

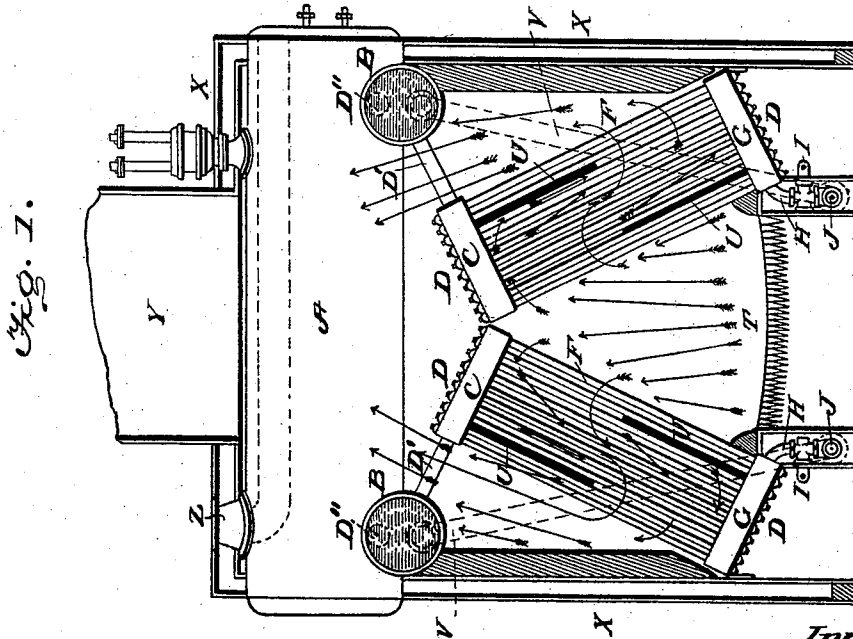
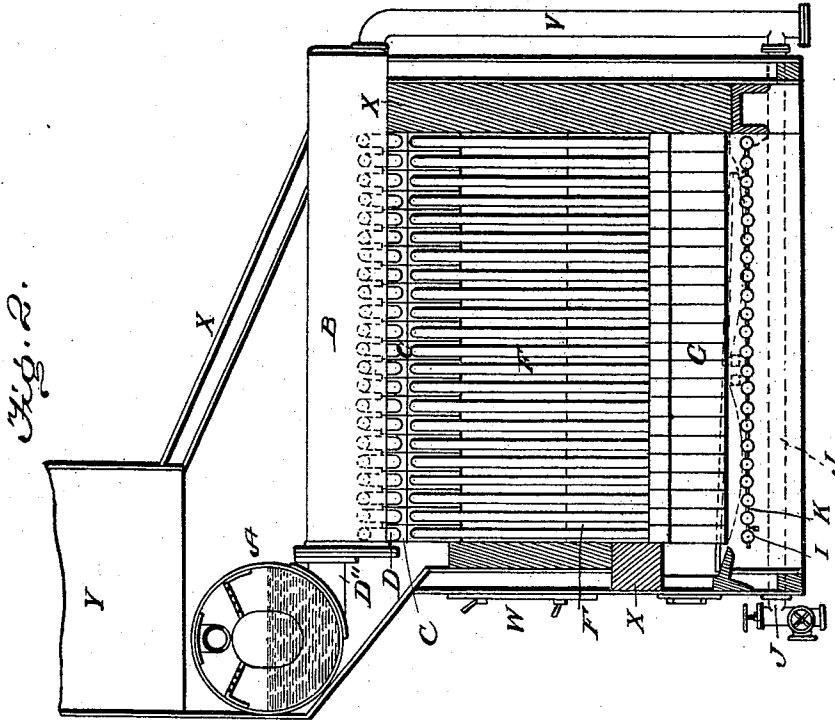
(No Model.)

4 Sheets—Sheet 1.

E. E. WIGZELL.  
WATER TUBE STEAM BOILER.

No. 591,444.

Patented Oct. 12, 1897.



Witnesses  
*Jas. J. Smith*  
*Arthur C. Cowle*

Inventor  
 Eustace Ernest Wigzell  
 by *W. L. Egan*,  
 Atty.

(No Model.)

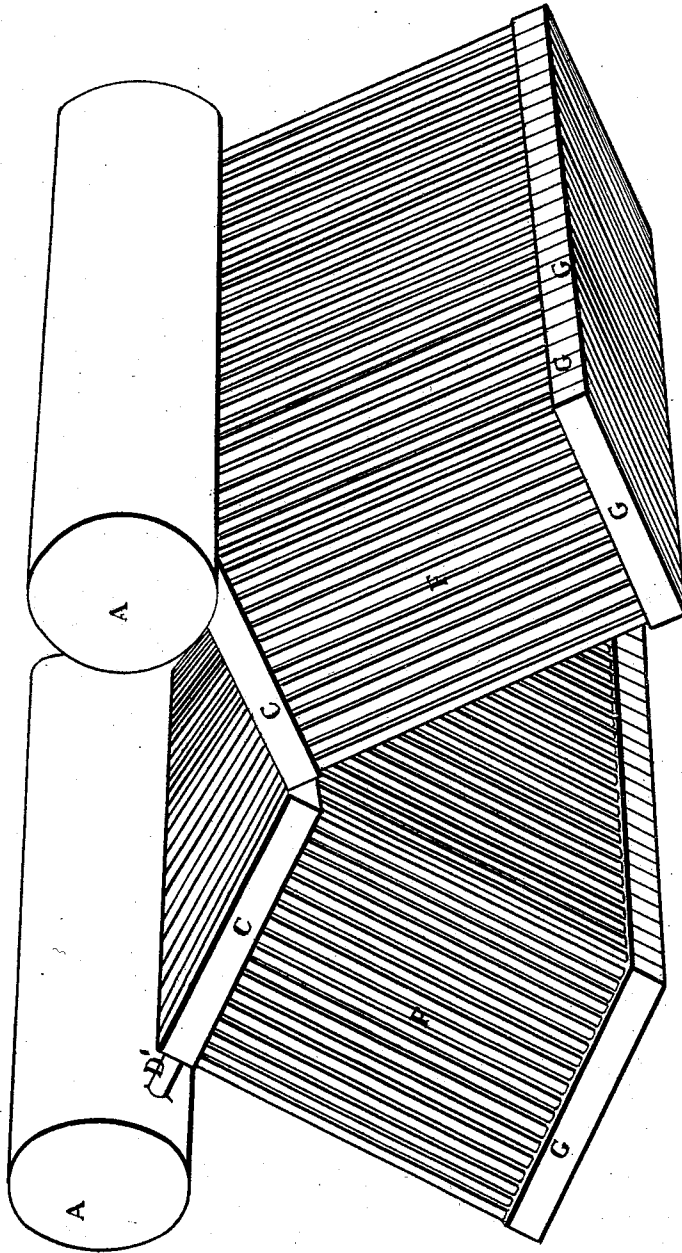
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E. E. WIGZELL.  
WATER TUBE STEAM BOILER.

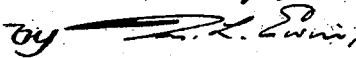
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Patented Oct. 12, 1897.

*Fig. 3.*



*Witnesses*  
*J. A. Elmer*  
*George M. Whitney*

*Inventor*  
*Eustace E. Wigzell*  
*by* *Atty.*

(No Model.)

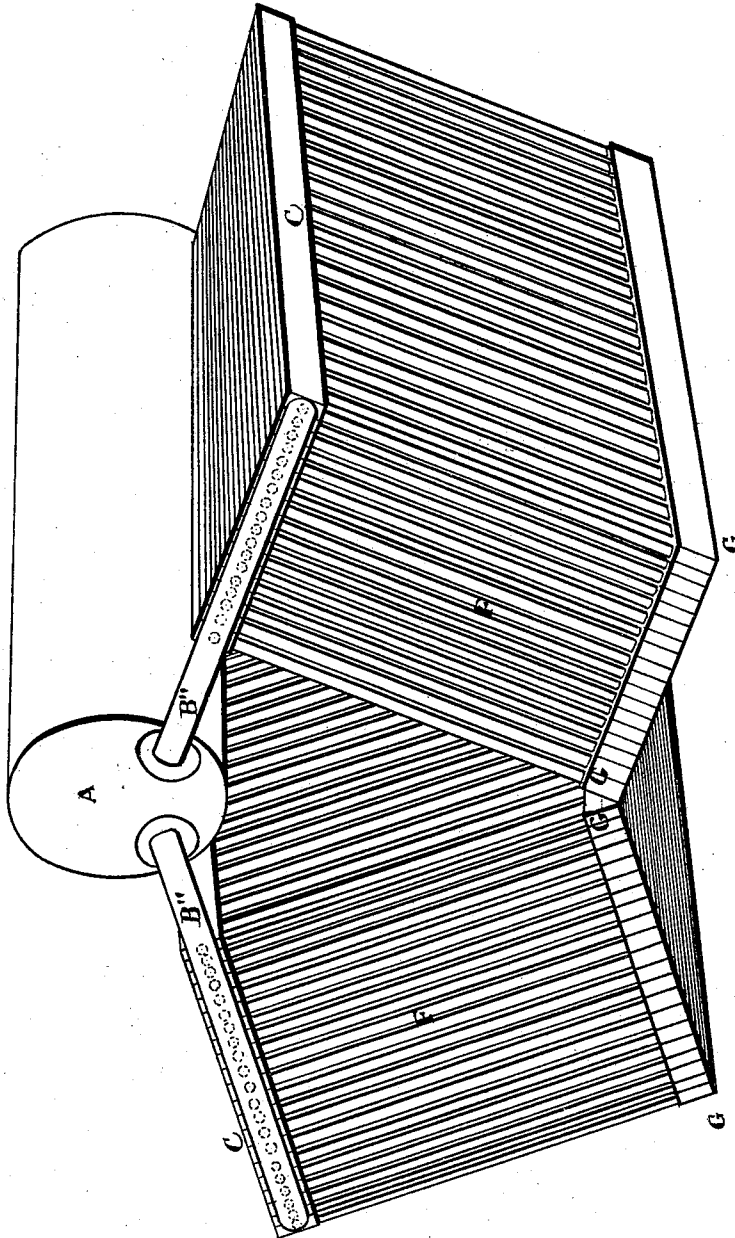
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E. E. WIGZELL.  
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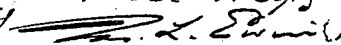
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*Fig. 4.*



*Witnesses*  
*J. S. Elmore*  
*George M. Whitney*

*Inventor*  
*Eustace Ernest Wigzell*  
*by*  *W. L. Smith*  
*Atty.*

(No Model.)

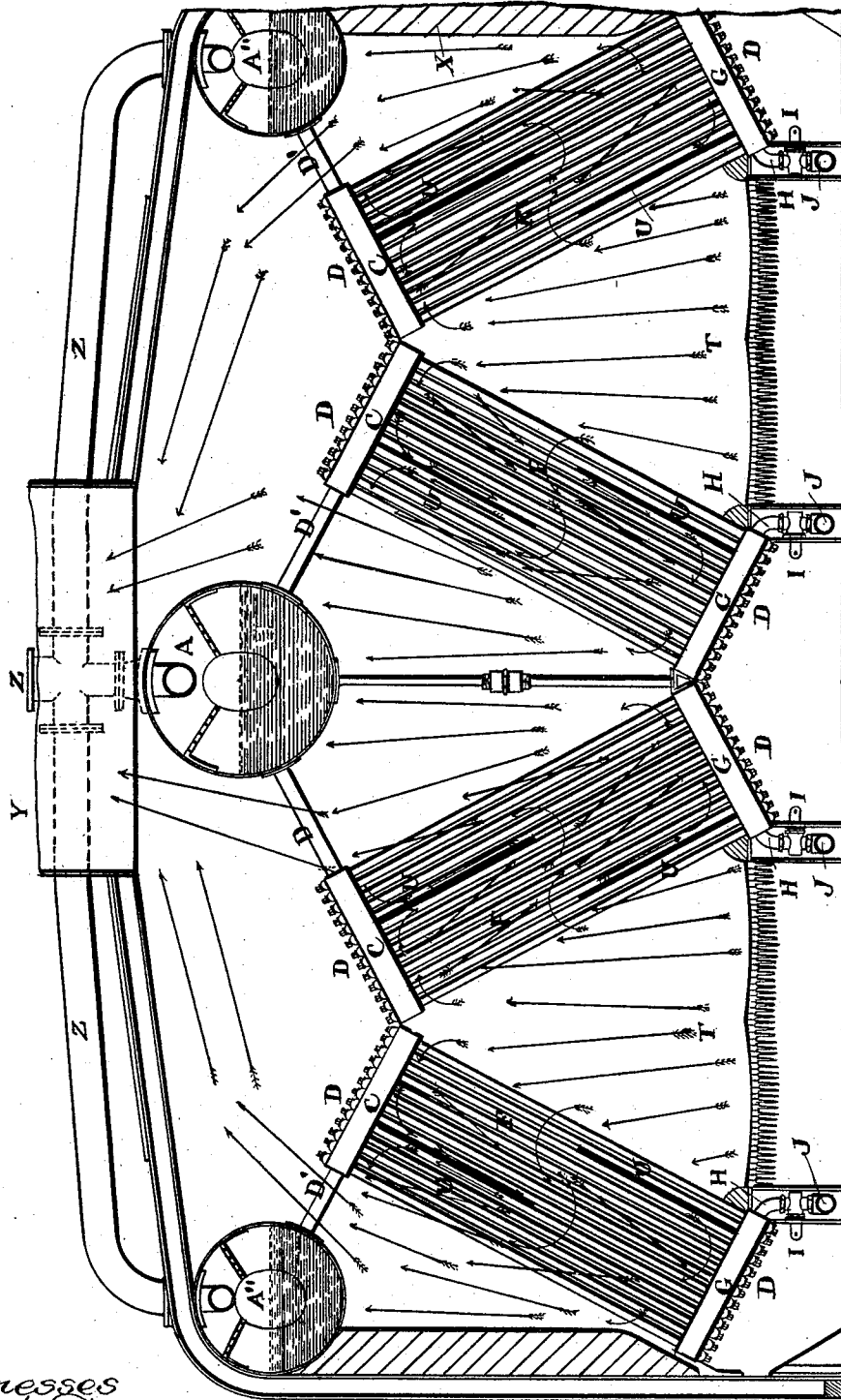
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*Fig. 5.*



Witnesses  
*J. S. Elmore.*  
*George M. Whitney.*

Inventor  
*Eustace Ernest Wigzell*  
 by *H. L. Swin,*  
 Atty.

# UNITED STATES PATENT OFFICE.

EUSTACE ERNEST WIGZELL, OF LONDON, ENGLAND.

## WATER-TUBE STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 591,444, dated October 12, 1897.

Application filed January 25, 1897. Serial No. 620,654. (No model.)

*To all whom it may concern:*

Be it known that I, EUSTACE ERNEST WIGZELL, engineer, of Billiter House, Billiter Street, London, England, a subject of Her Majesty the Queen of Great Britain and Ireland, and a resident of Albion Cottage, High Road, Loughton, London, in the county of Essex, England; have invented a new and useful Improvement in Water-Tube Steam-Boilers, of which the following is a specification.

This invention relates to water-tube steam-boilers in which the tubes are arranged in a group or groups made up of segregable sections, any required number of which can be put together for obtaining the desired heating-surface.

The objects of the present improvement are to construct an improved boiler on said principle which shall be simple in manufacture and highly effective in operation, and, more particularly, to provide for an active circulation of the water throughout all those portions of the boiler where such circulation is essential or desirable without undue agitation of the water in the steam and water chest, and to form effective flue-spaces within the group or groups of water-tubes and between such groups and the steam or water chests with which they communicate.

The invention consists in certain novel combinations of parts hereinafter set forth and claimed.

Four sheets of drawings accompany this specification as part thereof.

Figure 1 of these drawings represents an end view of an improved boiler, partly in vertical section. Fig. 2 represents a side elevation, partly in vertical section, projected from Fig. 1. Fig. 3 is a perspective view of two groups of water-tubes connected with a pair of water or steam chests according to this invention. Fig. 4 is a perspective view of two groups of water-tubes connected with a central water or steam chest, with sections arranged at right angles to those shown in Figs. 1, 2, and 3; and Fig. 5 is an end view, partly in vertical section, of a double boiler constructed according to the same invention.

Like letters refer to like parts in all the figures.

In all the several arrangements one or more horizontal water and steam chests A A' A'', preferably and conveniently cylindrical in shape, are connected, directly or indirectly, with groups of vertical angle-tubes, which are preferably arranged in converging pairs, and comprise, in common, tubes of uniform length and sections of uniform dimensions, which greatly facilitate the construction of the boiler.

In the arrangement represented by Figs. 1 and 2 a single water and steam chest A is arranged parallel with the front of the boiler, and a pair of cylindrical water-chests B, at right angles to said chest A, are interposed between the same and two groups of water-tubes, being connected with headers or "end boxes" C at the top of each group by tubes D', extending lengthwise from said end boxes, which are in this arrangement at right angles to said water-chests. The water-chests B are in turn connected with the water and steam chest A by necks D'', projecting lengthwise from the former at top. The tubes F, which are connected by said end boxes C at top, are connected at bottom by end boxes G. Horizontal inlet-pipes J at bottom are connected with the respective groups in this arrangement by branch pipes H, extending from said inlet-pipes into the adjacent ends of the lower end boxes individually, and circulating-pipes V preferably connect the rear ends of said inlet-pipes with those of said water-chests B. A free circulation of water is thus insured in all those parts of the boiler where such circulation is essential or desirable, while the water and steam chest A equalizes the pressure throughout the boiler and provides for a free separation of the steam.

A grate T of the required area is located between the groups of water-tubes at their lower ends, and baffle-plates U are inserted in the respective groups, flue-spaces being formed between the tubes F and between the connecting-tubes D', so that the flame and heat are caused to circulate in an effective manner through the groups of tubes and between the upper end boxes C and the water-chests B, as represented by arrows in Fig. 1.

The stem-outlet of the boiler is represented at Z, its uptake at Y, its shell at X, and its furnace-door at W, Fig. 2.

In the arrangement illustrated by Fig. 3 two converging groups of the vertical angle-tubes F, united in sections by end boxes C and G, are connected with a pair of horizontal steam and water chests A' and A at right angles thereto by connecting-tubes D', projecting endwise from the upper end boxes, flue-spaces being formed between the tubes F and the connecting-tubes D', as above described.

In the arrangement illustrated by Fig. 4 the vertical angle-tubes F are arranged in diverging groups, the individual tubes being united in sections by end boxes C and G, the sections intercommunicating with the water-space of a steam and water chest A through end pipes B'', and said water-tube sections and steam and water chest being parallel with each other. Flue-spaces are formed in this arrangement between the tubes F, as before, and between the respective groups of water-tubes and the sides of said steam and water chest by means of said pipes B''.

In Fig. 5 the vertical angle water-tubes F with their end boxes B and G and connecting-tubes D', the inlet-pipes J with their branches H, and the grates T with the baffle-plates U are constructed and arranged as in Figs. 1 and 2, being simply duplicated side by side, and X represents the boiler-shell, Y its uptake, and Z the steam-outlet, as in said Figs. 1 and 2. In the double boiler represented by said Fig. 5 the upper end boxes C communicate through the connecting-tubes D' with the water-spaces of the steam and water chests A and A' direct, as in Figs. 3 and 4, and the steam-spaces are connected with each other in a customary manner by a steam-outlet pipe Z common to all.

In all the arrangements the end boxes C and G, which are preferably in the form of square tubes arranged side by side and rendering the ends of their groups substantially closed as regards flue-spaces, are designed to be and are preferably provided with hand-holes (represented by their stoppers at D in Figs. 1 and 5) to provide for expanding the ends of the water-tubes within said end boxes and for withdrawing or plugging the individual tubes, and the branch pipes H of the inlet-pipes J are preferably provided individually with stop-cocks I, Figs. 1, 2, and 5, adapted to interlock with padlocked rods K, Fig. 2, so as to insure opening all the cocks before steam is raised. These features, however, form no part of my present invention, but are claimed and more fully set forth in my specification forming part of an applica-

tion for Letters Patent filed in the United States Patent Office the 10th of April, 1897, Serial No. 632,436.

Details which have not been described may be of known construction. A second steam and water chest may be added in Figs. 1 and 2, and other like modifications will suggest themselves to those skilled in the art.

Having thus described the said improvement, I claim as my invention and desire to patent under this specification—

1. The combination, in a water-tube steam-boiler, of groups of vertical angle-tubes united in sections by end boxes, at top and bottom, water-chests at top, tubular connections between the upper end boxes and said water-chests, inlet-pipes at bottom, tubular connections between said inlet-pipes and the lower end boxes, circulating-tubes connecting said inlet-pipes and water-chests, a horizontal steam and water chest at right angles to said water-chests and parallel with the front of the boiler, and tubular connections between the water-chests and the water-space of said steam and water chest, substantially as hereinbefore specified.

2. In a water-tube steam-boiler, the combination, substantially as hereinbefore specified, of vertical angle-tubes of uniform length united in sections by end boxes at top and bottom and arranged in groups with flue-spaces and baffle-plates between said tubes, said end boxes being arranged side by side and rendering the ends of the groups substantially closed as regards flue-spaces, horizontal steam or water chests at top, and tubular connections between the upper end boxes and said steam or water chests forming flue-spaces between the same at the sides of said chests.

3. A water-tube steam-boiler having uniform straight tubes arranged in two upwardly-converging groups and in parallel sections, end boxes in the form of square tubes at the top and bottom of each section, a horizontal inlet-pipe at the bottom for each group, branch pipes extending from said pipe into the adjacent ends of the lower end boxes individually, connecting-tubes extending endwise from the outer ends of the upper end boxes individually, a pair of steam or water chests into which said connecting-tubes open, and a connection between said chests, flue-spaces being formed between the tubes of both groups and also between said connecting-tubes, substantially as hereinbefore specified.

EUSTACE ERNEST WIGZELL.

Witnesses:

F. MEYER,  
W. NEWTON.