W. A. GILCHRIST.

STEAM BOILER FURNACE.

APPLICATION FILED APR. 17, 1911.

1,166,670.

Patented Jan. 4, 1916.

3 SHEETS—SHEET 1.

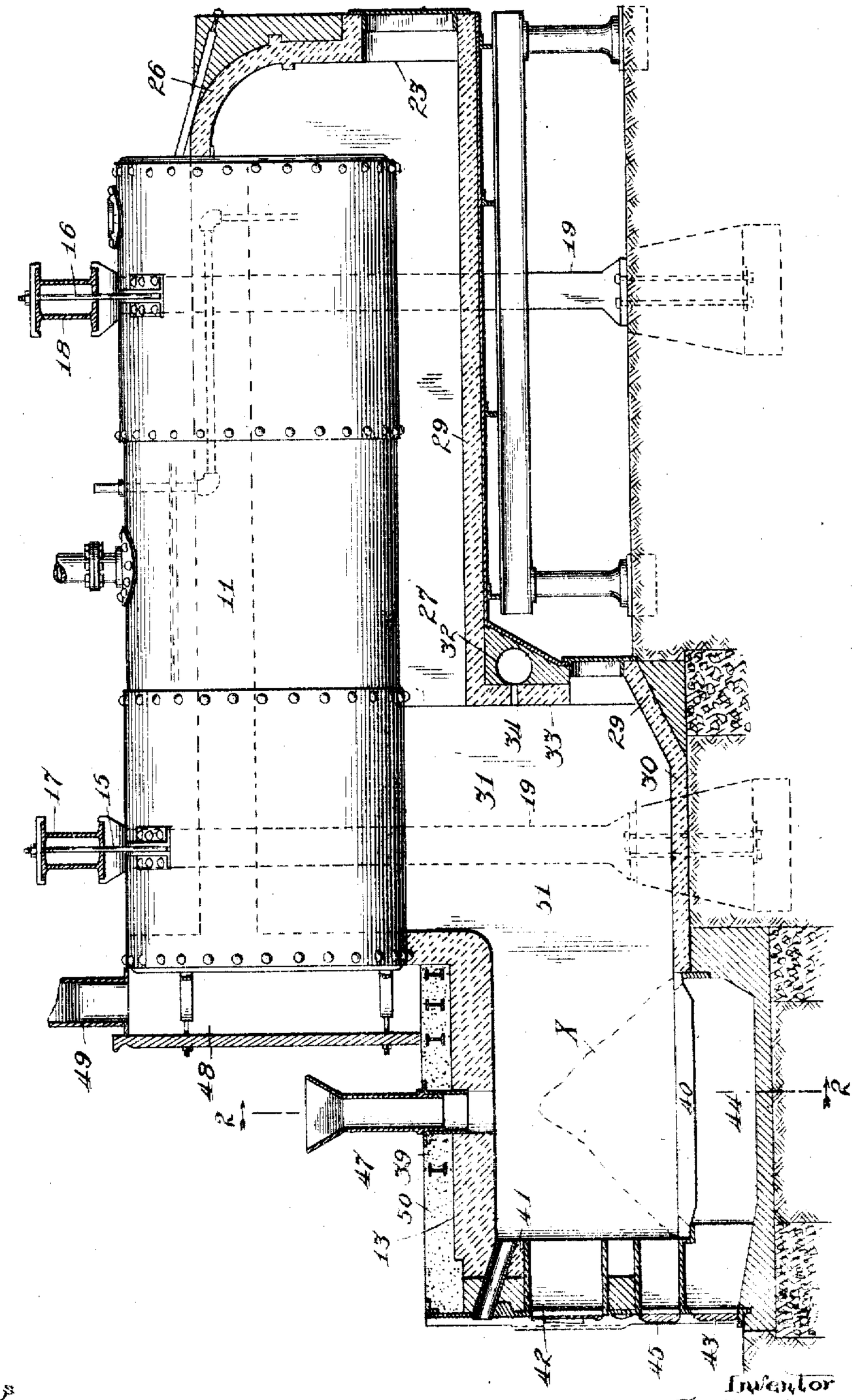

Fig. 1.

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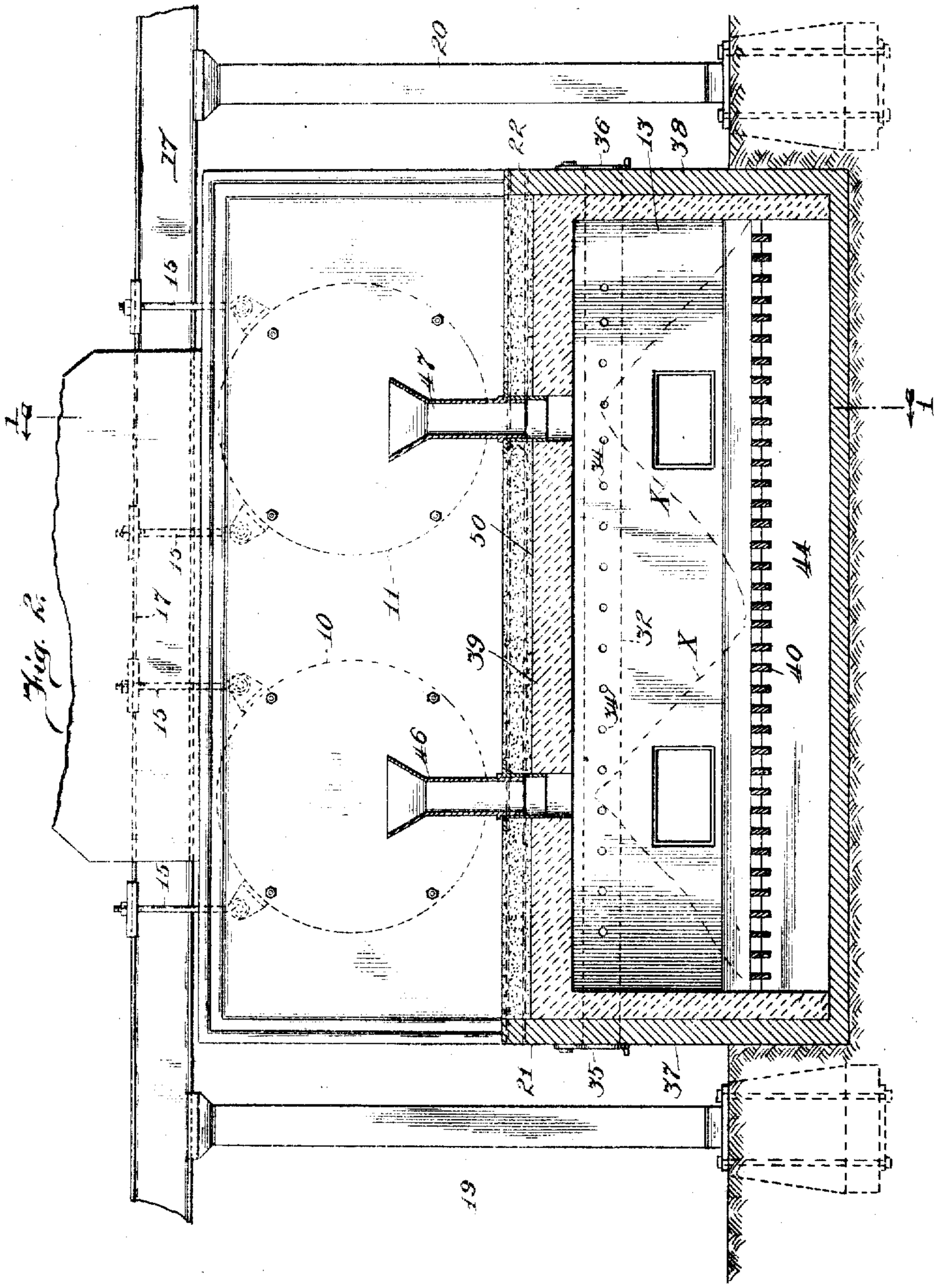

Fig. 2.

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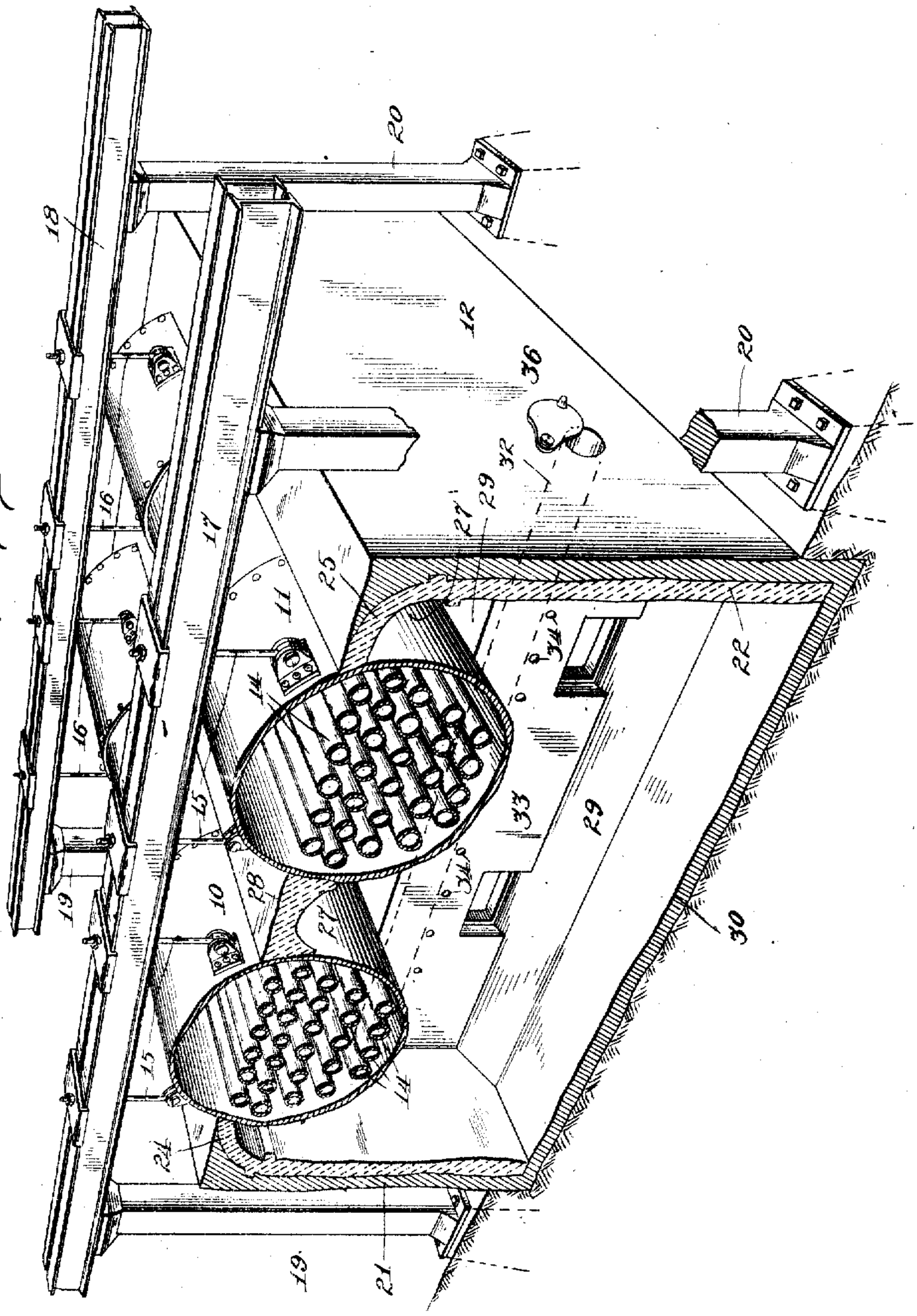
3 SHEETS—SHEET 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

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STEAM-BOILER FURNACE.

1,166,670. Specification of Letters Patent. Patented Jan. 4, 1916.

Application filed April 17, 1911. Serial No. 621,726.

To all whom it may concern:

Be it known that I, WILLIAM A. GILCHRIST, a citizen of the United States, and resident of Memphis, county of Shelby, and State of Tennessee, have invented certain new and useful Improvements in Steam-Boiler Furnaces, of which the following is a specification, and which is illustrated in the accompanying drawings, forming a part thereof.

The invention relates to steam boiler furnaces, and has for its primary object to provide improved means for generating steam through the use of such fuels as bagasse and the offal produced in the manufacture of lumber. As these fuels contain a large proportion of volatile combustible products and moisture, the vaporization of which absorbs a great deal of heat, difficulty has heretofore been experienced in maintaining the fire at a sufficiently high temperature for combustion to proceed rapidly, while still providing sufficient inclosed space and air supply for insuring that the combustion of the volatile products will be complete.

The present invention obviates this difficulty, and contemplates a fire-box separated from the boiler and a combustion chamber of large capacity having direct communication with the chamber of the fire-box. A high temperature may thus be attained in the fire-box, for the fire therein is not directly exposed to the relatively cool walls of the boiler shell and the gases produced in the fire-box have free access to the large combustion chamber through which their passage is sufficiently slow to admit of complete combustion.

In the accompanying drawings, Figure 1 is a longitudinal sectional view of a steam boiler furnace embodying the features of improvement provided by the invention, the plane of the section being indicated by the line 1—1 on Fig. 2, and the boiler being shown in side elevation; Fig. 2 is a transverse vertical sectional view taken on the line 2—2 of Fig. 1; and Fig. 3 is a perspective view of that part of the furnace and boiler setting in rear of fire-box, some of the parts being broken away.

The construction illustrated comprises a pair of horizontal cylindrical return flue steam boilers 10, 11. These boilers are of ordinary construction, and each is equipped with the usual return flue tubes 14 extending through the boiler shell from end to end. In carrying out the invention the boilers 10, 11, are mounted in a unitary masonry setting. This setting comprises side walls 21 and 22, and a rear end wall 23. As shown, the boilers 10, 11, are located side by side at the same elevation, and both are hung by front and rear stays, as 15, 15, and 16, 16, from beams 17 and 18, which extend transversely over the boiler setting 12 and are each supported adjacent their ends upon columns 19, 20, located beyond the side walls 21, 22, respectively, at each side of the boiler setting.

The side walls 21, 22, of the boiler setting are each turned inwardly at their higher ends, as indicated at 24, 25, to meet the adjacent sides of the boilers 10 and 11, respectively, preferably above the level of the return flues 14. Similarly, the rear end wall 23 of the boiler setting 12 is turned inwardly adjacent its higher end, as indicated at 26 (Fig. 1) to meet the rear end walls of the boiler shells. In this way a common flue space 27 is provided which extends beneath the boilers and along their under side portions, and communicates with the return flues 14 of the boilers at their rear ends. To provide a cover for the flue space 27 between the boilers 10, 11, an arched roof 28 is employed.

Preferably the floor 29 of the flue space 27 is vertically offset intermediate its ends, as indicated at 33, its front end portion 30 being at the lower level. A combustion space 31 of large capacity and of considerable vertical height is thus provided about the front end portions of the boilers. If desired a supplemental air supply may be introduced into the combustion chamber 31. This supplemental air supply is preferably introduced at the rear end of the combustion chamber, as through a transverse duct 32 which extends through the floor 29 of the flue 27 immediately in rear of its vertically offset portion 33, and this duct has a plurality of forwardly directed openings 34 communicating with the combustion chamber. Preferably the duct 32 extends through

the side walls 21, 22, of the boiler setting at its ends, and the openings thus provided are controlled by dampers 35, 36.

The two boilers 10, 11, are served from a common fire box generally designated by the numeral 13. This fire box is preferably located wholly in front of the plane of the front end walls of the boilers, and it is most desirably equal in width to the full width of the boiler setting 12 but is of relatively small depth. As shown, the fire box 13 has masonry side walls 37, 38, and a masonry roof 39. The fire box roof 39 is preferably flat and is located at a lower elevation than the boilers 10, 11. A grate 40 extending for the entire width of the fire box between the side walls 37, 38, is preferably located at the same elevation as the floor 30 of the combustion chamber 31. The front end wall 41 of the fire box 13 is provided with the usual fire doors 42, leading to that part of the chamber of the fire box which is above the grate, and with the usual draft doors 43 leading to the ash-pit space 44 provided below the grate. If desired additional doors 45 may be provided in the front wall 41 at the level of the grate 40 for the introduction of slice bars to stir the fire.

When the structure is to be used in connection with the manufacture of lumber, a pair of chutes 46, 47, will be preferably provided in the roof 39 of the fire box for the automatic delivery of offal onto the grate 40. In this case the chutes 46, 47, will be so placed as to deliver the offal into pyramidal piles X symmetrically arranged upon the grate 40. The two boilers 10, 11, preferably have a common smoke box or breeching 48 of usual construction. This breeching is located over the rear end portion of the fire box 13 in rear of the chutes 46, 47, and it communicates with a smoke pipe or stack 49 in the usual way. The rear end of the chamber of the fire box 13 is preferably open for its entire width and height as indicated at 51 and is in direct communication with the combustion chamber 31.

In the operation of the furnace the relatively low flat masonry roof 39 of the fire box 13 becomes highly heated by continued exposure to the flames, and as it will preferably be formed of non-conducting material, as by being covered with ashes or sand, as at 50 (Figs. 1 and 2) a high temperature will be maintained within the chamber of the fire box. Large quantities of vapor will thus be evolved from the piles of fuel X, and this vapor will pass freely into the combustion chamber 31 through the open rear end 51 of the fire box chamber. The combustion chamber 31 is of sufficient capacity to receive large quantities of vapor without requiring the same to pass through it rapidly, whereby the combustible portions of this vapor may be completely consumed before they enter the flue space 27. Furthermore the combustion of these vapors in the combustion chamber 31 assists in maintaining a high temperature in the fire box by reason of the position of the chamber 31 adjacent the fire box and by reason of the open communication between the two. It has been found that the offal from saw mills can be used for the generation of steam in furnaces of the kind here described, efficiently and without the formation of any considerable quantity of smoke, thus indicating that the combustion proceeds rapidly and that it is substantially complete.

While the duct 32 provides for the introduction of a supplemental air supply to the combustion chamber 31 when required, it will usually be found that sufficient air for complete combustion will enter through the grate 40 whereby the duct 32 need not be used, as by closing the ends of the duct through the use of the dampers 35, 36.

By making the rear wall 33 of the combustion chamber 31 vertical there is no opportunity for ashes carried over by the flames to collect on its surface so that it attains a high temperature. By having this wall directly face the chamber of the fire box there is an interchange of heat, by radiation and reflection, between this wall and the chamber of the fire box. This materially assists in maintaining a high temperature both in the fire box and in the wall itself. The travel of the gases through the flue space 27 is so rapid, because of the restricted size of this passage as compared with the size of the combustion space 31, that the floor of the passage is continuously swept clean, thus enabling it to attain a high temperature and assist in the transmission of heat to the under side of the boiler shell.

While the rear wall 33 of the combustion chamber is shown as extending straight across the boiler setting from side to side, this is not essential and no stress is laid upon the shape of the wall in this respect.

I claim as my invention—

A steam boiler for the use of saw dust and the like as fuel comprising, in combination, a fire box having a grate on which an ignited heap of the fuel is maintained and constituting a retort chamber, the rear end of the fire box being open for substantially its entire width and height, means for supplying air for combustion through the grate and fuel heap, a commodious combustion chamber located immediately in rear of the fire box and communicating directly with the chamber thereof through the said open rear end of the fire box, said combustion chamber being constructed to retain the gases delivered to it from the chamber of the fire box within the zone of combustion until their combustion is substantially complete and the rear wall of the said combustion

chamber being of refractory material and being located adjacent the fire box and having a surface which directly faces the chamber of the fire box through its said open rear end, whereby the combustion of the gases within the said combustion chamber, by direct reaction of heat upon the fuel heap and by radiation and reflection of heat from the said wall upon the heap, facilitates the drying and destructive distillation of the fuel, and a heating flue leading out of the said combustion chamber.

WILLIAM A. GILCHRIST.

Witnesses:
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Correction In Letters Patent No. 1,166,670.

It is hereby certified that in Letters P ·ant No. 1,166,670, granted January 4, 1916, upon the application of William A. Gilchrist, of Memphis, Tennessee, for an improvement in "Steam-Boiler Furnaces," an error appears in the printed specification requiring correction as follows: Page 2, line 113, claim, after the word "boiler" insert the word *furnace;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 3d day of October, A. D., 1916.

[SEAL.]

F. W. H. CLAY,

Acting Commissioner of Patents.