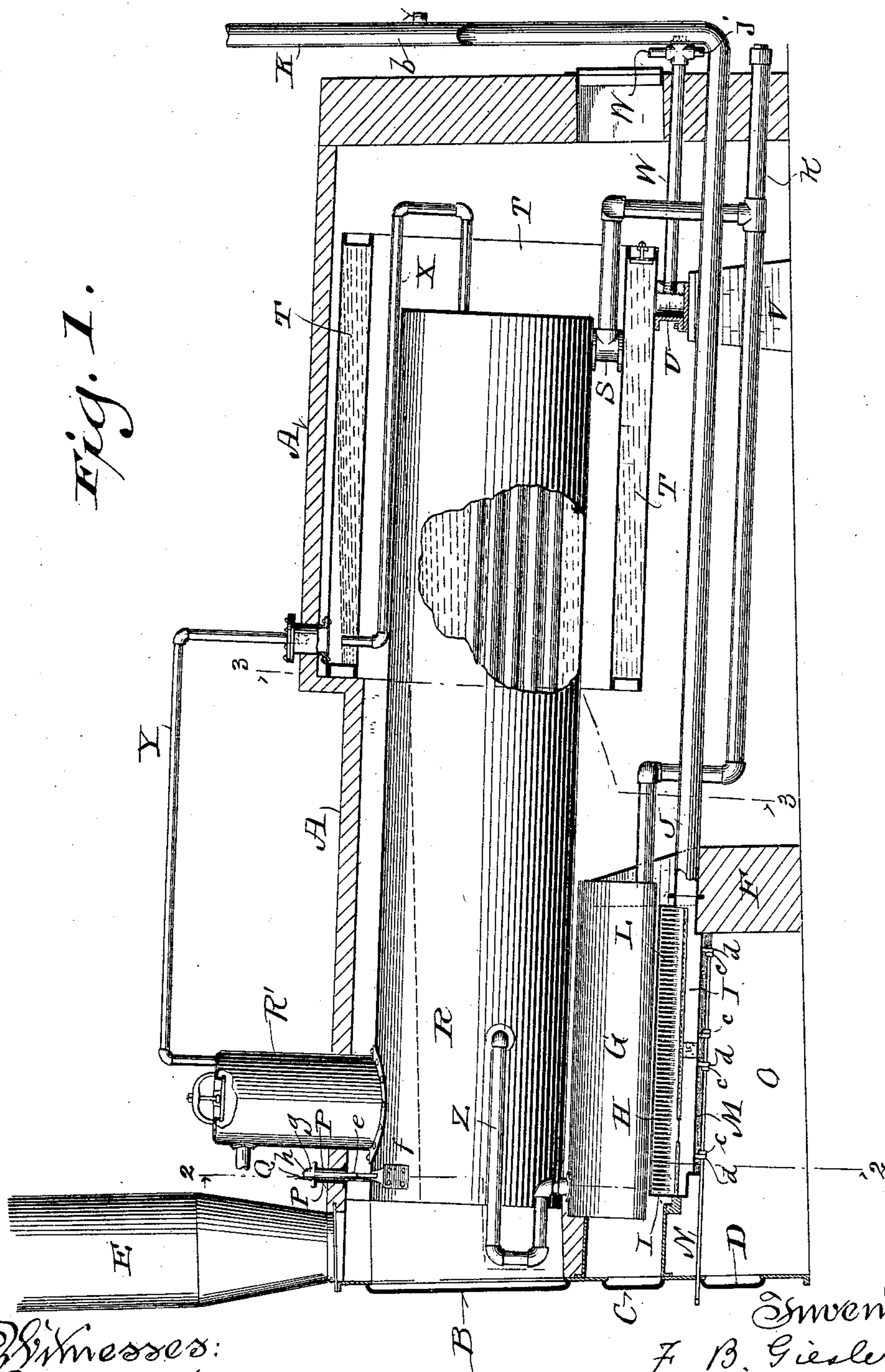


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No. 587,121.

Patented July 27, 1897.



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(No Model.)

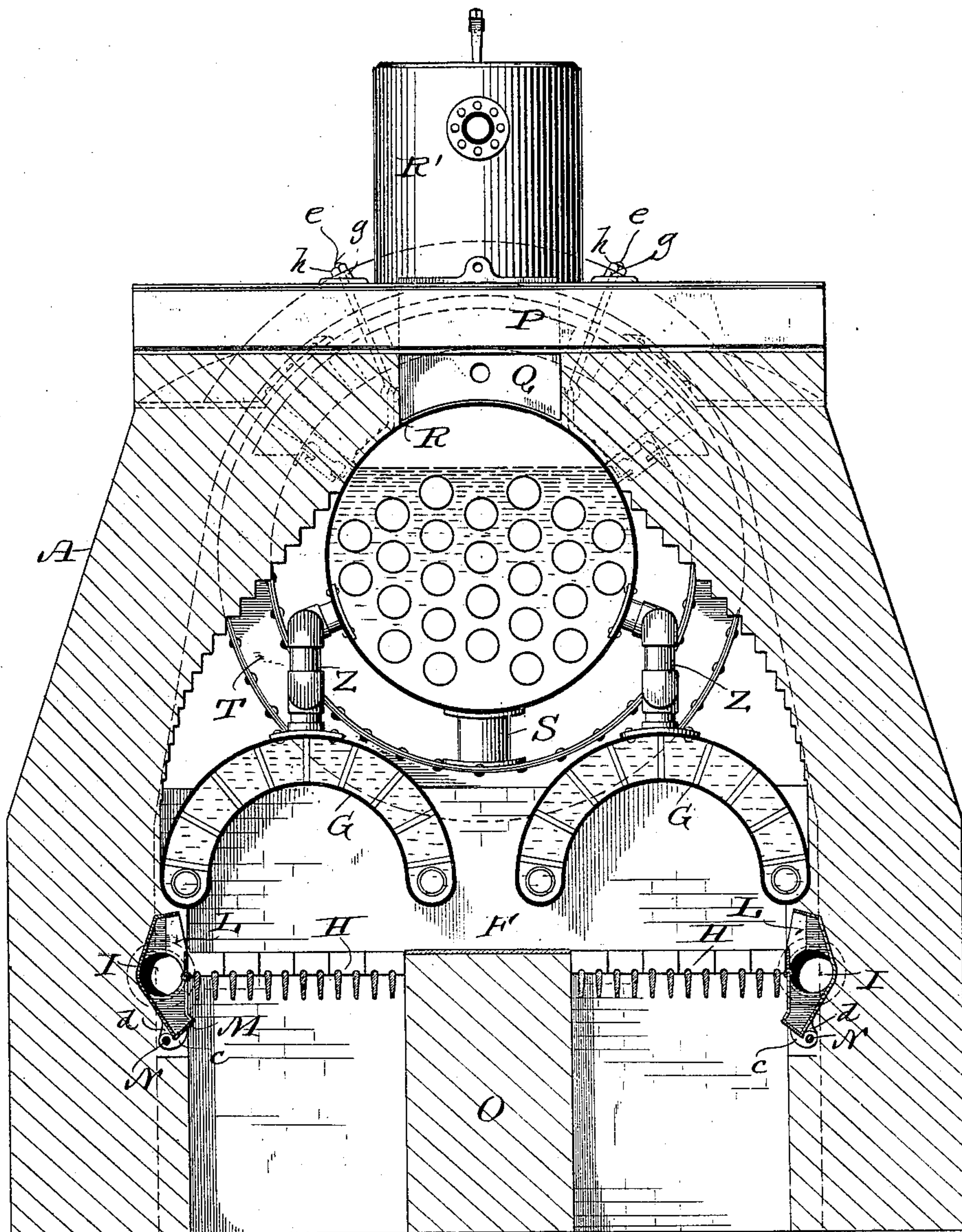
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F. B. GIESLER.  
STEAM BOILER FURNACE.

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*Fig. 2.*



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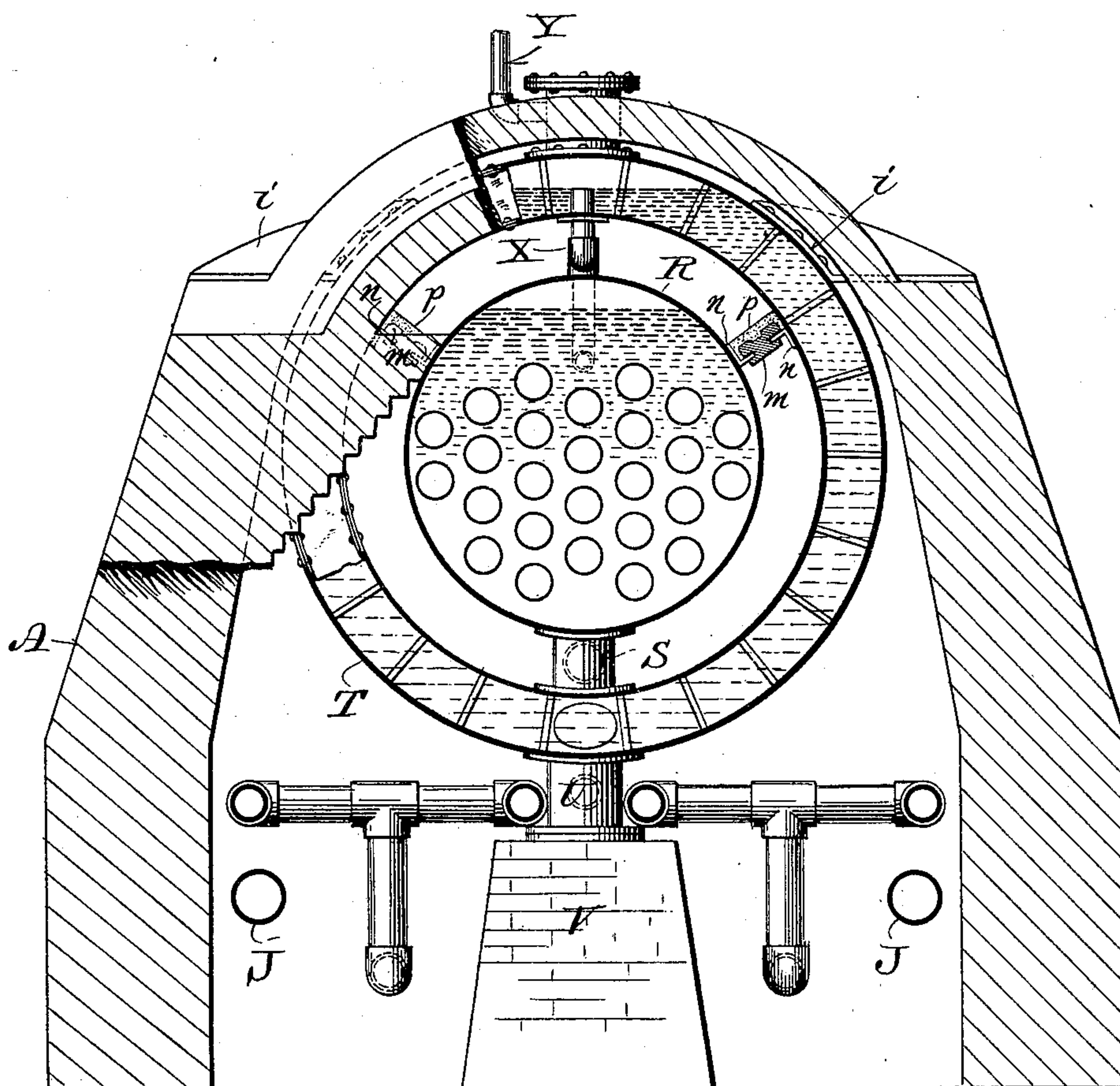
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*Fig. 3.*



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(No Model.)

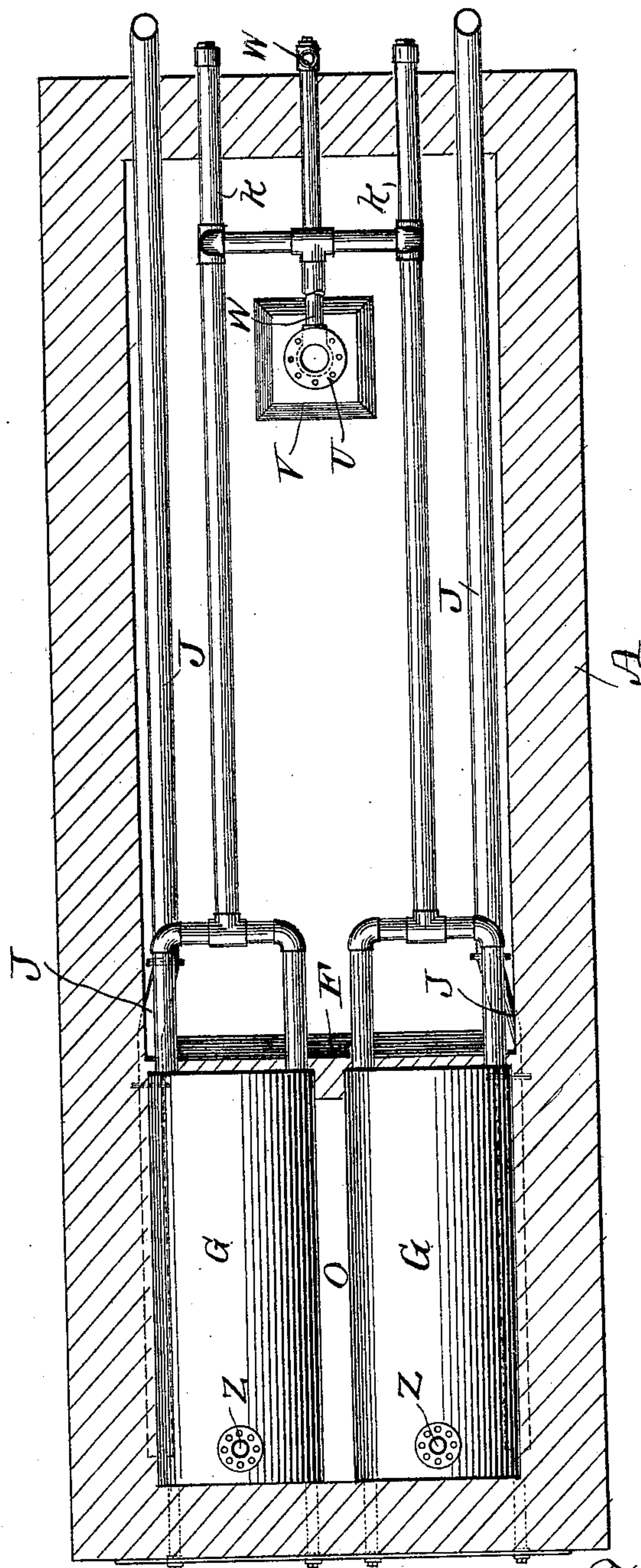
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*Fig. 4.*



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# UNITED STATES PATENT OFFICE.

FRANKLIN B. GIESLER, OF MILWAUKEE, WISCONSIN.

## STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 587,121, dated July 27, 1897.

Application filed October 2, 1896. Serial No. 607,634. (No model.)

*To all whom it may concern:*

Be it known that I, FRANKLIN B. GIESLER, a citizen of the United States, and a resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Steam-Boiler Furnaces; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention has for its objects to provide a smokeless boiler-furnace, cheapen the production of dry steam, prevent deposits in boilers, and increase horse-power capacity of the same. Hence said invention consists in certain peculiarities of construction and combination of parts hereinafter set forth with reference to the accompanying drawings and subsequently claimed.

In the drawings, Figure 1 represents a vertical longitudinal section of an improved boiler-furnace and a water-jacket therein, the boiler in said furnace and the water feed and circulating pipes being shown in elevation, portions of said boiler and its steam-dome being partly broken away; Figs. 2 and 3, transverse sections, respectively indicated by lines 2 2 and 3 3 in Fig. 1; and Fig. 4 a plan view, partly in horizontal section, illustrating the furnace-casing, air-conveyers, and water-circulating pipes embodied in my improvements.

Referring by letter to the drawings, A represents the brickwork or casing, B a front clean-out door, C a fire-door, D an ash-pit door, and E the draft-stack, of a boiler-furnace having the usual bridge-wall F intermediate of the fire-chamber and combustion-chamber.

Supported by the casing and bridge-wall within the fire-chamber of the furnace is a pair of what are well known as "Orvis steel arches" G, and set in the sides of said casing to extend longitudinally thereof above and below the fuel-grates H are boxes I, the latter being closed at their front ends and coupled at their rear ends to pipes J, these pipes serving as conveyers for air or steam, or both. As herein shown, the pipes J are located in the combustion-chamber and extend out through the rear wall of the furnace-casing. The rear end of each pipe may have separate connec-

tion with a fan or other apparatus for forcing air, or they may be branches of another pipe K, leading from such an apparatus, and the latter pipe is herein shown as provided with a coupling *b* for connection with a steam-pipe, although it is just as practical to provide each of the former pipes with such a coupling, and while reference is made to an air-forcing apparatus the supply of air to the boxes I may be the result of natural draft.

The inner side of each box I above the adjacent grate H has the form of a grating L, the latter being preferably made in sections that are in detachable connection with the remainder of said boxes, so that new ones may be readily substituted for those that burn out. Air or steam, or both, delivered by the pipes J to said boxes, finds its escape through the gratings K to pass up through fuel in the fire-chamber and mingle with the gases generated by combustion. Below the grates H the boxes I are provided with doors M, having brackets *c* in rigid connection with crank or key rods N, that turn in suitable bearings *d* and extend through the front of the ash-pit of the furnace to come within easy reach of a fireman. The ash-pit is shown divided by a central wall O into two compartments longitudinally of the furnace, and the doors M of the boxes I being opened surplus air or steam or the two intermingled may be let into said compartments to improve the draft, temperature, or both, of said furnace.

The gases generated from the fuel and mingled with the air under each of the Orvis arches form a junction where these arches terminate above the wall O, the heat at this point being of such intensity as to consume what would otherwise be heavy smoke, this result being due to the oxygen in said air, the latter being brought to a high temperature by its passage through the pipes J in the combustion-chamber on the way to the boxes I above specified.

Admission of steam through the boxes I increases the temperature in the fire-chamber because of the supply of hydrogen thus afforded, and the admission of the air and steam separately or conjointly is a matter of expediency in accordance with various conditions of the fire.



Set in the furnace-casing transversely of the same in rear of draft-stack E is a pair of angle-bars P, and an apertured lift-plate Q is arranged intermediate of the angle-bars to  
 5 retard products of combustion on their way to what is generally termed the "smoke-box" of the furnace through a conduit over the boiler, this conduit being hereinafter more particularly set forth. Hooks *e*, engaging  
 10 brackets *f* on the forward portion of a tubular boiler R, extend up between the angle-bars P and through washer-caps *g*, surmounting said bars, set-nuts *h* being run on the screw-threaded outer ends of the hooks  
 15 against the washer-caps. The front of the boiler forms the back of the smoke-box, as is ordinarily the case, and said boiler is inclined toward the rear, where it is provided with a depending stand S at rest within a  
 20 tubular water-jacket T, having a corresponding inclination. The water-jacket is arranged in the combustion-chamber of the furnace concentric with the boiler, and the diametrical dimension of said jacket is such that  
 25 space is formed between the two for the passage of products of combustion, said jacket being a cylinder formed by two shells of different diameters united at their ends by suitable heads and braced by stay-bolts at suitable  
 30 intervals.

Suspension-brackets *i* connect the front upper portion of the water-jacket with the furnace-casing, and the rear lower portion of said jacket is provided with a depending  
 35 stand U, that rests on a pillar V, of masonry or other suitable material.

A feed-water pipe W, extended through the rear wall of the furnace-casing, connects the stand U, and this pipe is preferably coupled to  
 40 a blow-off pipe J, as shown in Fig. 1. Water fed to the jacket T rises therein and finds its way by gravity into the boiler R through a connecting-pipe X, extended up into the upper high portion of said jacket to a predetermined height that determines the water-level in said boiler, steam-pressure in the  
 45 aforesaid jacket and boiler being equalized by pipe connection Y of the former with the steam-dome R', as shown in Fig. 1. It is to be understood that the boiler-stand S does  
 50 not communicate with the water-jacket and that the pipe X is the only means provided for supplying feed-water from said jacket to the boiler.

For the purpose of circulation the forward portion of the boiler is in pipe connection Z with the top of each Orvis arch near the front of the same, and by a system of piping, such as is clearly illustrated in Figs. 1 and 4, the  
 60 lower rear portion of said arches are connected to the stand S, that depends from said boiler within the water-jacket, this system of piping being provided with blow-off extensions *k*, run outside the furnace-casing.

That portion of the furnace-casing forward of the water-jacket is arched in against the

boiler to form the conduit over said boiler leading to the smoke-box, this conduit being interrupted by the apertured lift-plate above specified. The conduit is continued rearward  
 70 by partitions of fire-brick tiling *m*, set in on brackets *n*, made fast to said boiler and the water-jacket, the tiling being preferably covered by a mass *p* of fire-brick clay.

That portion of the furnace-casing over the water-jacket is made high enough to provide  
 75 a space for the circulation of products of combustion. Hence it will be understood that in practice said jacket and the boiler are enveloped in heat higher than the temperature of  
 80 steam, and their entire surface being inclosed there is no loss of heat-units by radiation except from so much of the steam-dome as extends outside the furnace-casing, this being  
 85 a matter of considerable importance in connection with perfect combustion of fuel, as above specified, owing to the fact that it effects a great saving in the matter of cost pertaining to the production of steam.

It will be understood that while the greater  
 90 portion of the products of combustion find their way through the boiler-flues to the smoke-box of the furnace the remainder of the same pass through the aperture in the plate Q into said smoke-box, and in case this  
 95 aperture is not sufficient for draft the plate may be lifted to increase the passage from the conduit over the boiler. The passage of products of combustion along the conduit over the  
 100 boiler and around the inclosed portion of its dome superheats the steam, thus making the latter very dry, whereby the horse-power capacity of said boiler is increased.

By having the feed-water pass through the jacket on its way to the boiler while exposed  
 105 to a temperature higher than that of steam it is freed from impurities, and the deposits that would otherwise accumulate in said boiler are caught in said jacket from which they may be readily blown off.

While I have described my improvements in connection with Orvis steel arches, they are not necessarily confined to a furnace embodying such arches, but the best results are  
 115 attained by the employment of the same as part of the water heating and circulating system.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—  
 120

1. A steam-boiler furnace provided with side boxes having discharge-gratings in detachable connection therewith above the fuel-grates and conveyers for air, steam or both in communication with the boxes.  
 125

2. A steam-boiler furnace provided with side boxes having discharge-gratings above the fuel-grates and door-controlled openings below said grates, together with conveyers for air, steam or both in communication with the  
 130 boxes.

3. A steam-boiler furnace having a pair of



boiler-connected Orvis-type steel arches in its fire-chamber and provided with side boxes that have discharge-gratings above the fuel-grates, together with conveyers for air, steam or both in communication with said boxes.

4. A steam-boiler furnace having a pair of boiler-connected Orvis-type steel arches in its fire-chamber and provided with side boxes that have discharge-gratings above the fuel-grates and door-controlled openings below said grates, together with conveyers for air, steam or both in communication with said boxes.

5. A steam-boiler furnace having a boiler-encircling water-jacket arranged within the combustion-chamber and connected at its lower portion with a feed-water pipe, the diametrical dimension of this jacket being sufficient to leave space between it and the boiler for the passage of products of combustion; an outlet-pipe leading from the upper portion of the jacket into said boiler, and a steam-pipe communicating with said jacket above its outlet.

6. A steam-boiler furnace having a boiler-encircling water-jacket arranged within the combustion-chamber and connected at its lower portion with a feed-water pipe, the diametrical dimension of the jacket being sufficient to leave space between it and the boiler for the passage of products of combustion; an outlet-pipe leading from a predetermined elevation in the upper portion of the jacket into said boiler, and a steam-pipe communicating with said jacket above its outlet.

7. A steam-boiler furnace having its fire-chamber provided with Orvis-type steel arches in water-circulating connection with the boiler, a water-jacket arranged within the combustion-chamber of the furnace to encircle the boiler and leave intermediate space for passage of products of combustion, a feed-water pipe in connection with the lower portion of the jacket, an outlet-pipe leading from the upper portion of said jacket into said boiler, and a steam-pipe communicating with the aforesaid jacket above its outlet.

8. A steam-boiler furnace having a boiler-encircling water-jacket arranged within the combustion-chamber and connected at its lower portion with a feed-water pipe, the diametrical dimension of the jacket being sufficient to leave space between it and the boiler; an outlet-pipe leading from the upper portion of the jacket into the boiler, a steam-pipe communicating with said jacket above its outlet, a products-of-combustion conduit over that portion of the boiler forward of the jacket, partitions intermediate of said boiler and jacket longitudinally of the same to form a continuation of the con-

duit, and an apertured plate interrupting said conduit adjacent to the smoke-box.

9. A steam-boiler furnace provided with side boxes having discharge-gratings above the fuel-grates, conveyers for air or steam or both in communication with the boxes, Orvis-type steel arches in the fire-chamber having water-circulating connection with the boiler, a water-jacket arranged in the combustion-chamber to encircle the boiler and leave intermediate space, a feed-water pipe in connection with the lower portion of the jacket, an outlet-pipe leading from the upper portion of the jacket into the boiler, a steam-pipe communicating with said jacket above its outlet, a products-of-combustion conduit over that portion of the boiler forward of the jacket, partitions intermediate of said boiler and jacket longitudinally of the same to form a continuation of the conduit, and an apertured plate interrupting said conduit adjacent to the smoke-box.

10. A steam-boiler furnace provided with side boxes having discharge-gratings above the fuel-grates and door-controlled openings below said grates, conveyers for air or steam or both in communication with the boxes, Orvis-type steel arches in the fire-chamber having water-circulating connection with the boiler, a water-jacket arranged in the combustion-chamber to encircle the boiler and leave intermediate space, a feed-water pipe in connection with the lower portion of the jacket, an outlet-pipe leading from the upper portion of the jacket into the boiler, a steam-pipe communicating with said jacket above the outlet, a products-of-combustion conduit over that portion of the boiler forward of the jacket, partitions intermediate of said boiler and jacket longitudinally of the same to form a continuation of the conduit, and an apertured plate interrupting said conduit adjacent to the smoke-box.

11. A steam-boiler suspended wholly within its furnace and having its steam-dome partly inclosed by the same, together with a water-jacket encircling the boiler within the combustion-chamber of said furnace, a feed-water pipe in connection with the jacket, an outlet-pipe of the jacket in communication with the boiler, and a steam-pipe connected to said jacket above its outlet.

In testimony that I claim the foregoing I have hereunto set my hand, at Milwaukee, in the county of Milwaukee and State of Wisconsin, in the presence of two witnesses.

FRANKLIN B. GIESLER.

Witnesses:

N. E. OLIPHANT,  
B. C. ROLOFF.