(No Model.) 2 Sheets—Sheet 1

C. L. LORRAINE.

BOILER FURNACE.

No. 516,334. Patented Mar. 13, 1894.

FIG. 1.

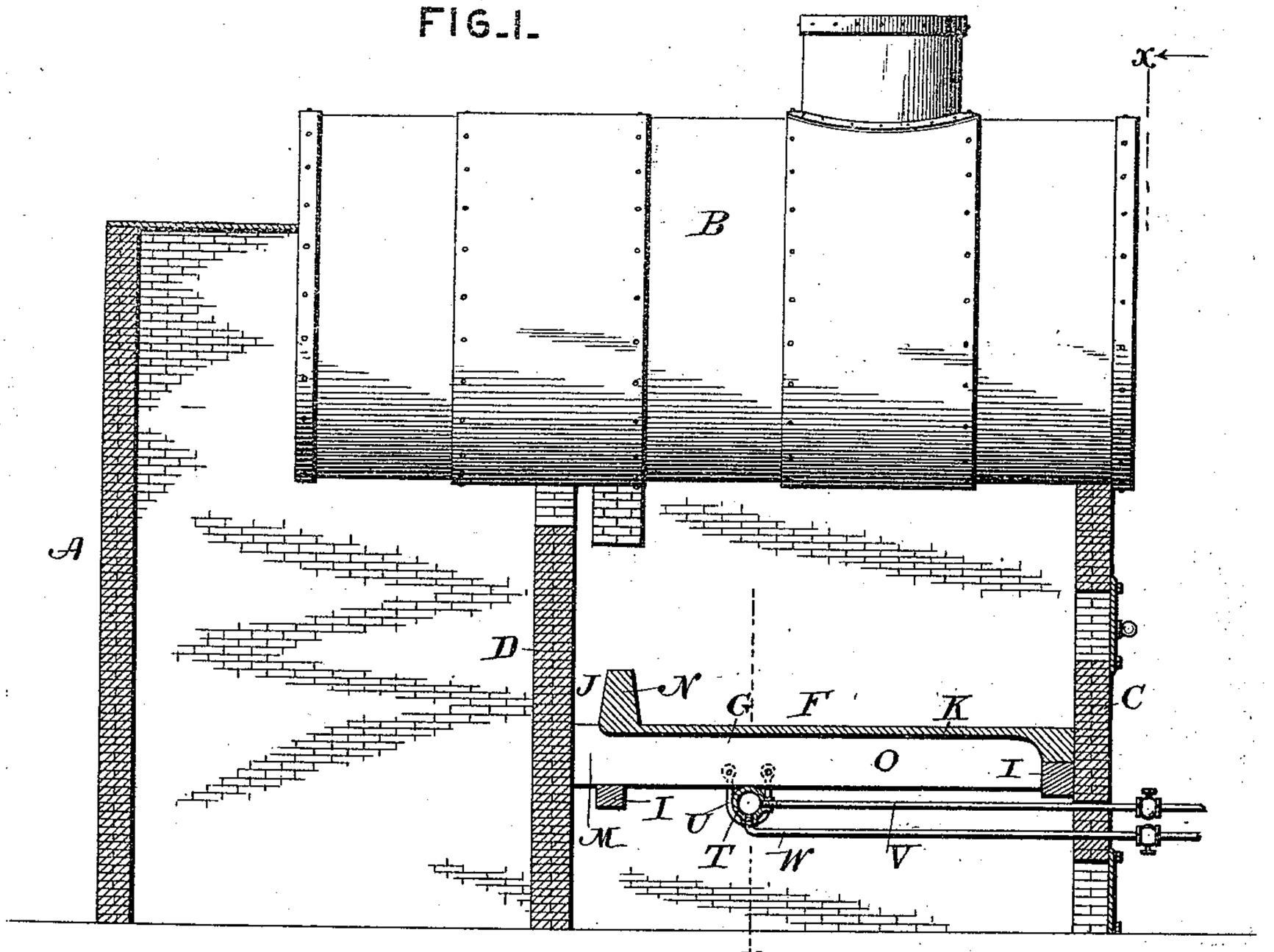
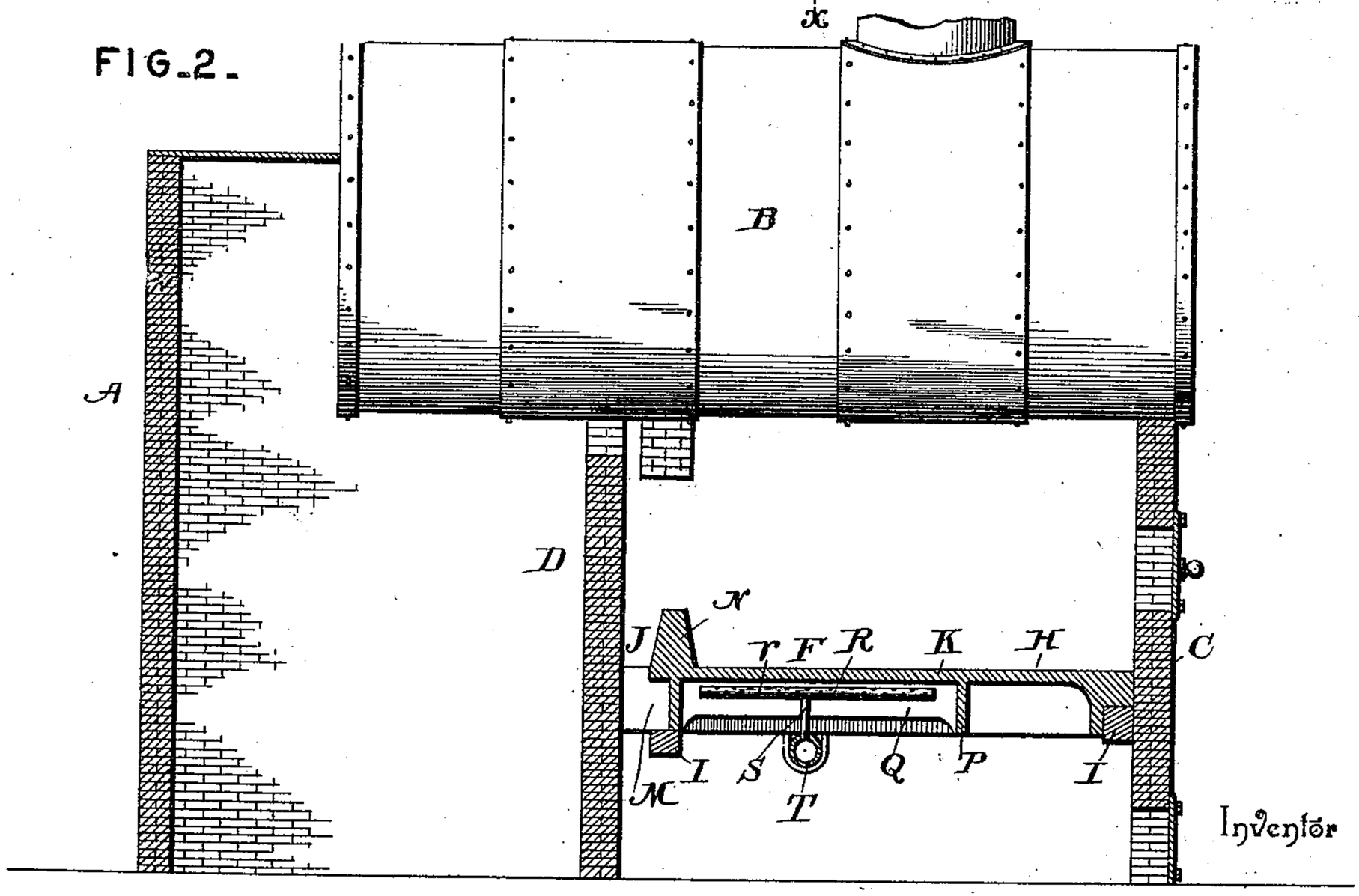


FIG. 2.



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(No Model.) 2 Sheets—Sheet 2.

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FIG. 3.

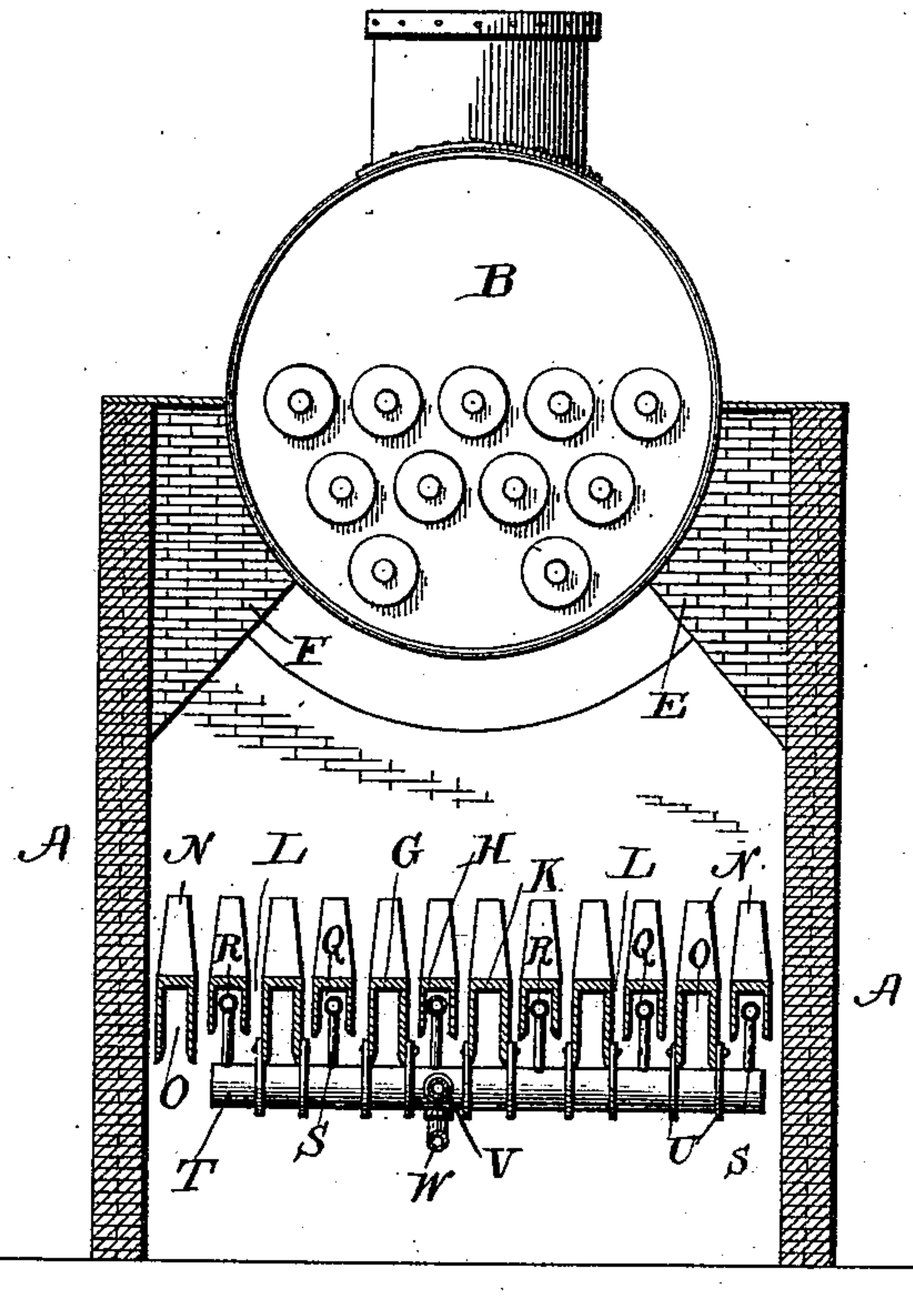

FIG. 4.

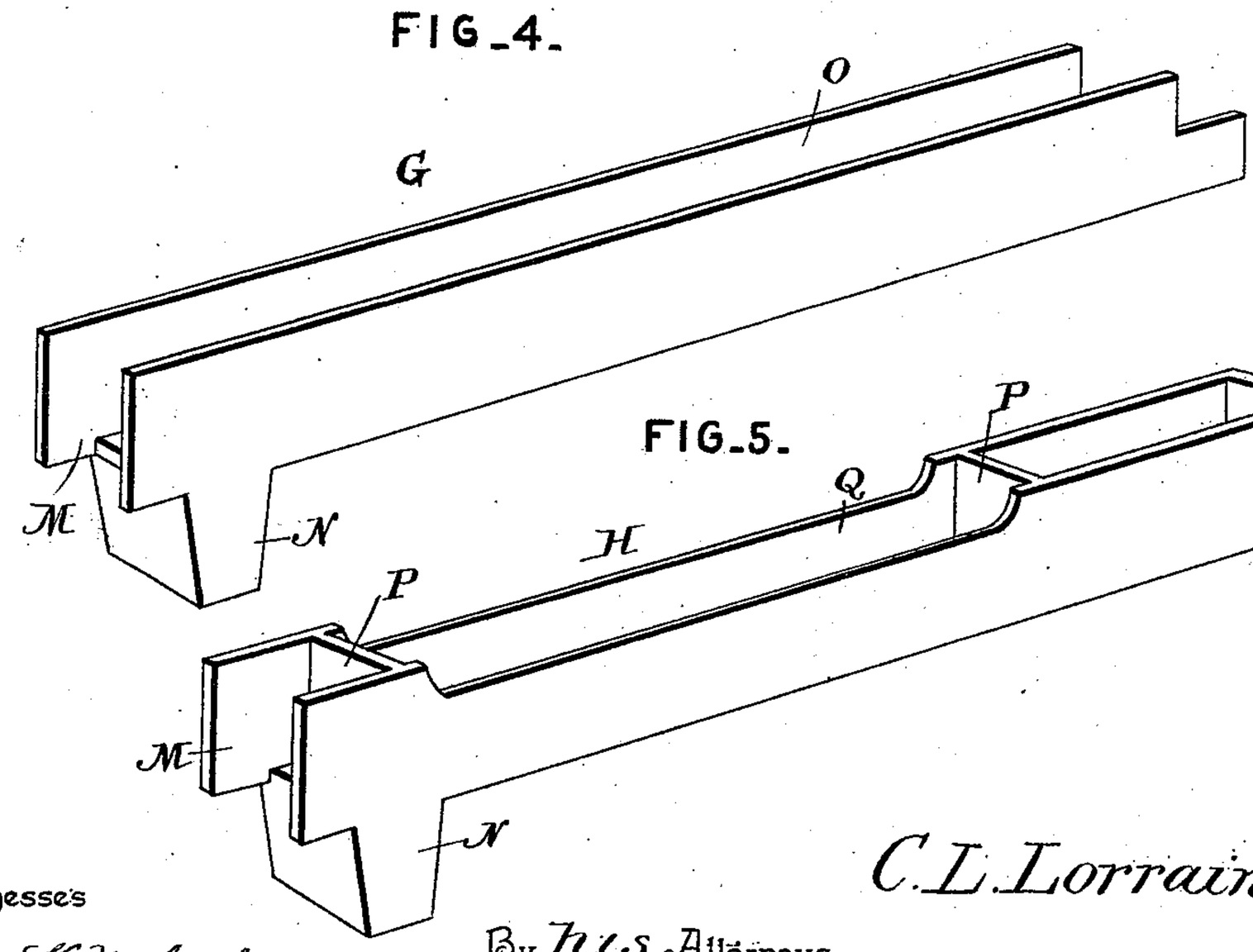

FIG. 5.

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UNITED STATES PATENT OFFICE.

CLARENCE L. LORRAINE, OF EAST JORDAN, MICHIGAN.

BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 516,334, dated March 13, 1894.

Application filed June 12, 1893. Serial No. 477,357. (No model.)

To all whom it may concern:

Be it known that I, CLARENCE L. LORRAINE, a citizen of the United States, residing at East Jordan, in the county of Charlevoix and State of Michigan, have invented a new and useful Boiler-Furnace, of which the following is a specification.

This invention relates to furnaces; and it has for its object to provide certain improvements in furnaces of that character especially adapted for heating steam boilers, whereby a more thorough combustion of the fuel will be secured, and also the consumption of the smoke issuing from the fire, thereby providing for the complete utilization of the fuel, and consequently a high degree of heat.

To this end the main and primary object of the present invention is to provide an improved fire grate in combination with certain draft devices for the same, whereby the results noted will be effectually secured.

With these and other objects in view which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination and arrangement of parts hereinafter more fully described, illustrated and claimed.

In the accompanying drawings:—Figure 1 is a central vertical longitudinal sectional view of a boiler furnace constructed in accordance with this invention, the section being through one of the grate bars of the grate. Fig. 2 is a similar view of the furnace, the section being through a different one of the grate bars. Fig. 3 is a central transverse sectional view on the line *x*—*x* of Fig. 1. Fig. 4 is a detail in perspective of one of the grate bars. Fig. 5 is a similar view of a different one of the grate bars.

Referring to the accompanying drawings, A represents a boiler furnace of the ordinary construction having the usual side, front and end walls, and supports therein the ordinary horizontal boiler B, of the ordinary type and secured in position within the walls of the furnace in a suitable manner. The said furnace A, incloses therein a suitable distance from its front wall C, the usual bridge wall D, which bridge wall is arranged under the boiler B, and terminates at its upper end short of said boiler, in order to permit the passage of the heat and other products of combustion thereover in the ordinary manner.

Arranged in front of the bridge wall D, and in the space occupied by the fire box of the furnace, are the opposite baffle brackets E. The baffle brackets E, are formed as a part of the sides of the furnace, or of other suitable material, and embrace the opposite lower edges of the boiler B, adjacent to the upper side edges of the bridge wall, so that the lighter gases arising from the fuel on the grate below said brackets, are compelled to pass under the same, near to the body of the fire or heat passing over the bridge wall, so that such gases become sufficiently heated to burn in the hot air furnished at that point, said baffle brackets in this manner assisting materially in the perfect consumption of the fuel placed on the grate F, arranged in the space between the bridge wall D, and the front wall of the furnace.

The grate F, comprises an alternate series of hollow grate bars G, and H, respectively, which grate bars have their front and rear ends resting on the transverse supporting cleats or bars I, arranged at the inner side of the front wall C, and at a point adjacent to the solid bridge wall D, the latter disposition of one of the transverse supporting bars providing means for supporting the rear or inner ends of said grate bars adjacent to and out of contact with the bridge wall, so as to leave a rear hot air circulating space J, directly in front of said bridge wall, for the purposes to be presently set forth.

Each of the alternate hollow grate bars G and H, are provided with closed tops K, which form a bed for the fuel, and are regularly spaced from each other so as to leave narrow draft spaces L, therebetween, such draft spaces being sufficiently narrow so that the major portion of the hot air, or draft below the grate bars, will pass up through the rear hot air circulating space J, as will be presently described, and the said hollow grate bars are each further provided at their extreme inner ends with the end air openings M, which communicate with the vertical circulating space J, directly in front of the bridge wall, to provide for the free circulation of hot air from below the grate bars up to a point in front of the bridge wall, and back of the fire, so as to provide a plentiful supply of hot air for the combustion of the gases passing over the top of said bridge wall.

The hollow grate bars G and H, are each provided upon their top faces directly in front

of the inner end openings M, with the upwardly projected fire lugs N, which serve to hold the coals onto the grate surface, and to confine the fire in front of the openings M and the rear hot air circulating space J, and the grate bars G are provided with the longitudinal bottom air passages O, extending longitudinally thereof from near their front ends and communicating directly with the end air openings M, so that the air from the ash pit, which rises into such grate bars, is heated up and circulated directly into the rear hot air circulating space J.

The depending sides of the hollow grate bars G, which inclose the longitudinal air passages O, project a distance below the lower ends of the corresponding inclosing sides of the other hollow grate bars H, which are much shorter, and the spaces inclosed between the shorter sides of the grate bars H, do not communicate with the end air openings M, but are closed by the transverse end walls P, cast into the grate bars H, to inclose heating spaces Q.

The hollow spaces of each of the grate bars open at the bottom into the ash pit, and those in the alternate bars H, are designed to accommodate the longitudinal steam jet pipes R. The longitudinal steam jet pipes R, are provided, throughout their length, with a series of jet openings *r*, which provide for jetting the steam into the closed spaces Q, throughout their entire lengths, and said pipes are attached to the upper ends of the vertical branch pipes S, arising from the transverse steam pipe T. The transverse steam pipe T, is disposed transversely under the entire series of grate bars, and is clamped in position by the U-shaped stirrups U, embracing the bottom of said pipe and attached at their ends to the sides of the grate bars G. A valved steam supply pipe V, leads into the large transverse pipe T, from one end or a suitable intermediate point, and a valved drain pipe W, connects with the bottom of said pipe T, to provide means for draining off the water of condensation which may have collected therein.

Now from the foregoing it will be apparent that there is a free end passage for the greater portion of the hot air circulated in the ash pit, so as to supply the escaping gases from the fire with the necessary heated air to insure their complete combustion, and by reason of leading the steam into certain hollow grate bars, such steam becomes superheated within such grate bars, and mixing with the hot air, passes below the short sides of the grate bars H, and up through the spaces L, into the fuel, whereby the combustion of such fuel is perfectly supported.

Changes in the form, proportion and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. In a boiler furnace, the combination with the bridge wall; of a series of spaced hollow grate bars arranged in front of and out of contact with said bridge wall, certain of said hollow grate bars being provided with end-closed heating spaces, and steam jet pipes arranged in said heating spaces, substantially as set forth.

2. In a boiler furnace, a series of grate bars having inner end openings communicating with the space directly in front of the bridge wall, and upwardly projected fire lugs disposed on their upper faces in front of said inner end openings, substantially as set forth.

3. In a boiler furnace, the bridge wall, a series of hollow grate bars having their inner ends terminating short of the bridge wall to leave a rear hot air circulating space and provided in such ends with end openings communicating with said space, and upwardly projected fire lugs in front of said end air openings, and a steam jet arranged in certain of said hollow grate bars, substantially as set forth.

4. The combination in a boiler furnace, of a series of regularly spaced hollow grate bars open at their bottom, certain of said grate bars having longer sides than the other grate bars and provided with longitudinal air passages opening into the space in front of the furnace bridge wall, and steam jet pipes arranged longitudinally in the other shorter grate bars, substantially as set forth.

5. In a boiler furnace, the combination with the bridge wall; of a series of regularly spaced hollow grate bars terminating at one end short of the bridge wall and provided in such ends with air openings communicating with the space in front of the bridge wall, certain of said hollow grate bars having longer sides than the other alternate bars and inclosing longitudinal hot-air passages, the other shorter grate bars having end-closed heating spaces, perforated jet pipes arranged longitudinally in said heating spaces, and a steam supply for said jet pipes, substantially as set forth.

6. In a boiler furnace, the combination with a series of hollow grate bars some of which are shorter in depth than the others, of a transverse steam pipe arranged below the grate bars, U-shaped stirrups embracing said pipe and attached to the sides of the deeper grate bars, branch pipes arising from the transverse steam pipe, and perforated jet pipes supported on the upper ends of said branch pipes and longitudinally in the shorter grate bars, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

CLARENCE L. LORRAINE.

Witnesses:
FRED E. BOOSINGER,
JOHN BOOSINGER.