

No. 698,323.

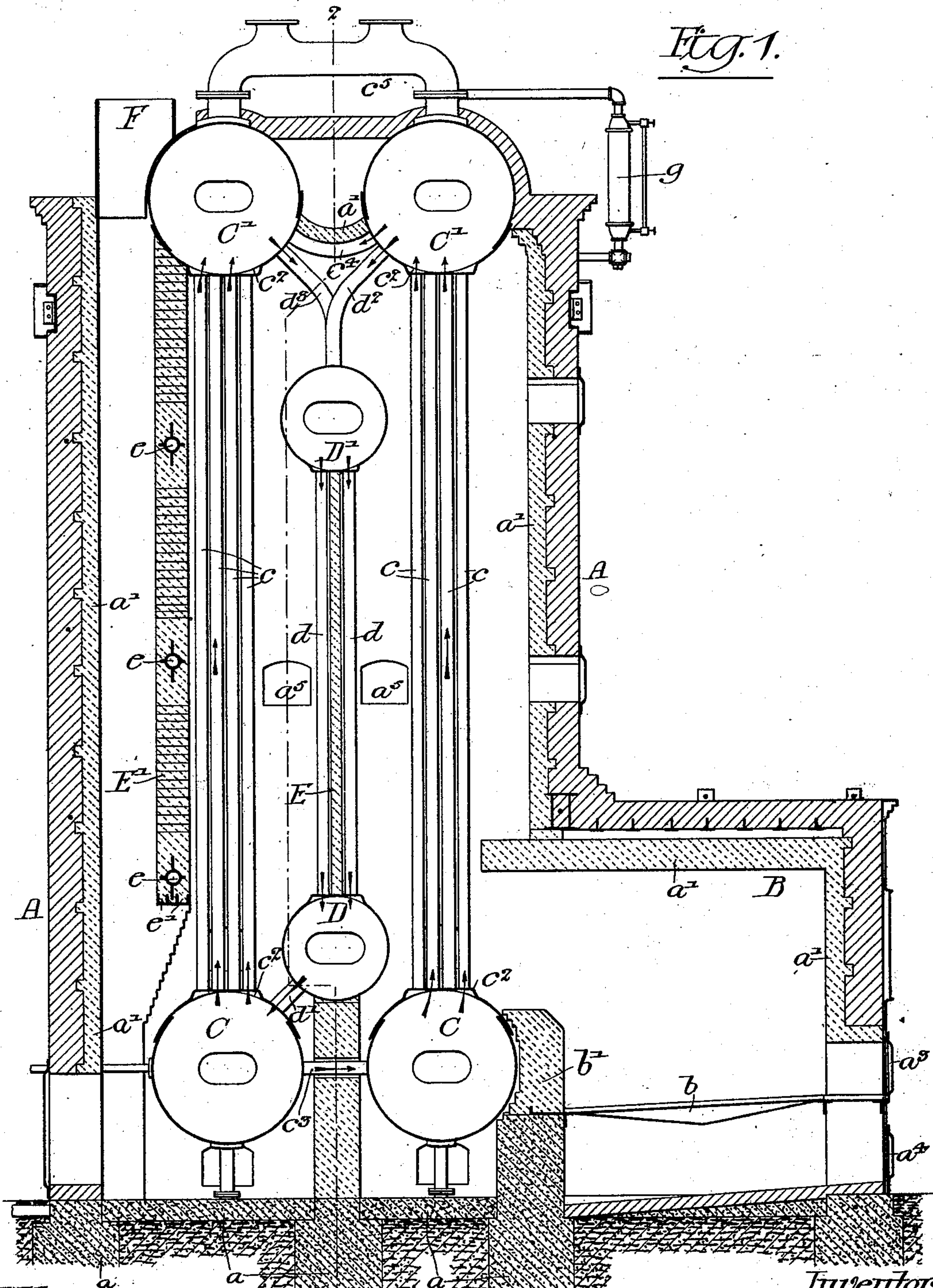
Patented Apr. 22, 1902.

E. G. RUST.
WATER TUBE BOILER.
(Application filed Nov. 14, 1901.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.



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Inventor
Edwin G. Rust,
by his Attorneys: *Howell & Howen*

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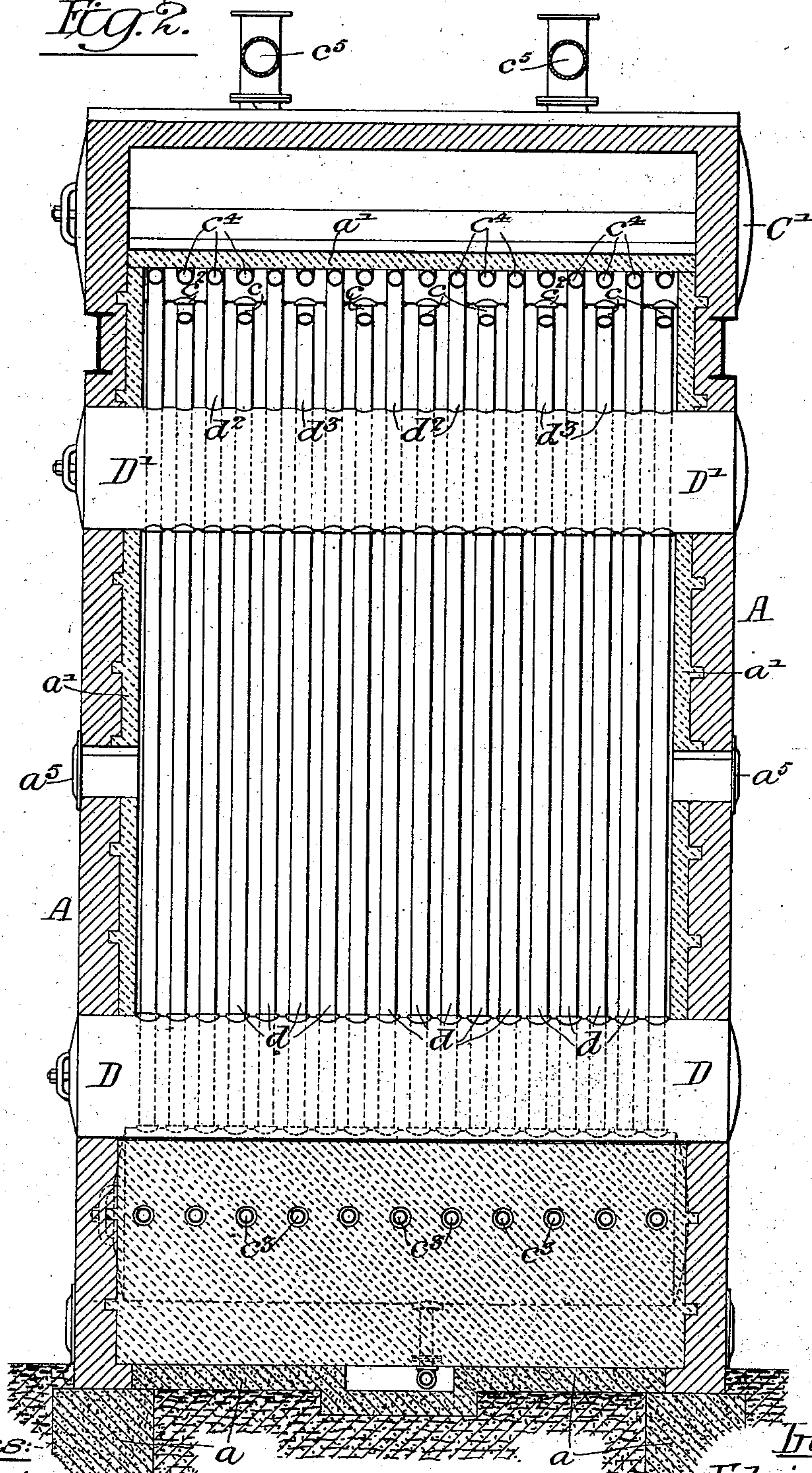
E. G. RUST.
WATER TUBE BOILER.

(Application filed Nov. 14, 1901.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

EDWIN GRAY RUST, OF PUEBLO, COLORADO.

WATER-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 698,323, dated April 22, 1902.

Application filed November 14, 1901. Serial No. 82,211. (No model.)

To all whom it may concern:

Be it known that I, EDWIN GRAY RUST, a citizen of the United States, residing in Pueblo, Colorado, have invented certain Improvements in Water-Tube Boilers, of which the following is a specification.

My invention relates to certain improvements in steam-boilers having for its object the provision of a water-tube boiler which while occupying a minimum of space shall have a relatively large heating-surface, at the same time being efficient in operation and of an inexpensive construction.

A further object is to utilize certain of the water drums and tubes for the support of one of the baffle-walls.

These objects I attain as hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical sectional view taken through the drums and furnace of my improved boiler; and Fig. 2 is a vertical sectional view taken on the line 2 2, Fig. 1.

In the above drawings, A is the boiler setting or casing, usually of brick, and supported in the present instance on concrete foundations *a*. This casing projects in front of the boiler proper to form the furnace B, this latter, together with the whole interior surface of the casing, being provided with a refractory lining *a'*. The grate is represented at *b*, and at its inner end is the bridge-wall *b'*.

Carried on any suitable framework around which the casing or setting is built are two drums C, and above these, at the top of the casing, are two others C' of similar construction, while water-tubes *c*, preferably all of the same length, extend between and connect the two pairs of drums, respectively. The tube-sheets of these drums are preferably of the construction set forth in my application for patent No. 81,420, filed November 7, 1901, each sheet being pressed out, so as to form a number of plane surfaces *c*², into each of which enter a series of the tubes *c*, each series consisting of four in the present instance.

The lower drums C are connected by a horizontal series of water-tubes *c*³, while the upper drums, owing to the requirements of water circulation, are connected by a series of curved tubes *c*⁴, in addition to which there

are two sets of steam-pipes *c*⁵, connecting said upper drums. Upon a wall of suitable refractory material extending between and somewhat above the two drums C is mounted a smaller drum D, while directly above this latter is a drum D', carried by the framework of the boiler at a level below the drums C'. The tube-sheets of these smaller drums are of a construction similar to that of the drums C and C', and they, like the larger pairs of drums, also are connected by a series of vertical tubes *d*. Each of the above series consists of two tubes spaced in the present instance about three inches apart, the space so formed being filled with a refractory wall or partition E, which extends across the boiler-casing and from the drum D to the drum D'.

The lower drum D is connected by a series of tubes *d'* to the drum C farthest from the furnace B, while two series of tubes *d*² and *d*³ extend from the upper portion of the drum D' to both of the drums C', the tubes of each series alternating with each other. These two drums D and D', with the refractory partition E between them, serve as a baffle-wall to direct the products of combustion from the furnace, so as to secure most efficient action, there being a second baffle-wall E', carried on hollow girders and channels *e* and *e'*, respectively, extending downwardly from the top of the boiler-casing just back of the rear drum C' and its tubes. The connection F to the stack is made between this latter drum and the rear wall of the casing.

The boiler is provided with the customary water-column *g*, and, besides the fire and ash doors *a*³ and *a*⁴, there are a number of doors *a*⁵ in the brick casing provided for the purpose of facilitating inspection and cleaning.

In operation the hot gases from the furnace pass out between the first set of tubes *c*, and after striking the tubes *d* on the front face of the baffle-wall E rise through the space between said wall and the front of the casing A, finally striking the bottoms of the upper drums C' and passing between the tubes *d*² and *d*³. From here the gases are directed down around the rear set of tubes *c*, between and around the drum D', with its back set of tubes *d* and the rear baffle-wall E'. Passing back between the rear set of tubes *c*, they

finally rise between the wall E' and the back wall of the casing to the stack F. Such a course of the products of combustion will give rise to a circulation of water in the boiler, as indicated by the arrows. Thus from Fig. 1 it will be seen that the water will rise through the front set of tubes c, and after entering the first drum C' will pass through to the tubes d' into the drum D' and down through the tubes d into the drum D. From here it flows through the tubes d' into the rear drum C and rises through the rear tubes c to the rear drum C'.

It will be noted that by the construction shown I am enabled to effectively utilize the space for heating-surface in which it was formerly customary to place a baffle-wall, at the same time employing the tubes in said space to support a relatively thin and light partition. In this manner I very materially increase the available heating-surface of the boiler without occupying any more space than is ordinarily taken by a boiler of much smaller capacity. By the use of the peculiar construction of tube-sheets I am enabled to use straight tubes all of the same length between each pair of drums, by this means reducing the cost of manufacture and making it possible to easily and quickly remove and replace any one of the tubes.

I claim as my invention—

1. The combination in a water-tube boiler, of two pairs of main drums having water-tubes extending between them, with a third pair of drums smaller in diameter than the main drums and placed parallel to them, said smaller drums also having tubes whereby they are connected and being above the lower and below the upper of said main drums, substantially as described.

2. The combination in a water-tube boiler of upper and lower main drums having tubes extending between them, with an auxiliary set of drums lying parallel to the main drums and also having tubes extending between them, said auxiliary set of drums being above the lower and below the upper of the main drums, substantially as described.

3. The combination in a water-tube boiler, of upper and lower main drums having tubes extending between them, with an auxiliary set of drums also having tubes connecting them and placed above the lower and below the upper of the main drums, said auxiliary set of drums being parallel with and connected to the main drums and of less capacity than the same, substantially as described.

4. In a water-tube boiler, the combination of two pairs of main drums, substantially vertical tubes connecting the members of each pair, a pair of auxiliary drums below the upper main drums and above the lower main drums, said auxiliary drums being parallel to

said main drums and also having substantially vertical tubes connecting them together, with a baffle-wall supported by the lower of said auxiliary drums, substantially as described.

5. In a water-tube boiler, the combination of two pairs of main drums, water-tubes connecting the members of each pair, a pair of auxiliary drums between said pairs of main drums, and also having water-tubes connecting them, said auxiliary drums being above the lower and below the upper of the main drums, and a baffle-wall supported by the lower auxiliary drum and extending between the tubes thereof to the upper auxiliary drum, substantially as described.

6. In a water-tube boiler, the combination of two pairs of main drums, water-tubes connecting the members of each pair, a pair of auxiliary drums between said pairs of main drums also having water-tubes connecting them, said auxiliary drums being above the lower and below the upper of the main drums and parallel to the same, and a baffle-wall supported by the lower auxiliary drum and extending between the tubes thereof to the upper auxiliary drum, said auxiliary drums being of a diameter less than the main drums and being connected thereto, substantially as described.

7. In a water-tube boiler the combination of two pairs of main drums, a series of water-tubes of equal length connecting the members of each pair, auxiliary drums parallel to and between said main drums, also having tubes of equal length connecting them, tubes connecting the lower of the auxiliary drums with the lower main drums, and tubes connecting the upper auxiliary drum with the upper main drums, substantially as described.

8. In a water-tube boiler, the combination of a furnace, upper and lower main drums having water-tubes connecting them, auxiliary drums of smaller volume between said main drums and also having tubes connecting them, with means for causing the hot gases from the furnace to rise vertically around the tubes of the front pair of main drums and after passing between the upper main drums and the upper auxiliary drums, to flow down between the tubes connecting the rear main drums and the tubes connecting the auxiliary drums, said means finally causing the gases to pass over the lower rear main drum and to enter a conduit connected to the stack, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWIN GRAY RUST.

Witnesses:

AXEL H. HELANDER,
JAMES F. CHAPMAN.