

No. 653,076.

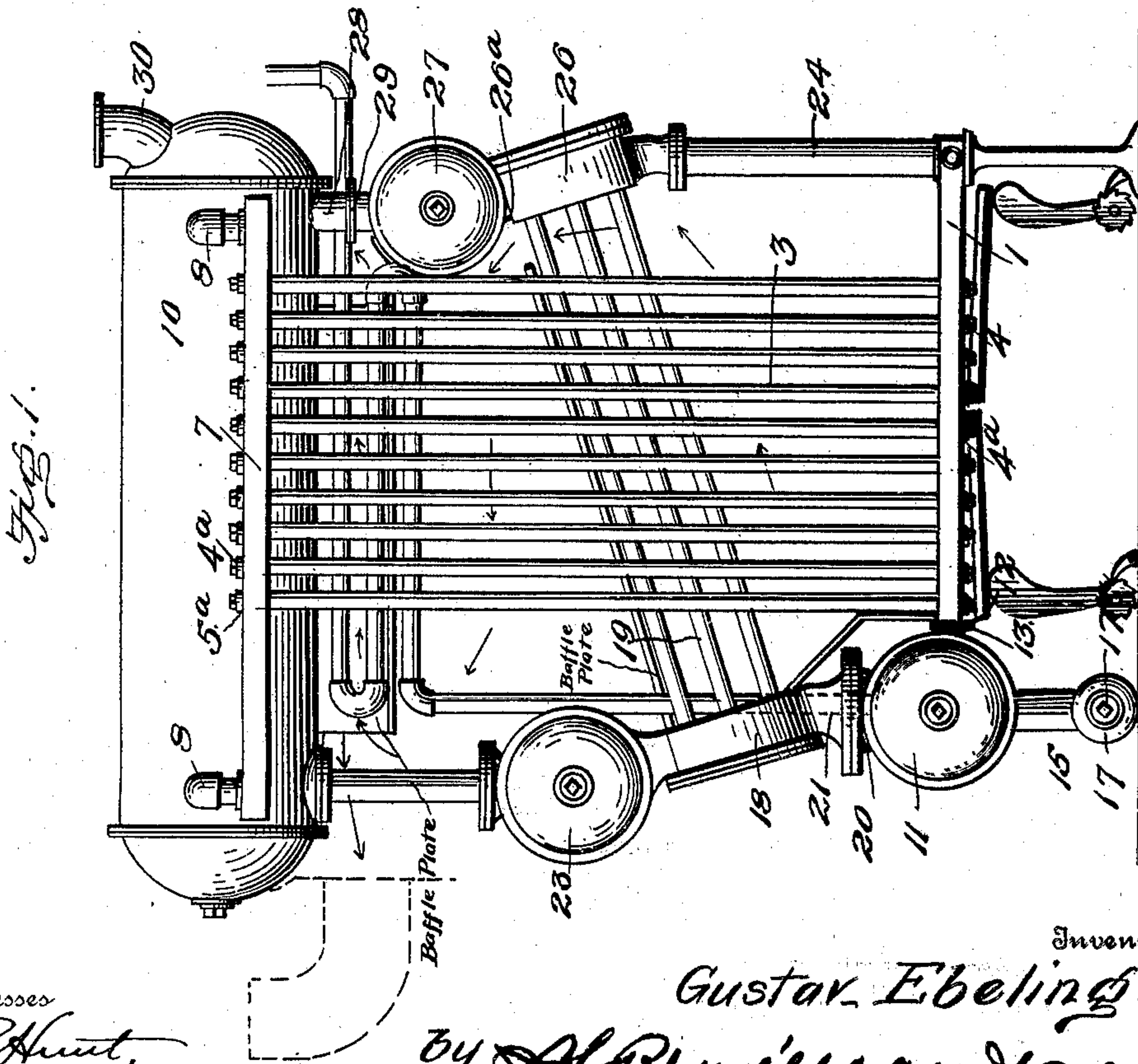
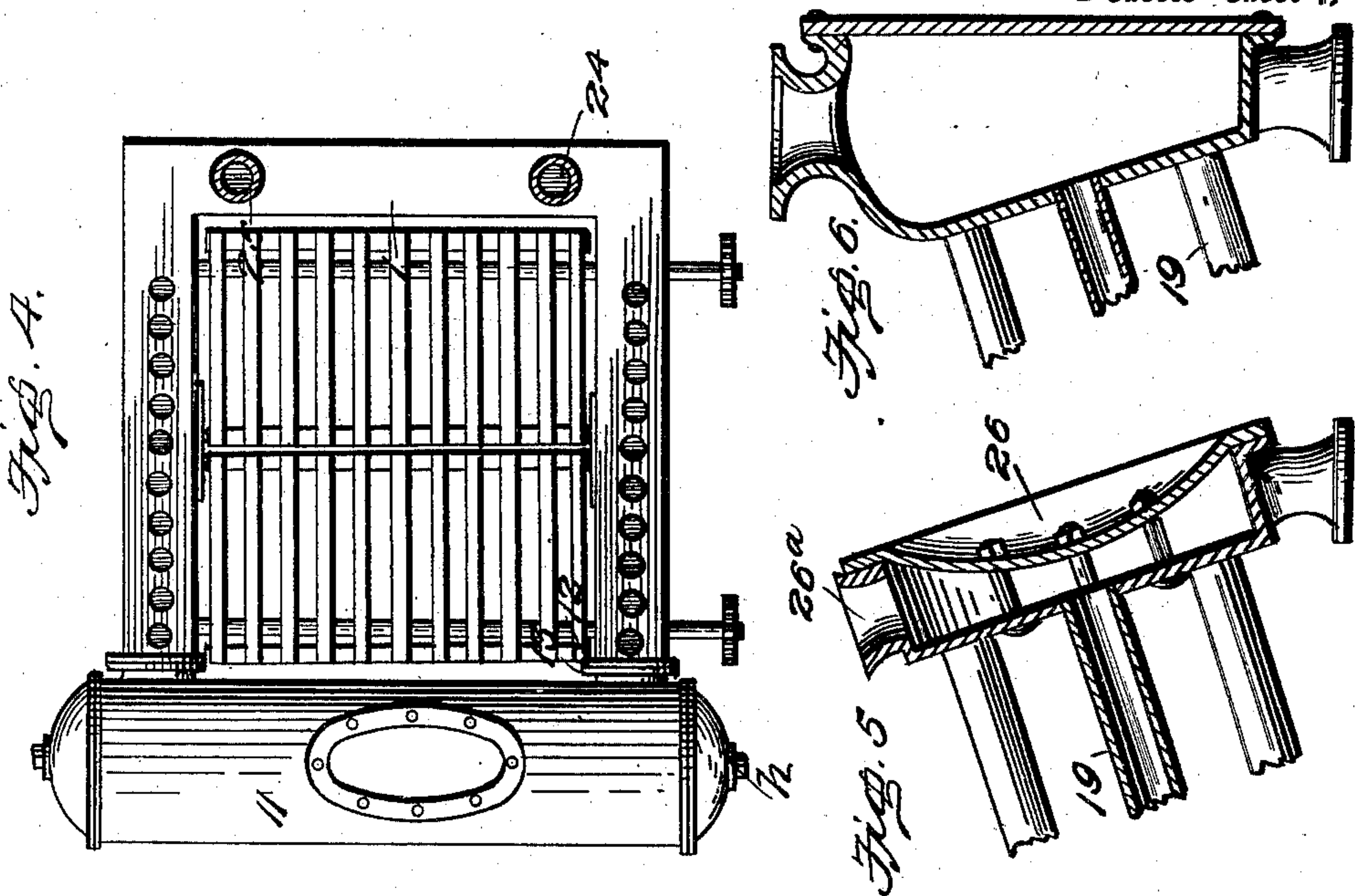
Patented July 3, 1900.

G. EBELING.  
STEAM BOILER.

(Application filed Mar. 15, 1900.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses

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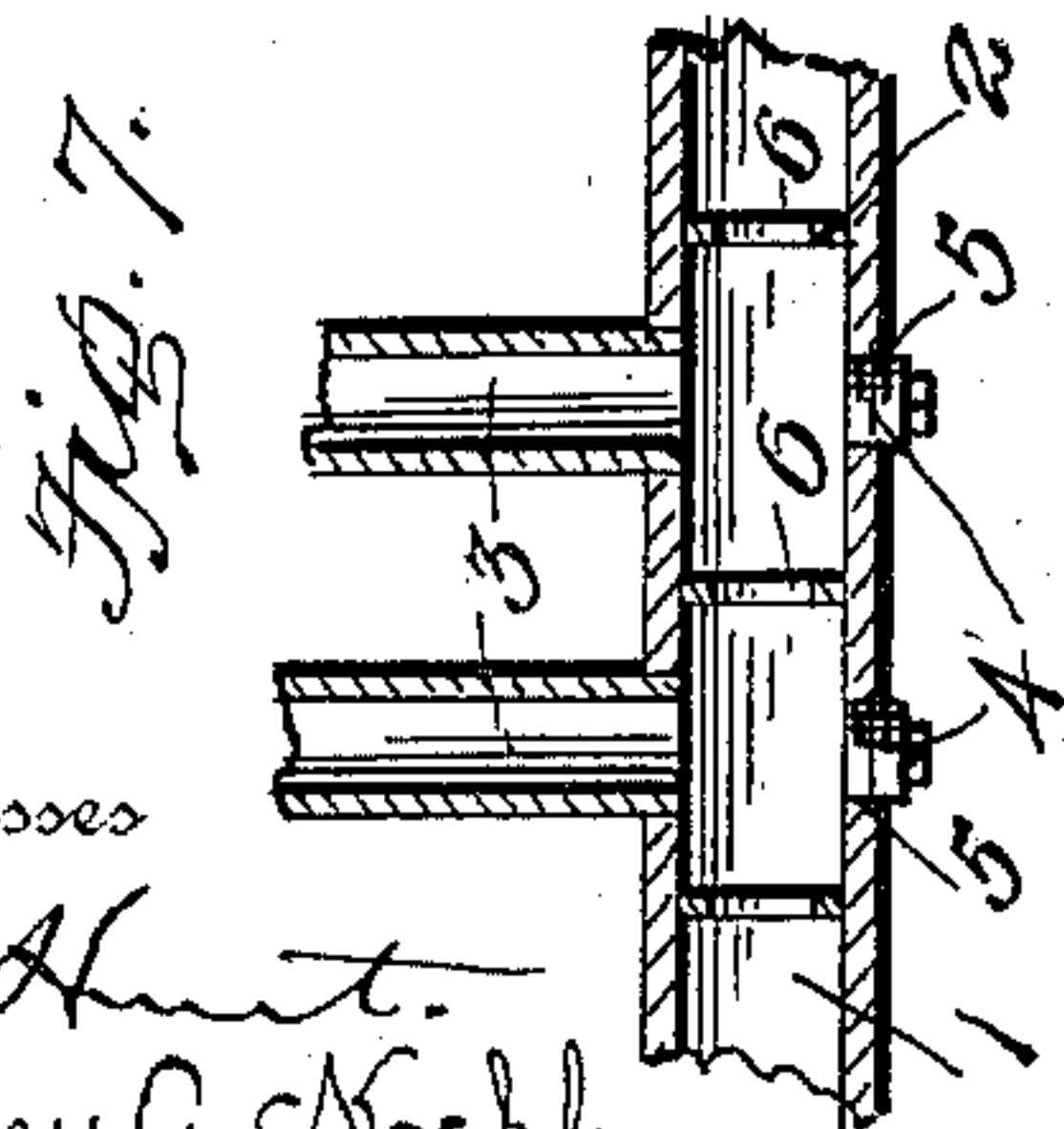
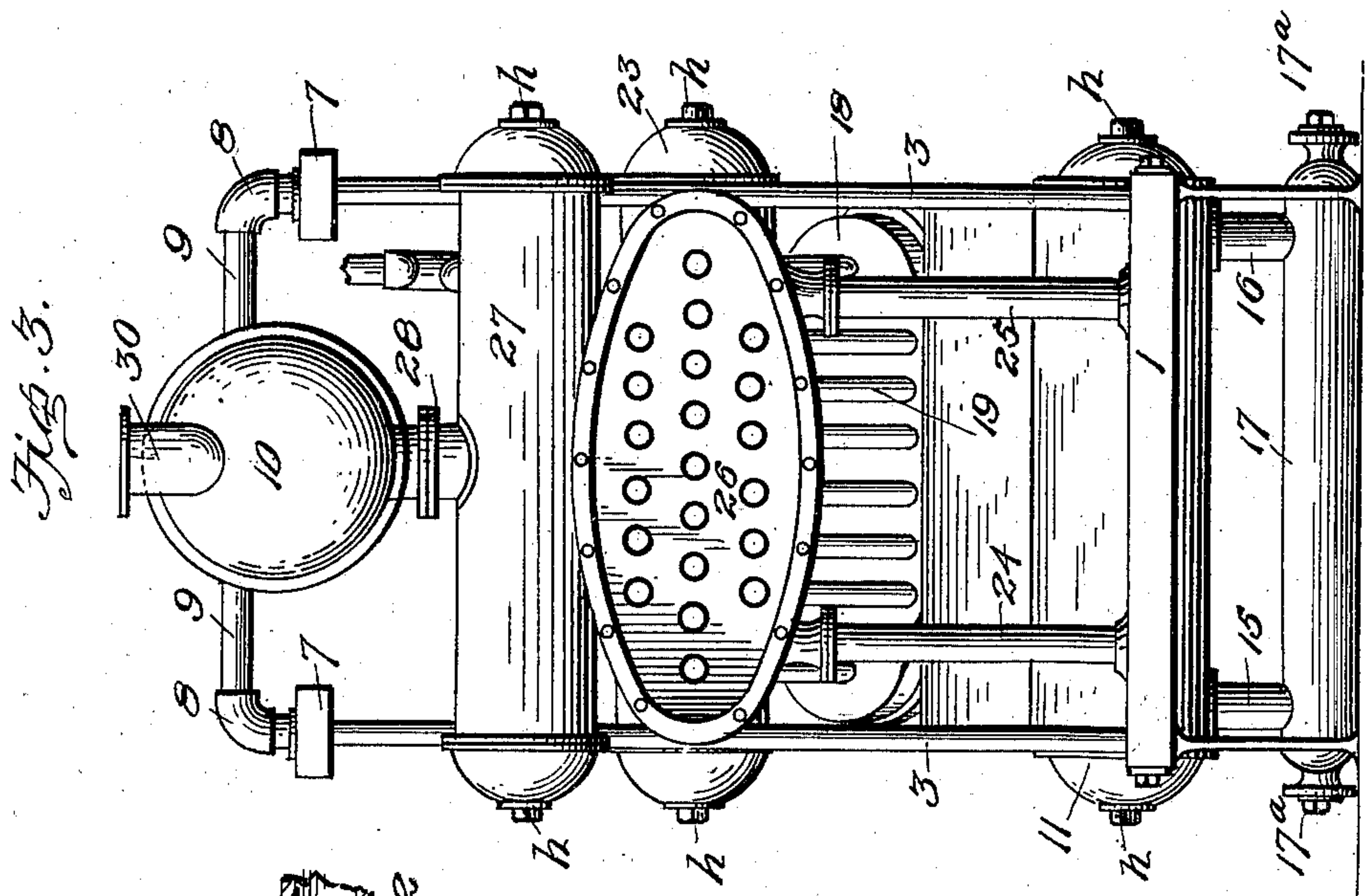
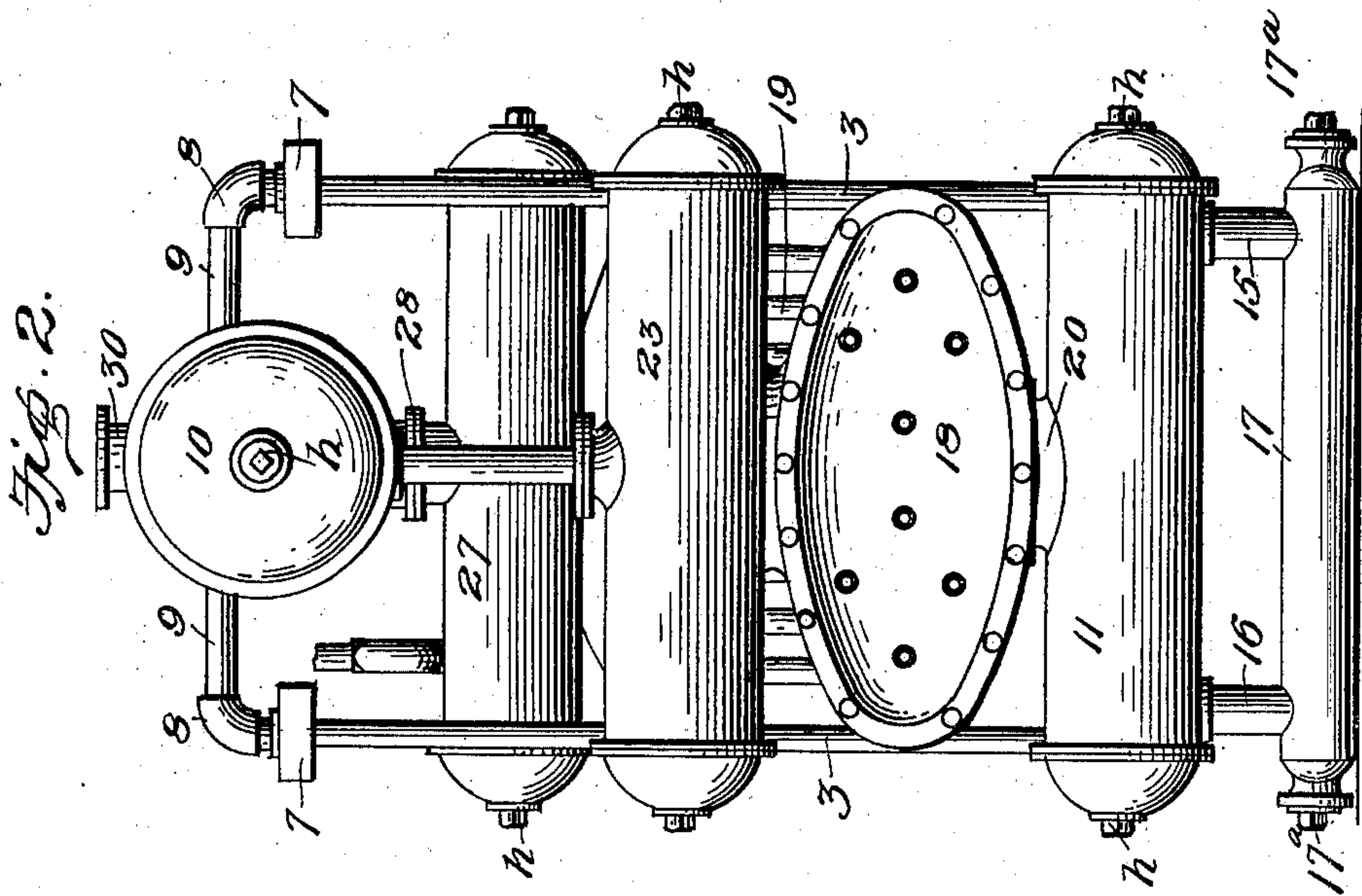
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# UNITED STATES PATENT OFFICE.

GUSTAV EBELING, OF CHESTER, PENNSYLVANIA, ASSIGNOR OF ONE-HALF  
TO WILLIAM M. BOULDEN, OF SAME PLACE.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 653,076, dated July 3, 1900.

Application filed March 15, 1900. Serial No. 8,772. (No model.)

*To all whom it may concern:*

Be it known that I, GUSTAV EBELING, a citizen of the United States, residing at Chester, in the county of Delaware and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Boilers; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to steam-boilers of the class commonly known as "tubular circulating-boilers," in which both vertical and inclined sets of tubes are employed and suitably incased in an incasing shell provided with the necessary doors, fire-grate, and ash-pit usually employed in connection with steam-boilers; and the invention consists in the novel construction and combination of parts of the steam-boiler, as hereinafter fully described and claimed.

In the annexed drawings, forming part of this specification, Figure 1 is a view in side elevation of the steam-drum, the front cylinder, the rear cylinder, the lower cylinder, the mud-drum, and blow-off, the vertical tubes, the inclined tubes, and the feed-water inlet and tubes of a steam-boiler embodying my improvements. Fig. 2 is a rear elevation of Fig. 1. Fig. 3 is a front elevation of Fig. 1. Fig. 4 is a top plan view of the U-shaped pipe. Fig. 5 is a vertical sectional view of the tube-holding sheets and the inclined tubes secured thereto. Fig. 6 is a vertical sectional detail view of a modification of one of the tube-sheets at the end of the inclined tubes, the tube-sheets being constructed alike at both ends of the inclined pipes; and Fig. 7 is a detail view of a portion of one of the supporting-frames, showing the open partition therein and the screw-plugs in the screw-seats of the same.

Referring by figures to the accompanying drawings, 1 designates the hollow rectangular supporting-frame in which the lower ends of the vertical boiler-tubes are seated. This hollow supporting-frame 1 is connected to the lower cylinder and provided with a vertical partition 2 between each two adjacent vertical tubes 3 and is also provided with removable screw-plugs 4 in screw-seats 5 between

each two vertical partitions. These vertical partitions are provided with horizontal openings 6, which permit of circulation of water and steam through said vertical tubes 3. The upper ends of said vertical tubes 3 are connected to a hollow upper supporting-frame 7, which is connected at each end by elbows 8 and pipes 9 to the steam-drum 10. This supporting-frame 7 is also provided with a set of vertical partitions, similar to those in the lower frame, between the upper ends of each two vertical tubes 3 and is provided in its upper face with screw-seats 5<sup>a</sup>, in which removable screw-plugs 4<sup>a</sup> are seated.

A lower cylinder 11 is connected at its front to the ends of the parallel hollow arms of the supporting-frame 1 by flanged collars 12 13, and the cylinder 11 is supported near each end by vertical pipes 15 16, connected at their lower ends with the mud-drum 17, which latter is provided in each end with a blow-off opening closed by a removable plug 17<sup>a</sup>. The lower cylinder 11 is connected with the lower head 18 of the inclined pipes 19 by centrally-disposed flanged connected pipes 20 21, and the upper connection 22 on the lower head 18 is connected to the rear cylinder 23, said cylinder 23 being connected with the steam-drum 10.

The front end of the hollow supporting-frame 1 is connected by two vertical pipes 24 25 with the upper flue-head 26 of the inclined pipes 19, and this flue-head 26 is connected by a centrally-disposed pipe 26<sup>a</sup> with the front cylinder 27, which latter cylinder is in turn connected with the steam-drum 10 by a sectional pipe 28, having collars 29 thereon. The steam-drum 10 is provided with an outlet-pipe 30 for the steam, by which the steam may be conveyed to the place of consumption. Each of the cylinders used in this construction is provided with blow-off holes in one or both ends, said blow-off holes being closed by screw-plugs *p*, so that said cylinders may be blown off or cleaned of scale when necessary.

The fire-grate used in this connection is made in two sections hinged at the sides to the fire-box upon horizontal shafts and connected together when in the elevated position by a suitable keeper, which when said



keeper has been removed will permit the sections of the grate to drop down and discharge its contents into the ash-pit.

The feeding of the boiler by means of a heater of the construction herein shown and described is of the greatest importance, as is also the lower cylinder and the mud-drum connected therewith. The force from a feed-pump drives the water through the connected pipes and keeps up a complete circulation of the water through the pipes—that is, entirely around through said pipes—so that the scale is carried down into the mud-drum, where said scale is blown off when the mud-plug is withdrawn from its seat. Moreover, the tube ends are each expanded in the tube-sheets, and each one of the tubes can be conveniently cleaned out when necessary, thereby prolonging the life of the boiler. The tube-sheets and bolts illustrated in Fig. 5 add great strength to the structure, as the tube-sheets proper are reinforced by the auxiliary sheets bolted thereto.

While the casing for the boiler is not illustrated herein, it is proper to state that it is made of sheet-steel and is provided with the necessary cleaning-doors, both in the front wall and in the rear wall of said casing, affording easy access to said tubes for permitting an attendant to properly and thoroughly clean said tubes when necessary.

While I have illustrated and described my steam-boiler in the form best known to me, it is obvious that many minor changes might be made in the construction of the same without departing from the character of the invention, and I do not therefore limit myself to the exact construction and combination of parts as herein set forth.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a tubular steam-boiler, the combination with the lower rectangular hollow tube-supporting frame connected by pipe connections with the lower cylinder 11; the upper rectangular hollow tube-supporting frame

connected by pipe connections with the steam-drum; a set of vertical tubes connecting said lower and upper hollow supporting-frames; the open vertical partitions in said lower and upper hollow tube-supporting frames; the inclined tubes having their open ends secured in the spaced tube-holding sheets; vertical pipes or tubes connecting said lower rectangular supporting-frame with said spaced front tube-holding sheets; the front cylinder and its pipes connected with the steam-drum and with said spaced front tube-holding sheets; pipes connecting said spaced front tube-holding sheets with said lower hollow supporting-frame; pipes connecting the lower rear tube-holding sheets with the lower and upper rear cylinders of the steam-boiler; a vertical pipe connecting said lower rear cylinder with the mud-drum; pipe connections between the lower rear tube-holding sheets, the lower rear cylinder and the upper rear cylinder; a vertical pipe connecting the upper rear cylinder with said steam-drum; and the circuitous feed-water inlet-pipe connecting a source of water-supply with said lower rear cylinder; substantially as specified.

2. In a tubular steam-boiler, the combination of the front cylinder, the lower and upper rear cylinders; the spaced tube-holding sheets and their inclined tubes, the steam-drum and the mud-drum and water and steam circulating pipes or tubes connecting said parts; of the upper and lower hollow supporting-frames provided with open partitions; vertical tubes connecting said supporting-frames between said open partitions; removable screw-plugs in screw-seats opposite the ends of each vertical tube; and a feed-water inlet-pipe connected with said lower rear cylinder; substantially as specified.

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

GUSTAV EBELING.

Witnesses:

J. HORACE WITSIL,  
J. M. WITSIL.