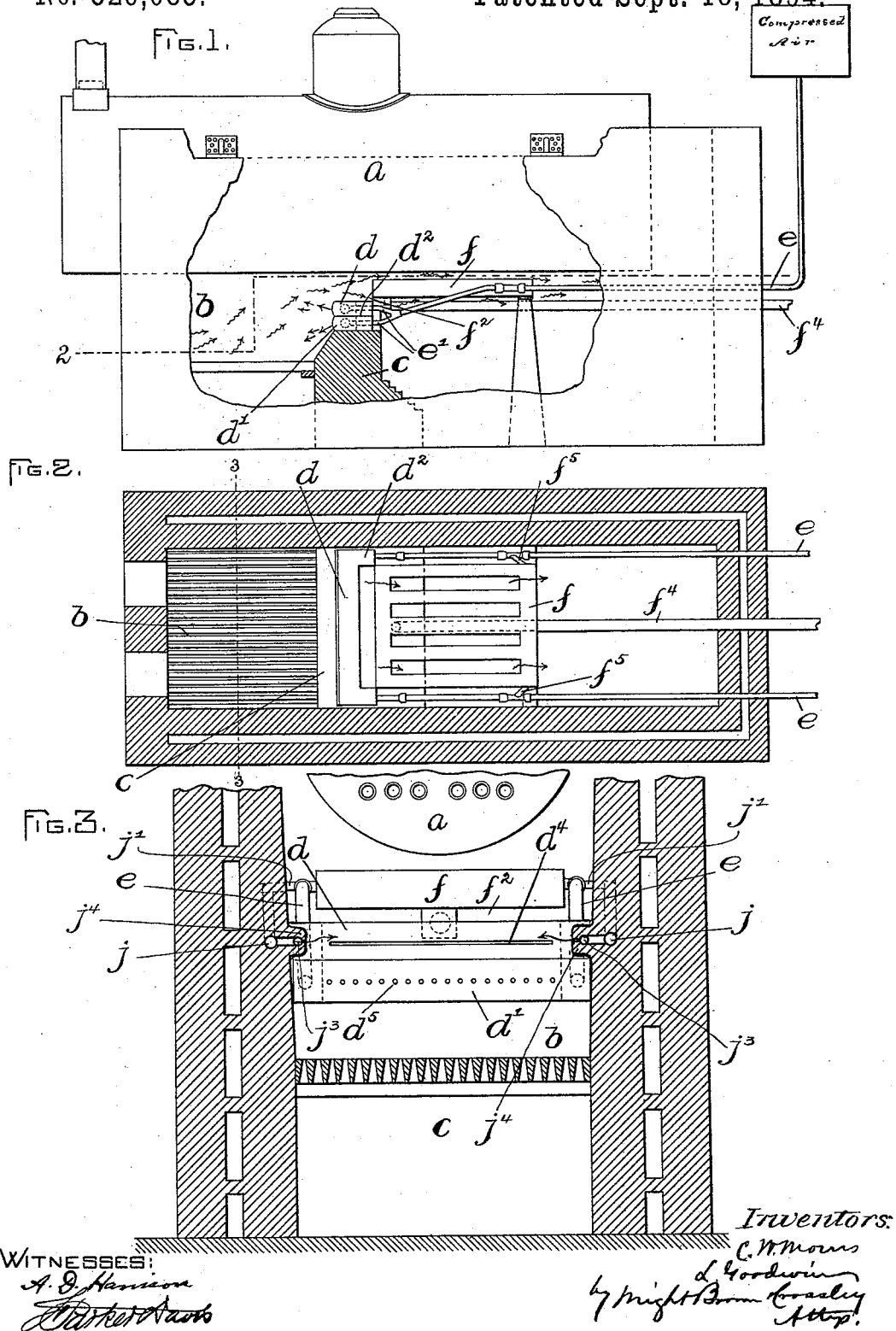


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SMOKE CONSUMING APPARATUS.

No. 526,085.

Patented Sept. 18, 1894.



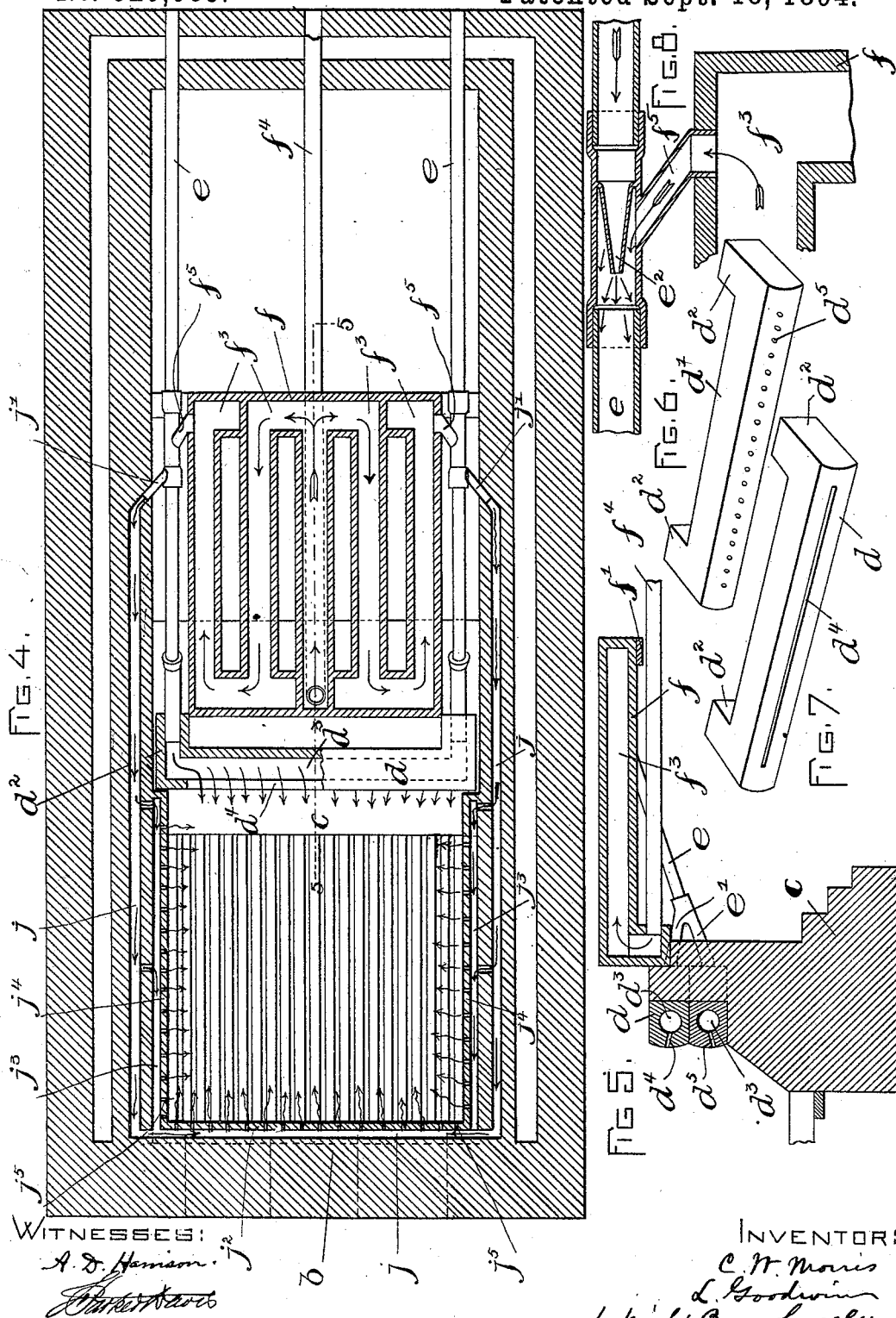
(No Model.)

2 Sheets—Sheet 2.

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# UNITED STATES PATENT OFFICE.

CHARLES W. MORRIS AND LEWIS GOODWIN, OF BOSTON, MASSACHUSETTS;  
SAID GOODWIN ASSIGNOR TO SAID MORRIS.

## SMOKE-CONSUMING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 526,085, dated September 18, 1894.

Application filed September 11, 1893. Serial No. 485,256. (No model.)

*To all whom it may concern:*

Be it known that we, CHARLES W. MORRIS and LEWIS GOODWIN, of Boston, in the county of Suffolk and State of Massachusetts, have  
5 invented certain new and useful Improvements in Smoke-Consuming Apparatus, of which the following is a specification.

This invention relates to certain improvements in the smoke consuming apparatus shown and described in Patent No. 479,767,  
10 granted July 26, 1892, to Wesley Smith.

The objects of the present invention are to provide means for more thoroughly heating the induced current of air before it  
15 reaches the fire-box, and for more uniformly distributing it throughout the fire-box.

To these ends the invention consists of certain novel features of construction and combination of parts hereinafter described and  
20 claimed.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 shows a side elevation of a stationary boiler and fire-box to which the invention is applied, the furnace wall being  
25 broken away and the bridge wall appearing in section. Fig. 2 shows a section on line 2—2 of Fig. 1. Fig. 3 shows a section on line 3—3 of Fig. 2, the parts appearing on a larger  
30 scale, and a modification being illustrated. Fig. 4 shows a horizontal section similar to that shown in Fig. 2, the parts being drawn to the same scale as in Fig. 3, certain parts  
35 which appear in plan in Fig. 2, appearing in section, and the modification appearing in Fig. 3 being shown in this figure. Fig. 5 shows a section on line 5—5 of Fig. 4. Figs. 6 and 7 show perspective details of the nozzles which deliver the air to the fire-box.  
40 Fig. 8 shows a section of the connections between the compressed air-conduit and the secondary air-conduit.

The reference letter *a* designates the boiler, *b* the fire-box, and *c* the bridge-wall. A pair  
45 of nozzles *d* and *d'* in the form of elongated rectangular castings rest one upon the other on an offset in the bridge-wall and have ears *d*<sup>2</sup> which extend by the ends of the bridge-wall. Each of said castings has a longitudinal bore *d*<sup>3</sup>, and an orifice or orifices extend-  
50 ing angularly from said bore out of the front

side of the casting. The orifice of the nozzle *d* is an elongated slot *d*<sup>4</sup> extending nearly its full length, whereas the nozzle *d'* has a line of holes or perforations *d*<sup>5</sup>. The slot *d*<sup>4</sup>  
55 and perforations *d*<sup>5</sup> extend on opposite angles or diverge, whereby the air injected through them will be distributed more completely through the fire-box.

Pipes or conduits *e* lead from a compressed  
60 air-reservoir and have branches *e'* which connect with the ears *d*<sup>2</sup> of the nozzles *d* and *d'* and communicate with the interior of said nozzles. A contracted nozzle *e*<sup>2</sup> is inclosed within  
65 each of the pipes *e* at a certain point. It will be observed that the said pipes pass through the furnace where they are exposed to the heated products of combustion from the fire-box.

A rectangular casing *f* is supported at its  
70 front end on the bridge-wall by means of a central leg *f*<sup>6</sup>, and at its rear end on a pier *f*<sup>7</sup>, or this casing may be supported in any other suitable manner. A space *f*<sup>2</sup> is left between this casing and the bridge-wall on each side  
75 of the supporting leg *f*<sup>6</sup>, whereby the heated products of combustion not only pass over this casing but also under the same so that the casing is thoroughly heated. Within the  
80 said casing is formed a tortuous passage-way *f*<sup>3</sup>, and a pipe or conduit *f*<sup>4</sup> conducts external air to the middle branch of said passage-way, and this pipe extends through the furnace where it is exposed to the heat. Each end of  
85 the passage-way communicates by a short pipe *f*<sup>5</sup> with one of the compressed air pipes *e* at such a point with respect to the nozzle *e*<sup>2</sup> (see Fig. 8) that the compressed air will induce a current of air through the tortuous  
90 passage-way.

The general principle and action of the apparatus here shown are substantially the same as that described in the patent hereinbefore referred to, and hence will require no elucidation herein. Suffice it to say that the object  
95 is to induce a current of air and inject it, heated, into the fire-box, to promote combustion therein.

It will be observed that by conducting the induced current of air through the tortuous  
100 passage in the casing *f* which is subjected on all sides to the heated product of combustion

from the fire-box, this induced current will be thoroughly heated before passing to the fire-box.

It will be seen that the objects primarily set out are accomplished by the construction and arrangement described.

A modification in the construction is shown in Figs. 3 and 4 in the form of a passage-way *j* communicating with branches *j'* of the pipes *e*, and extending around the sides and the front of the fire-box. As here shown this passage is formed in the furnace-walls, and at the front extends in a rib or bulged out portion *j<sup>2</sup>* of said wall and at the sides communicates with passages *j<sup>3</sup>* in similarly bulged out portions *j<sup>4</sup>*. Said bulged out portions *j<sup>2</sup>* and *j<sup>4</sup>* project over the grate and are provided with a series of perforations *j<sup>5</sup>* through which air enters the fire-box, as indicated by the arrow. By this construction, it will be seen that the air is distributed more thoroughly through the fire-box. Instead of forming the passages in the walls of the furnace, pipes may be laid in.

The parts exposed to the heat of the fire-box, as the nozzles *d* and *d'* and casing *f*, are made of refractory material, such as fire-clay.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination with a furnace or fire-box, of a casing exposed on all sides to the heated products of combustion and inclosing a tortuous passage-way having a port at the middle and at each end, a conduit connected with the central port and adapted to convey air under pressure into the tortuous passage-way, secondary conduits extending along opposite sides of the said casing and opening to the external air, said conduits inclosing contracted nozzles, passages affording communication between the end ports of the tortuous passage-way and the said secondary conduits and entering the latter back of the nozzles therein, and a nozzle extending across the back of the fire-box and communicating with the secondary conduits.

2. The combination with a furnace or fire-box, of a casing exposed on all sides to the

heated products of combustion and inclosing a tortuous passage-way having a port at the middle and at each end, a conduit connected with the central port and adapted to convey air under pressure into the tortuous passage-way, secondary conduits extending along opposite sides of the said casing and opening to the external air, said conduits inclosing contracted nozzles, passages affording communication between the end ports of the tortuous passage-way and the said secondary conduits and entering the latter back of the nozzles therein, and nozzles located one above the other and extending across the fire-box and having divergent outlet-openings and communicating respectively with branches of the secondary conduits.

3. The combination with a furnace or fire-box of a casing exposed on all sides to the heated products of combustion and inclosing a tortuous passage-way having a port at the middle and at each end, a conduit connected with the central port and adapted to convey air under pressure into the tortuous passage-way, secondary conduits extending along opposite sides of the said casing and opening to the external air, said conduits inclosing contracted nozzles, passages affording communication between the end ports of the tortuous passage-way and the said secondary conduits and entering the latter back of the nozzles therein, a nozzle extending across the back of the fire-box and communicating with the secondary conduits, and a passage extending around the sides and front of the fire-box and communicating therewith through suitable perforations, said passage communicating with the secondary conduits in advance of the nozzles therein.

In testimony whereof we have signed our names to this specification, each in the presence of two subscribing witnesses, this 6th day of September, A. D. 1893.

CHARLES W. MORRIS.  
LEWIS GOODWIN.

Witnesses:

FRED L. LAIRD,  
J. W. PECK.