G. S. BOSWORTH.
Fuel-Burner.

No. 208,221. **Patented Sept. 24, 1878.**

FIG. 1.

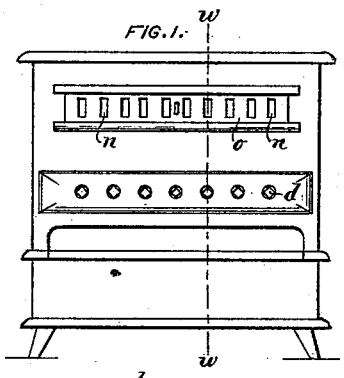
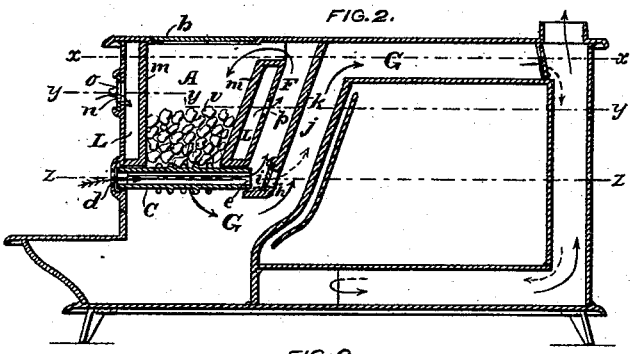


FIG. 2.



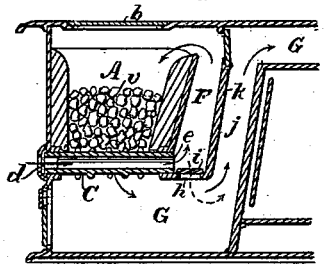
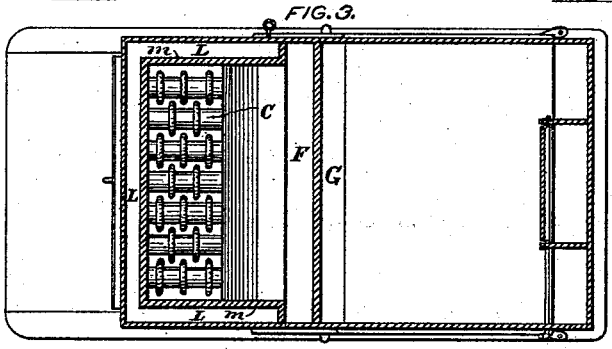


FIG. 6.

FIG. 3.



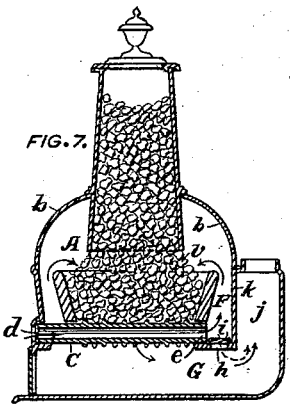
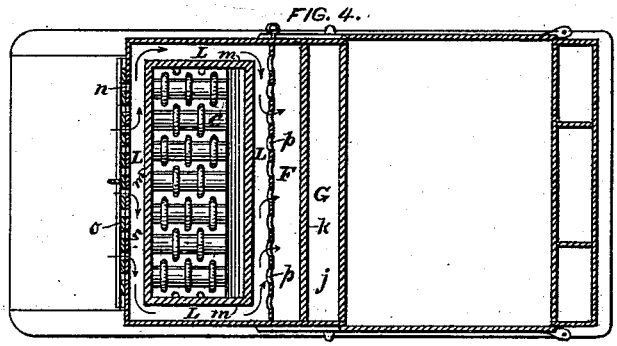


FIG. 7.

FIG. 4.



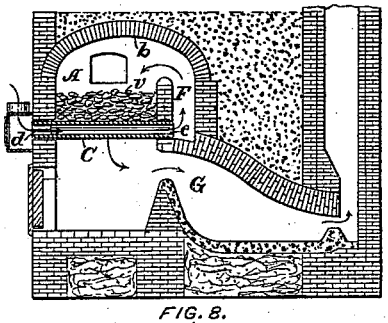
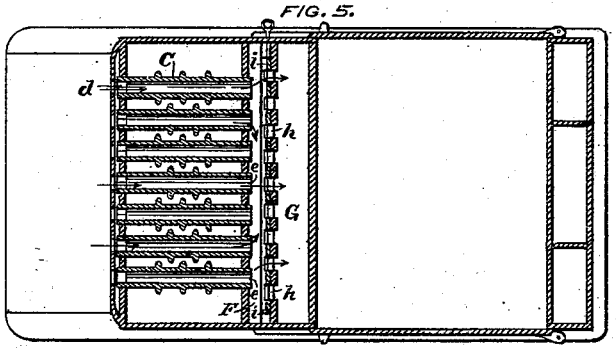


FIG. 8.

FIG. 5.



WITNESSES:

James H. Slade.
H. Prefontaine

INVENTOR:

George S. Bosworth

UNITED STATES PATENT OFFICE.

GEORGE S. BOSWORTH, OF TROY, NEW YORK.

IMPROVEMENT IN FUEL-BURNERS.

Specification forming part of Letters Patent No. **208,221**, dated September 24, 1878; application filed March 22, 1878.

To all whom it may concern:

Be it known that I, GEORGE S. BOSWORTH, of the city of Troy, in the county of Rensselaer and State of New York, have invented certain new and useful Improvements in Fuel-Burners, of which the following is a specification, reference being had to the accompanying drawing.

The general object of this invention is to produce a cheap, compact, and durable burner, by which ignited bituminous coal and similar solid fuel can be very thoroughly consumed.

In the aforesaid drawing, in which similar parts are marked by like letters in the different figures, Figure 1 is a front elevation; Fig. 2, a vertical section at the plane *w w* in Fig. 1; Fig. 3, a horizontal section at and plan of some parts below the plane *x x* in Fig. 2; Fig. 4, a horizontal section at and plan of some parts below the lines *y y* in Fig. 2; and Fig. 5, a horizontal section at and plan of parts below the plane *z z*—all of a fuel-burner in which my present invention is embodied. Figs. 6, 7, and 8 are vertical sections of burners, showing modified parts of the same invention.

A is a fire-chamber, covered by a top casing, *b*, and having in its bottom or lower part a tubular grate, C, adapted to support solid fuel, *v*, in the fire-chamber.

The tubes of the grate are open at their ends, and have communication at one end, *d*, with a supply of air, and at the other end, *e*, through a conduit, F, with the upper part of the covered fire-chamber.

G is a flue or passage leading from the under side of the grate C, to conduct off the gaseous products of combustion.

I thus combine the covered fire-chamber A, tubular fuel-supporting grate C, conduit F, and exit-passage G, in order that, while air shall be caused to pass through the tubes of the grate C, and thence into the upper part of the fire-chamber, to support the combustion of the ignited fuel therein, the hot and burning gases from the fuel shall at the same time be compelled to pass from the covered fire-chamber downward through the spaces between the tubes of the grate, and thereby more highly heat the air which passes through the tubes of the grate, and thence into the upper portion of the fire-chamber. I thus secure a more quick, intense, or complete combustion of the fuel than if air were passed through the tubes of the grate, and thence into the upper part of the fire-chamber, and the gases of combustion were not compelled to pass downward through the spaces between the tubes of the grate, but were conducted off above the latter, or than if the gases of combustion were passed down through the spaces between the tubes of the grate, and air passed through the grate were not thence conducted into the upper portion of the fire-chamber.

In connection with the above-described combination of the covered fire-chamber A, tubular grate C, conduit F, and exit-passage G, I commonly prefer to make an aperture or apertures, *h*, from the conduit F into the exit-passage G, and furnish the same with a damper, *i*, whereby a portion of the air that shall have passed through and been heated by the tubes of the grate can be admitted in regulated quantity into the exit-passage G, so as to thereby assist the combustion therein of the gases that shall have passed from the fire-chamber downward through the spaces between the tubes of the grate, and also, at the same time, lessen and regulate the quantity of air passing from within the tubes of the grate into the upper part of the fire-chamber A without obstructing or lessening the admission and passage of the air into and through the tubes of the grate.

In connection with the covered fire-chamber A, tubular grate C, air-conduit F and exit-flue G, combined as above described, I sometimes prefer to have a portion, *j*, of the exit-flue G extend along the casing *k* of the conduit F, so as to thereby increase the heat of the air passing from within the tubes of the grate through the conduit F, and into the upper portion of the covered fire-chamber, and thus promote combustion in the latter.

In connection with the covered fire-chamber A, tubular grate C, conduit F, and exit-passage G, combined as hereinbefore described, I often prefer to make an air-flue, L, along a part or the whole of the casing *m* of the fire-chamber, with an inlet aperture or apertures, *n*, furnished with a damper, *o*, and an outlet, *p*, whereby air can be admitted in regulated quantity into and conducted through the flue

L along the casing of the fire-chamber, so as to regulate the heat of the latter and of such admitted air, and thence into the upper part of the fire-chamber to assist combustion therein, and to lessen and regulate the draft and quantity of air passing through the tubes of the grate, and thence into the upper portion of the covered fire-chamber, without obstructing the entrance of the air into or its passage through or from the tubes of the grate.

I sometimes prefer to combine, with the covered fire-chamber A, tubular grate C, conduit F, and exit-passage G, the dampered aperture or apertures *h i*, and also the air-heating flue L, having the inlet and outlet apertures *n p* and damper *o*, so that while air shall freely pass through the tubes of the grate, and thence into the upper part of the fire-chamber, above the fuel therein, and thence, with the gases evolved from the burning fuel, downward through the spaces between the tubes of the grate into the exit-flue G, air, in regulated quantities, can at the same time be made to pass through the heating-flue L, and thence either wholly into the upper part of the fire-chamber, or partly into the latter and partly through the dampered apertures *h i*, in regulated quantity, into the flue G, to assist the combustion of unconsumed gases therein, lessen the downward draft through the fuel in the fire-chamber, and vary the draft of air through the tubes of the grate without obstructing the latter, as shall be desirable in using the burner in consuming various kinds of coal or fuel and in regulating the combustion of the fuel and volatile and gaseous matters evolved therefrom.

In carrying out this invention a damper can be applied to the inlet or outlet of the tubular grate, so as to thereby regulate and control the passage of the air therethrough, and thence into the upper part of the covered fire-chamber. I generally prefer, however, to not have any such damper, and thus insure the passage of air through the tubes of the grate, so as to avoid all liability of having the tubular grate quickly destroyed by the great heat communicated thereto by the ignited gases passing downward through the spaces between the tubes of the grate.

What I claim as my invention is—

1. The combination of the fire-chamber A, tubular fuel-supporting grate C, conduit F, and exit-passage G under the grate, whereby air is caused to pass through the tubes of the grate, thence into the upper part of the fire-chamber, and thence with the burning gases downward through the ignited fuel and spaces between the tubes of the grate into the exit-passage under the grate, substantially as set forth.

2. The combination of the fire-chamber A, tubular grate C, conduit F, flue G, and dampered passage *h i*, substantially as described.

3. The combination of the fire-chamber A, tubular grate C, air-conduit F, and flue G, leading from the under side of the grate, and having a part, *j*, along the casing *k* of the said air-conduit, as set forth.

4. The combination of the fire-chamber A, tubular grate C, conduit F, exit-flue G, and air-heating flue L, having inlet and outlet passages *n p* and damper *o*, substantially as described.

5. The combination of the fire-chamber A, tubular grate C, conduit F, exit-flue G, dampered passage *h i*, and air-heating flue L, having inlet and outlet passages *n p* and damper *o*, substantially as set forth.

In testimony whereof I hereunto set my hand in the presence of two subscribing witnesses this 16th day of March, 1878.

GEORGE S. BOSWORTH.

Witnesses:

JAMES H. SLADE.

W. PRÉFONTAINE.