

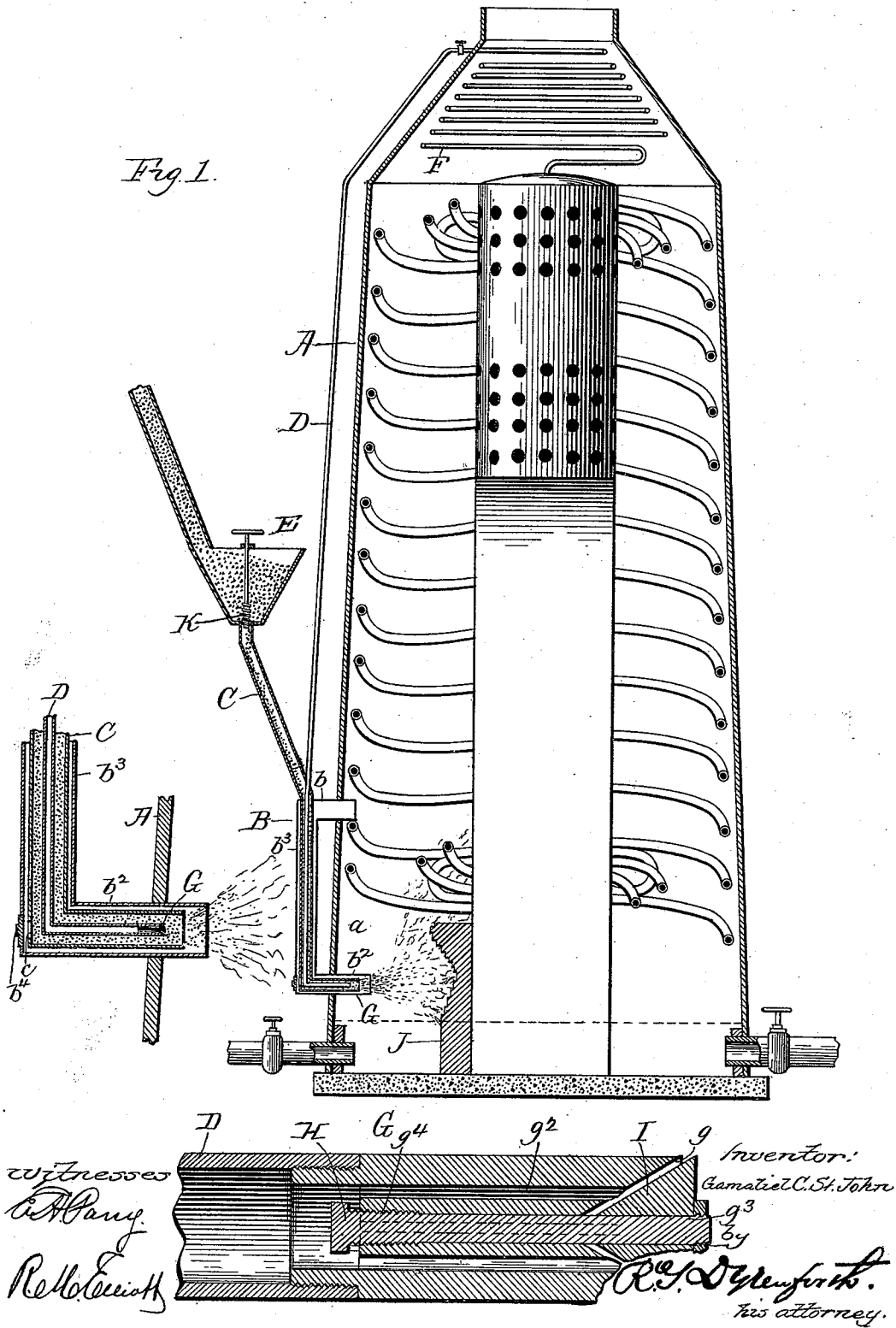
(No Model.)

G. C. ST. JOHN.
FUEL BURNER.

No. 553,696.

Patented Jan. 28, 1896.

Fig. 1.



UNITED STATES PATENT OFFICE.

GAMALIEL C. ST. JOHN, OF NEW YORK, N. Y.

FUEL-BURNER.

SPECIFICATION forming part of Letters Patent No. 553,696, dated January 28, 1896.

Application filed April 13, 1895. Serial No. 545,599. (No model.)

To all whom it may concern:

Be it known that I, GAMALIEL C. ST. JOHN, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Fuel-Burners; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to fuel-burners.

The object of the invention is to effect the complete and rapid combustion of pulverous fuel, such as pulverized coal, producing thereby an intense and regular heat without any attendant smoke and soot, such as follows the combustion of soft coal usually employed; furthermore, to provide means whereby portions of pulverized fuel which have escaped complete combustion will be caught and represented to the flame, thereby effecting the utilization of practically all of the fuel fed to the furnace.

With these objects in view, the invention consists in a fuel-burning attachment for stationary or other boilers, comprising a fuel-supply pipe, a superheated steam-supply pipe, and a hot-air return-pipe, the latter pipe serving as a casing for the other two pipes, whereby, at one and the same time, fuel, superheated steam, and hot air, the latter laden with portions of unconsumed fuel, will be projected into the fire-box of the boiler.

The invention further consists in the novel construction and combination of parts of a fuel-burner, as will be hereinafter fully described and claimed.

In the accompanying drawings, forming part of this specification, and in which like letters of reference indicate corresponding parts, I have illustrated one embodiment of my invention, capable of carrying the same into effect, although other forms of embodiment thereof may be employed without departing from the spirit of the invention, and in these drawings—

Figure 1 is a view in sectional elevation showing the fuel-burner attached to an ordinary upright boiler. Fig. 2 is a sectional detail view of the steam-nozzle used in connection with the burner. Fig. 3 is a sectional detail view of the lower end of the discharge-

nozzle, showing more clearly the construction and arrangement of its parts.

Referring to the drawings, A designates an ordinary upright boiler provided with usual fire-box *a*; B, the hot-air supply-pipe; C, the fuel-supply pipe, and D the superheated steam-supply pipe.

The hot-air supply-pipe B comprises two horizontal members *b b*², whereof the former projects into the fire-box at any point between the chimney-flue and the fire-door, as its main object is to draw hot gases from the furnace or fire-box, and the latter member, *b*², through the fire-door or side of the furnace into the fire-box, and a vertical member *b*³ connecting the members *b* and *b*², the whole constituting a flue through which the heated air and products of combustion pass forward or downward and into the fire-box near the grate-bars.

The fuel-supply pipe C connects with a suitable source of supply E of pulverized fuel, which source admits the fuel with as little air as possible, the fresh air required coming from other sources hereinafter stated, and is arranged concentrically with the members *b*² and *b*³, respectively, of the hot-air supply-pipe, and terminates some distance back of the end of the member *b*², for a reason that will hereinafter be stated.

The superheated steam-supply pipe D extends concentrically through and terminates a short distance from the end of the fuel-supply pipe C, the free end of the pipe D being provided with a suitable nozzle, fan-shaped or flaring, that will cause the flow of steam to be deflected and fill the free end of the member *b*² and fuel-pipe C, thereby inducing a greater draft in the member *b*² and pipe C. The steam may be supplied to the pipe D from the steam-dome; but for obvious reasons it is preferred to employ a coil F, which is located at the top of the boiler in position to be in direct line with the heated products of combustion from the fire-box.

The nozzle G may be of any preferred form; but for cheapness of construction and efficiency in use the form illustrated in Fig. 2 is preferred. This nozzle comprises a piece of metal having a flaring mouth *g* and a number of openings *g*² extending throughout the length thereof. Located centrally of the nozzle is an opening *g*³, having its rear portion

threaded, as at g^4 , and working within this opening and engaging the threaded portion is a headed pin or bolt H, having attached to its free end a cone I, adapted to fit within the mouth g . By turning the pin or bolt H the cone may be moved to or from the mouth g , and thus regulate the supply of steam and the force of its projection into the furnace.

When the burner is in operation the fuel passes down or through the supply-pipe C to the bottom thereof and is drawn therefrom to the free end of the pipe D by a draft of hot air from the fire-box, said draft being augmented by the steam escaping from the free end of the pipe D and is then projected into the fire-box, this projection being effected by means of the steam from the pipe D. This escape of steam also causes an induced draft in the pipe B, thereby causing the latter to catch and withdraw from the furnace the hot air and portions of the unconsumed products of combustion about to escape to the chimney and reintroduce them, along with the fresh fuel and superheated steam, into the fire-box, the object being to inject, by means of a steam-jet, fuel, steam, air, and gases into the fire-box as near the point of combustion as possible. This end is effected by the induced circulation of hot air through the pipe B together with superheated steam, delivering the mixed fuel, steam, hot air, and gases against a pile of bricks or slag J in the furnace in a highly-heated condition for immediate explosion and combustion, thereby preventing smoke and obtaining the greatest number of heat-units from a given bulk of fuel.

In order to intensify the force of projection of the fuel into the fire-box and facilitate the mixing and heating of the fuel, the pipe C is provided on its front side and in alignment with the discharge-openings of the pipes with an opening c , through which the heated air from the pipe B enters along with the fuel and assists and effects the necessary projection of the fuel. Should it be desired to supply cold air to the hot-air supply-pipe, a removable plug or valve b^4 may be employed, which will, by preference, be arranged in horizontal alignment with the opening c in the pipe C.

As before stated, the three pipes B, C, and D do not project the same distance within the fire-box, the member b^2 of the pipe B projecting the greatest distance, the pipe C the next, and the pipe D the shortest distance of all. By this arrangement the flow of steam from the steam-nozzle creates a partial vacuum in pipes B and C, and by its projection into the furnace produces a strong draft in the hot-air supply-pipe B and the fuel-supply pipe C and effects a regular projection of fuel—that is to say, the fuel is fed at all times in substantially-equal bulk to the fire-box, for the reason that the inner end of the member b^2 beyond the ends of the pipes C and D, respectively, forms a mixing-chamber from which the fuel is projected in a substantially-

uniform spray. This could not be effected if all the pipes projected the same distance within the fire-box.

It is to be understood that, if desired, the pipe C may be provided with suitable mechanism for preventing the fuel from clogging therein—such, for instance, as a worm-screw K or rods commonly employed; furthermore, that the fuel-burner is capable of being attached to and operated successfully with other types of boilers other than that shown.

I do not claim an oil-burner opening at both ends into the fire-box of a boiler or other heater, with the discharge end of the burner provided with a jet-nozzle, such arrangement being inoperative for the burning of pulverous fuel, inasmuch as the fuel would clog the nozzle and thus destroy the function of the burner.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A fuel-burner comprising a pulverous fuel supply-pipe, a superheated steam supply-pipe, and a hot-air supply-pipe having an unobstructed discharge-end, the latter pipe serving as a casing for the other two pipes, the discharge-ends of the three pipes being arranged, as shown, in relation to each other and of the same diameter throughout their length and projecting different distances within the fire-box, with the discharge-end of the hot-air supply-pipe projecting the greatest distance of all, whereby a mixing-chamber is formed in the lower free end of the said pipe, substantially as described.

2. A fuel-burner comprising a pulverous fuel supply-pipe, a superheated steam supply-pipe, and a hot-air supply-pipe projecting at both ends into the fire-box and having an unobstructed discharge-end, the latter pipe serving as a casing for the other two pipes, the discharge ends of the three pipes being arranged as shown in relation to each other and of the same diameter throughout their lengths and projecting different distances within the fire-box, with the discharge end of the hot-air supply-pipe projecting the greatest distance of all, whereby a mixing-chamber is formed in the lower free end of the said pipe, substantially as described.

3. The combination with a boiler or the like, of a hot-air supply-pipe open at both ends into the fire-box, and having a cold-air opening normally closed by a valve or the like, a pulverous fuel supply-pipe having an opening in alignment with the opening in the hot-air supply-pipe through which hot-air, or mixed hot and cold air may pass along with the fuel, and a superheated steam supply-pipe provided with a nozzle, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

GAMALIEL C. ST. JOHN.

Witnesses:

J. W. KENNEDY,
ELEANOR B. MANVILLE.