No. 621,587. Patented Mar. 21, 1899.

W. H. SMITH.

SMOKELESS FURNACE.

(Application filed Oct. 29, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

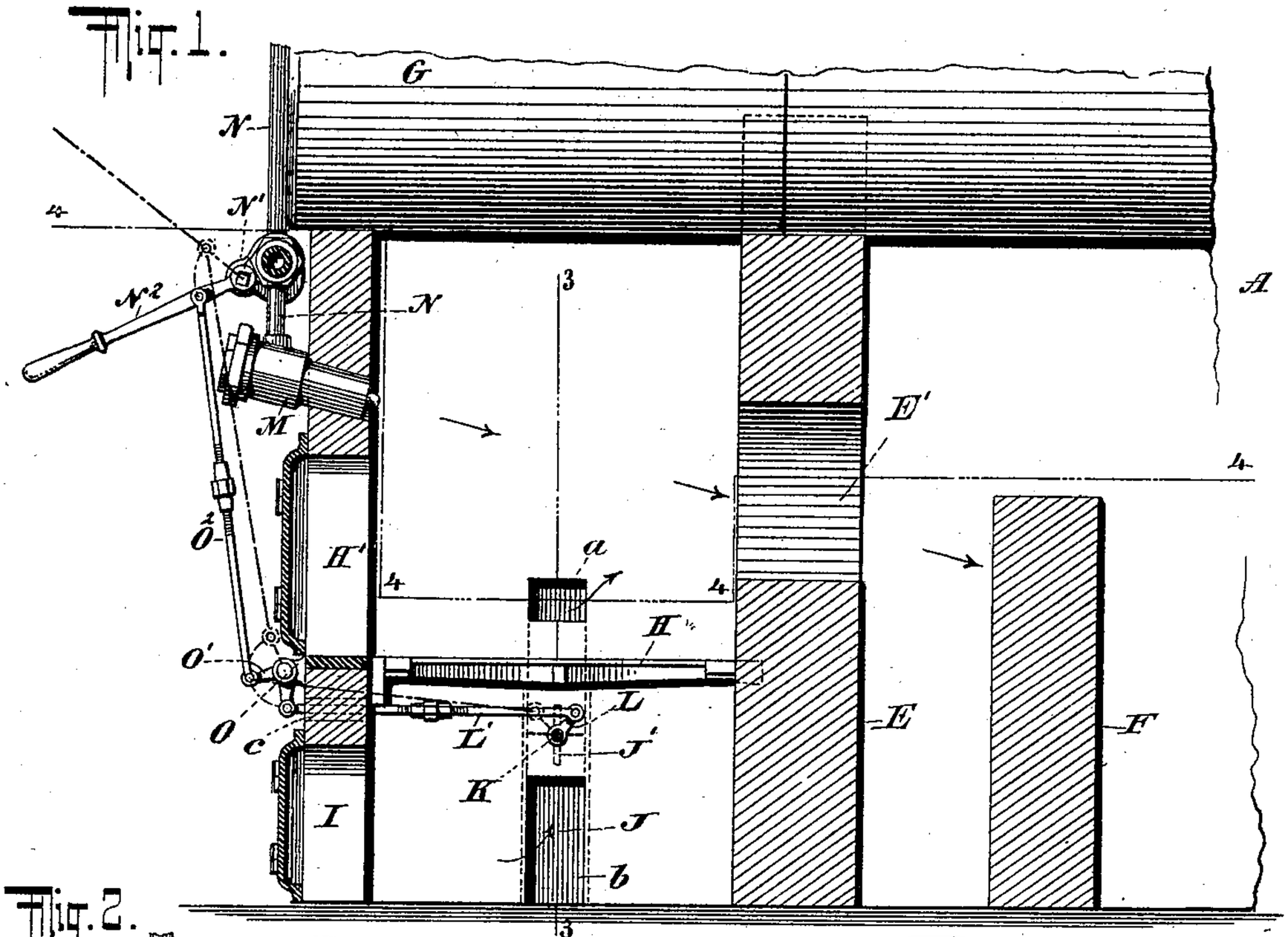

Fig. 2.

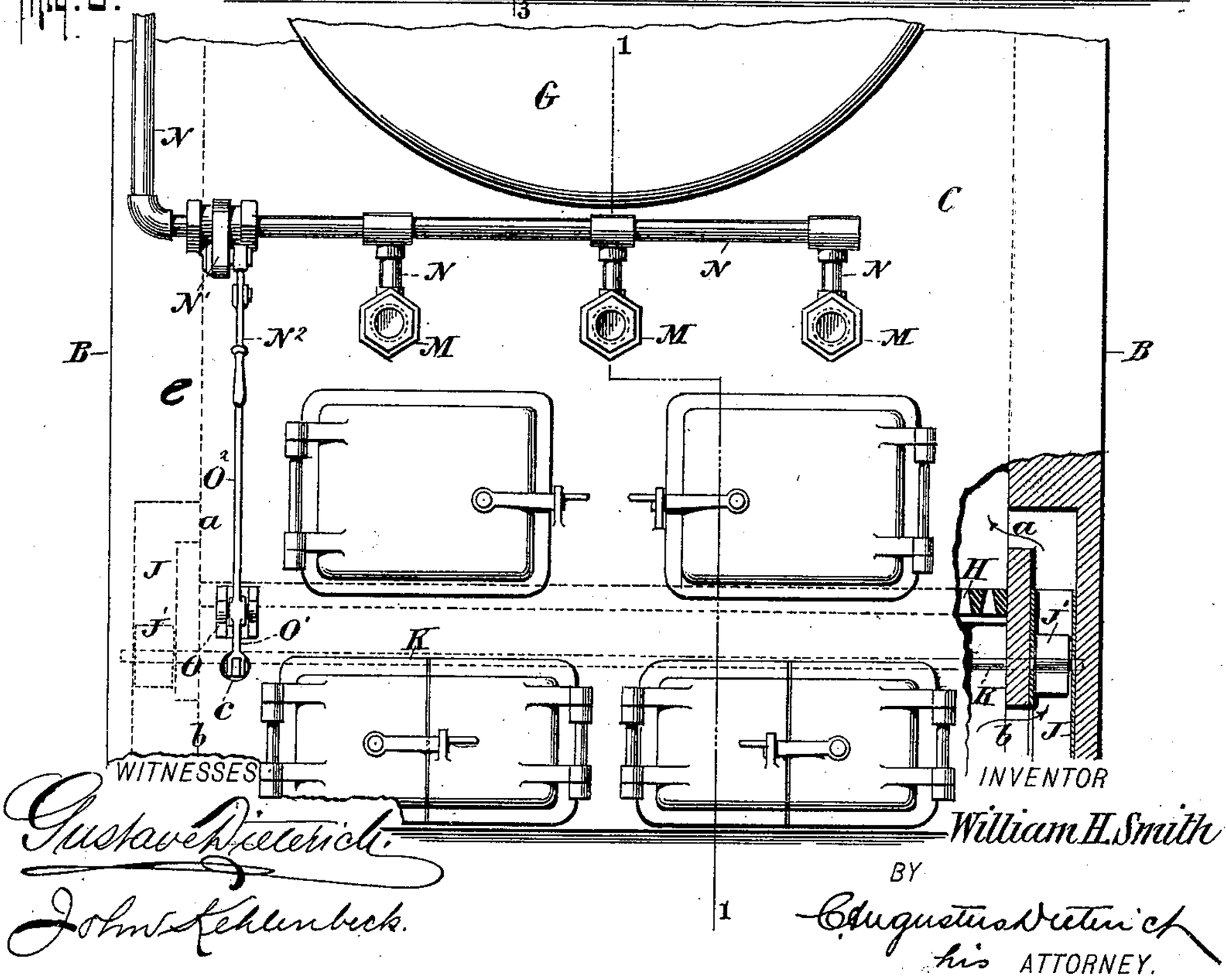

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Fig. 3.

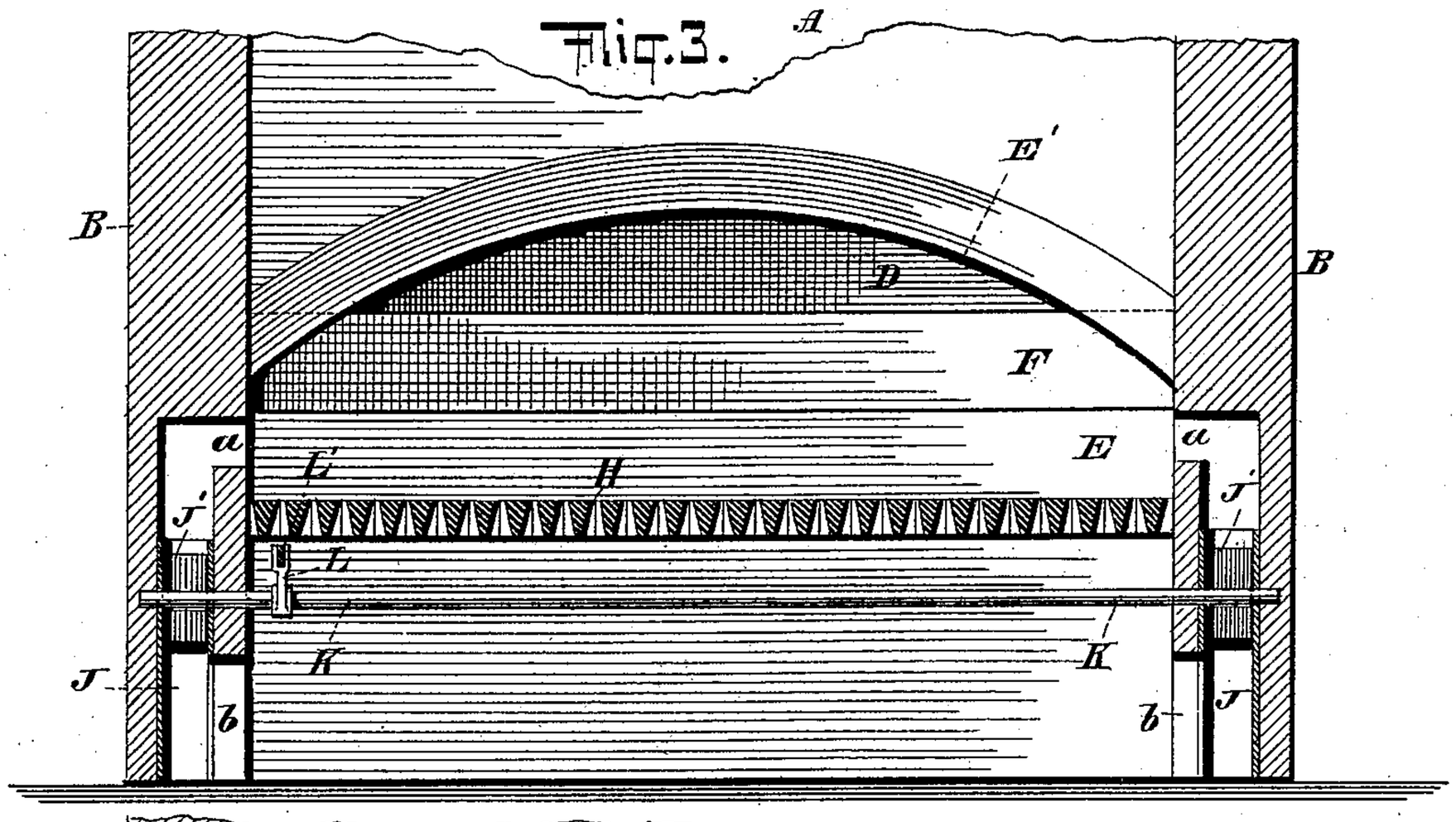
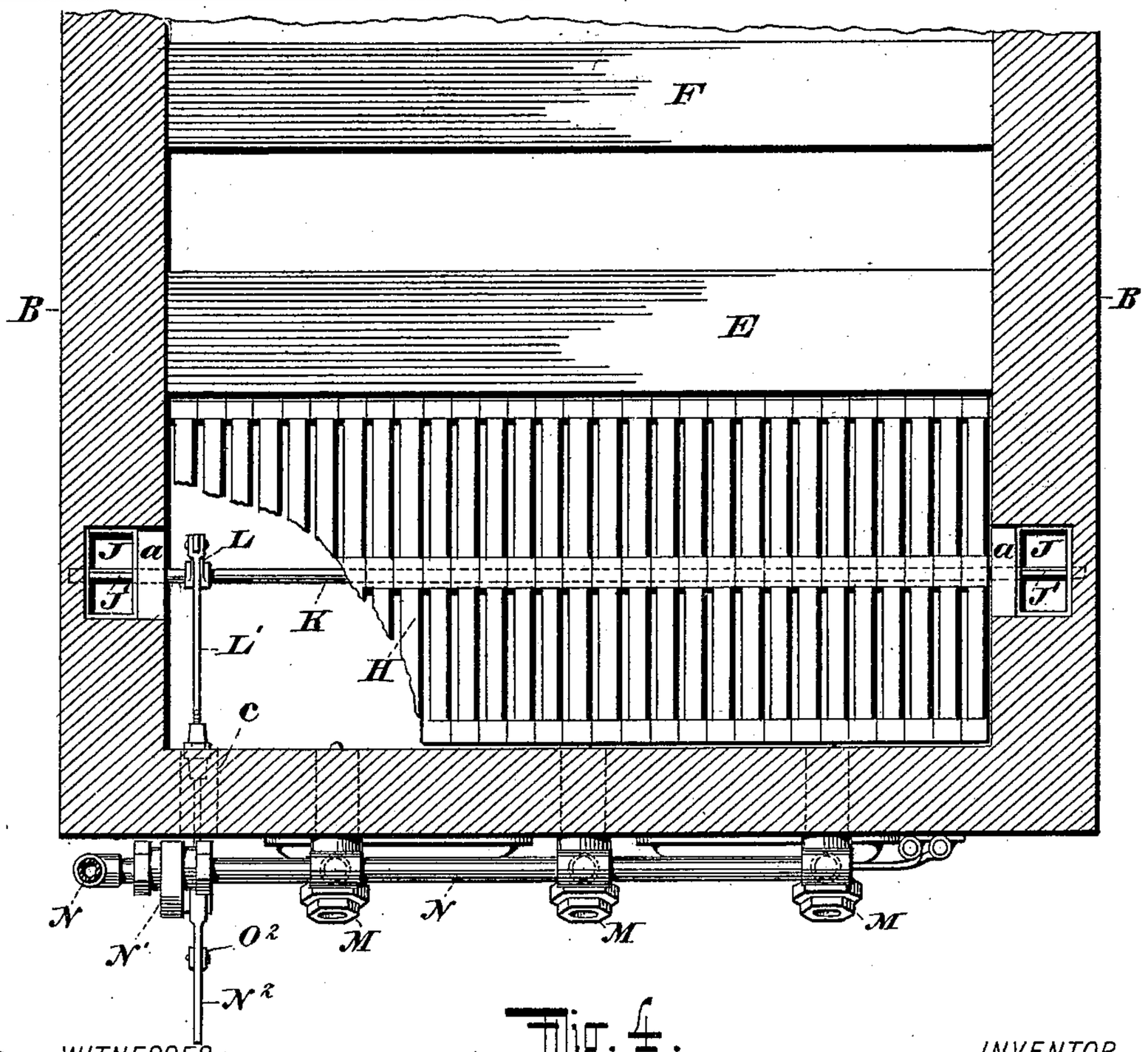


Fig. 4.



WITNESSES:

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UNITED STATES PATENT OFFICE.

WILLIAM H. SMITH, OF NEW YORK, N. Y.

SMOKELESS FURNACE.

SPECIFICATION forming part of Letters Patent No. 621,587, dated March 21, 1899.

Application filed October 29, 1898. Serial No. 694,922. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. SMITH, a citizen of the United States, residing at the city of New York, in the county and State of New York, have invented certain new and useful Improvements in Smokeless Furnaces, of which the following is a full, clear, and exact specification.

My invention relates to improvements in furnaces, and has for its object more particularly to provide a simple and efficient furnace for steam-boilers whereby it becomes possible to obtain a more perfect combustion of the fuel employed and to render the operation of the furnace more economical than has heretofore been possible by thus preventing the distillation of the volatile elements of the fuel, which upon being liberated under a low temperature are caused to pass off in the form of smoke and carry therewith minute particles of the useful elements of the fuel without having parted with their latent heat. These objects above set forth I am enabled to attain by means of my invention, which consists in the novel details of construction and in the combination, connection, and arrangement of parts, as hereinafter more fully set forth and then pointed out in the claims.

In the accompanying drawings, forming part of this specification, wherein like letters of reference indicate like parts, Figure 1 is a section taken on the line 1 1 of Fig. 2, showing a portion of the front of a boiler and furnace. Fig. 2 is a front view. Fig. 3 is a vertical section taken on the line 3 3 of Fig. 1, and Fig. 4 is a horizontal section taken on the line 4 4 of Fig. 1.

In said drawings, A designates a steam-boiler comprising the side walls B B, the front wall C, and the rear wall D. Extending across said furnace, within the walls thereof, are arranged a partition E, having an arched opening E′ therein, and to the rear of said partition E a bridge-wall or baffle F, the top of which is a trifle higher than the base of the opening E′ in the partition E, and G denotes a boiler of general construction which is supported at its forward end partly by the front wall A and the partition E. In the portion of the furnace intermediate the front wall and the partition E is supported a grate H. H′ H′ denote openings in said front wall provided with doors, whereby access may be had to the grate H, and below said openings H′ H′ are provided similar openings I I, whereby access may be had to the ash-pit of the furnace.

In the side walls B B of the furnace, to each side of the grate H, is arranged a flue or passage J, the upper portion of which is made of brick and has an opening *a*, which communicates with the portion of the furnace above the grate, and the portion of said flue below the grate is made of metal and has an opening *b* therein which communicates with the portion of the furnace below the grate H.

K denotes a rock-shaft which extends across the furnace below the grate and has its ends socketed in the walls of the lower portion of the flues J J, and upon said rock-shaft K, within the metallic portions of the flues J J, are fixed dampers or valves J′ J′, and upon the portion of the rock-shaft without the flues is fixed a lever L, to the end of which is pivotally secured one end of an adjustable link or rod L′, the other end of which extends forward and through an opening *c*, provided therefor in the front wall of the furnace.

In the front wall of the furnace are injectors M M M, which are connected to a pipe N, communicating with the steam-chamber of the boiler, and N′ denotes a gate-valve of ordinary construction arranged in said pipe N and provided with an operating-handle N^2, whereby said valve N′ may be opened or closed to admit steam to the injectors.

Upon the front of the furnace, directly above the opening *c* therein, is secured a bifurcated bearing O, within which is pivotally mounted a bell-crank O′, having the end of its vertical member pivotally secured to the end of the link or rod L′ and the end of its horizontal member connected by an adjustable link or rod O^2 with the handle N^2 of the valve N′.

The operation of the apparatus is as follows: When the furnace is started, the gate-valve N′ and the dampers or valves J′ J′ in the flues J J should be closed to the positions indicated by broken lines at Fig. 1. The fires are then permitted to burn with the ordinary draft until a temperature sufficient to raise steam of about fifteen pounds pressure in the boiler has been obtained. Hereupon the gate-valve N′ and simultaneously therewith the dampers or valves J′ J′ in flues J J are opened to the

positions indicated in full lines at Fig. 1. As soon as this has been done the injectors M M M will cause columns of air to be projected across the grate through the opening E′ in the partition E and strike the bridge-wall or baffle F. The air columns in being thus projected across the grate H will be heated to the furnace temperature by the fire and will, owing to their velocity, carry therewith against the bridge-wall or baffle F the unconsumed gases liberated above the grate and the heated air drawn up through the flues J J and cause the same to be retarded or temporarily confined between the partition E and said bridge-wall or baffle F until the superheated oxygen has had an opportunity to mix therewith and effect a perfect combustion.

When the operation of the furnace is to be discontinued, it simply becomes necessary to adjust the lever or handle N^2 of the valve N′ to the position indicated by broken lines at Fig. 1, whereupon the said valve N′ and the dampers J′ J′ in the flues will be closed, and then bank the fires, as usual.

Without limiting myself to the details of construction, which may be varied within the scope of the invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination with a furnace of a partition arranged therein separating the grate from the remainder of said furnace, an opening in said partition, a bridge or baffle wall arranged in said furnace behind the partition, a plurality of chambers arranged in the walls of said furnace contiguous to the grate having openings therein communicating with said furnace above and below the grate, valves arranged in said chambers, injectors arranged in the front of said furnace, a valve for governing the admission of fluid to said injectors, and means for simultaneously opening or closing the injector-valve, and the valves in the air-chambers, substantially as specified.

2. The combination with a furnace of a partition arranged therein separating the grate from the remainder of the furnace, an opening provided in said partition above the grate, a bridge or baffle wall arranged in said furnace to the rear of the partition and extending upward above the level of the base of the opening in the partition, a plurality of chambers arranged in the walls of the furnace contiguous to the grate having openings therein above and below the grate, a rock-shaft extending across the furnace below the grate having its ends pivotally supported within the chambers aforesaid, valves disposed upon said rock-shaft within said chambers, a lever fixed thereon intermediate its ends, and a link having one end pivotally connected to the end of the lever on said rock-shaft, a series of injectors arranged in the front wall of the furnace and extending into the same, a pipe connecting said injectors with a source of steam-supply, a valve arranged in said pipe having an operating-lever, and a bell-crank pivotally supported upon the front of the furnace, having one of its arms connected by a link with the lever of the valve in the steam-pipe aforesaid, and its other end connected to the link extending from the lever of the rock-shaft arranged below the grate within the furnace, substantially as specified.

Signed at the city of New York, in the county and State of New York, this 28th day of October, 1898.

WILLIAM H. SMITH.

Witnesses:
ALEX BERNHEIMER,
ALBERT FULLER.