

(No Model.)

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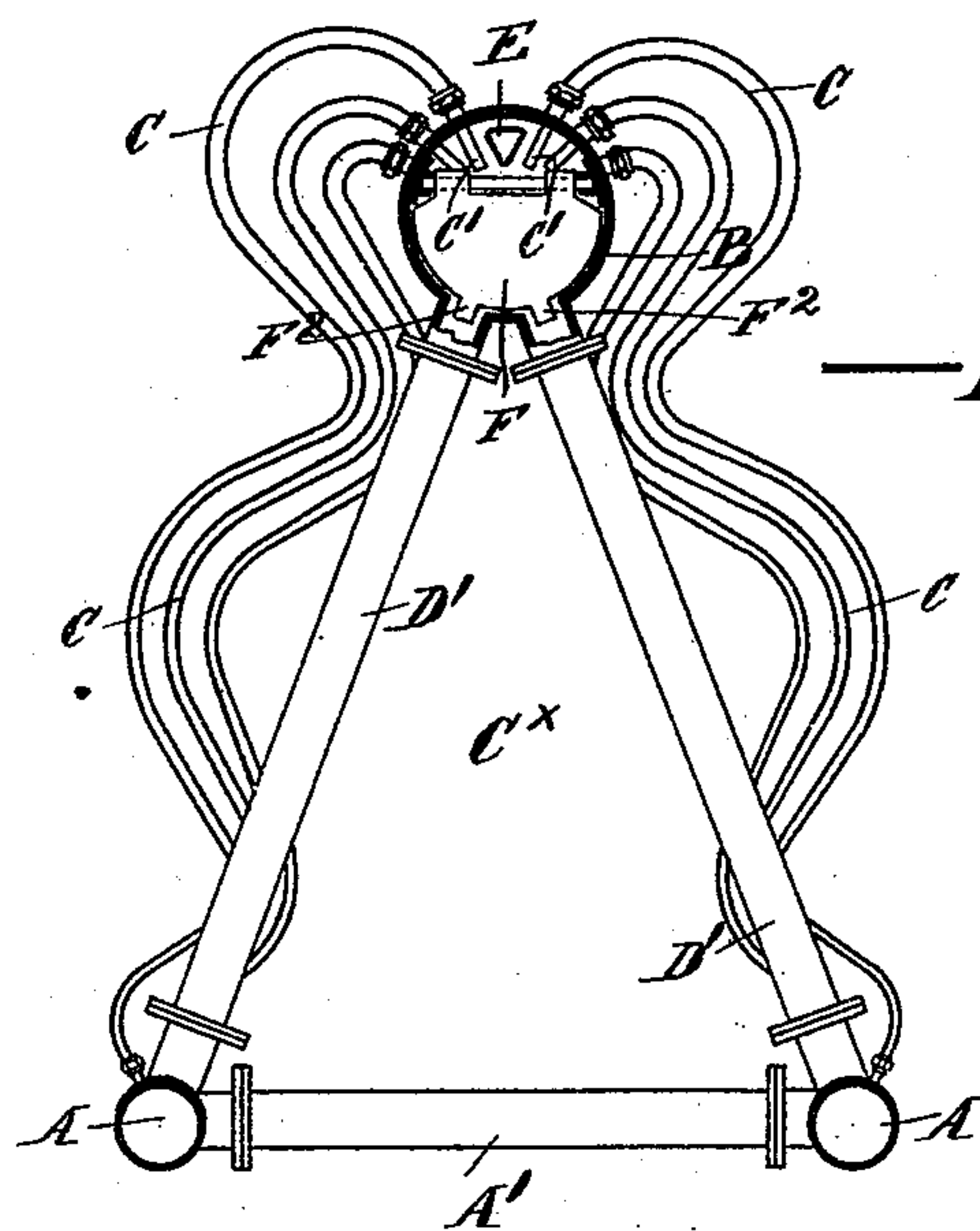
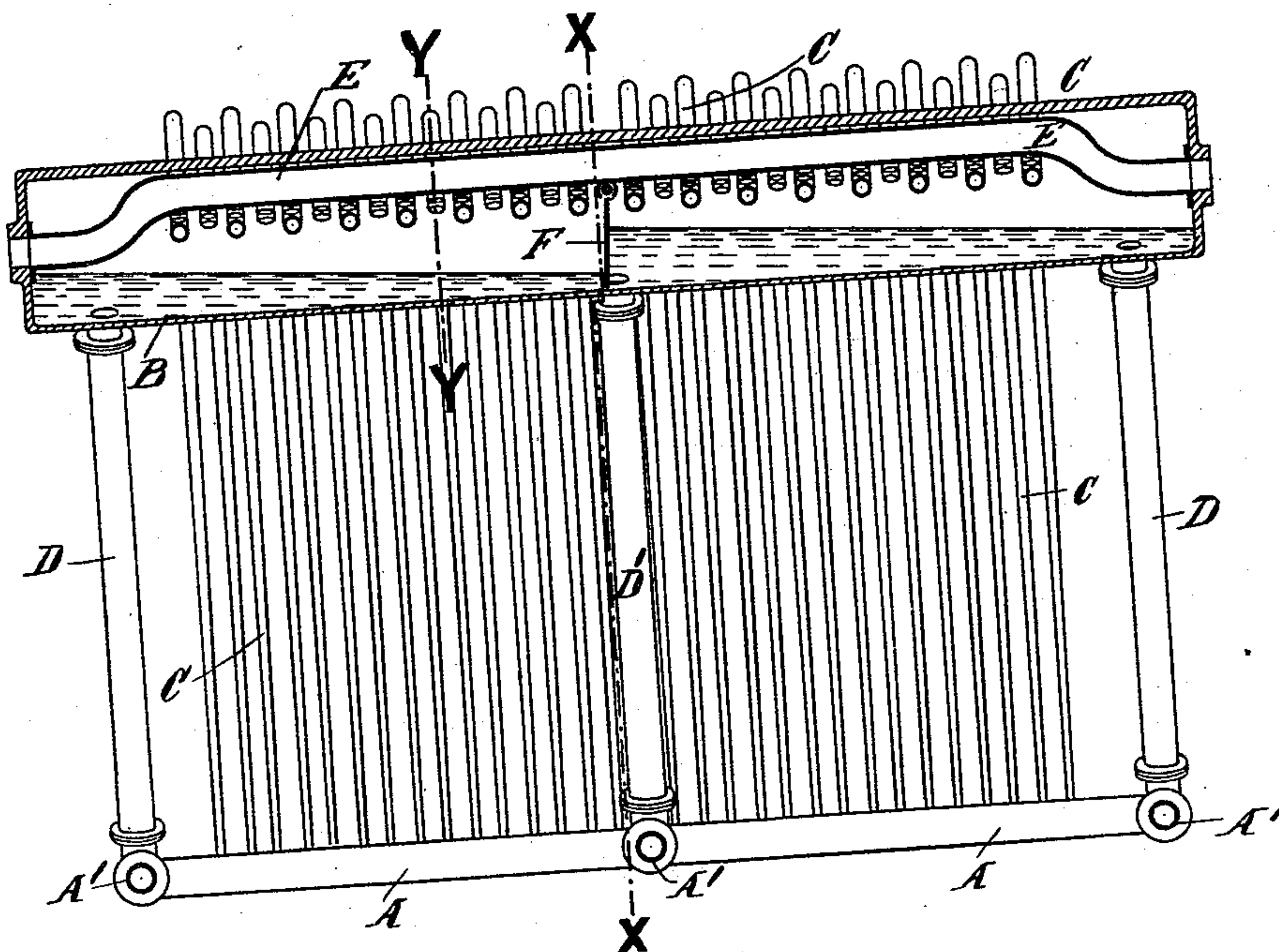
H. A. HOUSE & H. A. HOUSE, Jr.

TUBULOUS STEAM BOILER.

No. 521,164.

Patented June 12, 1894.

—Fig 1.—



—Fig 2.—

*Witnesses:*  
William Henry Beck  
Stephen Edward Gumpson

*Inventors:*  
Henry A. House  
Henry A. House Junior

(No Model.)

2 Sheets—Sheet 2.

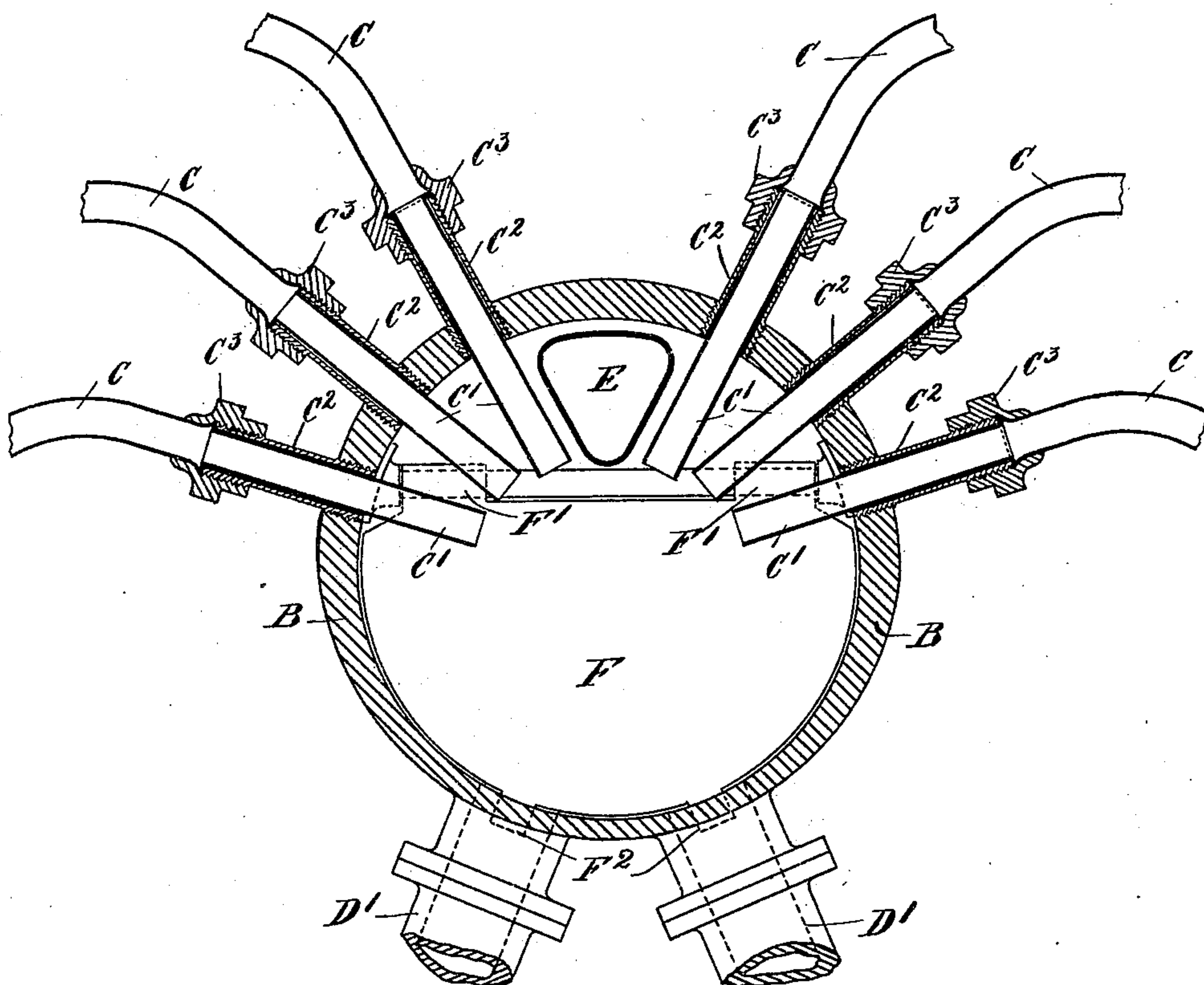
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—Fig 3.—



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*William Henry Beck*  
*Stephen Edward Gungor*

*Inventors.*  
*Henry A. House*  
*Henry A. House Junior*



# UNITED STATES PATENT OFFICE.

HENRY A. HOUSE AND HENRY A. HOUSE, JR., OF BRIDGEPORT, CONNECTICUT, ASSIGNORS OF ONE-HALF TO ROBERT RINTOUL SYMON, OF LONDON, ENGLAND.

## TUBULOUS STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 521,164, dated June 12, 1894.

Application filed July 13, 1893. Serial No. 480,416. (No model.) Patented in England September 13, 1893, No. 17,224.

*To all whom it may concern:*

Be it known that we, HENRY ALONZO HOUSE and HENRY ALONZO HOUSE, Jr., mechanical engineers, both citizens of the United States of America, and both temporarily residing at Teddington, county of Surrey, England, but usually of Bridgeport, county of Fairfield, and State of Connecticut, United States of America, have invented a certain new and useful Improvement in Tubulous Steam-Boilers, (for which we have obtained a patent in Great Britain, No. 17,224, dated September 13, 1893,) of which the following is a specification.

These improvements relate to that kind of tubulous steam boiler in which water-collectors or chambers below are connected with a steam and water chamber above, first, by a series of water tubes the lower ends of which are connected with the said lower water collectors or chambers, and the upper ends with the steam space of the upper chamber; such water tubes being exposed to the action of the fire for the purpose of heating the water in them, and secondly by certain pipes which connect the said lower water collectors or chambers with the water space of the upper chamber, and serve as circulating pipes for returning to the lower chambers any water carried up into the upper chamber by the heating tubes, such return circulating pipes being generally placed where they are not subject to the action of the fire. And the object of the improvements is in the first place to provide means for delivering any water that may be carried up through the heating tubes along with the steam, into the upper chamber in such manner that it is directed away from the steam outlet pipe, and on to the water contained in such upper chamber so as to avoid priming, and in the second place to provide means for preventing the water in the said upper chamber from running to one end thereof thereby preventing proper circulation at the opposite end, when, as often happens in such boilers when they are used on board ship, one end of the boiler is raised higher than the other.

In order that our said invention may be fully understood we will now proceed to de-

scribe the same with reference to the annexed drawings, in which—

Figure 1 is a longitudinal sectional elevation of a boiler of the kind referred to with the usual inclosing casing removed; Fig. 2 a transverse sectional elevation taken on line X—X of Fig. 1, and Fig. 3 a sectional elevation, to a much larger scale than Fig. 1, of the upper or steam chamber taken on the line Y—Y of that figure.

A represents the lower or water collectors or chambers, A' pipes connecting the said collectors or chambers together, B the upper, or steam and water chamber, C the series of heating tubes which are subjected to the action of the fire contained in the furnace space C<sup>x</sup>, their lower ends opening into the water collectors A and their upper ends into the steam space of the upper chamber B.

D are return circulating pipes connecting the water collectors A with the water space of the upper chamber B.

E is the anti-priming steam pipe for taking-off the steam from the chamber B to the point where it is to be used.

The action of boilers of this kind is well understood but we will shortly describe it in order to make clear the connection of our invention with such boilers. The fire, whether of solid fuel or gas contained in the space C<sup>x</sup> heats the series of pipes C and consequently the water in them; this water becomes partly converted into steam and rises into the steam chamber B accompanied by a portion of the heated water which is more or less deposited at the bottom of the chamber B, and returns by the circulating pipes D to the water collectors A so that there is a continual circulation of water up the heating pipes C from the collectors A to the steam chamber B, and from the latter through the pipes D back to the collectors A, the steam passing off by the pipe E. But as the steam chamber B is usually of small diameter there is danger of part of the water delivered into it by the pipes C being entrained into the steam pipe. To obviate this, baffle plates have been used opposite to the ends of the pipes C to divert the water downward, but these baffle plates have



not given satisfactory results, and instead thereof we employ an arrangement of nozzles C' projecting inward and downward from the ends of the pipes C as shown in Figs. 2 and 3.

C<sup>2</sup> are short lengths of tube or nipples screwed into the shell of the chamber B, and provided at their outer ends with union nuts C<sup>3</sup> which secure the trumpet-mouthed ends of the pipes C to the conical end of the tube C<sup>2</sup>. The nozzles C' rest by flanges at their outer ends on the ends of the tubes or nipples C<sup>2</sup>; they pass easily through the short tubes C<sup>2</sup> and project radially into the chamber B as shown. By these means the nozzles C' which are subject to a certain amount of wear and tear by the rapid passage of steam and water through them can be easily removed and fresh ones put into their place when necessary. These nozzles forcibly project the water downward onto the surface of that already in the chamber B in a direction below the level of the steam pipe E, thus preventing such water from rising with the steam to the holes in the said steam pipe.

When the boiler stands horizontally the water in the steam chamber B circulates back to the water collectors A by both end circulation pipes D D; but when the boiler is raised higher at one end than at the other, as shown in Fig. 1, by the pitching or other change in position of the ship or boat in which it may be placed, the water in the steam chamber runs to the lower end, and sometimes uncovers the circulating pipes D at the upper end so that there can be no circulation through those pipes. To obviate this inconvenience we employ return circulating pipes D' placed at or near the middle of the length of the water collectors A and steam chamber B, and we fit a swiveling plate F transversely in the chamber B. This plate is swiveled or hinged at F' over the circulating pipes D'. It is shaped to nearly fit the lower part of the internal circumference of the chamber B but to remain free to swing therein. Projecting parts F<sup>2</sup> of the plate F enter the upper ends of the pipes D'. When the boiler is horizontal the plate F hangs plumb over these pipes so that circulation of water can go on through them from each side of the plate; but when either end of the boiler falls lower than the other the plate F swings on its hinges F' until

its projections F<sup>2</sup> come to bear against the lower side of the pipes D' as shown in Fig. 1 and the water in the higher half of the chamber B heaps up against the plate F and is prevented thereby from rushing to the lower end of the boiler but circulates through the tubes D', the water in the lower part of the chamber B alone going to the pipes D at the lower end. This arrangement also assists in retaining sufficient water in the upper half of the steam chamber B to secure circulation thereof through the pipes D at the upper end of the said chamber.

We claim—

1. In a tubulous boiler of the kind described the combination with the lower collector chamber and the upper steam and water chamber of the series of heating pipes connecting the two, of nozzles connected to the ends of the heating pipes and projecting from above downward into the upper steam chamber so as to project the water in a direction below the level of the steam pipe, and having their open ends above the normal level of the water in said upper chamber, as set forth.

2. The combination with the lower collector chambers, the upper steam and water chamber and the intermediate heating pipes of a tubulous boiler, of short tubes or nipples entering the steam chamber nozzles extending through the same into the said chamber and having their open ends above the normal level of the water therein, and union nuts connecting the said nipples with the ends of the heating pipes as set forth.

3. The combination with the lower collector chambers the upper steam and water chamber, the heating pipes and the circulating pipes connecting the two chambers at the ends and at intermediate points, of a swiveled or hinged plate of approximately the diameter of the water chamber and suspended over the intermediate circulating pipes and capable of limited swing or play in opposite directions as set forth.

In witness whereof we have hereunto set our hands in presence of two witnesses.

HENRY A. HOUSE.

HENRY A. HOUSE, JUNIOR.

Witnesses:

WILLIAM HENRY BECK,

STEPHEN EDWARD GUNYON,

*Both of 115 Cannon Street, London.*