(No Model.) 2 Sheets—Sheet 1.

F. T. ROBINSON.

SMOKE CONSUMER.

No. 451,977. Patented May 12, 1891.

Fig. 1.

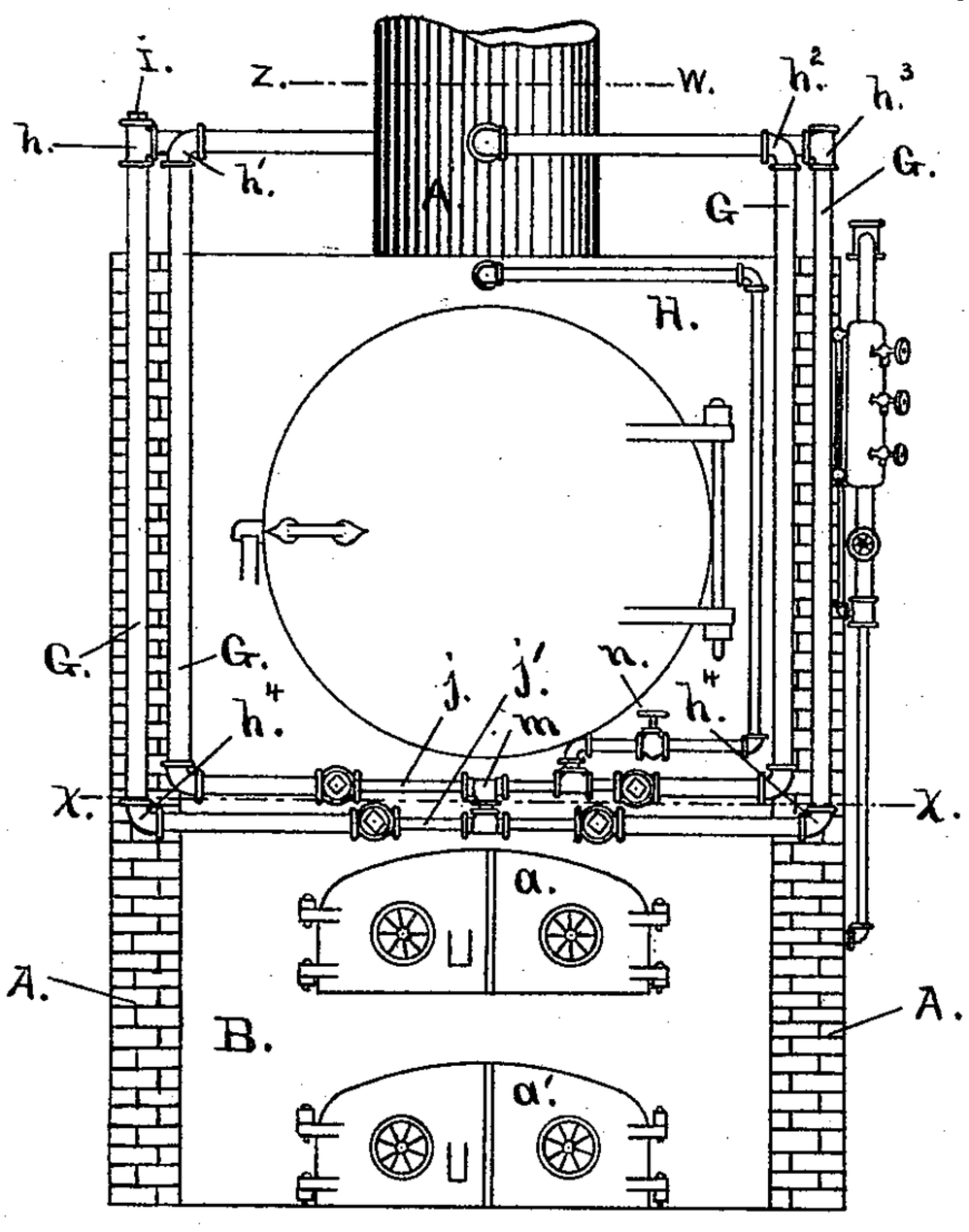


Fig. 3.

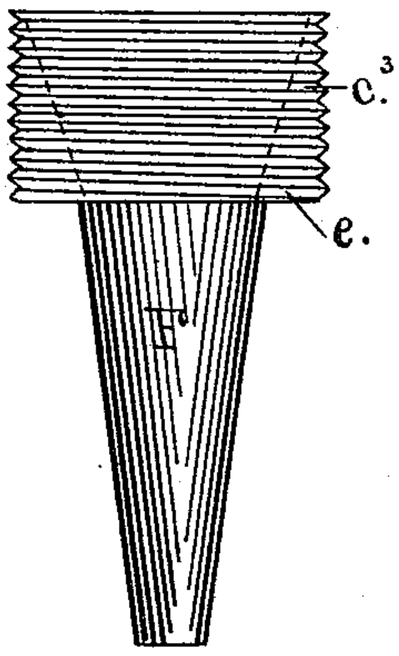


Fig. 2.

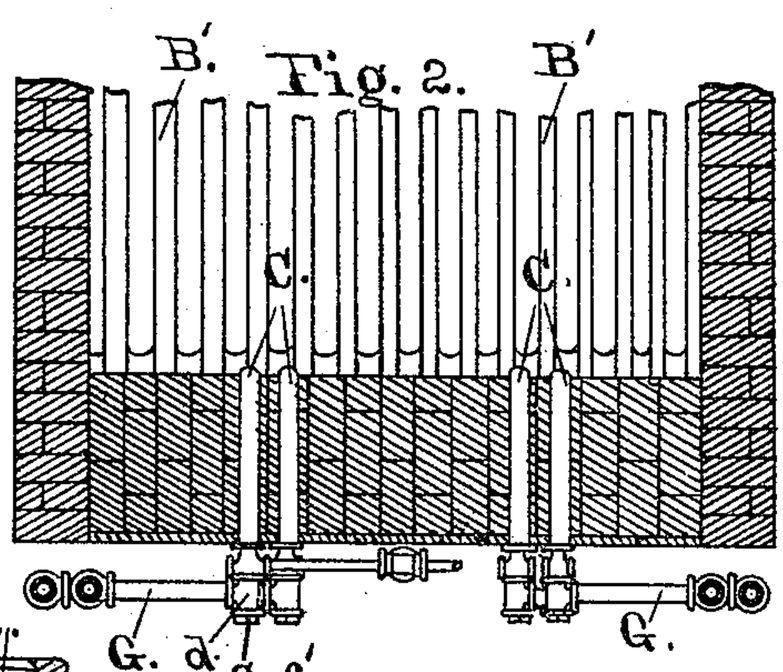


Fig. 4.

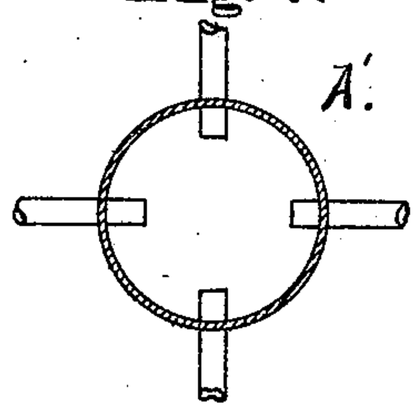


Fig. 5.

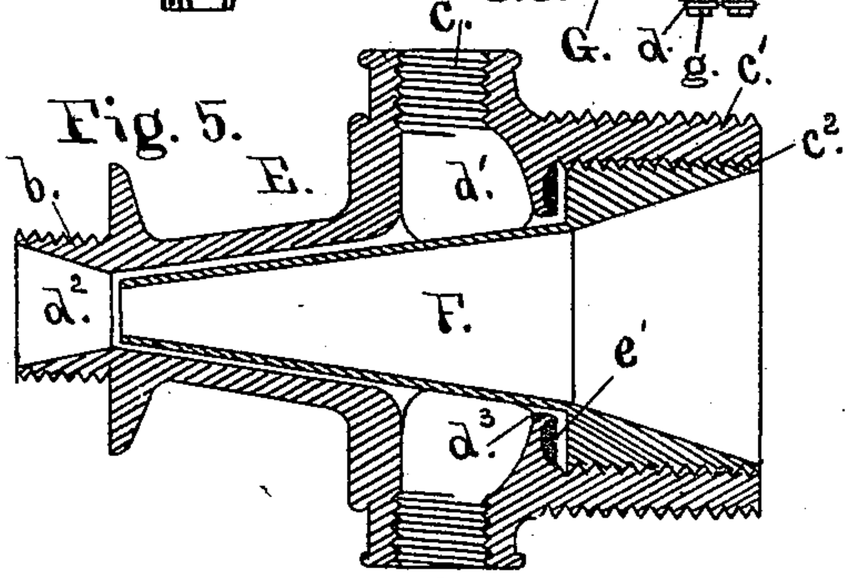
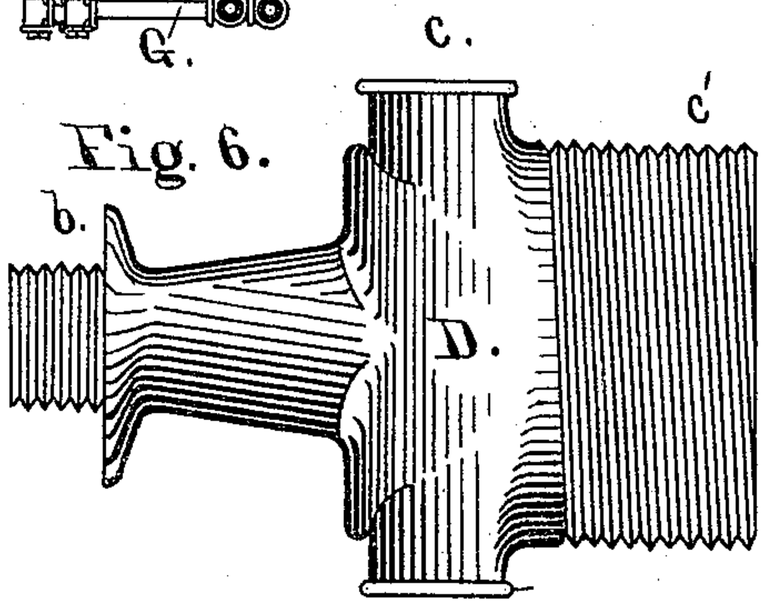


Fig. 6.



Witnesses
Frank L. Hartwell.
Geo. H. Hartwell

Inventor
Frank T. Robinson
By his Attorney Chas. C. Tillman

(No Model.)

2 Sheets—Sheet 2.

F. T. ROBINSON.

SMOKE CONSUMER.

No. 451,977. Patented May 12, 1891.

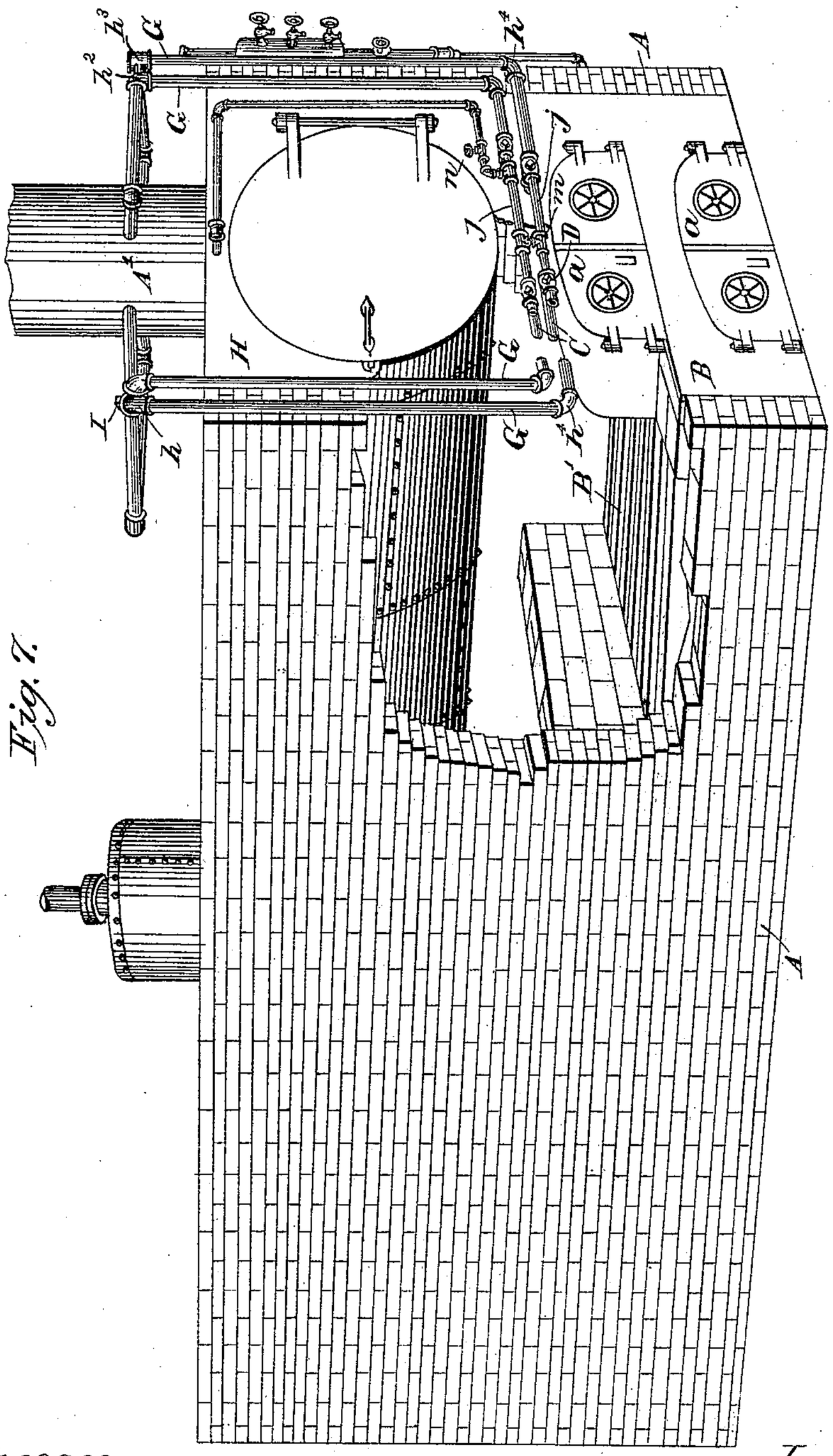


Fig. 1.

Witnesses:
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UNITED STATES PATENT OFFICE.

FRANK T. ROBINSON, OF CHICAGO, ILLINOIS.

SMOKE-CONSUMER.

SPECIFICATION forming part of Letters Patent No. 451,977, dated May 12, 1891.

Application filed June 13, 1890. Serial No. 355,386. (No model.)

To all whom it may concern:

Be it known that I, FRANK T. ROBINSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Smoke-Consumers, of which the following is a specification.

My invention relates to that class of smoke-consumers which may be applied to almost any kind of furnaces, but is more especially adapted for and designed to be used on steam-boiler furnaces; and it consists in certain peculiarties of the construction and the novel arrangement and operation of the various parts of the same, as will be hereinafter more fully set forth, and specifically claimed.

In order to enable others skilled in the art to which my invention pertains to make and use the same, I will now proceed to describe it, referring to the accompanying drawings, in which—

Figure 1 is a front view in elevation of a boiler-furnace with a portion of the smoke-stack showing my apparatus in position and the various pipes for the conveyance of steam, air, and furnace-gases. Fig. 2 is a horizontal sectional view of the front portion of the furnace, taken on line X X of Fig. 1, showing the grate-bars and discharge-pipes and a plan view of the retorts. Fig. 3 is a detail view of a cone or funnel shaped cylinder which fits in the casing of the retort. Fig. 4 is a plan view of the smoke-stack, showing a portion of the pipes for inducting and conveying the furnace-gases inserted therein. Fig. 5 is a longitudinal sectional view of one of the retorts, showing the cone-cylinder in place. Fig. 6 is a face view of the same; and Fig. 7 is a perspective view of a boiler and furnace, showing my attachments in position with a portion of the walls broken away to expose the interior of the furnace.

The object of my invention is to prevent, as nearly as possible, the escape of smoke, which is composed largely of unconsumed particles of carbon, and is generally wasted and lost by imperfect combustion, and to utilize this by ignition, thereby obtaining the full use and benefit of all the heating elements of the fuel, and economizing in the quantity of fuel as well as in the labor required to supply the same to the furnace. I obtain these results by the use of my apparatus and the novel arrangement of the parts thereof and by my improved method of collecting, treating, and consuming the gas or unburned particles.

In the drawings similar letters refer to corresponding parts throughout the different views.

A represents the walls of the furnace; A′, the smoke-stack; B, the face-plate, which is provided with the ordinary doors *a a′*, through which fuel is supplied and the ashes are withdrawn, respectively. B′ are the grate-bars, which are horizontally located, as usual, below the door *a* and extend a suitable distance back in the furnace.

At suitable points above the grate-bars through the face-plate and front wall are provided a number of holes for the reception and retention of the discharge-pipes C, which are inserted in said holes and have their inner ends open and about flush with the inner surface of the front wall, thus protecting them from the extreme heat of the fire.

To the outer end of each of the discharge-pipes is secured the retort D, which is provided for this purpose at its smaller end with screw-threads *b*, to engage with suitable screw-threads on the outer end of the discharge-pipes. The retorts D are made of two pieces E and F, and preferably of the form shown in Figs. 3 and 5. The piece E is a hollow cylindrical casing having on either side a screw-threaded opening *c* into the cavity thereof and provided at its larger or outer end with external and internal screw-threads *c′* c^2, the external threads being adapted to engage with an ordinary T-joint *d*, and the internal threads for the purpose of engaging with suitable threads c^3 on the large end of the piece F, which is a cone or funnel shaped cylinder with a funnel-shaped hollow tapering from the large to the lesser end, as shown, and when in place fits and partially telescopes in the chamber *d′* of the casing E, which chamber tapers toward the smaller end of the casing to a point opposite the termination of the screw-threads *b*, when it widens out, as shown at d^2, to admit of the expansion of steam and

the intermingling therewith of the gas as the mixture passes through the discharge-pipes out over the grate-bars.

It will be seen by reference to Fig. 5 that the tapering portion of the chamber d' is a little larger than the portion of the cylinder F that telescopes therein, and that a space of suitable size for the escapement of a desired amount of steam is thereby obtained, the quantity of steam under different degrees of pressure being regulated by enlarging or decreasing this space by partially withdrawing or farther inserting the cylinder F, which for this purpose is screwed into the large end of the case E, as shown.

In order to render this joint more close and effectual, an inwardly-extending flange d^3 is provided within the chamber d' at a suitable point between the opening in the large end of the case E and the openings c, and the side of the flange d^3 adjacent to the shoulder e on the piece F is formed with a circumferential groove or depression e', into which Babbitt metal or other suitable material for forming a washer or packing may be placed.

The large end of the retort D, having the screw-threads c', is screwed into an ordinary T-joint d, having a screw-threaded opening at each end for connection with the pipes G and a removable plug g opposite the opening, into which the retort is secured to enable the adjustment of the cylinder F. The pipes G are connected at one of their ends to the T-joints, and have their other ends inserted and secured in the smoke-stack at suitable points, as shown in Figs. 1 and 4, and are provided at proper points with suitable elbows or joints h h' h^2 h^3 h^4. At h and h^3 I have shown the joints formed with removable plugs i (at h^3 the plug being removed) to permit of the admission of air to the pipes when desired, and it is obvious that I may provide each pipe with such a joint at a desired point, or a similar means of admitting air.

In Figs. 1 and 2 of the drawings the pipes G are shown as secured to one end of the T-joints, the other end of the same and opposite the retort being plugged, and the T-joints screwed onto the large end of the retorts, the small end of which is connected to the discharge-pipes.

The pipe H, which supplies the steam to the retorts, is connected at one end to the boiler and at the other end to a pipe j, which is connected at each end to the retorts at the openings c, the opposite opening in each retort being closed in a suitable manner. Below the pipes j is a similar pipe j', connected in a like manner at each end to a retort and joined to the pipe j by a T m, through which the steam passes, the same being controlled by an ordinary steam-valve n, located at any convenient point on the pipe H.

In the drawings I have shown four retorts with their respective pipes, attached to the furnace; but I do not desire to limit myself to this number, as I may increase or diminish the number to meet the requirements of the furnace, as is obvious. I have also shown the pipes G as entering the smoke-stack, and while in most cases I prefer to locate them at this point, as being best adapted to catch or collect the unconsumed carbon as it escapes, yet I may vary their location and insert them at any point at the end of the boiler where the emission of smoke occurs.

The operation of my device is simple and as follows: The various parts are placed in position as above described, and the steam is admitted to the chamber d' of the retorts, when it will pass out of said chamber into the discharge-pipes over the grate-bars into the flame. This passage of the steam creates a vacuum in the cone-cylinder F, by reason of which a suction through the cylinder and pipes G from the smoke-stack is produced, thus drawing the unconsumed particles through the pipes and cylinders and mixing them with the steam at the point d^2, and the discharge-pipes from which the mixture is thrown over the flames and consumed.

In the drawings I have shown the discharge-pipes c located in the front wall of the furnace, and while in most cases I prefer this arrangement, yet I may place them in the side walls or in both front and side-walls, so as to discharge over the grate-bars.

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

1. A smoke-consumer consisting of a casing having a funnel-shaped chamber having openings therein and an interior flange provided with a groove for soft-metal packing, a hollow funnel-shaped cylinder telescoped in said chamber, an orifice between the casing and cylinder, and pipes communicating with the hollow cylinder and casing for conducting the furnace-gases, air, and steam to and from the retort, substantially as and for the purpose set forth.

2. A smoke-consumer consisting of a retort composed of a casing E, having a funnel-shaped chamber d' with enlargement d^2 and threaded openings c therein, the threaded ends b c' c^2, the flange d^3, having the groove e', the hollow funnel-shaped cylinder F, having the threaded end c^3 and shoulder e, telescoped in the chamber d', an orifice between the casing and cylinder, and pipes communicating with the hollow cylinder and casing for conducting the furnace-gases, air, and steam to and from the retort, substantially as and for the purpose set forth.

3. The combination, with a furnace, of a smoke-consumer consisting of a retort composed of a casing E, having a funnel-shaped chamber d' with enlargement d^2 and threaded openings c therein, the threaded ends b c' c^2, the flange d^3, having the groove e', the hollow funnel-shaped cylinder F, having the threaded end c^3 and shoulder e, telescoped in the chamber d', an orifice between the casing and cylinder, and the pipes G H, communicating at

one end with the retorts and at the other end with the boiler and at a point of the furnace where the emission of smoke occurs, substantially as and for the purpose set forth.

4. The combination, with a furnace, of a smoke-consumer consisting of a retort composed of a casing E, having a funnel-shaped chamber d' with enlargement d^2 and threaded openings c therein, the threaded ends b c' c^2, the flange d^3, having the groove e', the hollow funnel-shaped cylinder F, having the threaded end c^3 and shoulder e, telescoped in the chamber d', an orifice between the casing and cylinder, the pipes G, having means for the admission of air, and the pipes G H, communicating at one end with the retorts and at the other end with the boiler and at a point of the furnace where the emission of smoke occurs, substantially as and for the purpose set forth.

5. The combination, with a furnace, of a smoke-consumer consisting of a retort composed of a casing E, having a funnel-shaped chamber d' with enlargement d^2 and threaded openings c therein, the threaded ends b c' c^2, the flange d^3, having the groove e', the hollow funnel-shaped cylinder F, having the threaded end c^3 and shoulder e, telescoped in the chamber d', an orifice between the casing and cylinder, the pipes G, having means for the admission of air and communicating at one end with the retorts and at the other end with the smoke-stack, and the pipe H, communicating with the boiler and retorts, substantially as and for the purpose set forth.

In witness whereof I have hereunto set my hand and affixed my seal this the 10th day of June, 1890.

FRANK T. ROBINSON. [L. S.]

Witnesses:
FRANK L. HARTWELL,
CHAS. C. TILLMAN.