

No. 684,853.

Patented Oct. 22, 1901.

O. D. ORVIS.

STEAM BOILER FURNACE.

(Application filed June 29, 1900. Renewed Mar. 22, 1901.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 2.

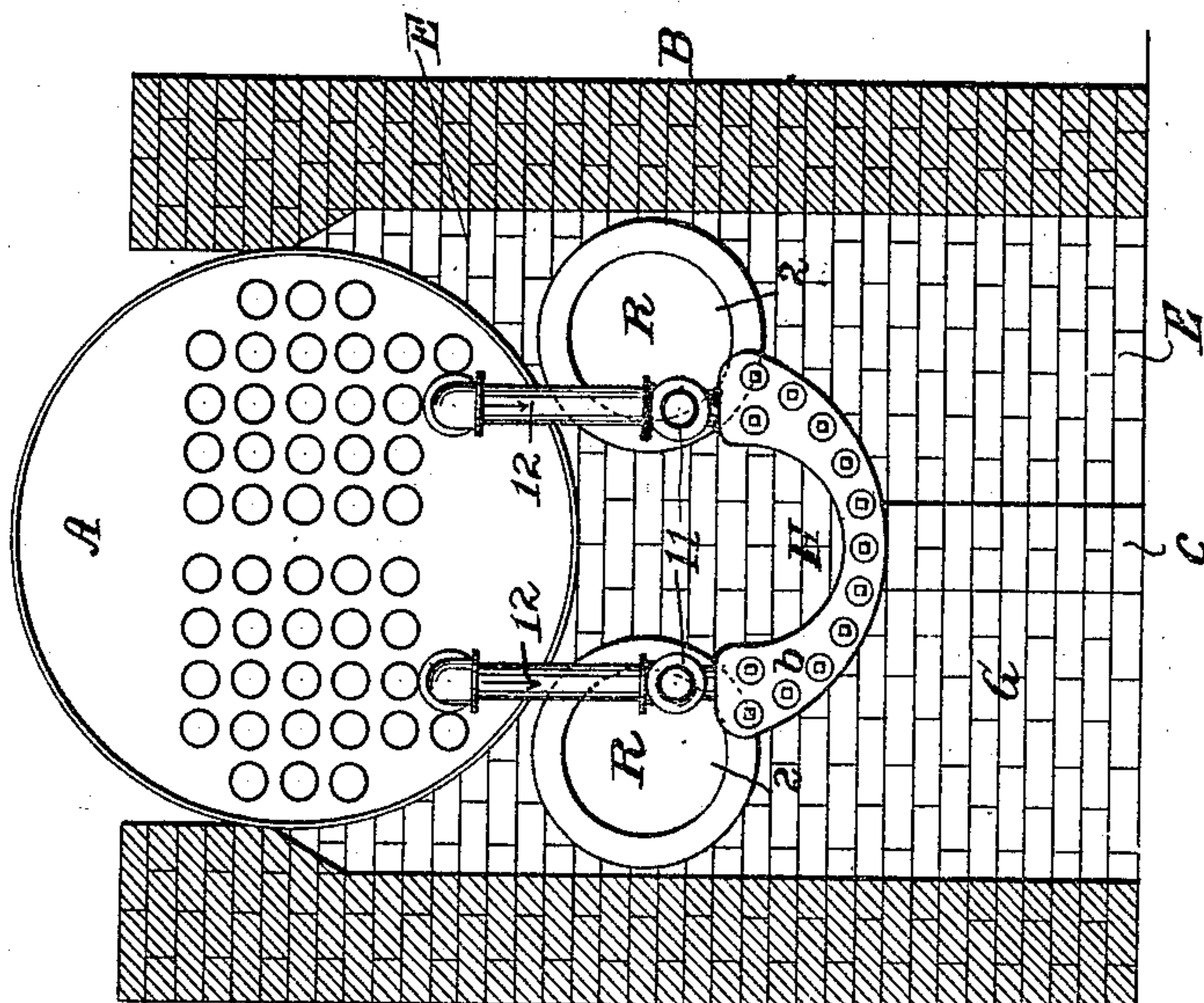
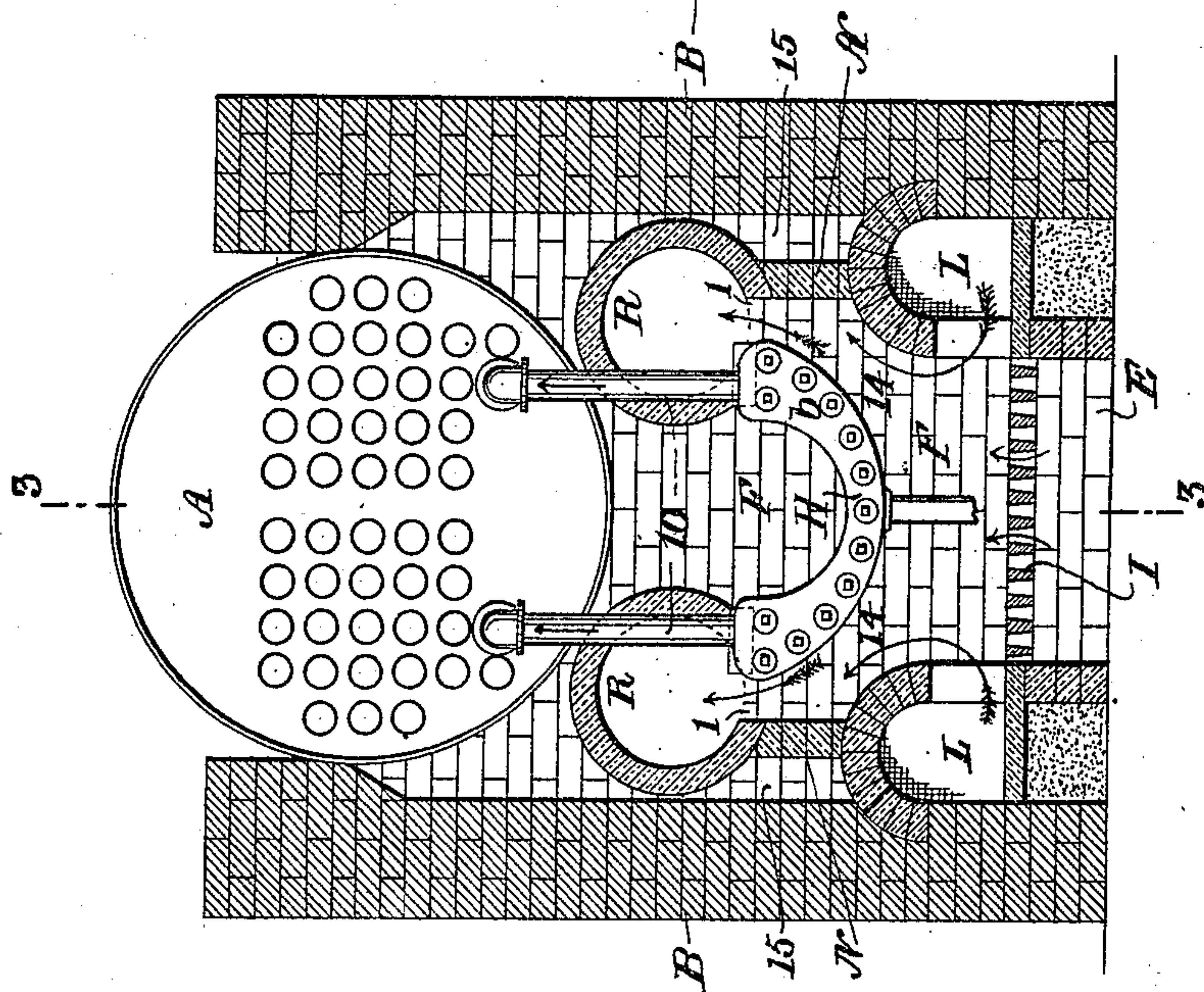


Fig. 1.



WITNESSES:

G. W. Eisnerbaum
C. P. Hendrickson

INVENTOR:

Orel D. Orvis

BY

A. K. Burdick
ATTORNEY.

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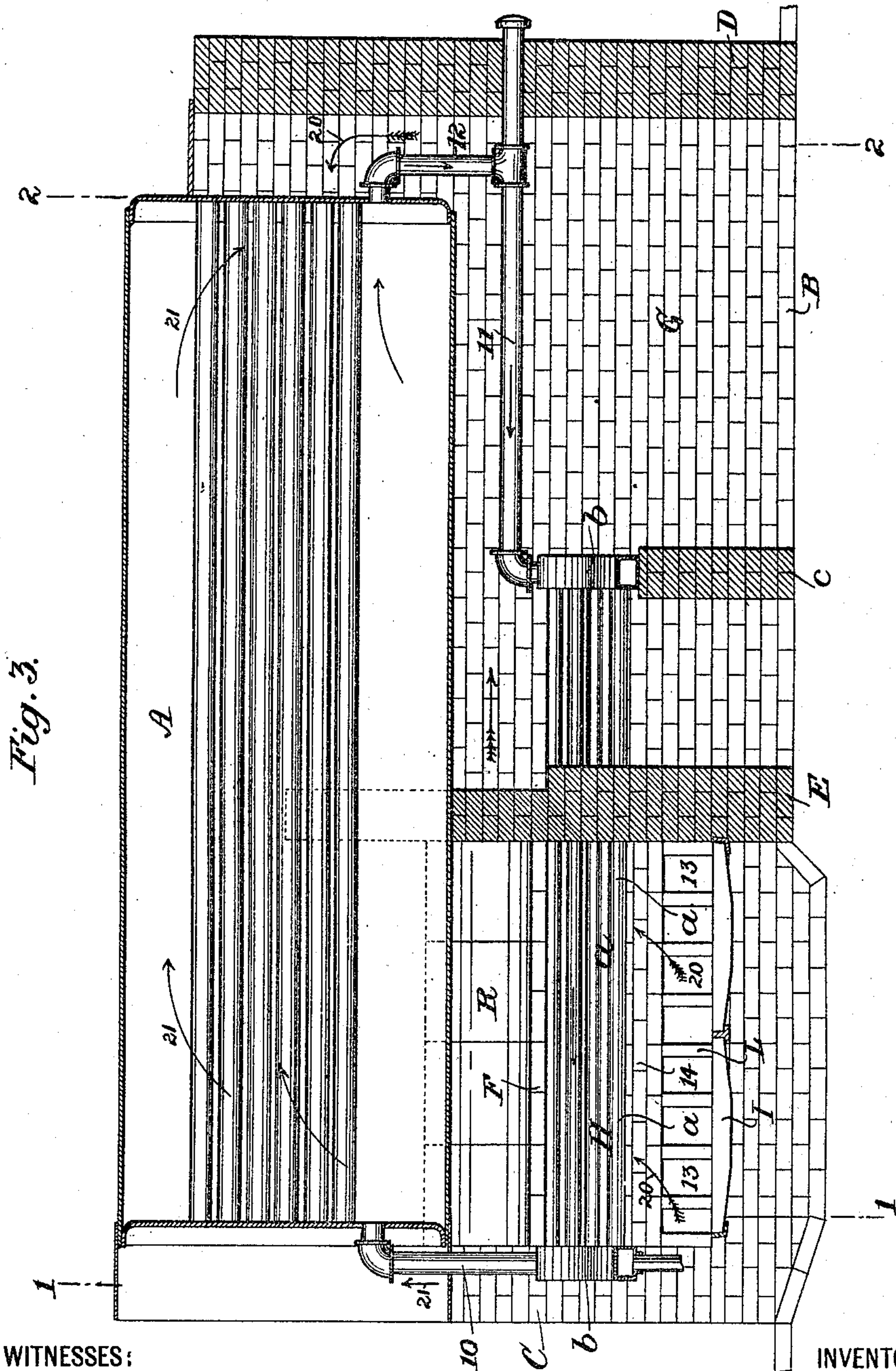
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WITNESSES:

Geo W Eisentrany
C. P. Hendrickson.

INVENTOR :

Orel H. Orvis

BY

BY *Arthur du Bourg*
ATTORNEY.

UNITED STATES PATENT OFFICE.

OREL D. ORVIS, OF NEW YORK, N. Y., ASSIGNOR OF FIFTY-ONE ONE-HUNDREDTHS TO WILLIAM L. WILKENS, OF SAME PLACE.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 684,853, dated October 22, 1901.

Application filed June 29, 1900. Renewed March 22, 1901. Serial No. 52,436. (No model.)

To all whom it may concern:

Be it known that I, OREL D. ORVIS, a citizen of the United States of America, residing at Manhattan borough, New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Steam-Boiler Furnaces, of which the following is a specification.

My invention has reference to improvements in that class of furnaces employing both a downdraft and an updraft and having two sets of grate-bars, of which the upper set is the water-grate, connected by suitable water-tubes with the boiler, and the lower set is adapted especially to receive the droppings of unconsumed fuel from the upper set of grate-bars.

The object of my invention is to provide a furnace for the generation of steam or for other purposes in which the gases resulting from the distillation and partial combustion of the solid fuel are consumed at a high even temperature and to further increase the efficiency by intermingling vapors or gases distilled from a separate mass of fuel with the burning gases issuing from the main body of the fuel.

With this object in view my invention consists, essentially, in a downdraft boiler-furnace provided with a dead wall forming, with the side and front walls, a confined fire-chamber; retorts located beneath the boiler adjacent to the side walls of the furnace and having longitudinal openings at their bottoms for the entrance of the products of combustion, said retorts communicating with the combustion-chamber at their rear ends; an upper trough-shaped grate located between the retorts and supporting the latter; a lower grate adapted to receive the droppings from the upper grate, and coking-chambers located adjacent to and on opposite sides of the lower grate and having lateral openings facing the said grate.

The nature of my invention will best be understood when described in connection with the accompanying drawings, in which—

Figure 1 represents a transverse vertical section on the line 1 1, Fig. 3. Fig. 2 is a similar section on the line 2 2, Fig. 3. Fig. 3

is a longitudinal vertical section on the line 3 3, Fig. 1.

Similar letters and numerals of reference designate corresponding parts throughout the several views of the drawings.

In the accompanying drawings I have shown my improvements applied to an ordinary return tubular boiler having the usual setting, consisting of the side walls B B, the front wall C, and the rear wall D, although it must be understood that my improvements may be applied to boilers of other constructions or to combined downdraft and updraft furnaces adapted for other purposes. In place of the usual bridge-wall, which permits the passage of the products of combustion over its top, I substitute a dead wall E, which extends completely across the furnace and is made high enough to entirely close off the fire-chamber F from the combustion-chamber G. In the fire-chamber F and a short distance below the adjacent portion of the boiler A are located two retorts R R, made of suitable refractory material and preferably arranged adjacent to the side walls B B of the furnace. The said retorts extend in the longitudinal direction of the furnace, starting from the back of the front wall and passing through the dead wall E and are provided at their bottoms with comparatively narrow openings 1, extending throughout their entire length, for the entrance of the products of combustion. The rear ends of the retorts are open, as at 2, for the passage of the products of combustion into the usual combustion-chamber G, back of the dead wall E, while their front ends are closed, although apertures may be provided at this end for the admission of air into said retorts.

In the fire-chamber F is located the upper water-grate H, consisting of a series of tubular grate-bars *a*, connected by suitable headers *b*. The front header *b* is connected by pipes 10 and fittings with the front of the boiler, while the rear header, which is preferably located within the combustion-chamber G and supported by a suitable pillar *c*, is connected by pipes 11 and 12 and fittings with the rear of the boiler. Below the water-grate H is located a second grate I, which is adapted to re-

ceive the droppings of unconsumed fuel from the upper grate. On opposite sides and adjacent to the grate I are arranged coking-chambers L, having suitably-arched tops, while the sides thereof adjacent to and facing the grate I are provided with apertures 13. The said coking-chambers extend substantially throughout the length of the fire-chamber F and are partially filled with the fuel, such as anthracite or bituminous coal, which is consequently subjected to the heat within the fire-chamber and is gradually distilled, and the ensuing vapors or gases mingle with the products of combustion passing downwardly and outwardly from the grate H. The retorts R R are preferably located in close proximity to the upper bars of the grate H and supported between the front wall of the boiler and the dead wall E by said bars and walls N, built up on the arches of the coking-chambers L. Air is admitted to the fire-chamber from above the upper grate and from below the lower grate through suitable doors, as usual.

The supporting-walls N for the retorts are located at a distance from the side walls of the furnace and extend from the front wall of the furnace to the dead wall E, thus forming air-spaces 15 at the sides of the fire-chamber F and reducing the quantity of heat lost by radiation at the side walls. The upper grate H is made trough-shaped for the reception of the fuel, and the arched tops of the coking-chambers L and the supporting-walls N form with said grate contracted channels 14, in which the upwardly-passing products of combustion from the fuel on the grate H and the vapors from the coking-chambers L mix and are then drawn through the retorts.

The more or less consumed gases issuing from the rear end of the retorts enter the combustion-chamber G in close proximity to the bottom of the boiler and on leaving said combustion-chamber pass through the boiler-tubes and are led to the chimney from the front of the boiler to the uptake and usual draft connections, all as indicated by arrows 20. The circulation of the water is as indicated by arrows 21.

It will be readily understood that by the admixture of the distilled vapors from the coking-chambers with the gases resulting from the distillation and combustion of the solid fuel a more complete combustion is effected and the quantity of air necessary for combustion is reduced, thus avoiding the usual lowering of the temperature.

In practice I prefer to make the trough-shaped upper grate H substantially semicircular in cross-section, so that the gaseous products of combustion can pass freely and radially between the grate-bars, and so effecting a better mixture with the distilled vapors from the coking-chambers L.

What I claim as new is—

1. A downdraft-furnace provided with a dead wall forming with the side and front

walls a confined fire-chamber, retorts located beneath the boiler adjacent to the side walls of the furnace, and having longitudinal openings at their bottoms for the entrance of the products of combustion, and said retorts communicating with the combustion-chamber at their rear ends, an upper trough-shaped grate located between the retorts and supporting the latter, a lower grate adapted to receive the droppings from the upper grate, and coking-chambers located adjacent to and on opposite sides of the lower grate and having lateral openings facing the said grate; whereby the retorts receive the mixed gases from the coking-chambers and the grates, substantially as described.

2. A downdraft-boiler furnace provided with a dead wall forming with the side and front walls a confined fire-chamber, retorts located beneath the boiler adjacent to the side walls of the furnace and having at their bottoms longitudinal openings for the entrance of the products of combustion, and said retorts communicating with the combustion-chamber at their rear ends, an upper trough-shaped water-grate passing through the dead wall and connected at its ends with the water-space of the boiler; said grate supporting the retorts within the fire-chamber, a lower grate adapted to receive the droppings from the upper grate, and coking-chambers located adjacent to and on opposite sides of the lower grate and having lateral openings facing said grate, substantially as described.

3. A downdraft-boiler furnace provided with a dead wall forming with the side and front walls a confined fire-chamber, retorts located beneath the boiler adjacent to the side walls of the furnace and having longitudinal openings at their bottoms for the entrance of the products of combustion, and said retorts communicating with the combustion-chamber at their rear ends, an upper grate located between the two retorts for the reception of the main charge of fuel, a lower grate adapted to receive the droppings from the upper grate, and coking-chambers located beneath the retorts and adjacent to the opposite sides of the lower grate; said coking-chambers being provided with lateral openings facing said grate, substantially as described.

4. A boiler-furnace provided with a dead wall forming with the side and front walls a confined fire-chamber, an upper grate for the reception of the main body of fuel, a lower grate adapted to receive the droppings from the upper grate, coking-chambers arranged in the fire-chamber adjacent to the lower grate, retorts located beneath the boiler and provided with openings at their bottoms and communicating with the combustion-chamber, and walls extending along the top of the coking-chambers and supporting the retorts, substantially as described.

5. A boiler-furnace provided with a dead wall forming with the side and front walls a confined fire-chamber, an upper trough-

shaped grate for the reception of the main body of fuel, connections between the water-space of the boiler and said grate; a lower grate adapted to receive the droppings from
5 the upper grate, coking-chambers arranged in the fire-chamber adjacent to the lower grate, retorts located beneath the boiler and supported on one side by the upper grate and communicating with the combustion-chamber, and walls extending along the top of the

coking-chambers, and supporting the other side of the retorts, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

OREL D. ORVIS.

Witnesses:

EUGENE P. HENDRICKSON,
A. FABER DU FAUR, Jr.