

No. 692,031.

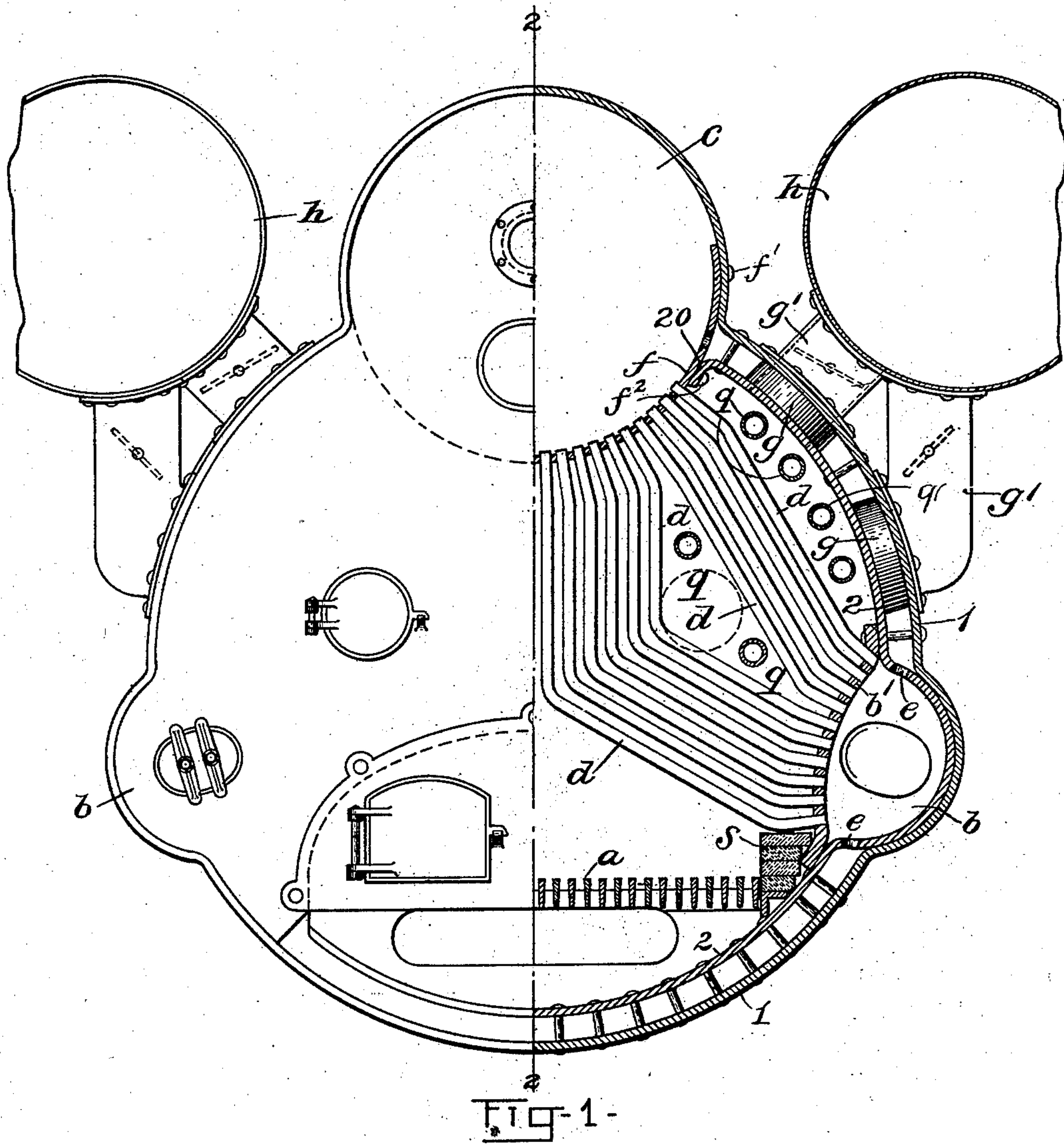
Patented Jan. 28, 1902.

G. H. RHEUTAN.
STEAM GENERATOR.

(Application filed July 16, 1901.)

(No Model.)

6 Sheets—Sheet 1.



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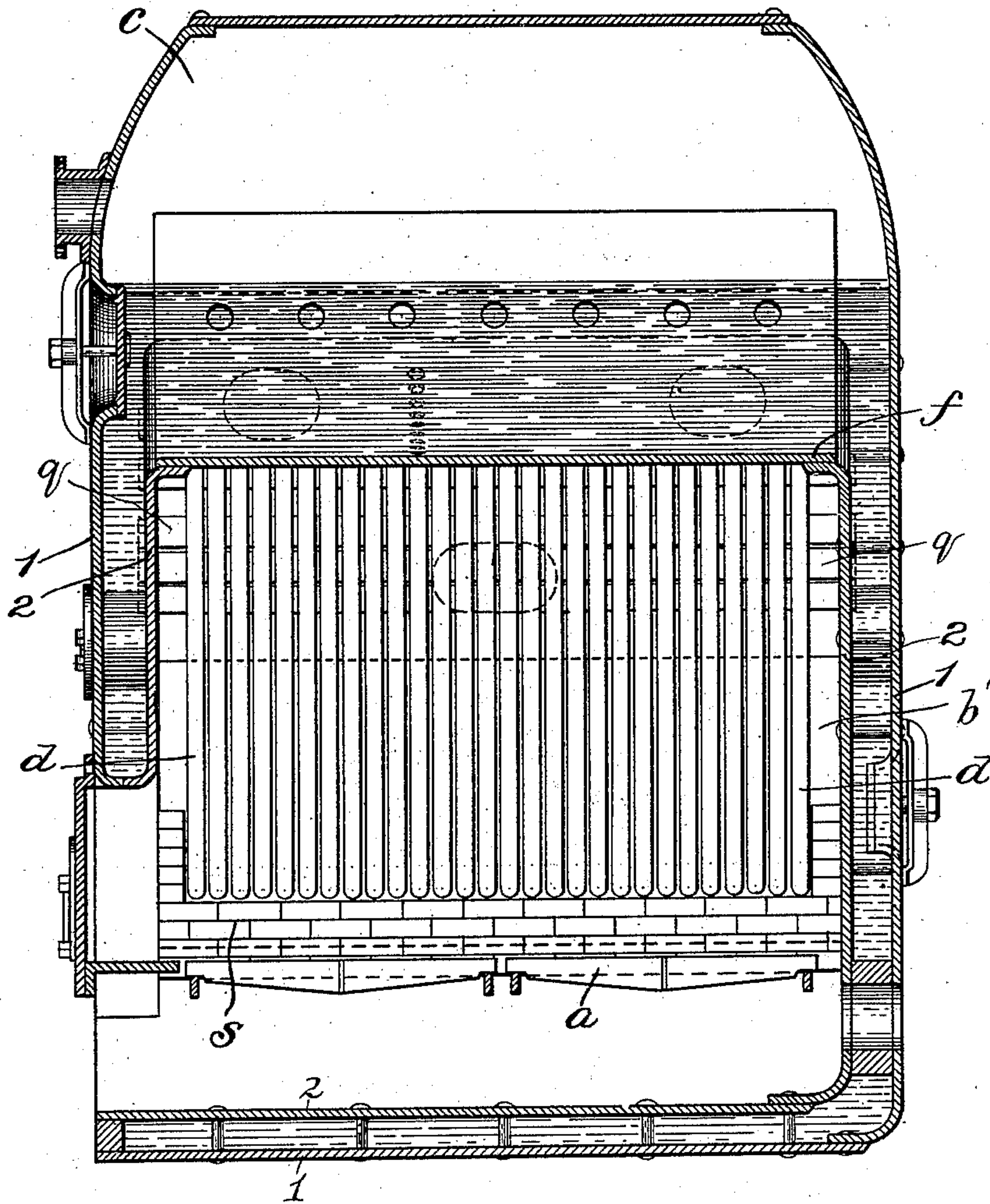


FIG-2-

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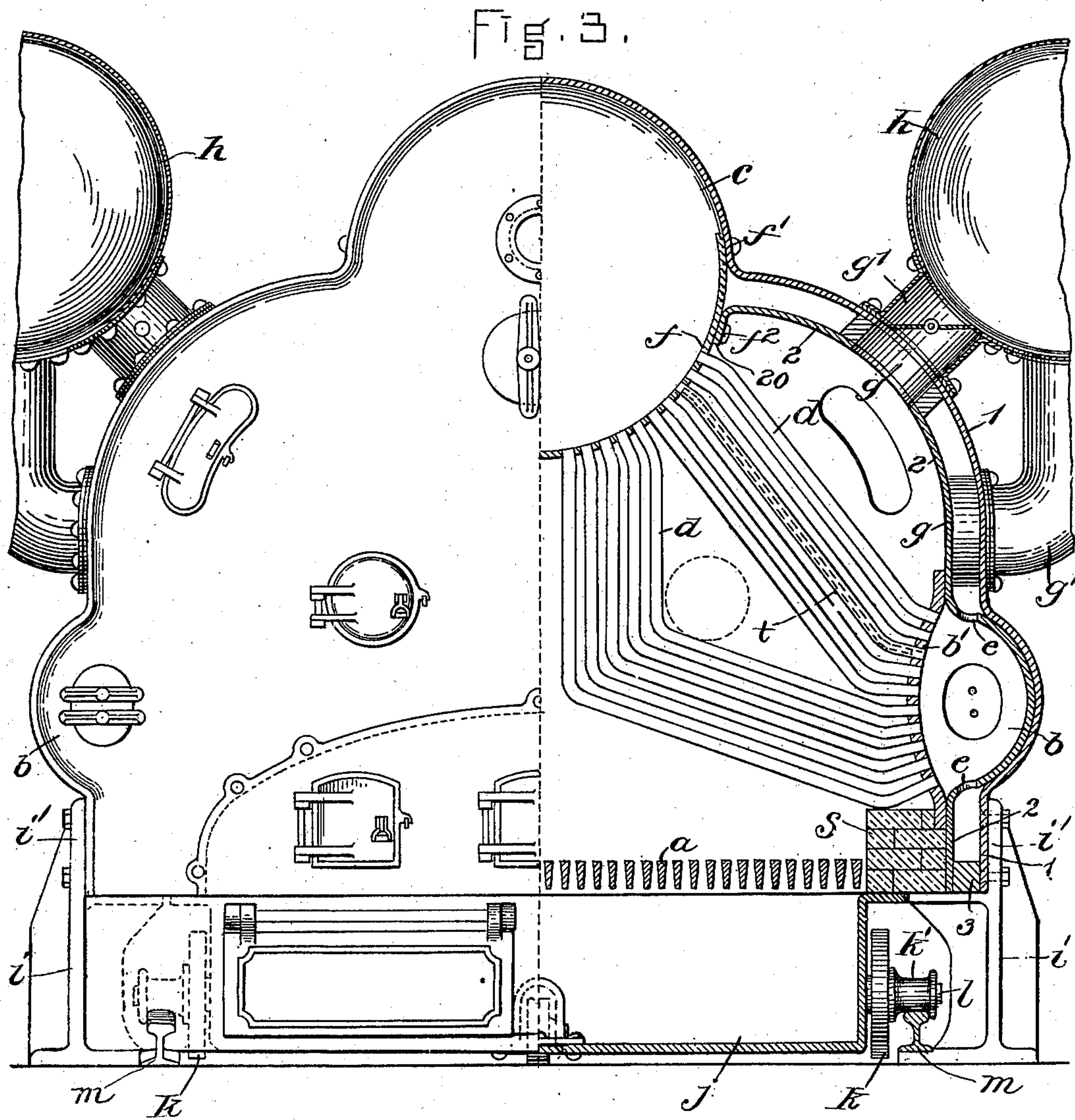
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G. H. RHEUTAN.
STEAM GENERATOR.

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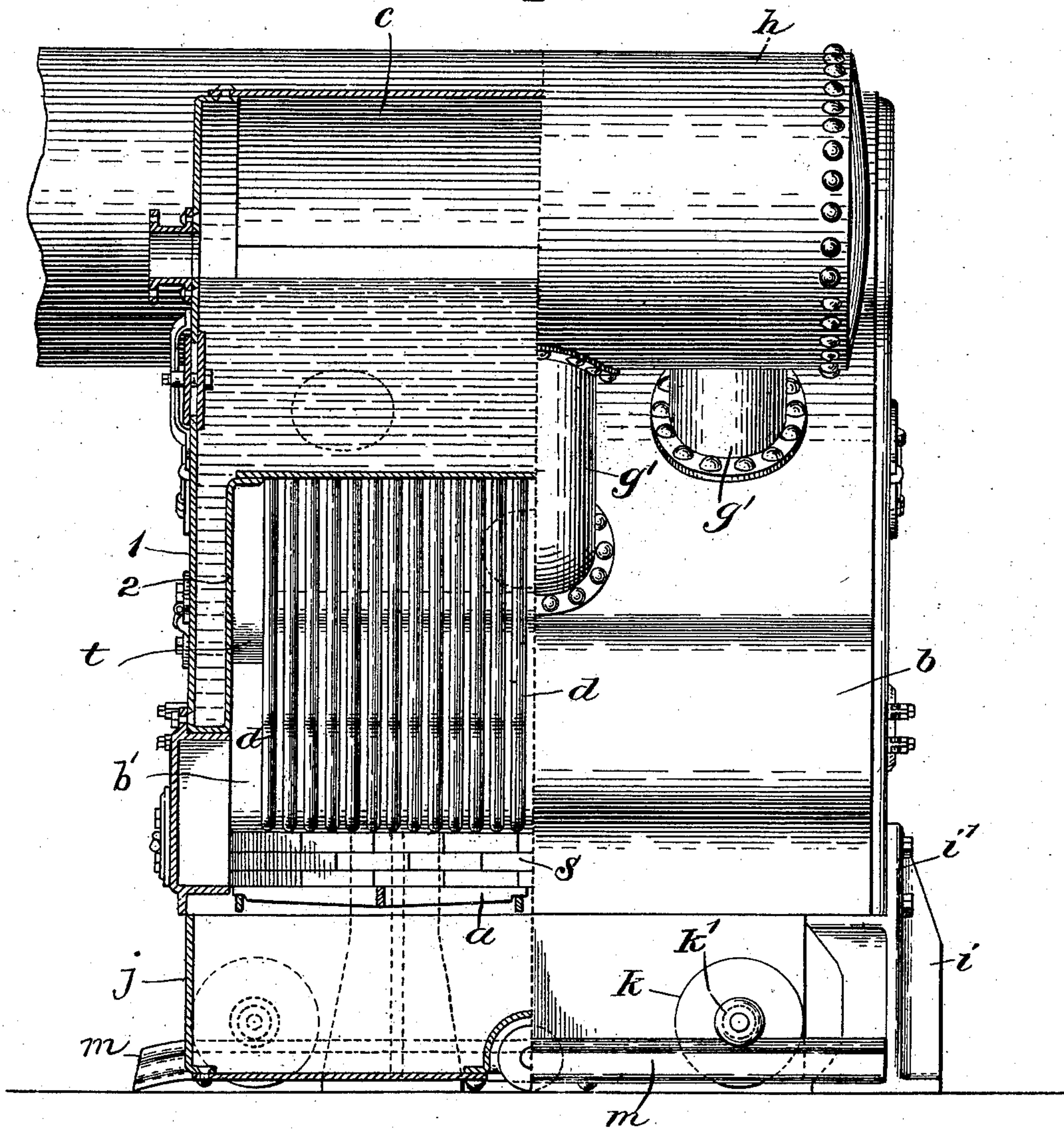
G. H. RHEUTAN.
STEAM GENERATOR.

(Application filed July 16, 1901.)

(No Model.)

6 Sheets—Sheet 4.

Fig 4-



WITNESSES.

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No. 692,031.

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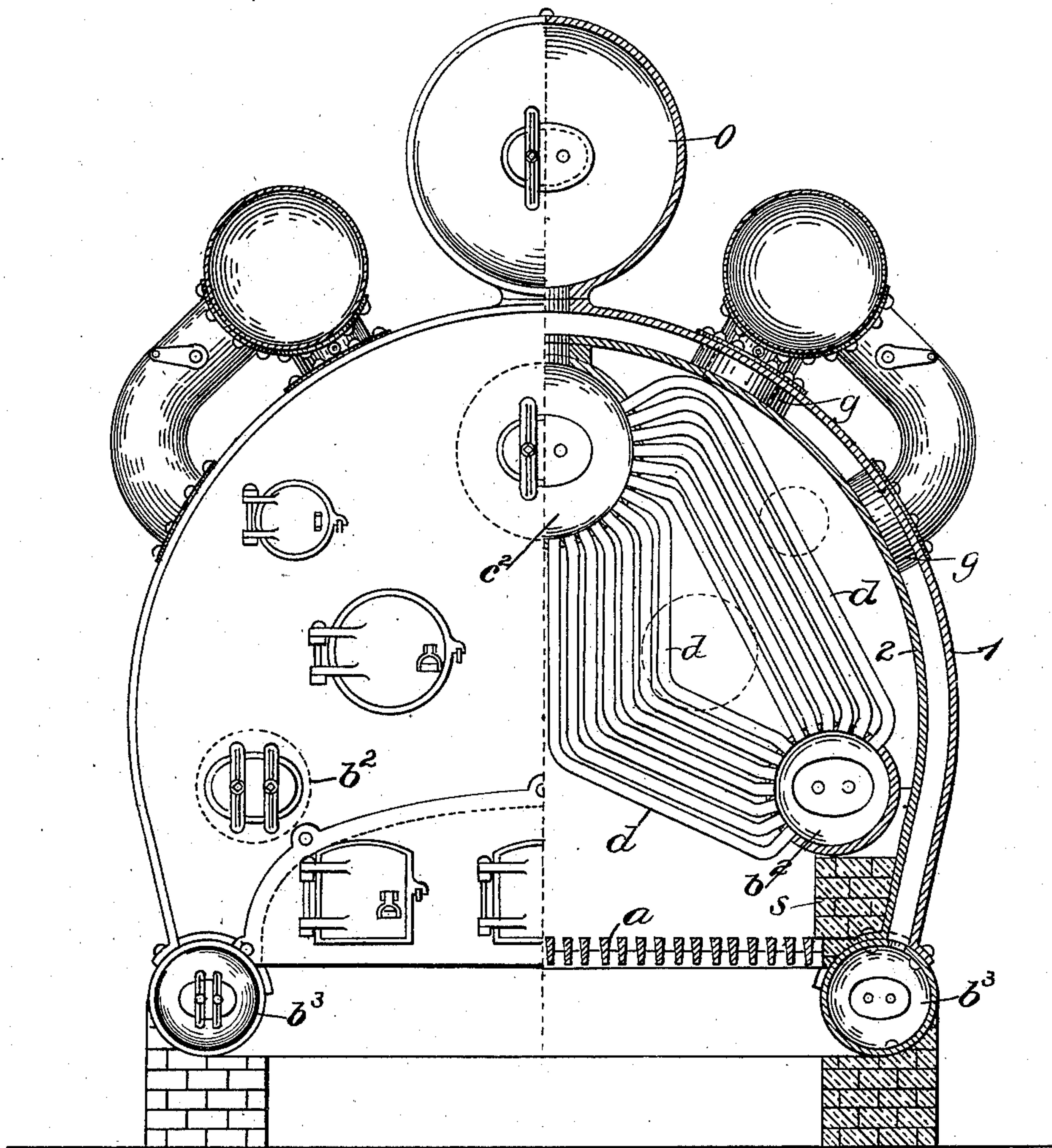
G. H. RHEUTAN.
STEAM GENERATOR.

(Application filed July 16, 1901.)

(No Model.)

6 Sheets—Sheet 5.

Fig. 5.



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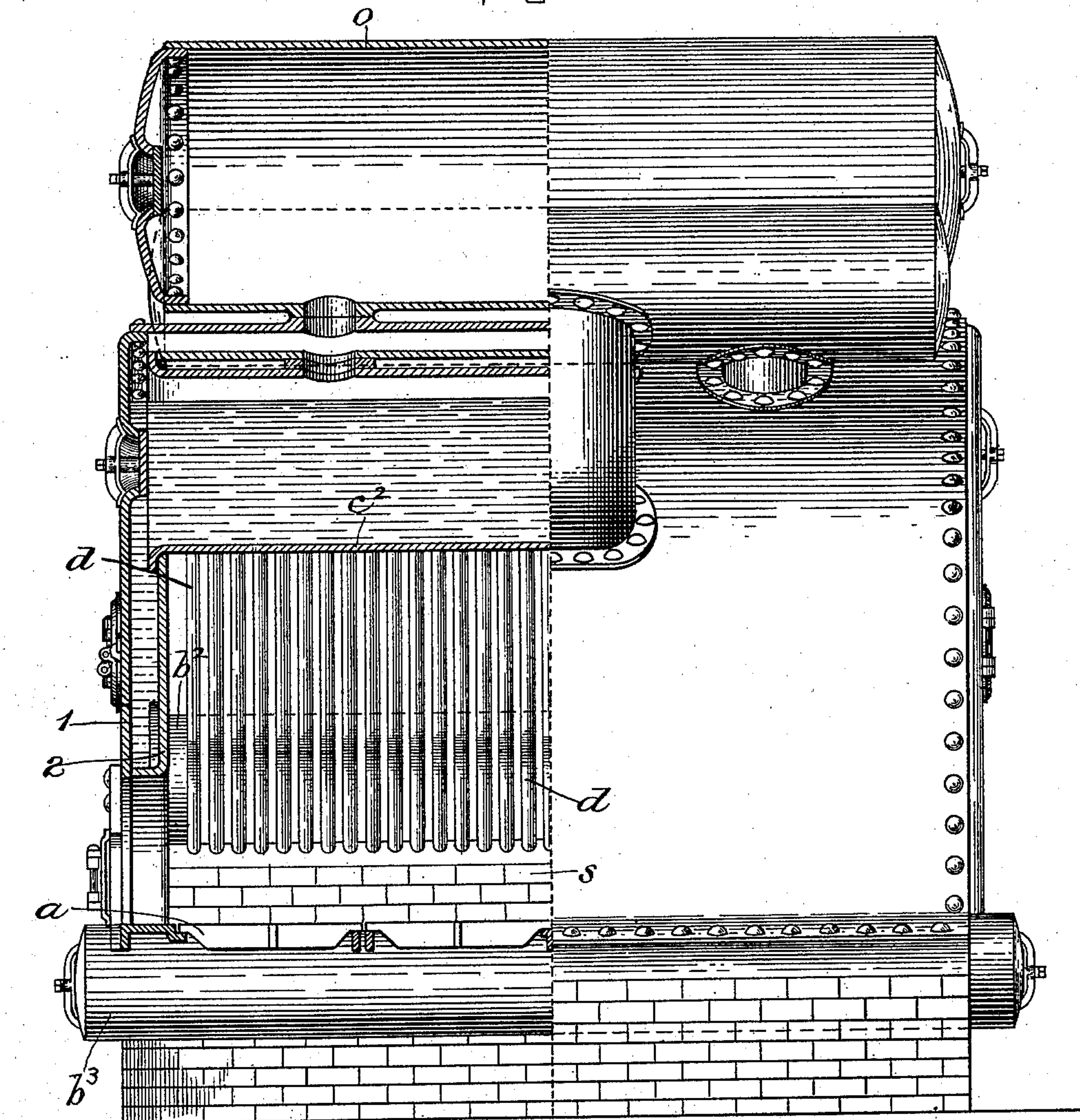
G. H. RHEUTAN.
STEAM GENERATOR.

(Application filed July 16, 1901.)

(No Model.)

6 Sheets—Sheet 6.

Fig. 6.



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UNITED STATES PATENT OFFICE.

GARRETT HERRING RHEUTAN, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR
OF ONE-HALF TO R. B. LINCOLN, OF WALTHAM, MASSACHUSETTS.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 692,031, dated January 28, 1902

Application filed July 16, 1901. Serial No. 68,507. (No model.)

To all whom it may concern:

Be it known that I, GARRETT HERRING RHEUTAN, of San Francisco, in the county of San Francisco and State of California, have
5 invented certain new and useful Improvements in Steam-Generators, of which the following is a specification.

This invention has for its object to provide
a boiler or steam-generator adapted particularly for marine use, but not necessarily confined thereto, which shall combine the rapid
10 steaming qualities of the water-tube boiler with the safety and durability of the less-complicated Scotch type of boiler in extensive
15 use.

The invention consists in the improvements which I will now proceed to describe and claim.

Of the accompanying drawings, forming a
20 part of this specification, Figure 1 represents a partial end elevation and partial transverse section of a steam-generator embodying my invention. Fig. 2 represents a section on line 2 2 of Fig. 1. Fig. 3 represents a partial end
25 elevation and partial transverse section of another embodiment of my invention. Fig. 4 represents a partial side elevation and partial longitudinal section of the embodiment shown in Fig. 3. Figs. 5 and 6 are views corresponding, respectively, with Figs. 3 and 4
30 and illustrating another embodiment or my invention.

The same reference characters indicate the same parts in all the figures.

35 In the drawings, *a* represents the furnace-grate. The fire-space over the grate is inclosed by an external boiler portion formed as a casing having an outer wall 1 and an inner wall 2, between which is a water-space.
40 Said casing covers the ends and sides of the fire-space and extends across the top of the same and presents a large area of heat-absorbing and steam-generating surface to the fire-space, besides confining the products of
45 combustion around the inner water-tube portion of the boiler, hereinafter described.

The form and construction of the external boiler portion may be variously modified, and I have shown in the drawings three forms of
50 construction embodying my invention.

In the embodiment of my invention shown

in Figs. 1 and 2 the external boiler portion is widened or enlarged at its side portions just above the level of the grate to form water-
drums *b b* and is also widened or enlarged at
55 its central portion over the center of the grate to form a steam-drum *c*. The walls 1 and 2 of the external boiler portion are curved outwardly and nested together to form the outer walls of the water-drums *b*, and the inner
60 walls of said drums are formed by tube-sheets *b'*, which are riveted at their edges to the inner wall 2 and are of crowning form or of relatively slight curvature, so that the tubes *d* of the inner water-tube portion of the boiler can
65 be conveniently inserted at their lower ends in said sheets. The ends of the water-drums communicate with the ends of the external boiler portion, and the upper and lower portions of the water-drums communicate with
70 the water-spaces above and below the water-drums through orifices *e e*, formed in the inner wall 2. This construction of the water-drums insures great strength and stiffness and freedom from liability to distortion and
75 displacement of parts. The outer wall 1 of the external boiler portion is curved outwardly to form the outer wall of the steam-drum, and the inner wall of said drum is formed by a tube-sheet *f*, which
80 is of substantially semicircular form and extends across the space between the inner and outer walls 1 2 and is riveted at *f'* to the outer wall of the steam-drum and at *f''* to flanges 20, formed on the inner wall 2. The
85 upper ends of the tubes *d* are inserted in the tube-sheet *f*, which is securely held by its connection with the outer and inner walls 1 and 2, the tube-sheet in turn holding the outwardly-curved portion of the outer wall 1 in
90 place as the outer wall of the steam-drum. The tubes *d* of the internal water-tube boiler are inclined inwardly and upwardly from the water-drums *b* to the steam-drum *c* and are preferably bent, as indicated in Fig. 1, each
95 tube having one or more bends, whereby it is permitted to move laterally when expanding or contracting, so that excessive strain on the tube-sheets to which the ends of the tubes are attached is prevented. The tubes *d* are
100 interposed between the grate and the sides of the external boiler portion between the wa-

ter-drums and the steam-drum. Said sides are provided with suitable outlets *g g* for the products of combustion, said outlets extending through the water-space of the external boiler portion and being connected by pipes *g' g'* with trunks or flues *h*, which may communicate with the base of a smoke-stack. (Not shown.) The arrangement of the outlets *g* is such that the products of combustion necessarily pass through the spaces between the tubes *d* on their way to the outlets. It will be seen that the external boiler portion confines the products of combustion around the tubes *d* of the water-tube portion and regulates the passage of the said products through the spaces between the tubes. The inner wall 2 of the outer boiler portion adds to the large area of heat-absorbing surface of the generator and is protected by the water and steam spaces between the inner and outer walls, so that safety and durability are insured and the heat is economized. The parts of the external boiler portion between the lower rows of tubes *d* and the level of the grate are protected from the fire in this as well as in the other embodiments of my invention hereinafter described by walls *s* of fire-brick. The form and arrangement of the tube-sheets *b'* and *f* is such that the tubes *d* can be inserted and removed at any point on said sheets by a workman stationed within the furnace. The outer and inner walls 1 and 2 are here shown as extended from one water-drum to the other under the grate, thus forming a water-bottom.

In Figs. 3 and 4 I show an embodiment of my invention in which the external boiler portion is extended as a water-leg only a short distance below the water-drums. The said water-leg is formed by the lower portions of the walls 1 2 and filling strips or bars 3 interposed between the said walls and bolted or riveted thereto. It will be seen that the water-leg, extending below the water-drums *b b*, constitutes a truss or girder-like support for the water-drums, preventing any spreading or distortion of the walls of said drums. The said water-leg is supported by standards or brackets *i*, having flanges *i'* bearing against the outer sides of the water-leg. These brackets are rigidly secured, and they collectively constitute a support which holds the boiler securely in place. *j* represents an ash-pan having wheels *k*, journaled on arms *l*, affixed to the sides of the pan. The hubs of the wheels *k* are elongated and form rollers *k'*, which when the ash-pan is in place bear on fixed track-rails *m*. Said rails are elevated, so that when the rollers *k'* rest on them the wheels *k* are raised slightly from the floor. The outer ends of the tracks *m* are curved downwardly, as shown in Fig. 4, and when the rollers run off from these curved ends the wheels *k* drop onto the floor of the boiler-room. The track-rails *m* are supported by the brackets *i* at opposite sides of the space under the grate. It will be seen that the

rails *m* and rollers *k'* constitute the entire support for the ash-pan when the latter is in place, so that there is no occasion for a floor or other support under the ash-pan. A large opening may therefore be made in the boiler-room floor under the grate, so that the structure and hull of the vessel may be conveniently inspected.

Figs. 5 and 6 show a modification in which the water and steam drums *b² b²* and *c²* instead of being formed as enlargements or integral parts of the external boiler portion are formed independently of the walls 1 2 of the external boiler portion and are suitably connected with the space between said walls. An additional steam drum or dome *o* is provided above the outer boiler portion, and mud-drums *p p* are provided at the lower edges of the sides of the outer boiler portion.

In each of the embodiments of my invention here shown and described the outer and inner walls 1 2 are connected and supported by suitable stay-bolts, suitable clean-out openings are provided for the fire-space, and suitable manholes to give access to the water and steam drums.

In Figs. 1 and 2 I show longitudinal tubes *q q* extending from the front to the rear end of the external boiler portion at right angles with the tubes *d*, said tubes *q* occupying portions of the fire-space which are left vacant by the illustrated arrangement of the tubes *d*.

Baffle-plates *t* (shown in Fig. 4 and by dotted lines in Fig. 3) may be secured to the inner walls of the ends of the external boiler portion, said plates being formed to fill the spaces between said ends and the tubes *d* adjacent to the said ends. These baffle-plates prevent the products of combustion from passing too freely between the ends of the rows of tubes *d* and the ends of the external boiler portion.

I claim—

1. A steam-generator comprising a grate, an external boiler portion formed as a casing inclosing a fire-space over the grate, the sides of the external boiler portion being widened to form water-drums extending longitudinally of the boiler, and an internal water-tube boiler composed of tubes extending inwardly and upwardly from said water-drums to the steam-space of the external boiler portion, the tubes being within said fire-space.

2. A steam-generator comprising a grate, an external boiler portion formed as a casing inclosing a fire-space over the grate, the steam-space of the external boiler portion being widened to form a longitudinally-extending steam-drum, and an internal water-tube boiler portion composed of tubes extending inwardly and upwardly from opposite sides of the grate and communicating at their lower ends with the water-space of the external boiler portion and at their upper ends with said steam-drum, the tubes being within the said fire-space.

3. A steam-generator comprising a grate, an

external boiler portion formed as a casing inclosing a fire-space over the grate, the sides of the external boiler portion being widened to form longitudinally - extending water-
 5 drums, while the upper central steam-space of the external boiler portion is widened to form a longitudinally-extending steam-drum, and inclined tubes connected at their lower ends with the water-drums and at their up-
 10 per ends with the steam-drum, the said tubes constituting an internal water-tube boiler portion located within the fire-space.

4. A steam-generator comprising an external boiler portion formed as a casing inclosing
 15 a fire-space and having its sides widened to form water-drums, the inner sides of said drums being of crowning form, and inclined tubes inserted at their lower ends in said crowning inner sides and connecting said wa-
 20 ter-drums with the steam-space of the external boiler portion, the tubes constituting an internal water-tube boiler portion located in said fire-space.

5. A steam-generator comprising an external boiler portion formed as a casing inclosing
 25 a fire-space and having its walls curved outwardly and nested together along its lower sides to form the outer walls of water-drums, and crowning tube-sheets affixed to the inner
 30 wall of the external boiler portion and forming the inner walls of said water-drums, and inclined tubes inserted at their lower ends in said tube-sheets and connecting said drums with the steam-space of the external boiler
 35 portion, the tubes being within the fire-space.

6. A steam-generator comprising an external boiler portion formed as a casing inclosing a fire-space and having its outer wall curved outwardly to form the outer wall of a
 40 longitudinally-extending steam-drum, and its inner wall curved inwardly to form the inner wall of said steam-drum, and inclined tubes inserted at their upper ends in the inner wall of the steam-drum and connecting said steam-
 45 drum with the water-space of the external boiler portion.

7. A steam-generator comprising an external boiler portion formed as a casing inclosing a fire-space and having its outer wall curved outwardly to form the outer wall of a
 50 longitudinally-extending steam-drum, the inner wall of the external boiler portion being composed in part of a tube-sheet forming the inner wall of said steam-drum, the edges of
 55 said tube-sheet being attached to the outer walls of the external boiler portion, and inclined tubes inserted at their upper ends in the said tube-sheet and connecting the steam-drum with the water-space of the external
 60 boiler portion.

8. A steam-generator comprising a grate,

an external boiler portion formed as a casing inclosing a fire-space over the grate, said portion having outlets for the products of com-
 65 bustion, and an internal water-tube boiler portion composed of inclined tubes extending inwardly and upwardly from opposite sides of the grate and communicating at their lower ends with the side water-spaces of the
 70 external boiler portion and at their upper ends with the steam-space thereof, said tubes being interposed between the grate and the said outlets, whereby the products of combustion are caused to pass between the tubes on
 75 their way to said outlets.

9. A steam-generator comprising a grate, an outer jacket-shaped steam-generating portion inclosing a fire-space over the grate, an
 80 inner water-tube portion located within said space, and longitudinal water-tubes extending from the front to the rear ends of the jacket portion substantially at right angles with the tubes of the water-tube portion, said
 85 longitudinal tubes being located between the inner tubes of said water-tube portion and the jacket portion.

10. A steam-generator comprising an external boiler portion formed as a casing inclosing a fire-space and having its sides widened to form water-drums of crowning form at
 90 their inner sides, the said external portion being extended below said drums to form a water-leg which acts as a truss or girder to prevent the spreading or distortion of said drums, and inclined tubes inserted at their
 95 lower ends in said crowning inner sides and connecting said water-drums with the steam-space of the external boiler portion.

11. A steam-generator comprising a grate, an external boiler portion formed as a casing
 100 inclosing a fire-space over the grate, said portion having outlets for the products of combustion, an internal water-tube boiler portion composed of inclined tubes extending inwardly and upwardly from opposite sides of
 105 the grate and communicating at their lower ends with the side water-spaces of the external boiler portion and at their upper ends with the steam-space thereof, said tubes being interposed between the grate and the said
 110 outlets, whereby the products of combustion are caused to pass between the tubes on their way to said outlets, and baffle-plates closing the spaces between the ends of the external boiler portion and the ends of the water-tube
 115 portion.

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

GARRETT HERRING RHEUTAN.

Witnesses:

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 E. BATCHELDER.