fig. 2.

In the drawings the letter A indicates a steam dome or drum supported upon water-legs B B', the interior of the drum and legs communicating, as usual. The upper ends of the water-legs are bolted to the bottom *a* of the drum A. At its lower end the back water-leg B' rests on a cradle C, which bears upon rollers *c*, allowing for the movement of the water-leg due to variations of temperature. At this lower end of the back water-leg B' may be placed a water-inlet or water-supply pipe D. At the bottom of the front water-leg B is placed the door-opening *e* for admission to the fire-box E, the box and opening being of any ordinary construction.

The water-tubes F pass under the drums A and connect the two water-legs B B'. Each tube passes entirely through the water-legs and is securely held in place by fastenings on the outside of the water-legs. A wa-

ter-tube F is composed of a cylindrical body portion *f*, which extends entirely through the boiler from the outside of one water-leg to the outside of the other and is held therein by fastening devices. Where the body portion *f* passes through the inner face *b* of the water-legs, it is swelled, so as to have an enlargement *f'* on one side and an enlargement *f''* on the other side of the inner face *b* of the water-leg. At its outer end the body portion *f* is received and held by a thimble G. This thimble G is securely held in the opening in the outer face *b'* of the water-leg. If desired, the thimble may be provided with shoulders *g g'* outside and inside of the face *b'*, so as to effectually prevent movement of the thimble in such face. On the inside the thimble G has outside the line of the face *b'* a shoulder *g''*. The outer end of the body portion *f* of the water-tube F is turned down with a head *f''*, which engages and snugly fits the interior shoulder *g''* of the thimble G. This engaging or retaining thimble G receives on its outer end *g''* a threaded nut H, which closes the end of the water-tube, the extreme end *g''* of the thimble G being received into a recess *h* of this nut H. In that portion of the water-tube which is between the two faces *b b'* of the water-leg there are made several elongated openings *f''*, in the present instance two being shown opposite each other.

With a construction of boiler such as shown it will be seen that the boiler is only provided with those parts which are essential to its operativeness as a boiler. There are no stays or auxiliary supporting devices either inside the boiler or between the two faces of the water-legs. An absence of these stays is rendered possible by the peculiar construction and arrangement of the water-tubes. As the tubes are enlarged at the inner faces of the water-legs and are held in the outer faces by the thimbles, the tubes themselves are firmly attached to both faces of the water-legs and act as braces not only between the two water-legs, but also between the two faces of each water-leg. Also with the construction indicated the water-tubes may be

easily cleaned both inside and out by removing the nut at one end for cleaning the interior.

Having thus described my invention, what I claim is—

1. A water-tube boiler provided with front and back water-legs, and water-tubes connecting and passing through the water-legs, said tubes being firmly attached to the inner
10 faces of the water-legs and independent attachments which hold the water-tubes to the outer faces of the water-legs, such water-tubes forming braces for said water-legs and providing a circulation through said boiler,
15 as set forth.

2. A water-tube boiler provided with wa-

ter-legs and tubes connecting the two legs, such tubes being held by enlargements at one face of a water-leg and by nuts at the other face.

3. The combination of the water-leg, B, the tube, F, having the enlargements, $f'f'^2$, at the face, b , of the water-leg and the thimble, G, between the tube, F, and the face, b' , of the water-leg.

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

JOHN BARNERD BENDER.

Witnesses:

E. W. GAGE,

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