

907,111.

Patented Dec. 15, 1908.

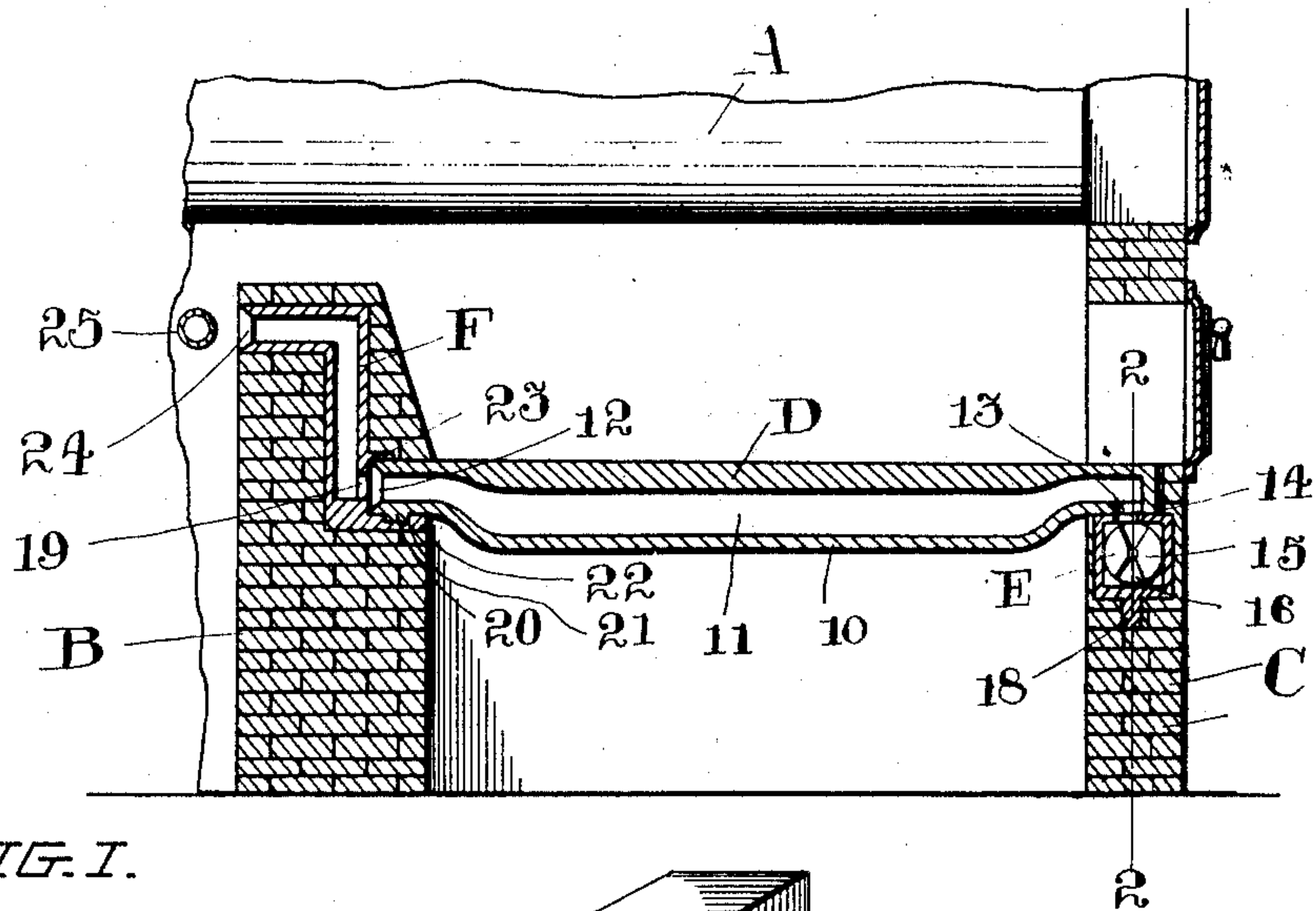
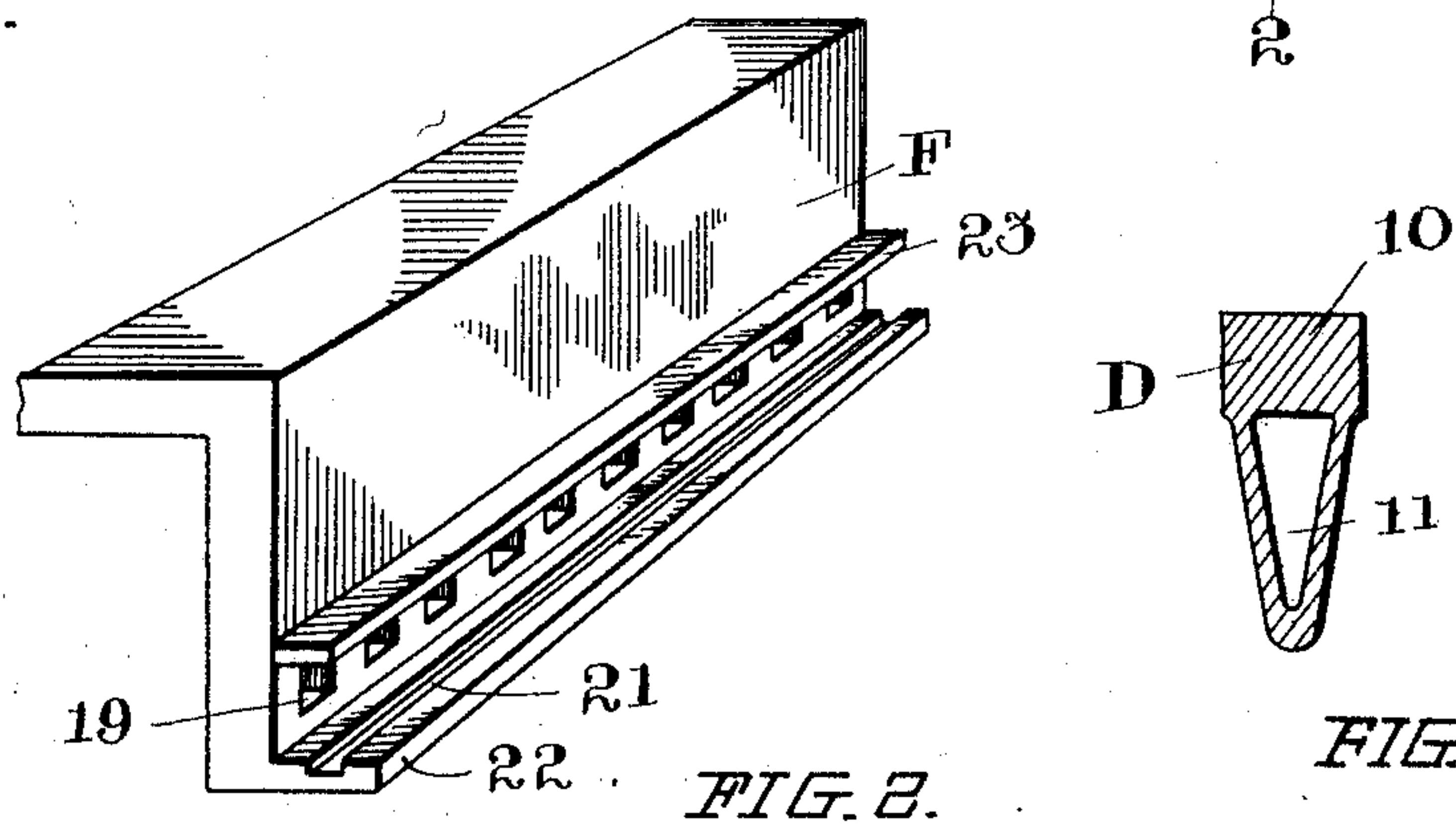
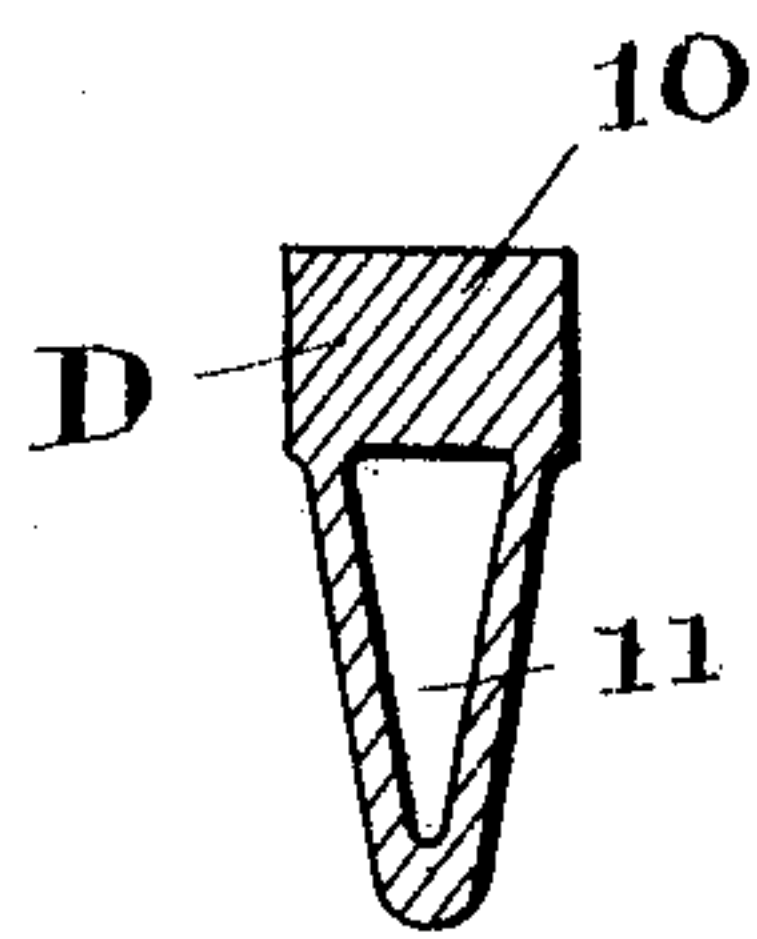


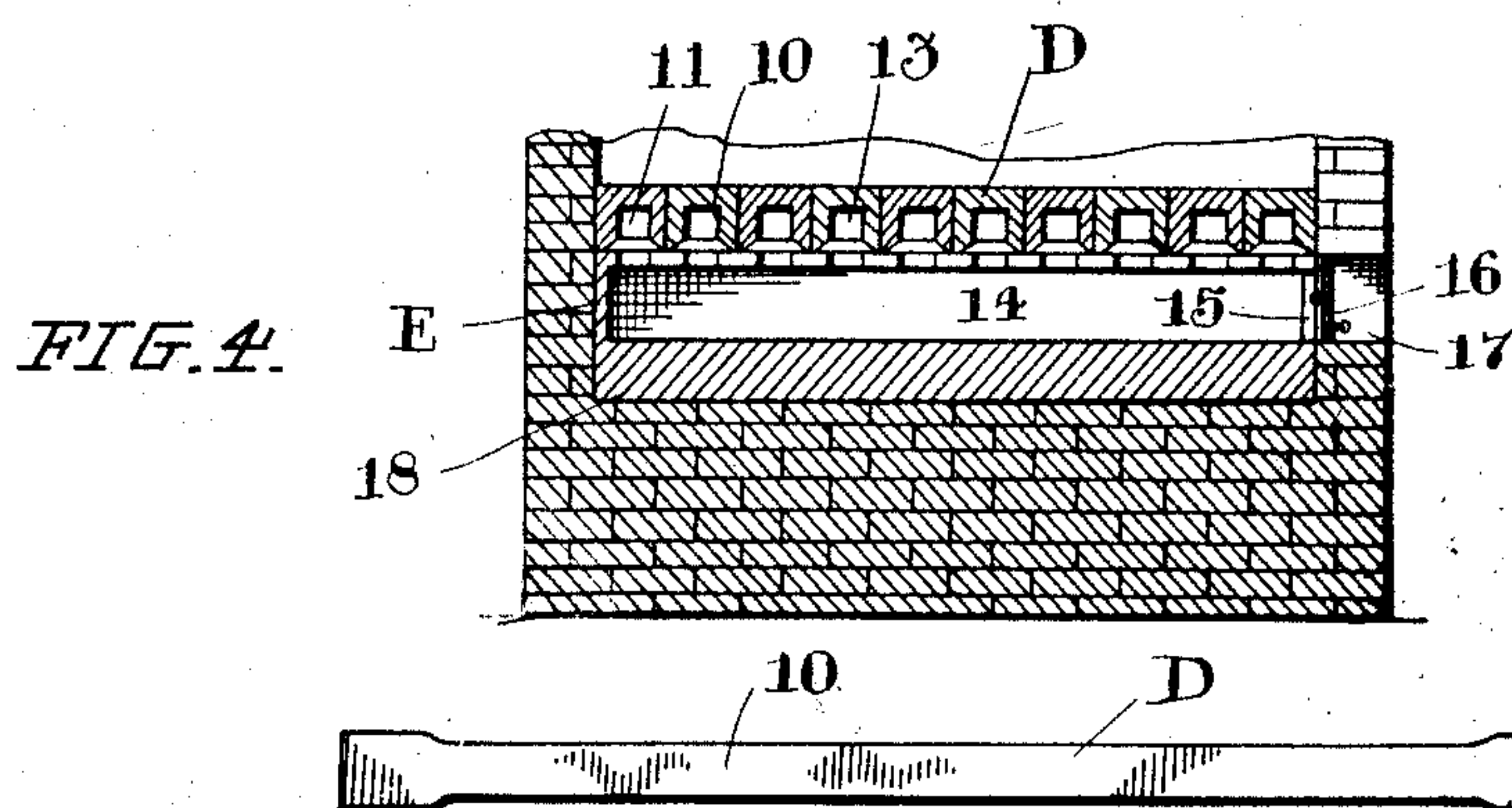
FIG. 1.



*FIG. 2.*



*FIG. 3.*



*FIG. 5.*

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BY *Frank B. Lusk* ATT'Y.



# UNITED STATES PATENT OFFICE.

JOHN MILLER FLEMING, OF IROQUOIS, ONTARIO, CANADA, ASSIGNOR OF ONE-FOURTH TO  
HIRAM WYMAN CHAMBERLIN AND ONE-FOURTH TO JAMES ROBERT GARDNER, OF  
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## GRATE-BAR AND FUEL-SAVER.

No. 907,111.

Specification of Letters Patent.

Patented Dec. 15, 1908.

Application filed May 4, 1908. Serial No. 490,862.

*To all whom it may concern:*

Be it known that I, JOHN MILLER FLEMING, of the town of Iroquois, in the county of Dundas, Province of Ontario, Canada, have invented certain new and useful Improvements in Grate-Bars and Fuel-Savers, of which the following is a specification.

My invention relates to improvements in grate bars and fuel savers, and the objects of my invention are to provide means for simultaneously maintaining the grate bars cool, to prevent destruction thereof and for producing a secondary combustion beneath the boiler to effect a saving in fuel, to consume the carbon particles and prevent smoke; and it consists essentially of a grate bar having a conducting passage-way there-through communicating at one end with an inlet air chamber having an adjustable opening and at the other with an air chamber in the bridge wall, which discharges to the rear thereof, all as hereinafter more fully set forth and described in the accompanying specification and drawings.

In the drawings,—Figure 1 is a sectional view illustrating a portion of a boiler having my improved grate bar and fuel saver attached thereto. Fig. 2 is a perspective view of the air chamber in the bridge wall. Fig. 3 is a transverse sectional view through one of the grate bars. Fig. 4 is a section along the line 2—2, Fig. 1. Fig. 5 is a top view of one of the grate bars.

In the drawings like letters of reference indicate corresponding parts in each figure.

Referring to the drawings, A represents part of the boiler, including a bridge wall B and front wall C. The grate bars D are formed by a plurality of separate bars 10, each of which has an air conducting passage-way 11 extending therethrough from one end to the other near the underside thereof, and provided with ports 12 and 13 at opposite ends.

It will be observed that the passageway through each of the grate bars is enlarged towards the center part and constricted at each end. This gives an opportunity for the cold air passing into the bar to be expanded by the heat and the pressure of the expanded heat forces the air in the rear part of the grate bar out through the constricted opening in the form of a jet, and this jet causes the air to pass through the air chamber F in the bridge wall with great rapid-

ity, and thereby more thoroughly promotes the secondary combustion after passage out of the air chamber.

The ports 13 are formed on the underside and are adapted to register with ports 14 provided in the air chamber E located in the front wall and on which the grate bars rest. This chamber extends transversely of the front wall and has at one end a port 15 controlled by an ordinary damper 16 which communicates through a passageway 17 in the wall with the open air. To counteract the effect of the heat and maintain the proper shape of this chamber, a flange 18 is formed on the bottom extending downwardly therefrom. The ports 12 on the opposite end of the grate bars are adapted to register with ports 19 provided in an air chamber F located in the bridge wall. The grate bars are held in engagement with this chamber by means of tongues 20 on each port, which engage a groove 21 provided in a flange 22 on the air chamber, a flange 23 being provided and adapted to abut the upper side of the grate bars. This air chamber is substantially L-shaped in form and has a port 24 discharging at the rear of the bridge wall. Immediately in front of this port there may be provided a water conducting pipe 25 through which the feed water of the boiler may be circulated, thereby heating the same and effecting economy in the amount of fuel necessary to heat the water.

In operation the air is drawn through the air chamber E through the passageways 11 in the grate bars, thereby cooling the underside of the said bars, into the air chamber F, which discharges the air in the rear of the bridge wall. Here the air, which will have been heated by its passage through the grate bars, commingles with the unconsumed products of combustion and hot gases flowing over the bridge wall from the fire on the grate bars, producing a secondary combustion which assists in the heating of the boiler and also reduces the amount of smoke which would otherwise escape from the chimney by consuming the carbon particles.

It will be observed that only the inner end of the grate bars are fixed, so the outer end only rests by gravity on the air chamber E, thus permitting a slight expansion and contraction to correspond with the heating and cooling thereof.

It will be observed that by the passageway



11 being near the underside, the upper side of the grate bar is not cooled to any appreciable extent. It will also be observed that the amount of metal on top of the passage-way through each grate bar is considerably greater than that below, and this is a considerable advantage, as it increases the wearing surface and prevents burning out of the bar, the metal on top being substantially equal to that of an ordinary grate bar. The life of the wearing surface is also prolonged by the hollow web below the same, through which the air passes.

It will be readily understood that while the invention has been described in detail in the accompanying specification and drawings, changes, within the scope of the appended claims may be made without departing from the spirit of the invention.

What I claim as my invention is:

1. In an apparatus of the class described, a bridge wall provided with an air passageway therethrough, a plurality of hollow grate bars whose upper surface is substantially in a straight line, each formed with a depending central enlargement from the upper wall intermediate the ends thereof, and the lower wall being curved downwardly intermediate its ends, whereby an enlarged air expansion chamber provided with a restricted inlet and a restricted outlet is formed, said outlet being adapted to project the air into the air passageway of the bridge wall in the form of a jet, under the propulsion of the expanding air, the said grate bars communicating at their inner ends with the air passageway in the bridge wall, and means for placing the outer ends of the grate bars in communication with a supply of air.

2. In an apparatus of the class described, a hollow grate bar, whose upper surface is substantially in a straight line, the walls of the upper portion intermediate its ends being thicker than the walls of the lower portion and the walls at each end, and the lower wall being spaced from the upper wall, intermediate its ends a greater distance than the space between the upper and lower walls at each end whereby an enlarged chamber provided with a restricted inlet and a restricted outlet is formed.

3. In an apparatus for the purpose specified, the combination with the bridge wall and air chamber therein, having suitable outlet ports, said bridge wall being provided with a plurality of inlet ports in the side thereof, with an integral supporting member on the exterior beneath the inlet ports, said member having a groove therein, of a plurality of grate bars having air passageways with outlet ports registering with those in the air chambers, and having tongues engaging the groove in the supporting member, and means placing the opposite ends of the grate bars in communication with a source of air supply.

4. In an apparatus of the character specified, the combination with the bridge wall, an air chamber therein having a suitable outlet port, said bridge wall being provided with a plurality of inlet ports in the side thereof with flanges above and below the same, one of said flanges having a groove therein, of a plurality of grate bars having air conducting passage-ways with outlet ports registering with the ports in the air chamber, the ends of the grate bars being adapted to extend between the flanges and each of the grate bars having tongues engaging said groove, and means for placing the opposite ends of the grate bars in communication with a source of air supply.

5. In an apparatus for the purpose specified, a bridge wall provided with an air passageway therethrough, the said air passageway being provided with a plurality of inlet ports, a plurality of grate bars having air passage-ways with outlet ports registering with said air inlet ports, the bridge wall being provided with a groove below said inlet ports, each grate bar being provided with a tongue engaging said grooves and means placing the opposite ends of the grate bars in communication with a source of air supply.

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

JOHN MILLER FLEMING.

Witnesses:

RUSSEL S. SMART,  
J. H. GLEN.