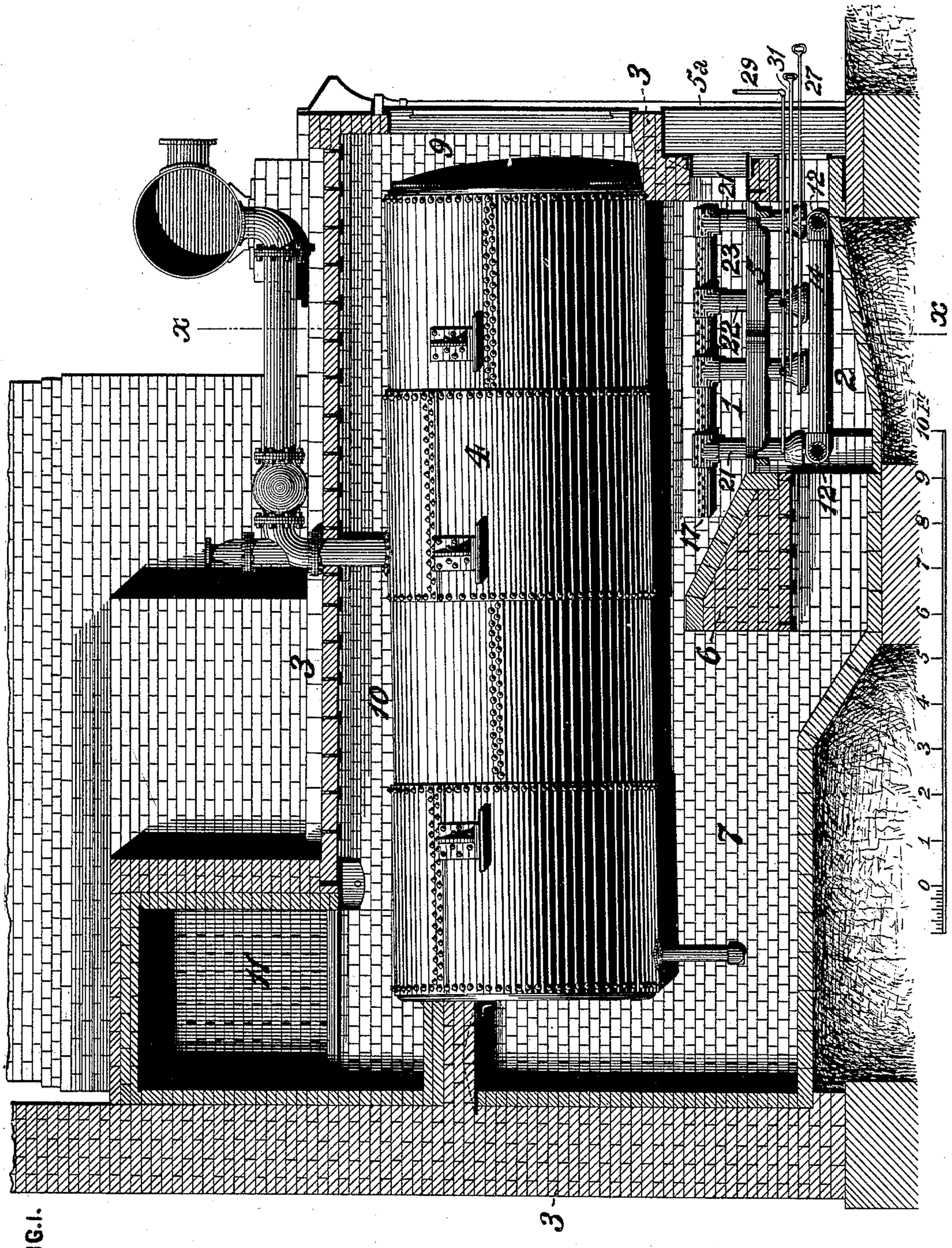
(No Model.) 2 Sheets—Sheet 1.

T. McSWEENEY.

GAS BURNER FOR BOILER FURNACES.

No. 405,497. Patented June 18, 1889.



WITNESSES:

E. Newell.
F. E. Gaither

INVENTOR

T. McSweeney,
by J. Snowden Bell,
Att'y.

(No Model.) 2 Sheets—Sheet 2.

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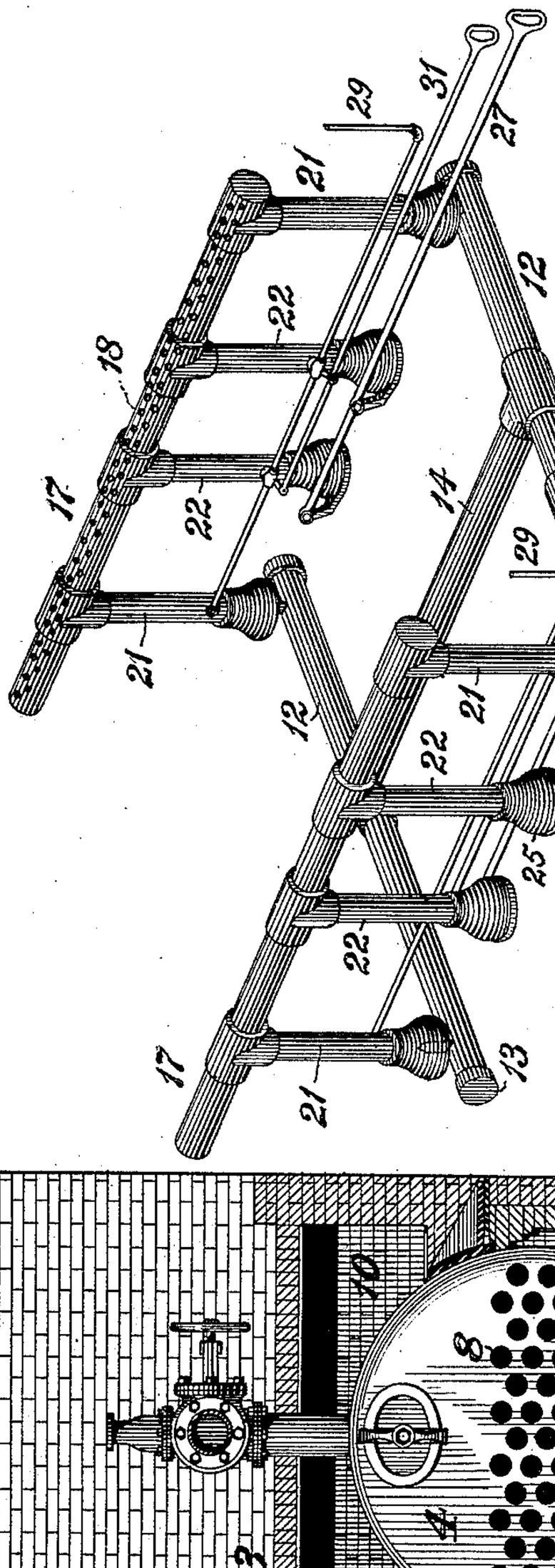

FIG. 3.

FIG. 2.

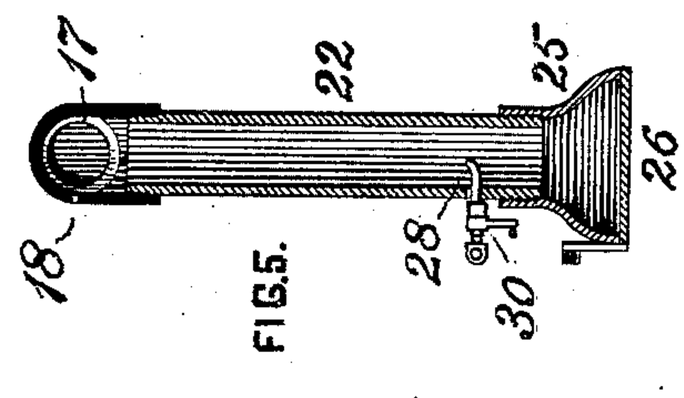

FIG. 5.

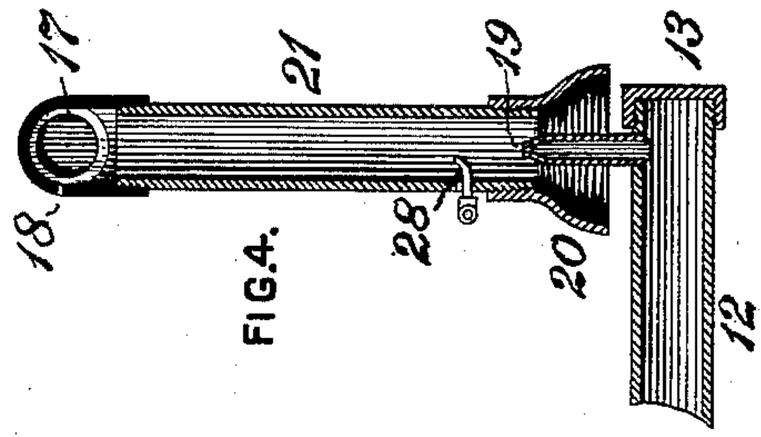

FIG. 4.

WITNESSES:

E. Newell

F. E. Gaither

INVENTOR,

T. McSweeney,

by J. Snowden Bell,

Att'y

UNITED STATES PATENT OFFICE.

TERRENCE McSWEENEY, OF ALLEGHENY, PENNSYLVANIA.

GAS-BURNER FOR BOILER-FURNACES.

SPECIFICATION forming part of Letters Patent No. 405,497, dated June 18, 1889.

Application filed March 7, 1889. Serial No. 302,325. (No model.)

To all whom it may concern:

Be it known that I, TERRENCE McSWEENEY, a citizen of the United States, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Gas-Burners for Boiler-Furnaces, of which improvement the following is a specification.

The object of my invention is to admit of the effective and economical utilization of gaseous fuel in boiler-furnaces of the ordinary construction without involving the employment of complex or expensive appliances or preventing the use of solid fuel, as heretofore, whenever the same may for any reason become necessary or advisable.

To this end my invention, generally stated, consists in certain novel devices and combinations, including two or more gas-distributing pipes connected one with the other and with a gas-supply pipe and supported in the ash-pit of a boiler-furnace, a pair of perforated burner-pipes each supported adjacent to one side of the furnace above its grate, a series of mixer-pipes each communicating with one of the burner-pipes and having an open end inclosing a jet-pipe leading out of one of the distributing-pipes, valve-governed supplemental air-supply pipes leading into the burner-pipes, and steam-jet pipes leading into the supplemental air-pipes and mixer-pipes.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a vertical longitudinal central section through a steam-boiler setting, illustrating an application of my invention; Fig. 2, a vertical transverse section through the same at the line $x\,x$ of Fig. 1; Fig. 3, a view in perspective of the apparatus detached; and Figs. 4 and 5, longitudinal sections, on an enlarged scale, through a mixer-pipe and a supplemental air-supply pipe, respectively.

My invention is illustrated as applied in connection with the furnace 1 and ash-pit 2, formed within the setting 3 of a horizontal return tubular steam-boiler 4, which is, under the ordinary construction, adapted to be heated for the generation of steam by the combustion of coal or other solid fuel upon the usual series of grate-bars 5, which are interposed between the furnace and ash-pit. The products of combustion pass from the furnace over the bridge-wall 6 into the combustion-chamber 7, thence through the boiler-tubes 8 into the front connection 9, and therefrom through a top flue 10, inclosing the upper portion of the boiler to the uptake or chimney flue 11, the construction, so far as described, according in all substantial particulars with those heretofore and now in general use.

In the practice of my invention I provide two or more gas-distributing pipes 12, which are closed at their ends by tight caps 13, and are of slightly less length than the width of the ash-pit 2, so as to fit easily transversely therein. The pipes 12, which are connected one to the other by a pipe or pipes 14, are supported horizontally in the ash-pit 2 upon brick-work or other suitable stands, and a gas-supply pipe 15, governed by a regulating cock or valve, is connected to the pipe 12 nearest the fire-front 3^a. The grate-bar adjoining each side of the furnace is removed, and a burner-pipe 17 is located and supported in or near the vertical plane of said bar, above the level of the grate, the other bars of which are undisturbed, the inner sides of said burner-pipes, or those toward the center of the furnace, being perforated with a series of burner-openings 18. A gas-discharge jet-pipe 19 is connected to each of the distributing-pipes 12 near its ends, each of said jet-pipes being inclosed by the flaring open-ended mouth-piece 20 of a vertical mixer-pipe 21, which extends upwardly through the space vacated by the removal of a grate-bar, and is connected at its upper end to the burner-pipe 17 on that side of the furnace. The flaring mouth-pieces 20 and inclosed jet-pipes 19 act in the manner of injectors to draw in air from the ash-pit by the suction of the gas discharged from the jet-pipes, the air and gas being mingled in the mixer-pipes 21 and delivered therefrom into the burner-pipes 17, at the openings of which the mixture of air and gas is ignited, the flames impinging from opposite directions, so as to prevent an unduly rapid escape of products of combustion and diffuse and maintain a high heat in the furnace and combus-

tion-chamber upon the lower surface of the boiler. It will be obvious that, if preferred, the gas-distribution pipes 12 may be located longitudinally instead of transversely in the ash-pit, so that both gas-jets 19 of each pipe may discharge into the mixer-pipes of a burner-pipe on one side of the furnace, the pipes 12 being in such case connected by a transverse pipe 14, to which the supply-pipe is in turn connected.

In order to provide for the admission of such additional supply of air as may from time to time be found desirable for effecting the thorough combustion of the gas, each of the burner-pipes 17 is provided with one or more supplemental air-supply pipes 22, which communicate at their upper ends with the burner-pipes and extend downwardly therefrom into the ash-pit in the same vertical plane as the mixer-pipes 21. The spaces above the level of the grate between the mixer-pipes and supplemental air-supply pipes and below the burner-pipes are filled in with brick-work 23, which prevents the passage of air into the furnace at the sides of the grate-bars, and the latter are in operation covered with a layer of cinders or other incombustible material, which permits only a small quantity of air to be drawn through the grate into the furnace. A layer of brick or other refractory material 24 is also placed upon the tops of the burner-pipes 17, in order to protect their upper portions from the action of the heat, as well as to deflect the flames from the burner-openings toward the center of the furnace. The lower ends of the supplemental air-supply pipes 22 are provided with flaring mouth-pieces 25, which are fitted with hinged valves or doors 26, which may be entirely closed or opened to a greater or less degree by regulating rods or bars 27, which are coupled to their pivots and extend outwardly through the fire-front 5^a.

A steam-jet pipe 28, communicating with a supply-pipe 29, leading from the steam-space of the boiler, extends into each of the mixer-pipes 21 and supplemental air-supply pipes 22, said jet-pipes being governed by cocks 30, which are actuated by rods 31, extending outwardly through the fire-front adjacent to the rods of the doors 26.

The steam discharged from the jet-pipes 28 serves to draw in air similarly and supplementally to the action of the gas discharged from the jet-pipes 19, and is of special advantage when, by reason of a temporary low pressure of gas, sufficient air is not injected by the gas-jets. The escaping steam is further decomposed by the heat of the furnace, and its constituents, combining with the gaseous elements in combustion therein, correspondingly increase their calorific effect and tend to prevent the deposition of unconsumed carbon in the form of soot in the boiler-tubes.

It will be seen that my improvement is readily applicable at comparatively slight cost to boiler-furnaces of any of the ordinary types without requiring alteration or modification of the construction of the furnace proper or of the accessories employed for burning solid fuel therein, thereby attaining the substantial advantage of enabling the same to be used for such periods as may be desired whenever, by reason of a deficiency in the supply of gas, breakage or derangement of mains or valves or for any other reason such operation may become necessary or be deemed advisable. The only preliminary required for application to existing furnaces is, as above stated, the removal of a grate-bar on each side, and upon the withdrawal of the bed of cinder from the grate the furnace is, without other preparation, in readiness to be fired with coal in the usual manner. The admixture and regulation of the proper proportions of air and gas are provided for under variations of gas-pressure by the steam-jets and valved air-supply pipes, and an effective application of heat to the boiler is attained by the lateral burner-pipes and transverse direction of the flames issuing from the series of burner-openings therein.

I am aware that boiler-furnaces having a series of vertical passages or pipes formed in or extended through their side walls for the injection of jets of air and steam or of gas and air above their grates have been heretofore proposed and illustrated, and also that perforated burner-pipes for the combustion of gas were known in the art prior to my invention. Said devices I therefore distinctly disclaim.

The leading and characteristic feature in which my invention differs from boiler-furnaces of the type above disclaimed is that in the former the gas-burning devices provided are of such construction as to be located wholly between the side walls of the furnace, and, being thus independent thereof, are applicable to any of the ordinary boiler-settings without involving modification therein, while in the latter a setting of special construction is required to admit of their employment. I thereby attain the advantages of structural economy and facility of application to existing furnaces, with the presentation of appliances of such character as will not in any wise interfere with the use of solid fuel whenever the same may be found necessary.

I claim as my invention and desire to secure by Letters Patent—

1. The combination, with a boiler-furnace, of two perforated burner-pipes each supported longitudinally within and adjacent to one side of the furnace above the grate-level, mixer-pipes leading through the furnaces from the burner-pipes into the ash-pit and having open lower ends, and gas-jet pipes communicating with a common supply-pipe and leading into the lower ends of the mixer-pipes, substantially as set forth.

2. The combination, with a boiler-furnace, of two perforated burner-pipes each supported longitudinally within and adjacent to

one side of the furnace above the grate-level, a series of grate-bars supported in the furnace below said burner-pipes and between the vertical planes thereof, mixer-pipes leading through the furnace from the burner-pipes into the ash-pit and having open lower ends, and gas-jet pipes communicating with a common supply-pipe and leading into the lower ends of the mixer-pipes, substantially as set forth.

3. The combination, with a boiler-furnace, of two perforated burner-pipes each supported longitudinally within and adjacent to one side of the furnace above the grate-level, mixer-pipes leading through the furnace from the burner-pipes into the ash-pit and having open lower ends, two or more connected gas-distribution pipes supported in the ash-pit, gas-jet pipes leading from said distribution-pipes into the lower ends of the mixer-pipes, and a gas-supply pipe communicating with said distribution-pipes, substantially as set forth.

4. The combination, with a boiler-furnace, of two burner-pipes each supported longitudinally within and adjacent to one side of the furnace above the grate-level and perforated with burner-openings on its side nearest the center of the furnace, a series of grate-bars supported in the furnace below said burner-pipes and between the vertical planes thereof, a brick filling interposed between each of the outer grate-bars and the adjacent side of the furnace, a layer of brick or other refractory material supported on the top of each burner-pipe, mixer-pipes leading through the furnace from the burner-pipes into the ash-pit and having open lower ends, and gas-jet pipes communicating with a common supply-pipe and leading into the lower ends of the mixer-pipes, substantially as set forth.

5. The combination, with a boiler-furnace, of two perforated burner-pipes each supported longitudinally within and adjacent to one side of the furnace above the grate-level, mixer-pipes leading from the burner-pipes into the ash-pit of the furnace and having open lower ends, gas-jet pipes communicating with a common supply-pipe and leading into the lower ends of the mixer-pipes, and steam-jet pipes controlled by regulating-valves and leading into the mixer-pipes, substantially as set forth.

6. The combination, with a boiler-furnace, of two perforated burner-pipes each supported longitudinally within and adjacent to one side of the furnace, mixer-pipes leading from the burner-pipes into the ash-pit of the furnace and having open lower ends, gas-jet pipes communicating with a common supply-pipe and leading into the lower ends of the mixer-pipes, supplemental air-supply pipes leading from the burner-pipes into the ash-pit, regulating doors or valves hinged or pivoted to the lower ends of said supplemental air-supply pipes, and steam-jet pipes controlled by regulating-valves and leading into the supplemental air-supply pipes, substantially as set forth.

In testimony whereof I have hereunto set my hand.

TERRENCE McSWEENEY.

Witnesses:
J. SNOWDEN BELL,
R. H. WHITTLESEY.