

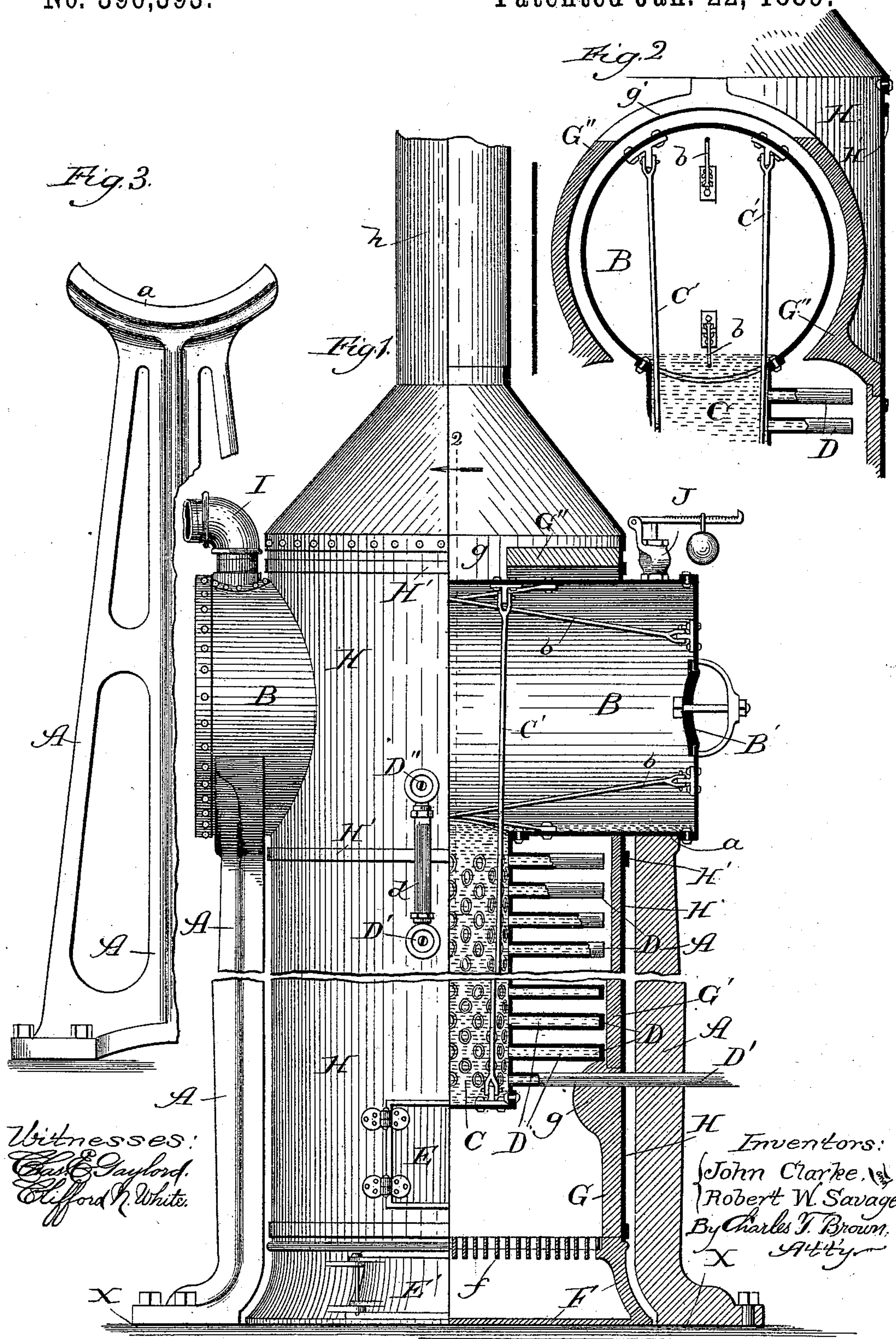
(No Model.)

J. CLARKE & R. W. SAVAGE.

RADIAL TUBE BOILER.

No. 396,393.

Patented Jan. 22, 1889.



UNITED STATES PATENT OFFICE.

JOHN CLARKE AND ROBERT W. SAVAGE, OF TYLER, TEXAS.

RADIAL-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 396,393, dated January 22, 1889.

Application filed August 27, 1888. Serial No. 283,821. (No model.)

To all whom it may concern:

Be it known that we, JOHN CLARKE and ROBERT W. SAVAGE, citizens of the United States, residing at Tyler, in the county of Smith and State of Texas, have invented certain new and useful Improvements in Radial-Tube Boilers, of which the following is a complete description sufficient to enable one skilled in the art to understand and construct the same.

We are aware that radial or porcupine steam-boilers of the kind to which our invention relates have been heretofore constructed, and that various methods of constructing such boilers have been practiced; and we are further aware that patents have been granted on such boilers, among others the patent to H. C. Goulding, September 14, 1886, No. 349,039, and the one to E. S. T. Kennedy, December 20, 1887, No. 375,324.

The purpose of our invention is, mainly, to so improve the construction and design of boilers of this class that larger quantities of steam and dryer steam may be obtained therefrom, and at less cost than has been heretofore possible in such boilers; and our invention consists, principally, of a horizontal steam-reservoir supported by suitable standards placed under each end thereof, a vertical water and steam-generating chamber suspended from said steam-reservoir, radial horizontal tubes having the outer ends thereof closed and the inner ends secured in said vertical chamber in the ordinary manner, and a casing, preferably metallic, inclosing a fire-brick covering or casing which surrounds the said horizontal steam-reservoir, the said vertical chamber and the horizontal radial tubes secured therein with the fire-pot of said boiler, which is placed underneath the vertical chamber and radial tubes.

We have illustrated our invention by the drawings accompanying this specification and forming a part hereof, in which—

Figure 1 is a view showing one side of the boiler in elevation and the other side in section. Fig. 2 is a section on line 2 2 of Fig. 1. Fig. 3 is an elevation of the standard supporting the horizontal steam-reservoir used in our invention and from which the water and steam-generating chamber is suspended.

Like letters refer to like parts throughout the several views.

X is the foundation, on which standards A A are placed. These standards A A are firmly secured to the foundation at the lower ends thereof, and at the upper ends have circular rests *a* of substantially the same size as the outer surface of the horizontal steam-reservoir B.

B is the horizontal steam-reservoir, consisting of a cylinder of somewhat larger size than is the water and steam-generating vertical cylinder suspended therefrom.

b b are tie-rods in steam-reservoir B.

B' is the man-hole in steam-reservoir B.

C is a vertical cylinder having horizontal tubes D secured therein and radiating therefrom. In our invention the water is contained in the vertical cylinder C and radiating-tubes D, and enters a short distance into horizontal steam-reservoir B, cylinder C and radiating-tubes D thereby constituting our water and steam-generating chamber.

c' c' are tie-rods extending from the upper surface, or nearly so, of the horizontal steam-reservoir B to the lower end of vertical chamber C.

D' D' are extended radial tubes, and are so extended to allow the feed-pipe and blow-off cock to be attached thereto, and also that gage *d* may be placed upon the boiler.

D'' is a pipe extending from gage *d* to reservoir B.

E is the fire-box door, and E' is the ash-box door.

F is the ash-pan wall and base, and is formed preferably of cast-iron.

f are the grate-bars.

G is the fire-brick surrounding the fire-box, and is provided with projecting portion *g*. Projecting portion *g* of the fire-brick surrounding the fire-box is intended to come a short distance above the burning contents of the fire-box when our device is in use.

G' is fire-brick placed on the upper edge of and supported by ash-box F. Fire-brick G' may be somewhat less in thickness than is fire-brick G.

G'' is a fire-brick arch surrounding horizontal steam-reservoir B so far as said steam-reservoir is inclosed in the metal casing here-

inafter described, and is placed at a sufficient distance from said horizontal steam-reservoir to permit the gaseous products of combustion, if there be any, and the smoke to pass
 5 between it and said reservoir, thereby escaping from the fire-box through the chimney or flue of the boiler. Under smoke stack or flue *h* there is an opening in brick arch *G''* into said chimney or flue.

10 *H* is a metal covering surrounding fire-brick *G*, *G'*, and *G''* and extending above the same, having at the extreme upper end thereof smoke pipe or flue *h*.

H' *H'* are metal bands around casing *H*.

15 *I* is the pipe or coupling through which the steam contained in steam-reservoir *B* is taken for use.

J is a safety-valve.

In the operation of our invention the heated
 20 products of combustion in the fire-box are deflected against vertical cylinder *C* by projection *g* on fire-brick *G* in the ordinary manner, and, passing between the several radial horizontal tubes *D*, the contents thereof are
 25 thereby heated, and such rising products of combustion, after passing by such radial tubes *D*, pass between the outer surface of horizontal steam-reservoir *B* and the inner surface of fire-brick arch *G''*, thus maintaining
 30 at a high temperature the contents of said horizontal steam-reservoir. As the water contained in vertical cylinder *C* and tubes *D* is heated, as described, the said water extending a short distance into horizontal steam-
 35 reservoir, the steam generated therefrom may enter into said horizontal steam-reservoir *B*, from which it is taken for use through coupling *I*. The whole weight of the horizontal steam-reservoir, the suspended cylinder *C*, radial tubes *D*, and the contents thereof is
 40 supported by standards *A*. The horizontal steam-reservoir *B* is at no place in contact with fire-brick arch *G''*, and fire-brick *G'* is not necessarily in contact with said steam-
 45 reservoir, although, as illustrated in Fig. 1, it is shown in contact therewith, as said reservoir passes through metal covering *H*. Tie-rods *C'* *C'* materially assist in sustaining the weight of vertical cylinder *C*, tubes *D*, and
 50 their contents, as well as the pressure therein caused by the contained water and steam, and a sufficient number to insure safety should be used. Metal covering *H* is held rigidly in position by surrounding bands *H'*
 55 *H'*, any desired number being used. Vertical

cylinder *C* being suspended from horizontal steam-reservoir *B* in such a manner as to be entirely free from contact with any portion or part of the boiler other than at its point of connection and suspension from said steam-
 60 reservoir, said vertical cylinder may expand or contract under varying temperatures without injury thereto.

Having thus described our invention, what we claim, and desire to secure by Letters Patent of the United States, is—

1. A steam-boiler consisting of a horizontal steam-reservoir, a vertical cylinder provided with radial tubes suspended therefrom and forming a steam-generating chamber, all supported by standards placed underneath said
 70 horizontal steam-reservoir and outside of the casing surrounding said steam-generating chamber, and the fire-box placed under said steam-generating chamber, all substantially
 75 as described, and for the purposes set forth.

2. A steam-boiler consisting of a horizontal steam-reservoir, a vertical steam-generating chamber with radial tubes thereon suspended from said horizontal steam-reservoir, a fire-
 80 box placed underneath said vertical steam-generating chamber, a casing composed of fire-brick and other suitable material surrounding said fire-box, vertical steam-generating chamber, and a portion of said horizontal
 85 steam-reservoir at a suitable distance therefrom, and standards placed outside of said casing and underneath the ends of said horizontal steam-reservoir, thereby supporting said horizontal steam-reservoir and said
 90 vertical steam-generating chamber with the radial tubes placed thereon, all substantially as described, and for the purposes set forth.

3. The combination, in a steam-boiler, of ash-pan *F*, fire-box brick *G* *G'*, placed thereon, arch *G''*, covering *H*, surrounding said fire-
 95 brick *G* *G'* and arch *G''*, bands *H'* *H'*, securing covering *H* in position, horizontal steam-reservoir *B*, supported by standards *A* *A*, placed outside of said covering *H*, and vertical
 100 steam-generating chamber *C*, provided with radial tubes *D*, suspended from said horizontal reservoir *B*, all substantially as described, and for the purposes set forth.

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Witnesses:

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