(No Model.)

2 Sheets—Sheet 1.

A. E. DETWILER.

KILN.

No. 516,629. Patented Mar. 13, 1894.

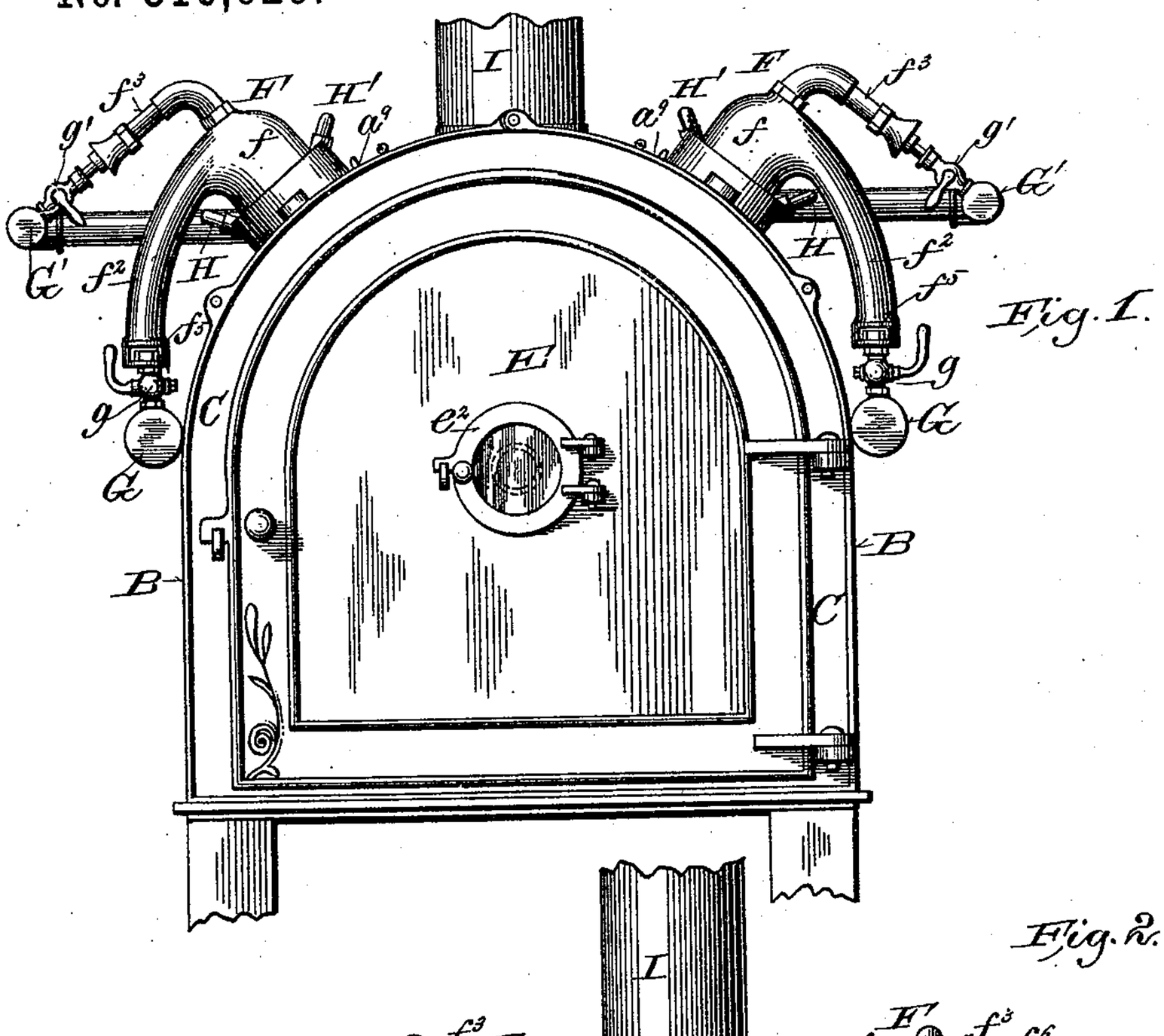


Fig. 1.

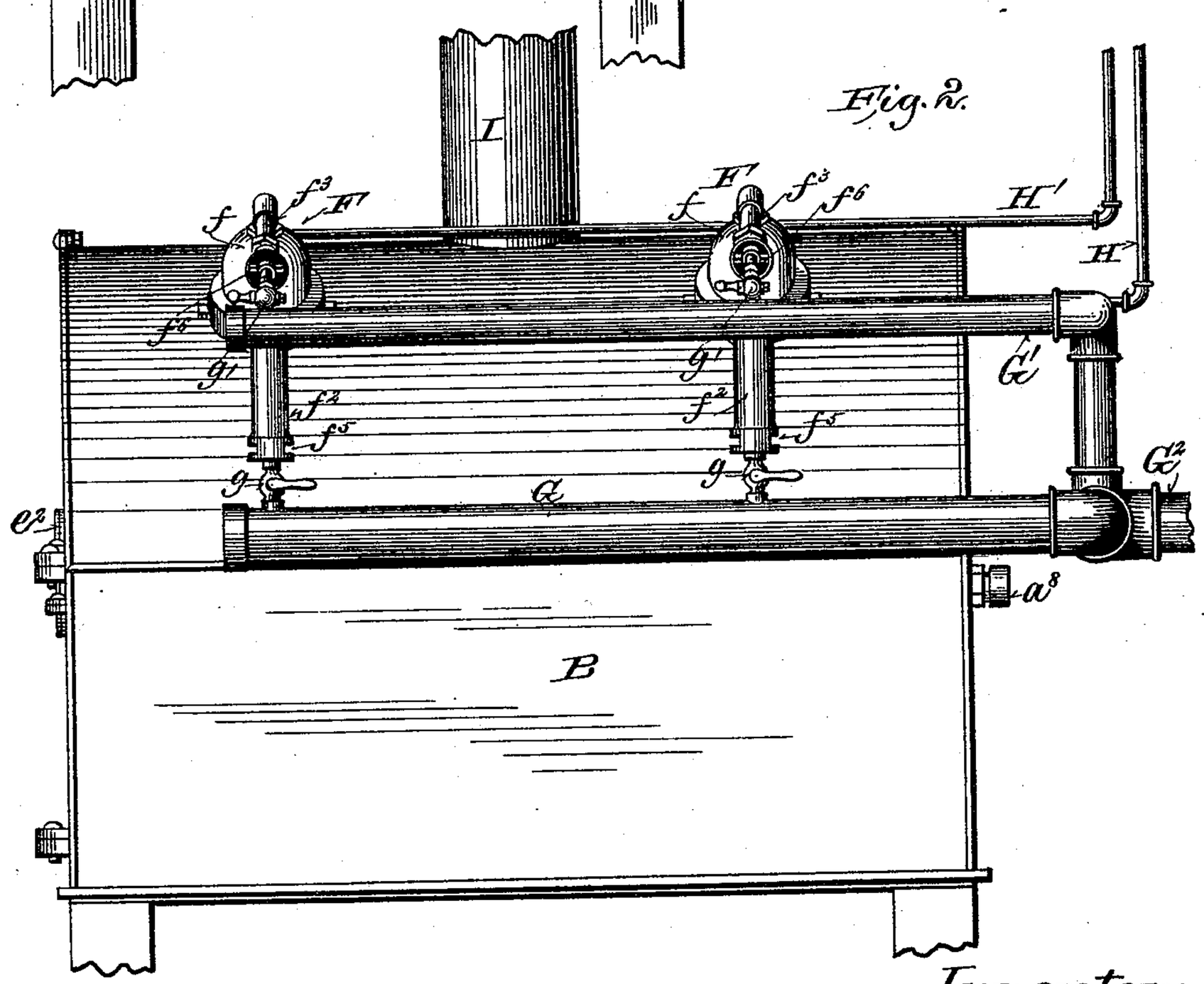


Fig. 2.

Witnesses:
E. C. Hamson
Chas. L. Goss.

Inventor:
Alfred E. Detwiler
By Winkle Flanders Smith Bottum & Vale
Attorneys.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

A. E. DETWILER.

KILN.

No. 516,629. Patented Mar. 13, 1894.

Fig. 3.

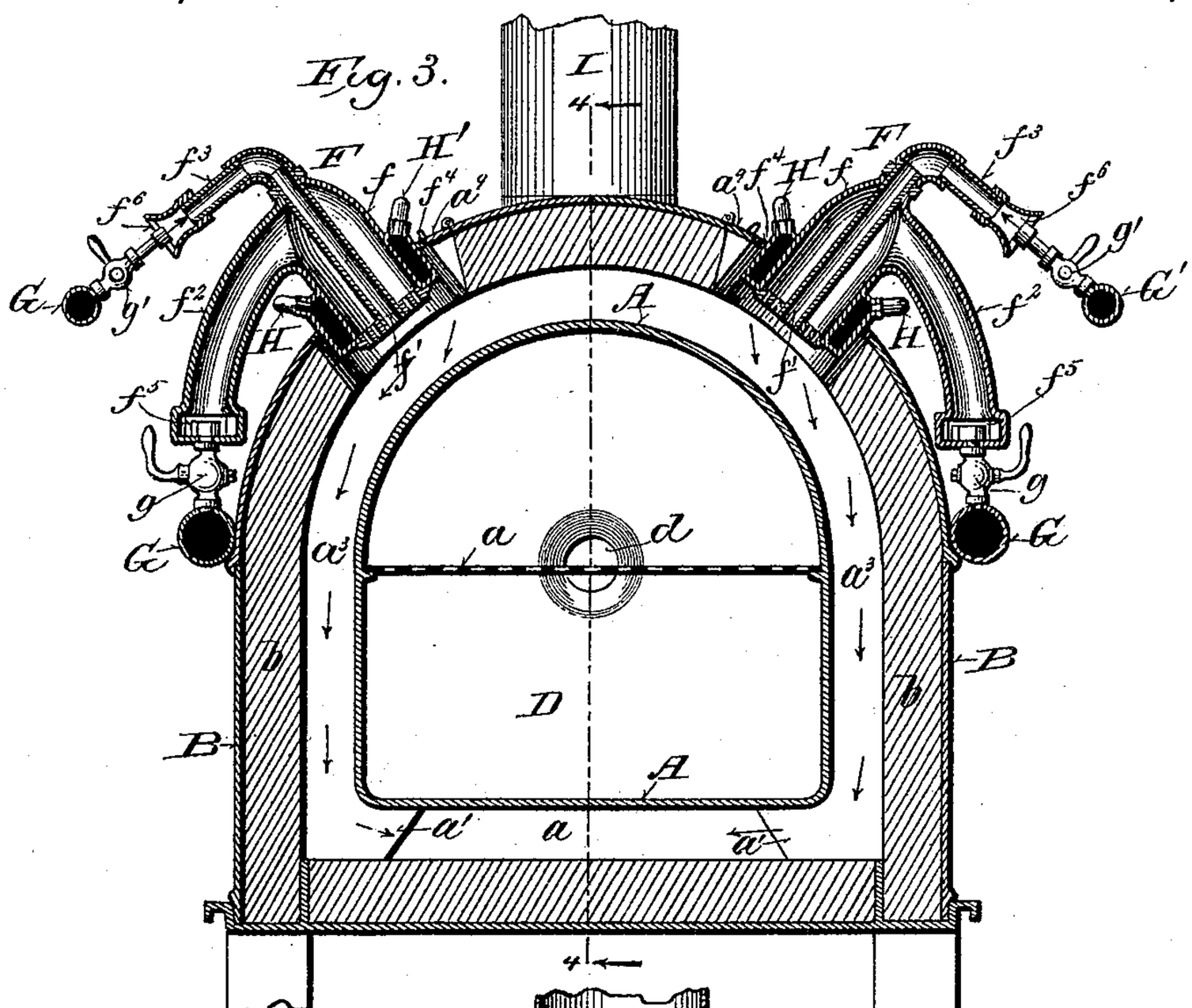
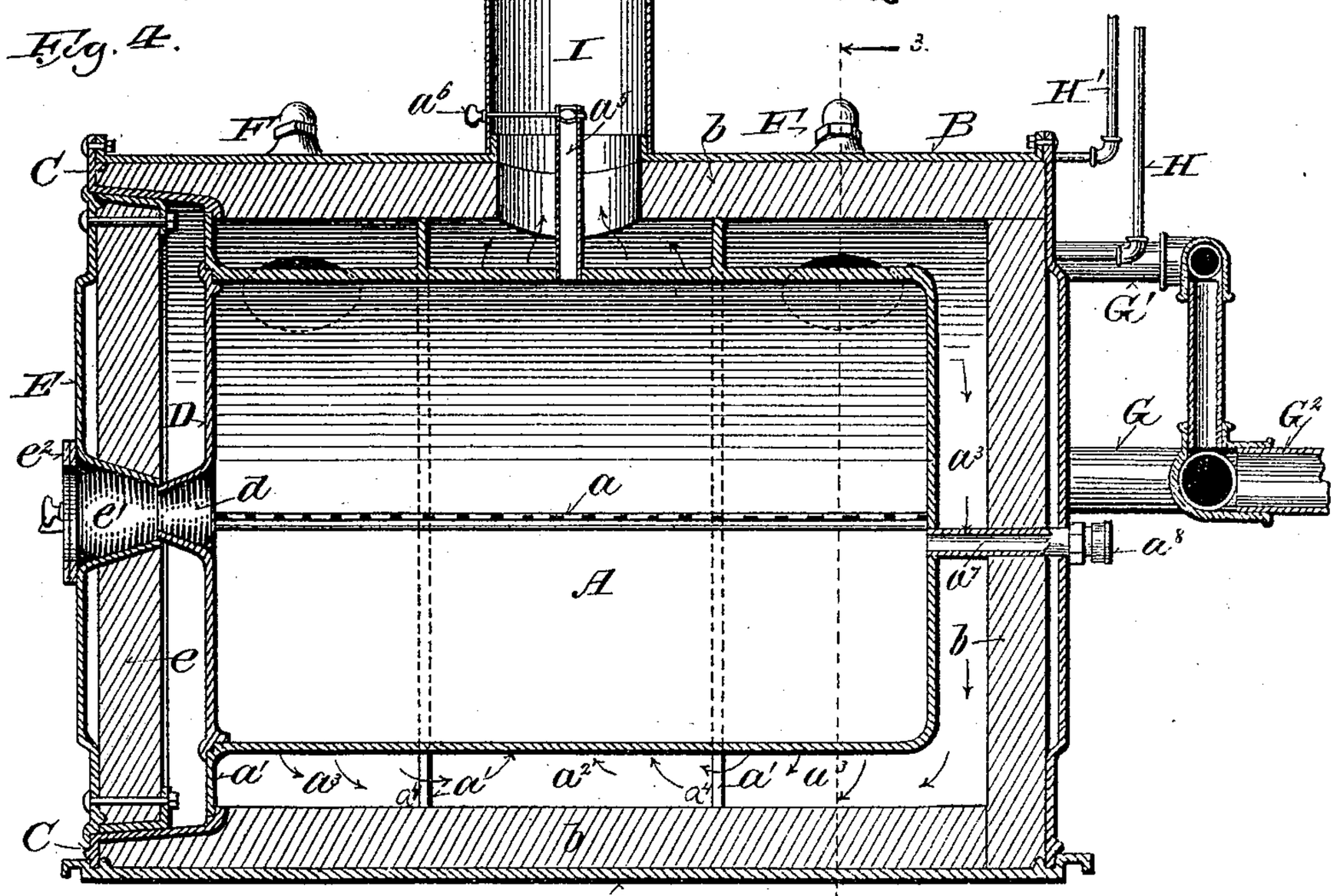


Fig. 4.



Witnesses:
C. E. Aumon
Chas. L. Goss.

Inventor:
Alfred E. Detwiler
By Winkler Flanders Smith Bottum & Vilas
Attorneys

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ALFRED E. DETWILER, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO THE MILWAUKEE GAS STOVE COMPANY, OF SAME PLACE.

KILN.

SPECIFICATION forming part of Letters Patent No. 516,629, dated March 13, 1894.

Application filed November 29, 1890. Serial No. 373,048. (No model.)

To all whom it may concern:

Be it known that I, ALFRED E. DETWILER, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Kilns; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

The main object of my invention is to produce a steady uniform temperature throughout the oven or muffle, that is, to prevent the over heating of the lower portion and the under heating of the upper portion, which frequently occurs in ovens or kilns of this class.

It consists essentially of an inner oven or muffle, surrounded by a jacket or casing which forms therewith a descending flue around the sides, together with suitable heating appliances communicating with the upper portion of said flue and an exit or opening communicating with the lower part of said descending flue, and of certain other peculiarities of construction and arrangement, especially in the heating appliances, hereinafter particularly described and pointed out in the claims.

In the accompanying drawings like letters designate the same parts in the several figures.

Figure 1 is a front elevation of my improved kiln. Fig. 2 is a side elevation of the same. Fig. 3 is a vertical cross section on the line 3—3, Fig. 4, and Fig. 4 is a vertical longitudinal section on the line 4—4, Fig. 3.

A represents the oven proper or muffle, preferably made of cast iron of any suitable shape and size, according to the purpose for which the kiln or oven is to be employed. It is preferably provided with a removable slide *a*, which may be removed when large articles are to be placed in the muffle, and affords when in place, a support for small articles, thereby increasing the capacity of the kiln.

B represents an outer casing, preferably constructed of cast iron, conforming approximately to the shape of the muffle A. It is provided on the inside with a lining *b* of fire brick, or other suitable refractory and non-conducting material, so as to prevent the over heating of the casing B and the escape and loss of heat. The muffle A is preferably formed or provided on the outside with outwardly projecting flanges *a' a'*, which bear at their outer edges against the lining *b* and the front plate C of the kiln, and thereby support said muffle at a distance from the surrounding casing, leaving a space, which is separated by said flanges into a central ascending flue a^2 and descending flue a^3 at each end. These flues communicate with each other underneath the muffle through openings a^4 left in the flanges *a'*, as shown in Figs. 3 and 4.

D represents the door applied to the front end of the muffle, and E a door opening into the front end of the casing, as shown in Fig. 4. The door E is provided with a lining *e* of fire brick, and has a central sight opening *e'*, corresponding in position with a sight opening *d*, in the door D. A mica door e^2 is provided, for closing the opening *e'*.

F F represent double gas burners by which the kiln is heated. They are each composed of an inner and outer tube or shell *f* and *f'*, which are connected respectively by angular extensions f^2 and f^3 with the gas supply pipes G and G', the supply of gas to the burners being controlled by cocks *g g'*. The inner tube *f'* of each burner passes centrally through the outer tube or shell *f*, and is secured at its ends therein. The outer shell *f* is formed or provided with a water jacket f^4, with which the water supply and discharge pipes H H' are connected, so as to maintain a circulation of water around the burner and prevent the over heating of the same.

The extensions f^2 and f^3 of each burner are provided with air intake openings f^5 and f^6, preferably at or near the points where the cocks *g g'* communicate with the same, so as to supply the requisite amount of oxygen for the proper combustion of the gas as it passes to the inner and outer burner tubes *f f'*. The outer or larger burner tube or shell *f*, and its extension f^2 may be conveniently cast in a single piece, while the inner tube *f* and its extension f^3 may be conveniently constructed of ordinary gas pipe and couplings. The inner end of the larger shell or tube *f*, is formed with perforations or openings around the open end of the tube *f'*, for the escape of

the gas. The burners are inserted in openings in the upper part of casing B into the descending flues a^3 a^3. With a kiln of the size and construction of that illustrated, I prefer to employ four burners, two for each descending flue located as shown in the drawings. The gas pipes G G′ are connected by suitable branches and couplings with any suitable supply pipe G^2, as shown in Figs. 2 and 4, and the water pipes H H′ are connected with a tank (not shown).

I is a chimney or exit flue opening out of the upper portion of the ascending flue a^2. This connection may be made underneath the oven without affecting the operation of the kiln.

a^5 is a vent tube opening out of the top of the muffle A into the chimney I for carrying off the vapors which are generated in the muffle. It is provided with a valve or damper a^6.

a^7 is a tube for admitting a limited supply of air into the rear end of the muffle. It projects through and opens outside of the casing B, and is provided at its protruding end with a cap a^8 or other suitable device for closing it when desired. The sight openings d and e' in the doors at the front end of the kiln serve the same purpose at the front end of the muffle as the tube a^7 does at the rear, the door e^2 affording means for opening and closing the same. Any other suitable provision for the admission of a limited supply of air to the muffle during that period of the operation of firing when the vapors are given off from the material, may be provided. Around each burner where it enters the casing, a space is left to supply air at the point of combustion, and doors a^9 are provided in the casing whereby access is had to the inner ends of the burners for the purpose of lighting them.

My improved kiln operates as follows: The article or articles to be fired are placed in the muffle, the doors D and E closed, and the burners F lighted at their ends opening into the flues a^3 or the space inclosed between the muffle A and casing B. At first the vent tube a^5, the air supply tube a^7 and the sight opening are left open to ventilate the muffle and carry off the vapor given off from the material being fired, but when the moisture has been driven off, the air supply and vent openings are closed and the operation continued until the desired result is attained. The temperature may be regulated and controlled by the cocks g, and g' through which gas is supplied to the several burners.

For the purpose of gradually raising the temperature of the oven, the smaller inner portions f' f' of the burners are first lighted and burned for a time alone, while the gas is shut off from the larger outer portions f f, which are afterward lighted therefrom by simply turning on gas through the cocks g g. In this way the explosion or flashing back which might otherwise occur if it were attempted to first light the entire burner at once or the larger portion f thereof, is avoided. The hot air and gases produced by the burners F F, in the upper portions of flues a^3 a^3, together with the flame resulting from combustion, are compelled to descend at the sides and rear end of the muffle A in contact therewith underneath the same, where they pass through the openings a^4, into the central ascending flue a^2 in which they rise at the sides of the muffle, escaping at the top of said flue a^2 into the chimney I, as indicated by arrows in Figs. 3 and 4. The hot air and gases from the burners at the top of the kiln being thus compelled to descend around the sides of the muffle to find an exit underneath the same, produce in effect a uniform temperature within and throughout the muffle and prevent the over heating or burning of articles in the lower portion, while articles in the upper portion thereof are under heated. While the top of the muffle subjected directly to the effect of the burners becomes more intensely heated than the bottom, the greater radiant heat to which the articles being fired are subjected from above, is balanced by the conduction of heat from below through the bottom or slide of the muffle upon which they rest and through the articles themselves.

Keeping down the temperature of the burners by means of the water jackets f^4 insures a more uniform and perfect combustion, inasmuch as the exclusion of the air supply which would otherwise result from the over heating of the burner and adjacent parts of the kiln, is thus avoided.

With kilns of considerable height, in which the heat would be carried with difficulty to the bottom of the oven, I may provide in connection with the overhead burners an additional burner or burners underneath the oven.

Although I have shown and described for illustration of my invention, a kiln designed particularly for firing china, by slight modification the device may be adapted for use as an oven for baking or other purposes.

Various changes in the details of my kiln may be made to adapt it to various uses, without affecting its mode of operation or departing from the spirit of my invention.

I claim—

1. In a kiln, the combination with an oven or muffle, of a flue descending at its side, and a heater located adjacent to and communicating with the upper portion of said flue, substantially as and for the purposes set forth.

2. In a kiln, the combination with an oven or muffle, of a casing inclosing at its sides descending flues, and a heater located adjacent to and communicating with the upper portion of said flues, substantially as and for the purposes set forth.

3. In a kiln, the combination with an oven or muffle, of a casing inclosing a flue space outside of the same, and an inverted burner opening downwardly into said flue space, substantially as and for the purposes set forth.

4. In a kiln, the combination with an oven

or muffle, of a casing inclosing a flue space about the same and having an opening into the upper part of said space, a gas burner projecting into said opening, and an air inlet into said flue space adjacent to said burner, substantially as and for the purposes set forth.

5. In a kiln, the combination with the muffle or oven, of a casing inclosing the same and forming therewith an ascending and a descending flue outside of said muffle, said flues communicating with each other at the bottom of the oven and the ascending flue having an exit, and a burner communicating with the upper portion of the descending flue, substantially as and for the purposes set forth.

6. In a kiln, the combination with the muffle or oven of flues descending and ascending at the sides of the oven and communicating with each other underneath the oven, and an inverted burner opening downwardly into the upper part of the descending flue and an exit opening out of the upper part of the ascending flue, substantially as and for the purposes set forth.

7. In a kiln, the combination with the muffle or oven, of a casing inclosing descending flues at the sides of the oven and an inverted gas or vapor burner opening downwardly into the upper part of the descending flue, an air intake opening being provided in the casing adjacent to the burner, substantially as and for the purposes set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

ALFRED E. DETWILER.

Witnesses:
CHAS. L. GOSS,
E. G. ASMUS.