No. 772,760. PATENTED OCT. 18, 1904.

I. A. TIMMIS.

METHOD OF PROMOTING COMBUSTION OF FUEL.

APPLICATION FILED MAY 7, 1904.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1

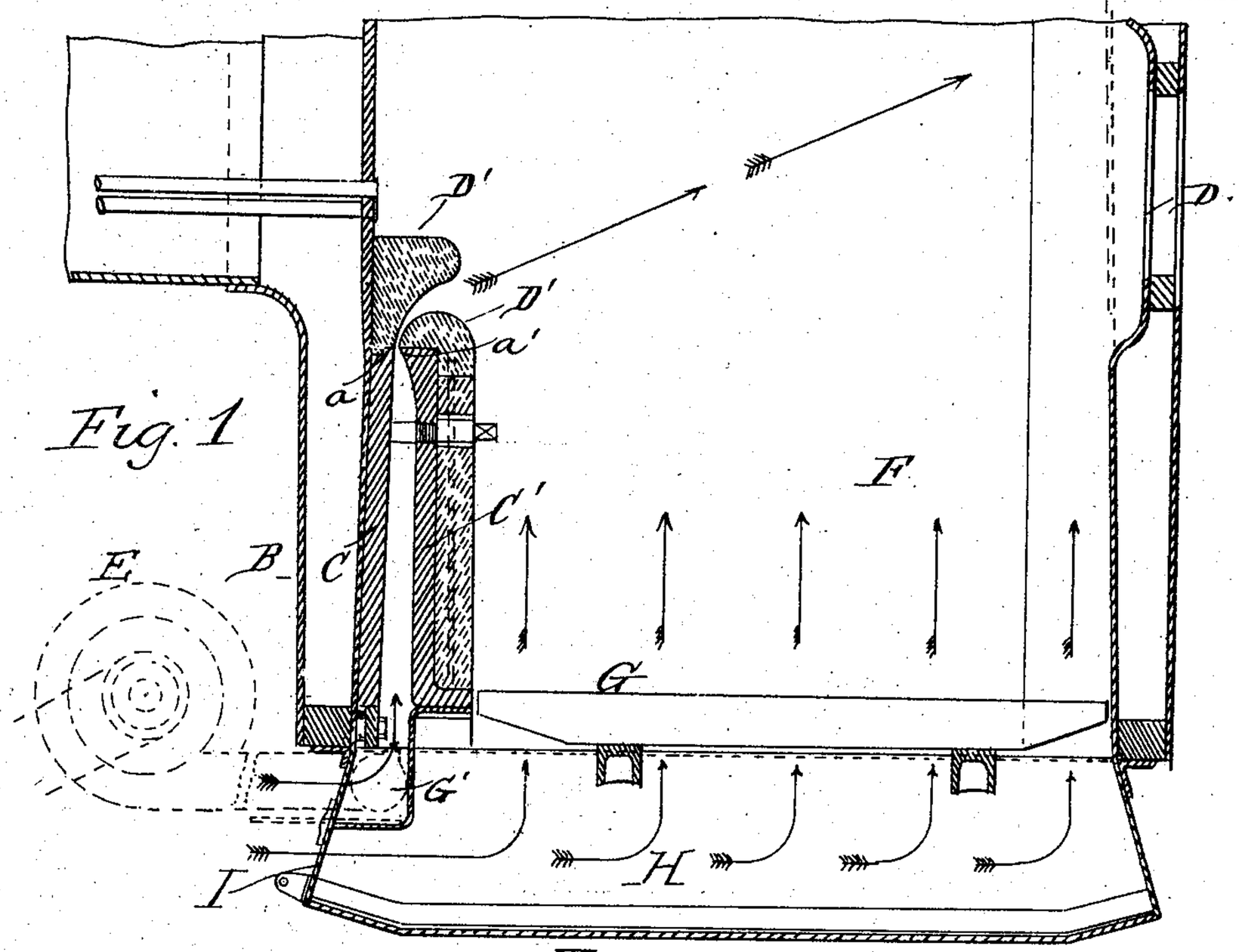
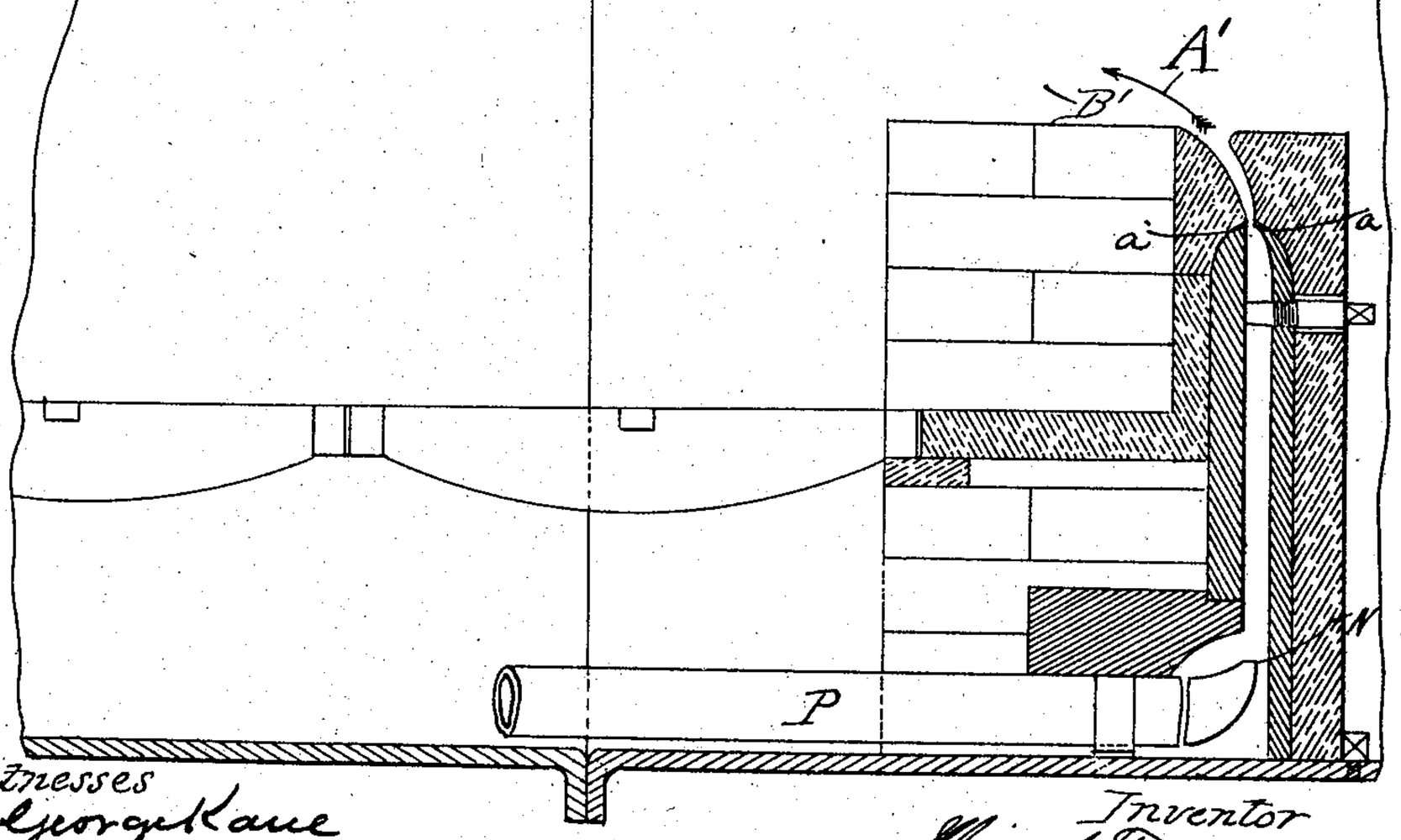


Fig. 3



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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2

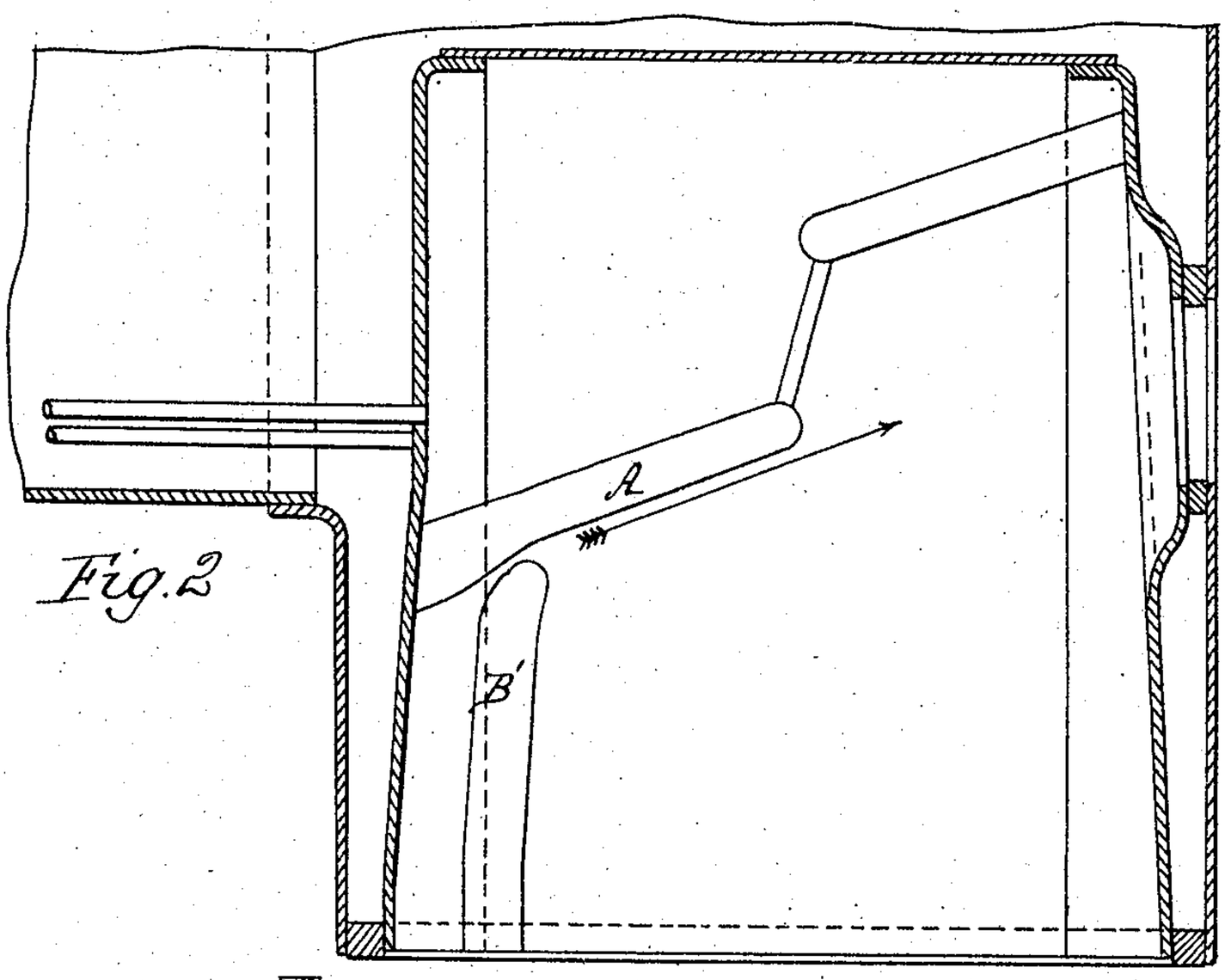
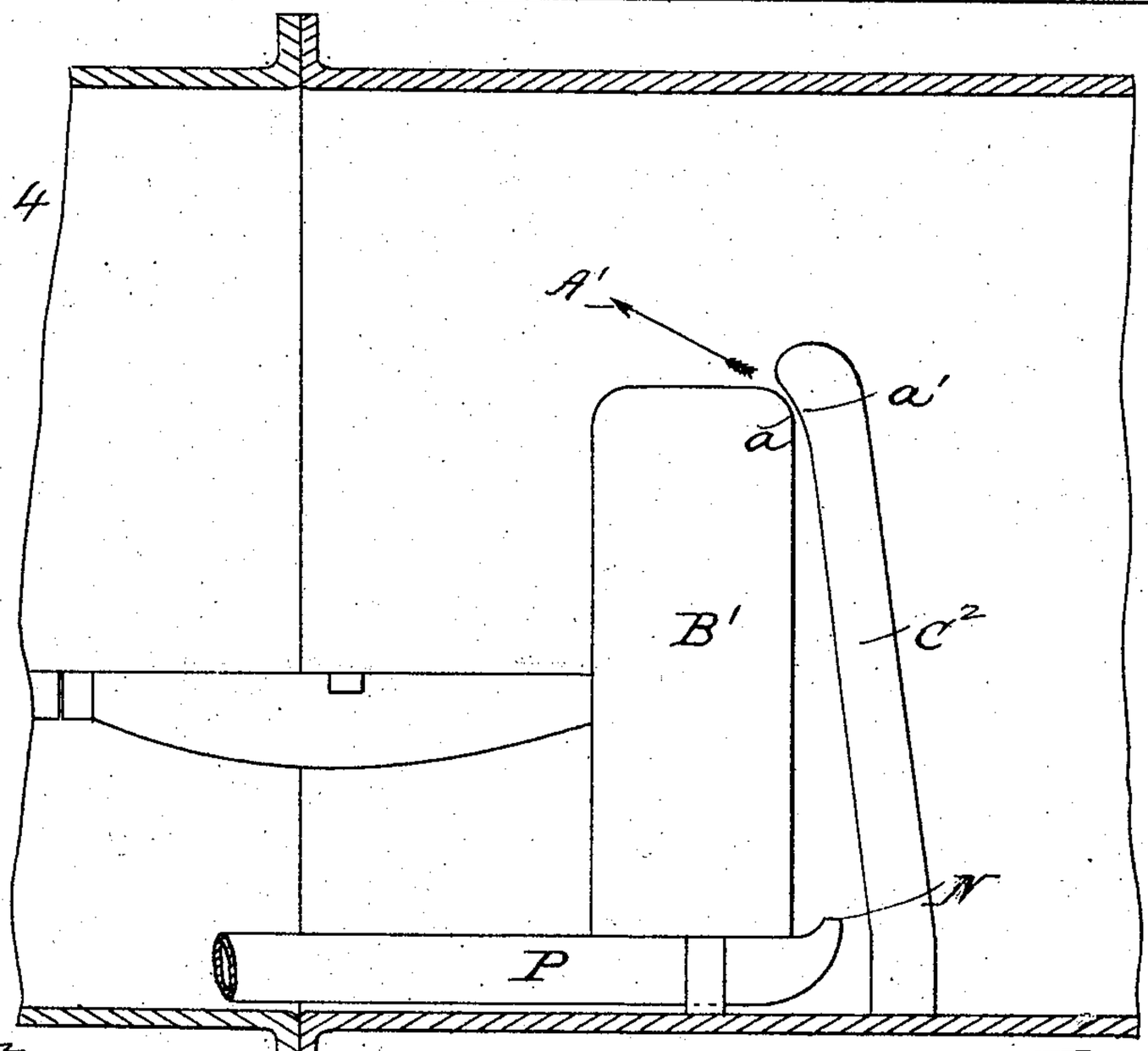


Fig 4



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UNITED STATES PATENT OFFICE.

ILLIUS AUGUSTUS TIMMIS, OF LONDON, ENGLAND.

METHOD OF PROMOTING COMBUSTION OF FUEL.

SPECIFICATION forming part of Letters Patent No. 772,760, dated October 18, 1904.

Application filed May 7, 1904. Serial No. 206,894. (No model.)

To all whom it may concern:

Be it known that I, ILLIUS AUGUSTUS TIMMIS, a subject of the King of Great Britain, residing at London, in the county of Middlesex, England, have invented new and useful Improvements in Methods of Promoting Combustion of Fuel, of which the following is a specification.

This invention has relation to locomotive and other boilers, and has for its object the provision of a novel method for promoting perfect combustion of fuel in the fire-box, to effect economy in fuel consumption, the elimination of sparks and smoke, saving in cleaning tubes, and also for permitting the use of low-grade fuel.

In accomplishing the objects of my invention I introduce air under pressure into the combustion-chamber of a boiler in the form of a broad film extending across the chamber and so directed and controlled that it offers resistance to the passage of particles of unconsumed carbon and turns them back into the zone of combustion and affords a supply of oxygen that promotes perfect combustion of the carbon-charged gases from the fuel.

Attempts have heretofore been made to project a film of air across the combustion-chamber of a furnace for the purpose of promoting perfect combustion, but without effective results, and I have found that the difficulty has been owing, first, to the defective construction of the devices for admitting the air to the combustion-chamber and, secondly, and particularly in the case of locomotive-boiler furnaces, because of the suction in the blast-exhaust chamber and tubes which was opposed to the insufficient pressure of the air used to produce the film or sheet in the combustion-chamber. The high steam-pressure generally used in locomotive-boilers—say about two hundred pounds—causes such a sharp suction force in the exhaust chamber and tubes that this force amounts with only one hundred and fifty pounds of steam to from thirty-eight to forty-two pounds per square foot, while the air-pressure generated by the forward motion of the locomotive and conveyed to the combustion-chamber by air catchers and connections is not more than ten to twelve pounds per square foot, this low pressure being due, in part, to the location of the air-catchers. I find as a consequence that it is necessary to introduce the film of air across the fire-box at a greater pressure than that of the suction generated in the blast-chamber—say using one hundred and fifty pounds of steam at a pressure of forty-five pounds per square foot—and to obtain such pressure that a blower or other means for producing the required pressure must be used. I have found, moreover, that the film or baffle-plate of air injected into and across the fire-box must be a definite and regulatable thickness and that slight variations very materially affect, if not wholly destroy, the effect.

In carrying my invention into effect I employ a peculiar form and construction of air-guides, consisting of flat plates converging to form a narrow slit or mouth at their upper ends and surmounted by fire-clay blocks to protect the lips from contact with the flames and direct the film across the fire-box. The thickness of the film of air is regulated by the distance between the metal lips, instead of being regulated by the distance between the fire-clay protecting-blocks, and when so protected as above the lips of the metal plates or guides remain at the same distance apart. When, as heretofore constructed, the air-guides have had the lips for controlling or regulating the thickness of the air film or sheet at the ends of the fire-clay blocks, the latter by being melted became useless.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of a locomotive fire-box with my improved air-guides in position, and Fig. 2 is a vertical longitudinal section of a modified furnace structure. Figs. 3 and 4 are respectively longitudinal sectional views of further modifications.

B designates the shell of the boiler of a locomotive-engine; F, the fire-box; D, the door; and G, the grate-bars; H, the ash-pan, and I the door to the latter.

C C′ designate two castings arranged along the rear wall of the fire-box, one being fixed in an upright position against the rear wall and the other being fixed a short distance in front of the same and arranged with its lower

part extending down some distance into the ash-pit. The castings C C′ are contracted at their upper ends to form lips, as shown at *a a′*, between which is provided a narrow elongated space forming a mouth through which the air leading in between the castings from below is contracted, so as to form a thin sheet or film. Upon and secured to the castings are arranged the fire-clay blocks D′ D′, having their inner opposing surfaces curved, so as to direct the film of air toward and across the fire-box, these curved surfaces gradually diverging from each other, so as to not obstruct the flow of air. The space between the lips *a a′* is carefully determined and regulated to produce the required film, sheet, or blanket of air, the thickness of which does not in any way depend upon the distance apart of the fire-clay surfaces, and as the lips *a a′* are protected by the blocks the width of the space between will remain constant, whereas if the lips were formed on the fire-clay blocks the latter, by reason of their disintegration, would soon vary in shape and the space become too wide.

As previously indicated, I employ a forced draft or pressure of air to be conveyed between the castings C C′ and into the fire-box, and this may be produced by a blower E, operated from the axles of the locomotive or by a small stationary engine, or by any other suitable power. The forced blast of air is led from the blower through the conduits G′ into the space between the castings C C′, and so upward between the lips *a a′*.

By another method or variation of means I make the air-guides as follows: Instead of castings and fire-clay blocks (shown in Figs. 1 and 3) I fit (see Fig. 2) a hollow arch or baffle-plate A, of metal plates, and another hollow guide or bridge-plate B′. Both these communicate with the boiler and contain water from it. They may be made so that they can be cleaned out from the side of the boiler by removing a specially-constructed covering-plate on the outside of the fire-box part of the boiler opposite to their junction with the boiler. To insure a proper circulation of water, the bottom of each must be connected with the boiler-water, and there must be a free-flowing connection at the top. From the top of A there must be one or more pipes connecting the top of A with any part of the top of the boiler. The feed-water into the boiler may be sent through either or both of these hollow water-chambers. One or more similarly-constructed hollow metal chambers may be fitted in the upper part of the fire-box to act as baffle-plates and connected with the boiler in its upper part and containing steam or water and steam and may be (see Fig. 2) connected with the bottom baffle-plate A. Each of these hollow chambers is fitted with stays to enable it to withstand the pressure. It is clear that the lower hollow chambers add largely to the water-heating surface, and the top ones act as steam-superheaters.

In using this invention on stationary boilers Fig. 3 explains the fitting of a flue-boiler where P is the pipe conveying the forced draft through the nozzle N and up through the lips *a a′* of the metal guides at the front of the bridge B′ in the direction of the arrow A′. This bridge may be a hollow metal casing containing boiler-water, and an arrangement, as in Fig. 4, may be fitted where B′ and C^2 both contain boiler-water. A forced double draft may be fitted here also, one over the fuel and one through it. In stationary boilers the forced draft may be obtained from any fitted source of power.

The following are the advantages of the system: First, elimination of smoke and sparks; second, in locomotives the preservation of the tube-plate; third, absence of carbon deposits in tubes and flues; fourth, superheating; fifth, greater efficiency of heating-surface; sixth, saving in labor; seventh, saving in coal.

Having described my invention, I claim and desire to secure by Letters Patent—

The method of promoting combustion of fuel in boiler-furnaces, having an exhaust-blast, which consists in forcing air in the form of a thin sheet or film into and across the combustion-chamber, above the fuel, at a pressure exceeding the suction force of the exhaust.

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Witnesses:
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