

(No Model.)

R. MARSHALL.
ATTACHMENT FOR STEAM BOILER FURNACES.

No. 426,599.

Patented Apr. 29, 1890.

FIG. I.

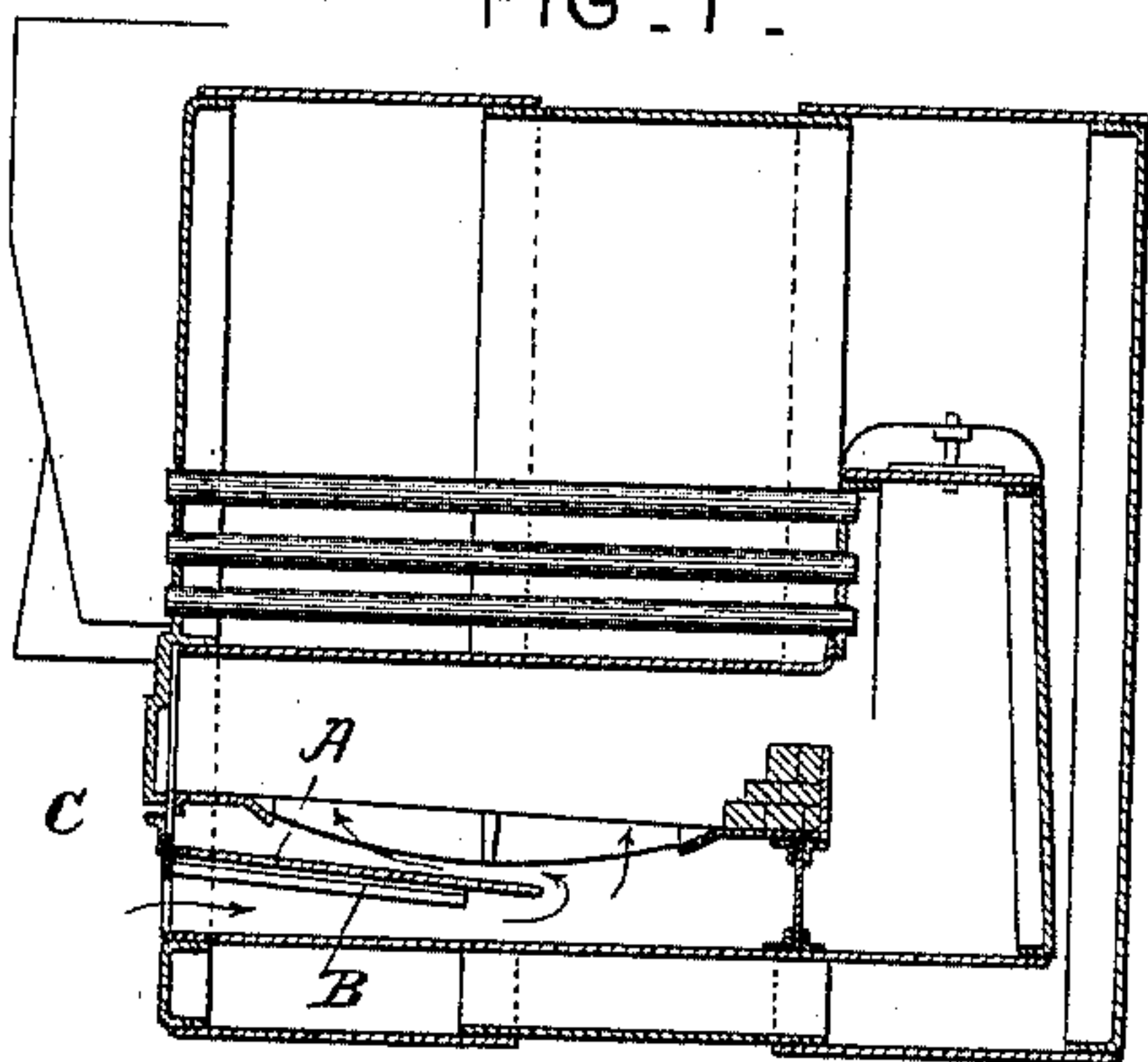


FIG. II.

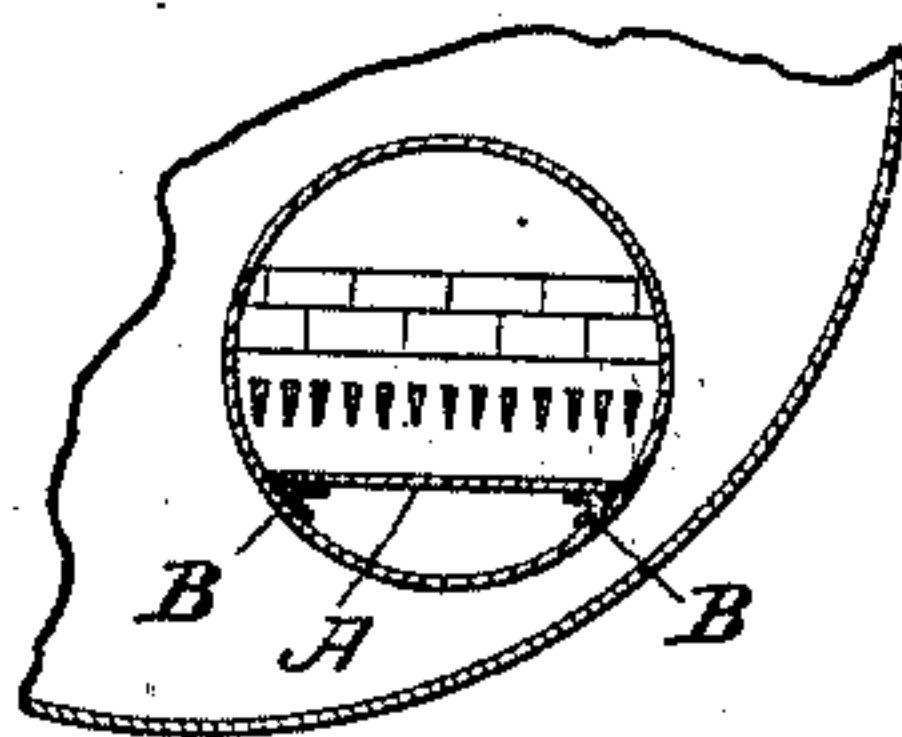


FIG. III.

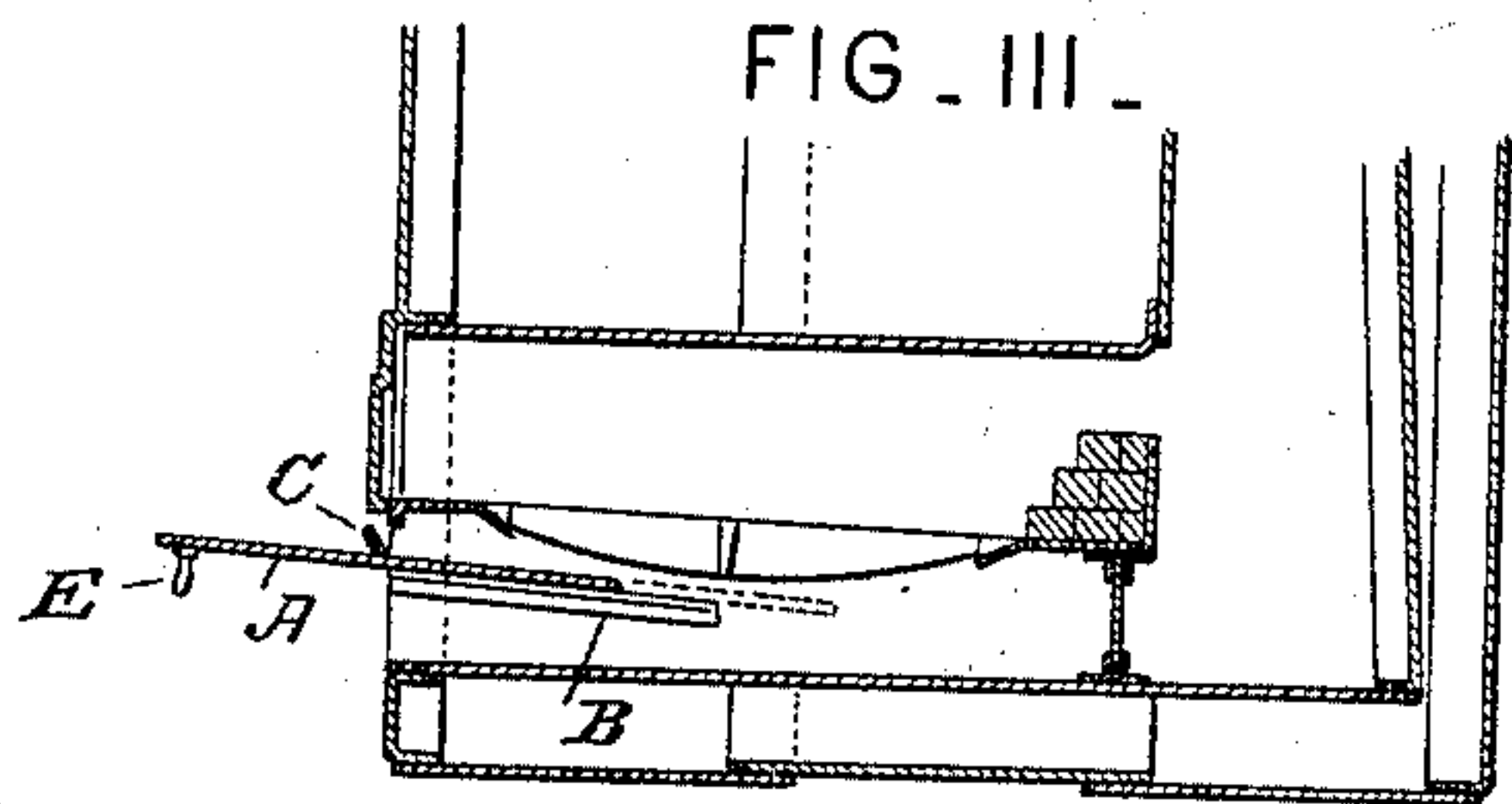


FIG. IV.

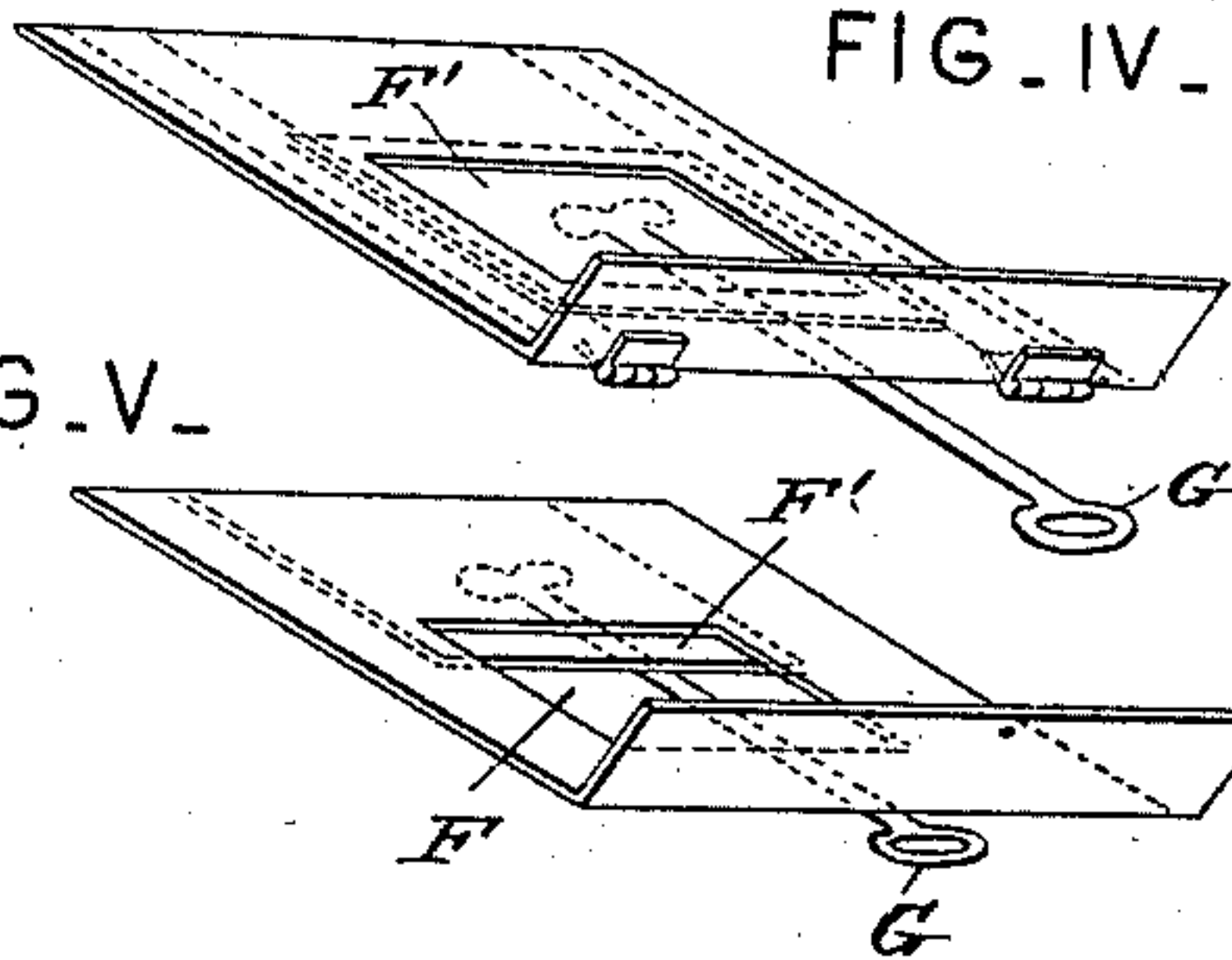


FIG. V.

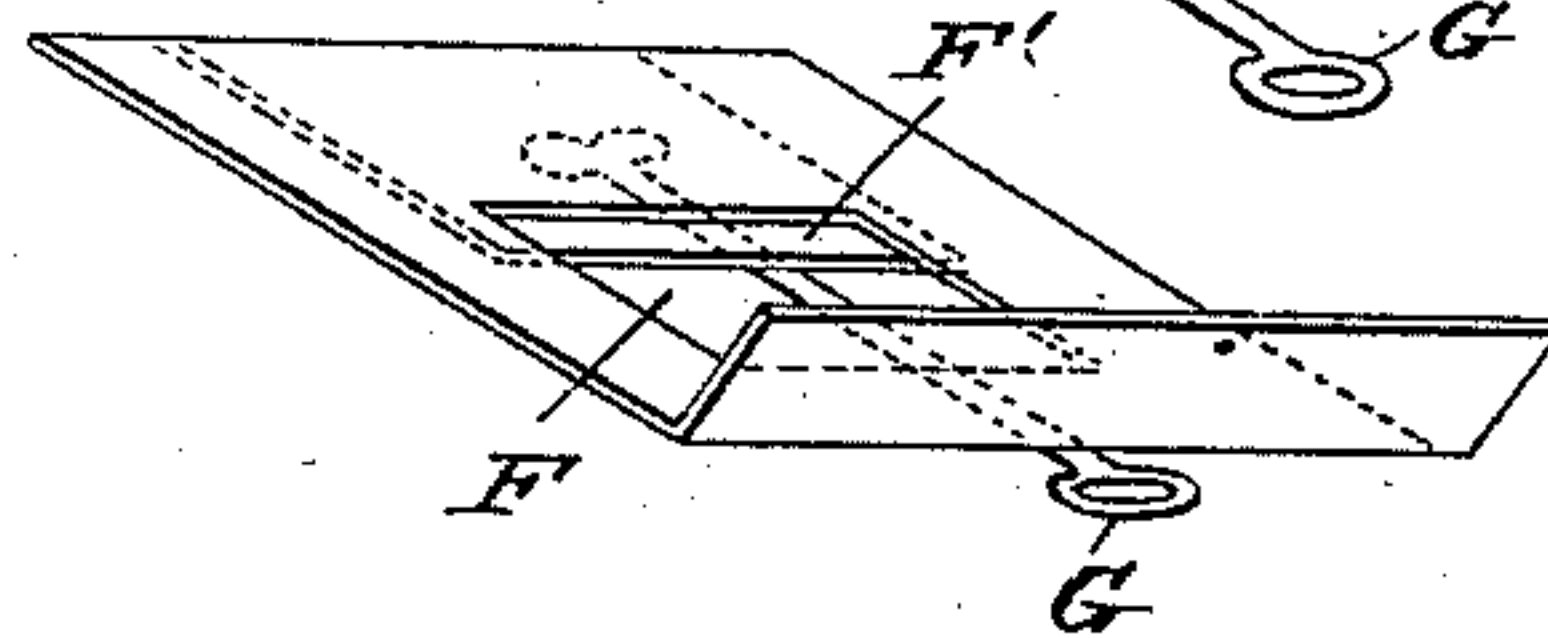


FIG. VII.

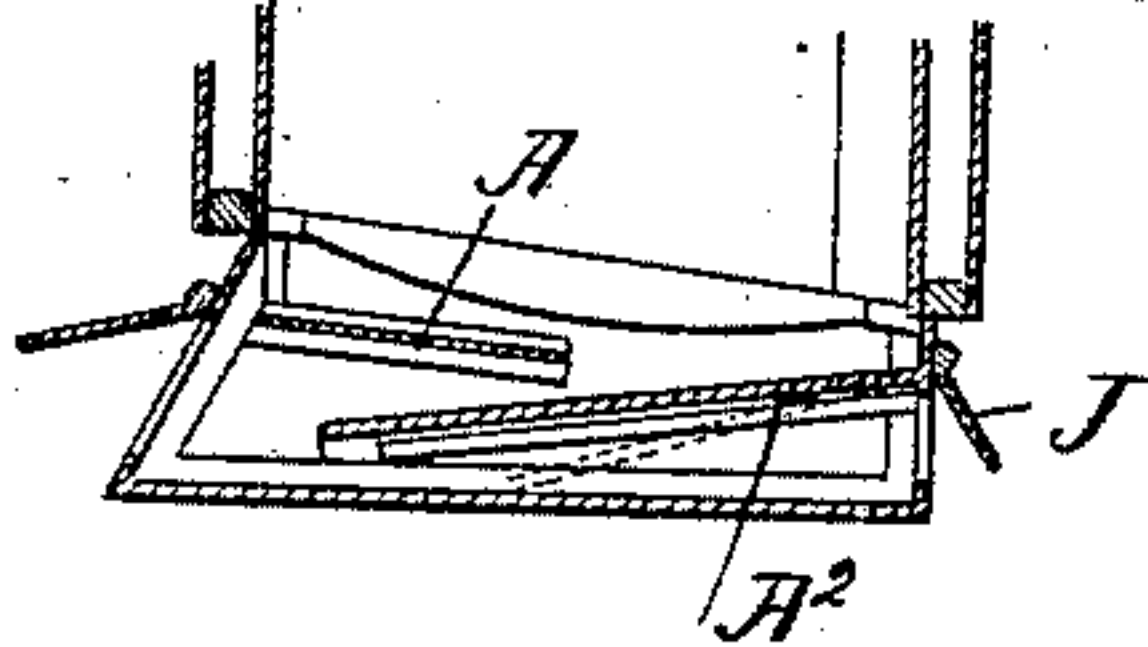


FIG. VI.

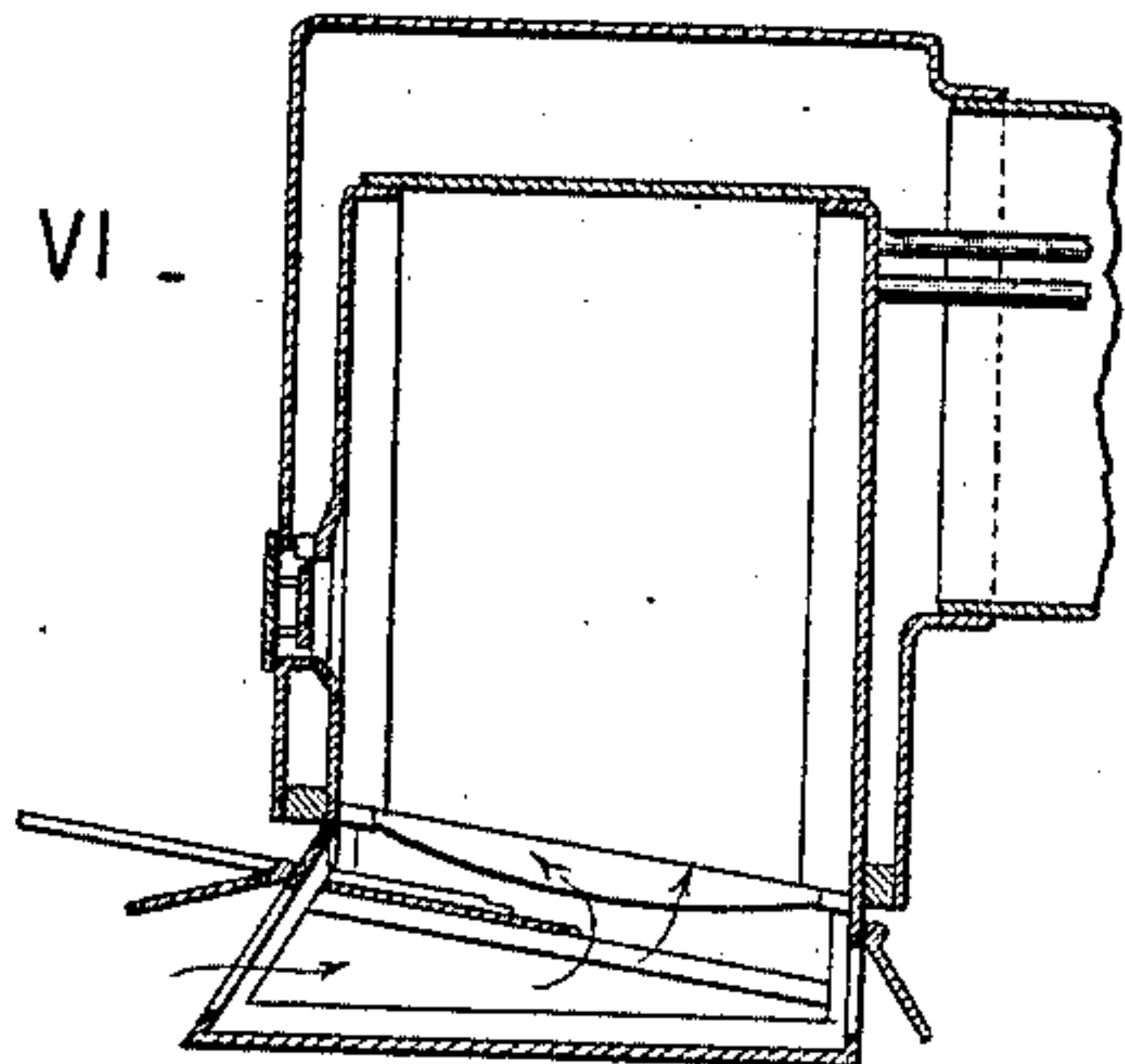
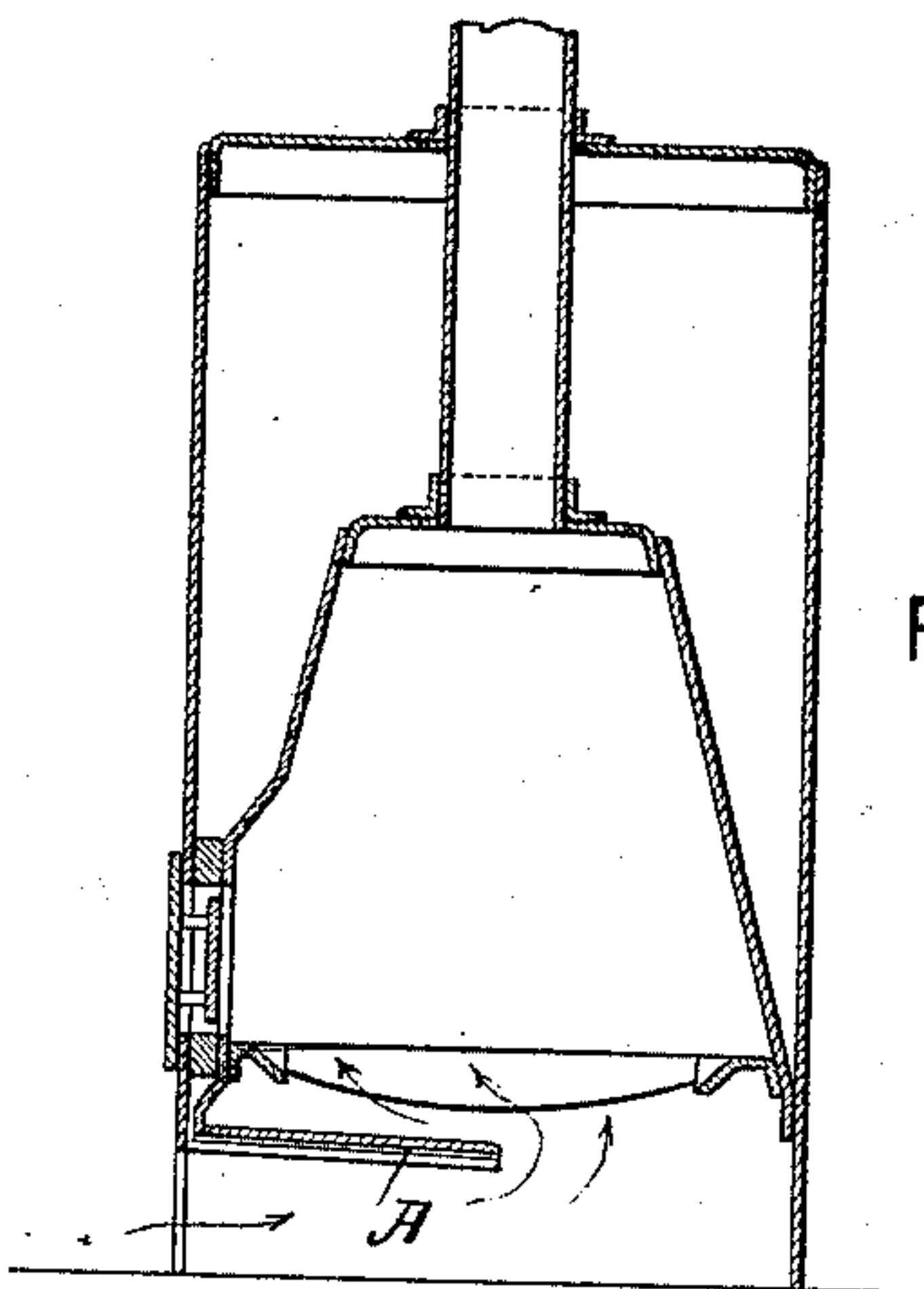


FIG. VIII.



Attest:
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UNITED STATES PATENT OFFICE.

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ATTACHMENT FOR STEAM-BOILER FURNACES.

SPECIFICATION forming part of Letters Patent No. 426,599, dated April 29, 1890.

Application filed February 8, 1890. Serial No. 339,650. (No model.) Patented in England April 22, 1887, No. 5,888; in France May 12, 1887, No. 183,539; in Belgium May 12, 1887, No. 77,431; in Germany May 13, 1887, No. 41,217; in Italy June 21, 1887, XLIII, 25; in Spain July 21, 1887, No. 7,010, and in Austria-Hungary February 12, 1888, No. 19,080 and No. 1,282.

To all whom it may concern:

Be it known that I, ROBERT MARSHALL, a resident of London, England, have invented a new and useful Improvement in Attachments
5 for Steam-Boiler Furnaces, (for which I have obtained patents in Great Britain, No. 5,888, dated April 22, 1887; in France, No. 183,539, dated May 12, 1887; in Germany, No. 41,217, dated May 13, 1887; in Belgium, No. 77,431,
10 dated May 12, 1887; in Austria-Hungary, Nos. 19,080/1,282, dated February 12, 1888; in Spain, No. 7,010, dated July 21, 1887, and in Italy, No. XLIII, Vol. 25, dated June 21, 1887,) which improvement is fully set forth in the
15 following specification.

This invention has for its object to effect increased economy in fuel and afford greater heating power to boiler-furnaces by means which cause the combustion of the fuel in
20 such a manner that at the front part of the furnace, where the fresh fuel is introduced, this is in great measure only subjected to a distilling process, so as to give off its volatile constituents, which, in passing forward over
25 the inner part of the fuel in a high state of incandescence, there enters into combustion with the highly-heated air-supply passing up through the fuel. I effect this object by supplying the fuel on the front part of the furnace-bars or on the dead-plate with only a
30 very limited quantity of air heated to a considerable degree; so as only to maintain a thin layer of the fuel in a state of incandescence on the fire-bars or dead-plate, the heat from
35 which layer effects the distillation of the volatile constituents from the thick layer of fresh fuel above it.

In carrying out the invention a flat plate is placed beneath the horizontal grate-bars
40 and in close proximity thereto, the plate extending across the space and from the front wall of the furnace to within a short distance of the rear wall, forming a long but thin space or passage between the upper surface of the
45 said plate and the grate-bars. The air enters beneath this plate and travels in contact with

under side to the rear end thereof, when it rises vertically, the greater portion passing through the fuel over the back portion of the grate, where the layer of fuel is comparatively
50 thin and combustion is most advanced. A smaller part of the air enters the thin space described, becoming highly heated therein, and finally rises through the thicker mass of fuel at the front of the grate. It is an im-
55 portant feature of the operation of this invention that this highly-heated body of air is sufficient to maintain only a thin layer of fuel immediately above the bars in a state of incandescence, all the superincumbent mass
60 undergoing merely a process of distillation, while the air admitted to the back of the grate is more than is required to completely consume the smaller amount of fuel lying
65 there, so that the excess of air in a highly-heated state will impinge upon and effect combustion of the fuel-gases distilled off from the fuel above the front part of the grate, as aforesaid.

The device whereby this important economy in combustion is effected is extremely
70 simple. Its application and use require no modification or special arrangement of the boiler-furnaces to which it is attached. It is readily, and in many cases has been, applied
75 to furnaces already in use with excellent results.

In order that the said invention may be fully understood, it will now be described in connection with the accompanying drawings, 80
in which—

Figure I represents in longitudinal section an ordinary boiler-furnace with the attachment in place. Fig. II is a partial view in front elevation, part of the furnace-wall being removed. Fig. III illustrates in longitudinal section a sliding plate. Figs. IV and V show the plate provided with slides or valves. Figs. VI and VII illustrate the application of the invention to a locomotive
90 boiler-furnace, and Fig. VIII its application to a vertical steam-boiler furnace.

Referring to Figs. I and II, A is the before-mentioned plate fixed in a practically-horizontal position at a small distance from the under sides of the front part of the horizontal furnace-bars and extending right across the furnace, being supported by angle-irons B B on the sides of the furnace. The space between the plate A and the bars is closed by a flap C, hinged either to the plate A, as shown, or to the front of the furnace, so that by opening this flap access can be had to the upper part or plate A, or air may be admitted directly into the space above said plate. In ordinary operation the flap C is closed and the whole of the air-supply enters beneath the plate A, and after passing beyond the inner end thereof the greater part of it rises up through the back part of the grate-bars, while a smaller portion passes backward in the thin space between A and the front part of the grate-bars, becoming highly heated, and then rising up between the bars to enter into combustion with a thin layer of the fuel on this part of the bars. The air-supply passing up through the back part of the grate-bars, being more than will enter into combustion with the solid fuel there situated, will partly pass through the same, becoming highly heated, and will impinge upon and enter into combustion with the combustible gases that are passing forward from fuel on the front part of the furnace.

In the arrangement shown in Fig. III the plate A is not fixed, but can be slid in and out upon the angle-iron bearings B, being provided with a handle E for this purpose. By this means the effect of the plate upon the combustion can be modified according to the position of the plate. The flap C is in this case fixed on the furnace-front.

Figs. IV and V show perspective views to an enlarged scale of the plate A, formed with an opening F, which can be made more or less closed by a slide F', moved by a handle G, so as to admit more or less air from below into the space between the plate and the bars.

Fig. VI shows a vertical section of a locomotive fire-box with this invention applied thereto, the plate A being in this case arranged to be slid upon angle-iron supports I by means of the handle E, either into the position shown or into the opposite position on the other side of the fire-box, according to the direction in which the engine is traveling. The fresh fuel must in this case be thrown either on the front part or on the back part of the grate, according to the position of the plate A; or, instead of arranging the plate A to shift, as described, it may be fixed in the position under the front end of the grate, and a second plate A², Fig. VII, be fixed below it, extending from the back end of the fire-box, just above the flap J, to within a certain distance of the front end, so that when the en-

gine is running forward the air-supply entering through J passes, first, forward underneath A², and then back again underneath A into the furnace, while on running backward the air-supply entering through the flap K passes directly underneath A to the furnace; or, in place of the fixed plate A², the flap J, instead of opening outward, as usual, may be arranged to open inward and be considerably extended in length, as shown in dotted lines at Fig. VII, so that when raised it will serve in lieu of the plate A².

Having now described my invention, I would observe in conclusion that it has been proposed heretofore to combine with a grate inclined to an angle of more than forty-five degrees from the horizontal an inclined air-deflecting plate in front of the grate, the object being to afford an independent supply of air to the lower or back portion of the grate, where in this instance the bulk of the fuel must necessarily lie. This construction is not designed or adapted to form a thin air-space under the front part of the grate or to cause a small portion of the air admitted under the deflecting-plate to pass into such space and become heated therein.

It is essential to effect the objects of my invention that the plate should form a thin air-space open at the back. It is also essential that the grate should not be inclined downward, as in that case it is manifestly impossible to maintain at the front of the bars a thick layer of fuel, which will necessarily gravitate downward. It has also been proposed prior to my invention to divide the space under a grate into two compartments by a vertical partition and admit air to the front compartment direct through the front wall of the furnace and to the rear compartment by a passage or channel extending under both compartments. This construction is also radically different from that herein described and claimed, and operates to accomplish different results. Both the prior devices lack the simplicity and readiness of application which characterize my invention.

Disclaiming, therefore, what is old, I claim as my invention—

1. The combination, with a horizontal furnace-grate, of a plate extending under the front part only of the grate-bars and in close proximity thereto, forming a thin air-heating space beneath said bars, the air-inlet being beneath said plate, so that in operation the air passes backward under said plate, and the greater portion rises vertically through the rear part of the grate, while a small portion enters said heating-space and reaches the fuel at the front of the grate in a highly-heated condition, substantially as described.

2. The combination, with the furnace-grate, of a plate extending under the front part of the grate between it and the air-inlet, and

bearings for said plate upon which the latter is supported, so that it can slide in and out, substantially as described.

3. The combination, with a furnace-grate, of a plate beneath the front part of the same, forming above it a thin air-heating space, said plate being provided with valves or slides, substantially as described.

In testimony whereof I have signed this

specification in the presence of two subscribing witnesses.

ROBT. MARSHALL.

Witnesses:

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