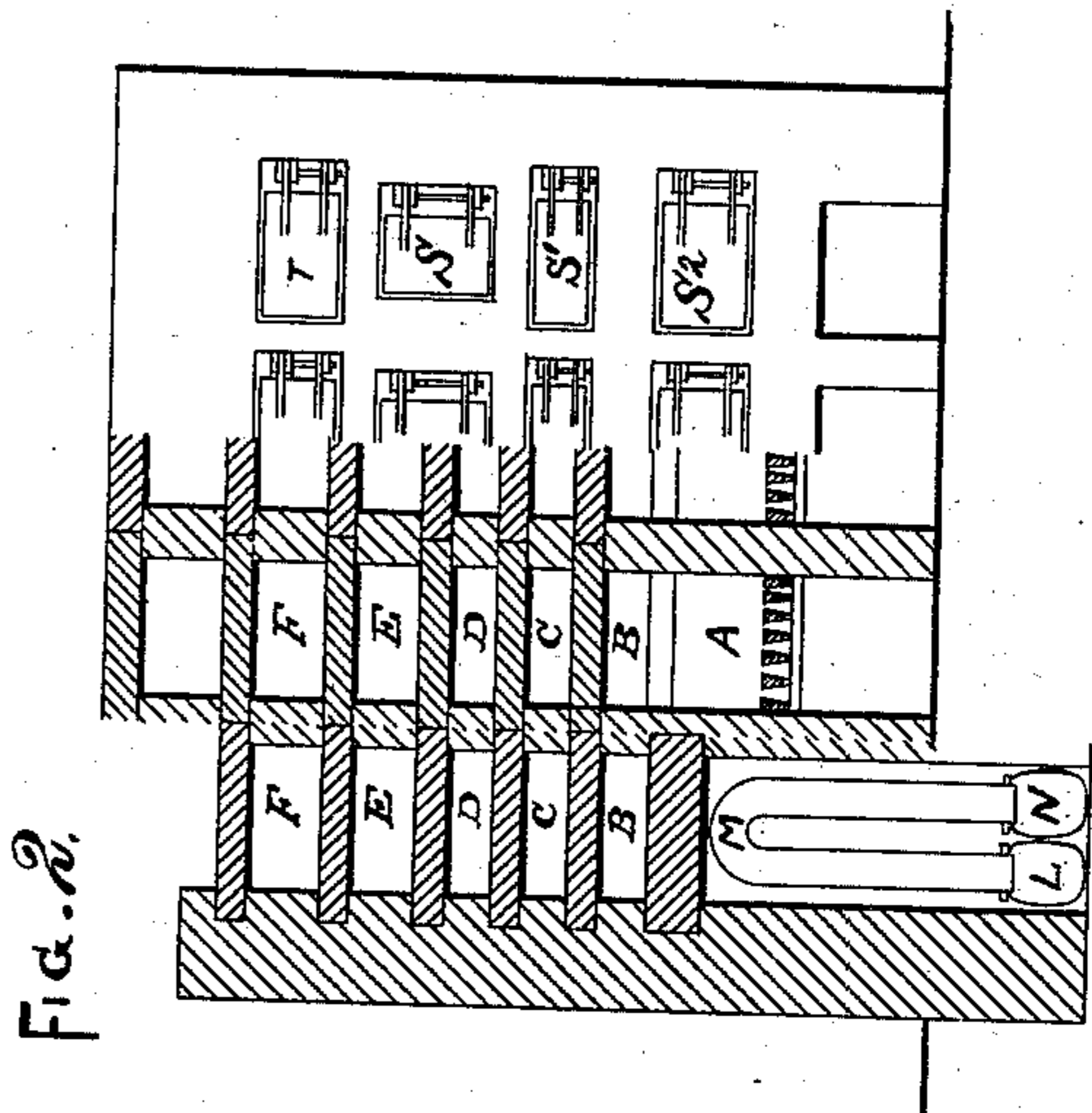
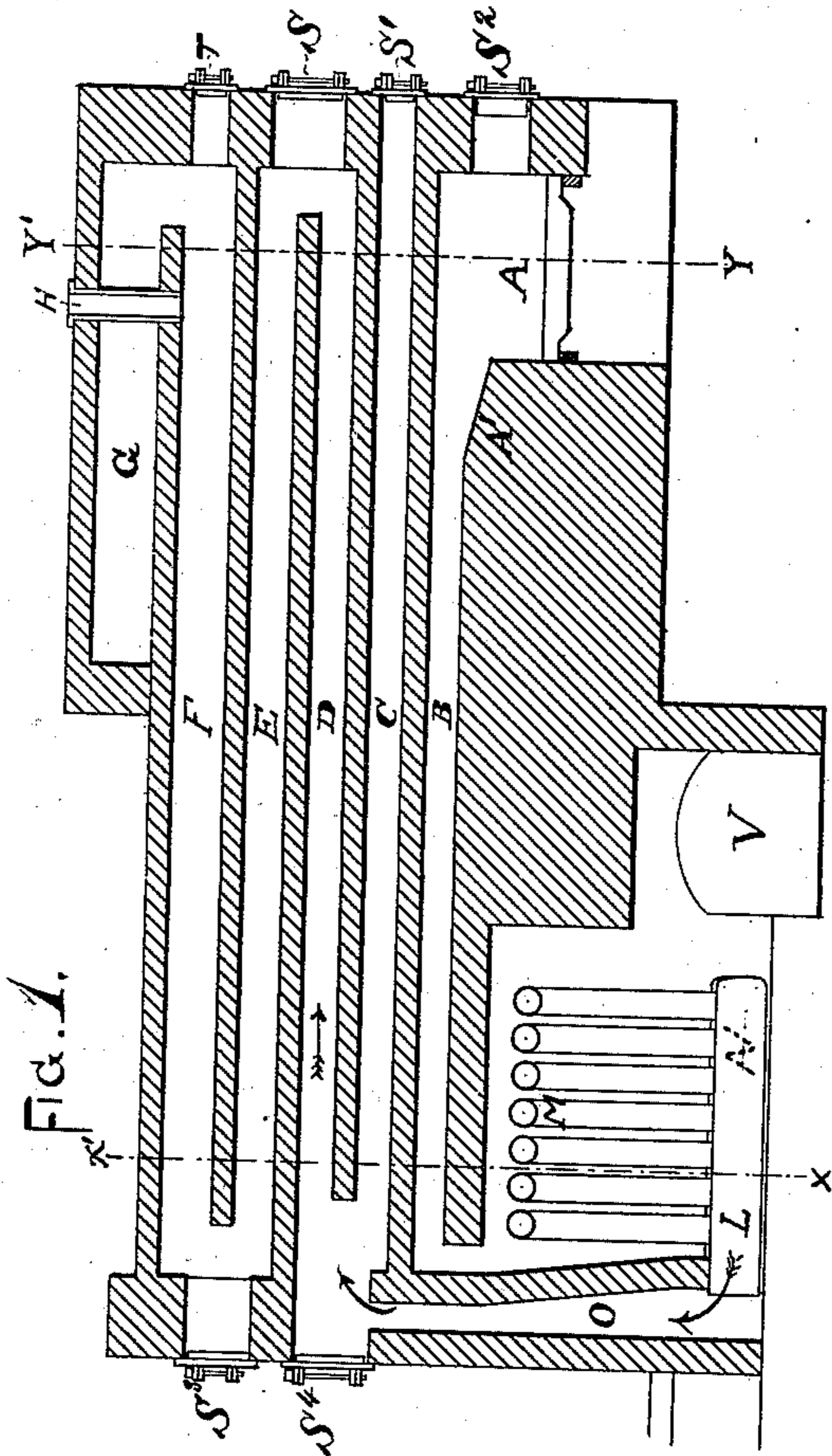


W. E. GIFFORD.
Ore-Roasting Furnace.

No. 219,634.

Patented Sept. 16, 1879.



— WITNESSES: —

Witnessed.
J. L. Brown

INVENTOR: —
Wm. E. Gifford
by his attorney
Thos. S. Watson

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Fig. 3.

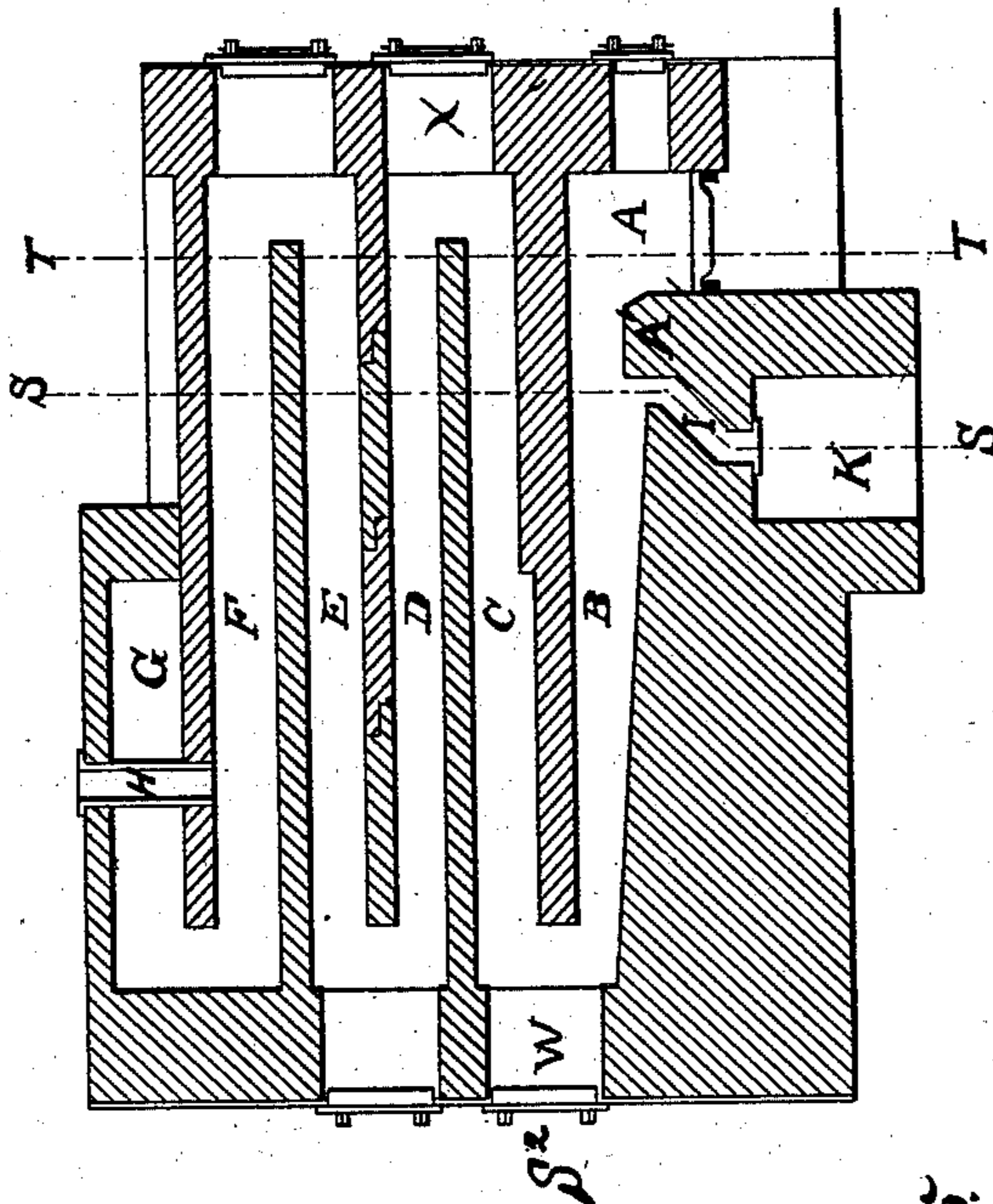


Fig. 4.

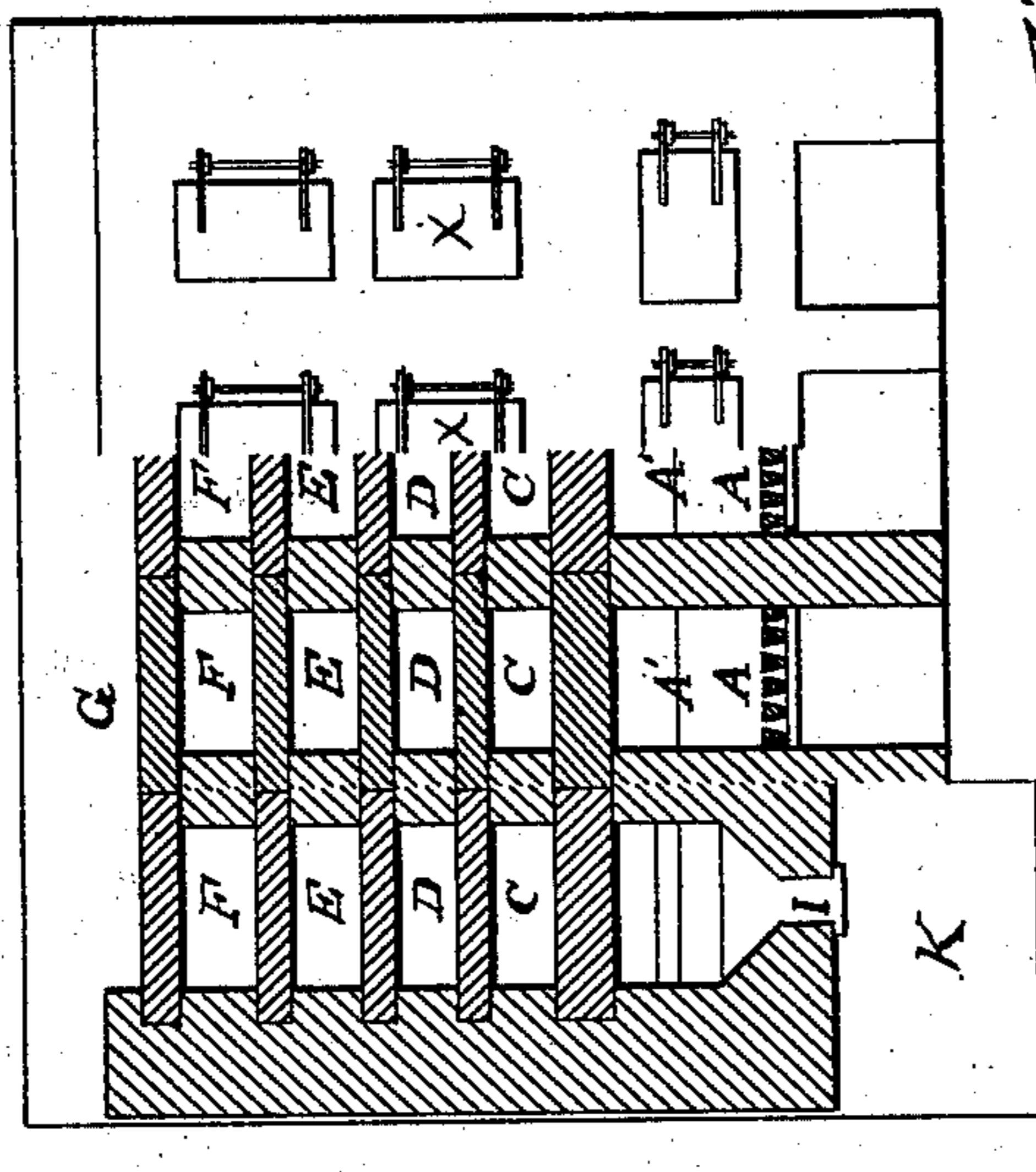
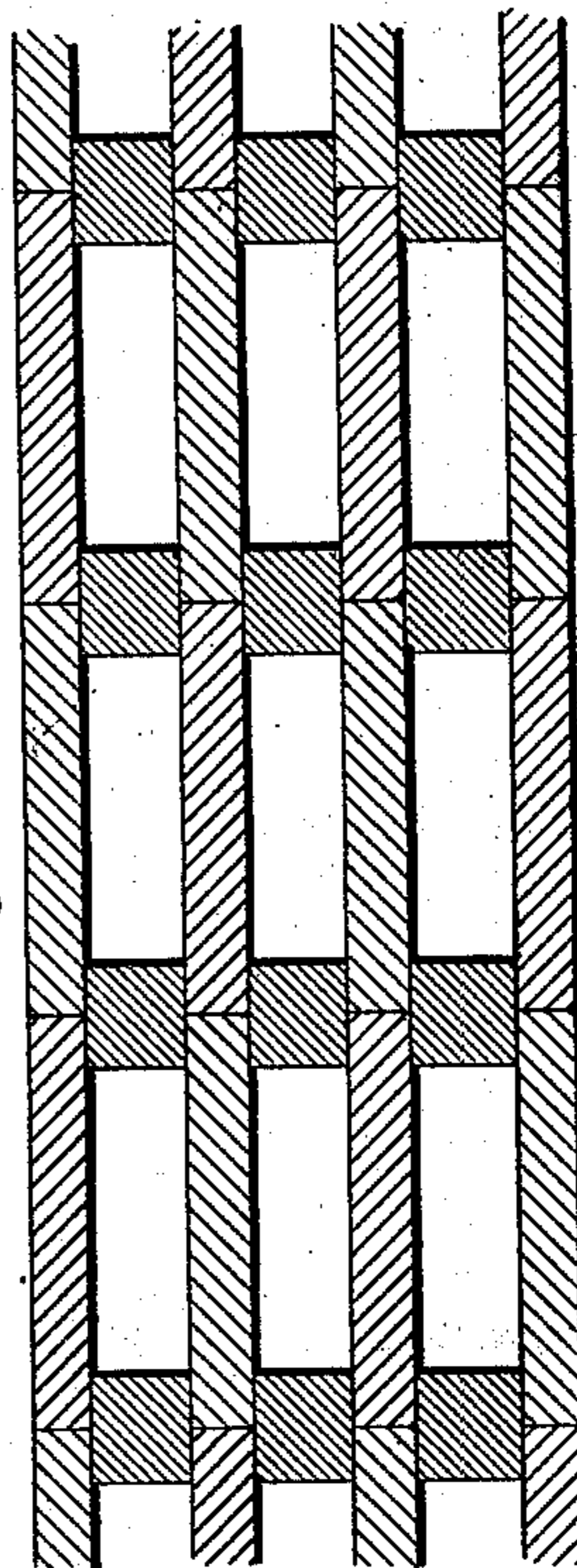


Fig. 5.



— WITNESSES: —

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UNITED STATES PATENT OFFICE.

WILLIAM E. GIFFORD, OF BROOKLYN, ASSIGNOR TO HIMSELF AND EDWIN BOLITHO, OF NEW YORK, N. Y.

IMPROVEMENT IN ORE-ROASTING FURNACES.

Specification forming part of Letters Patent No. **219,634**, dated September 16, 1879; application filed August 29, 1878.

To all whom it may concern:

Be it known that I, WILLIAM E. GIFFORD, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Furnaces for Roasting Ores; and I do hereby declare that the following is a full, clear, and exact description thereof.

My improved furnace may be used for roasting ores generally, but is more especially adapted for roasting crushed ore containing pyrites or other sulphides requiring careful and thorough work.

This invention consists in the combination, in a furnace, of a series of hearths divided into narrow sections, lying one above the other, with suitable inlet-pipe and connecting arched pipes for supplying air to the hearths; also, in a furnace constructed in sections and tiers, consisting of front and rear walls, a number of parallel walls extending from front to rear, and forming the sections and floors of slabs or tiles, spanning without arching the distance between the said parallel walls, and arranged one above the other to form a series of tiers in each section, the tile floor being omitted for a suitable distance alternately at front and rear, and the several tiers in each section communicating by the openings thus left with each other alternately at opposite ends; also, in a furnace constructed in sections, side by side, and tiers, one above the other, and communicating alternately at opposite ends, and provided at the top with a transverse flue connecting the different sections, and allowing the gases therefrom to mingle in and be carried off by the common flue; also, and finally, in the combination, with a furnace constructed with ore-spaces or tiers one above the other, and communicating with each other alternately at opposite ends, and flues connecting it directly with a chimney, the floor of the lowest ore-chamber leading from the fire-place, of a heater arranged to be heated by the products of combustion from the fire-place, and connected by a suitable uptake with the ore-spaces, all of which will be more fully herein-after set forth.

My furnace may be employed for different

purposes; but it is especially designed for roasting ores containing sulphur when it is desirable to utilize the sulphur in the manufacture of sulphuric acid and to leave the roasted ore in a condition favorable for the extraction of such valuable metals as it may contain.

The accompanying drawings form a part of this specification, and represent what I consider a good method of carrying out the invention.

Figure 1 is a vertical longitudinal section. Fig. 2 is a front elevation, partly in section. The sectional portion is in two different planes, the extreme left of the figure being on the line *xx* in Fig. 1, and the middle of the figure being on the line *yy* in Fig. 1. Fig. 3 is a longitudinal section, showing the doors upon front and rear through which the ore is manipulated by proper tools, the products of combustion acting directly upon the ore; Fig. 4, a front elevation of the same, partly in section; and Fig. 5, a detail view.

Similar letters of reference indicate corresponding parts in both the figures.

I construct my furnace in sections and tiers, the term "section" in this specification meaning a lateral division of the furnace from the middle of one partition to the middle of the next, and the term "tier" meaning a vertical division from one floor of tiles to the next above. The sections are of such width that the spaces between the partitions may be simply covered with tiles or slabs of moderate thickness without arching. These tiles form, also, the floor of the next tier above. The width of this space may be eighteen inches, more or less.

The tiers are of such height as to allow sufficient room for the passage of air through the spaces and for manipulating the ore on the tiles. This height may be such as to leave the spaces from six to nine inches high.

The length of the furnace is such as to allow the ore in the spaces to be manipulated from either end. This length may be fifteen feet, more or less.

The mode of construction is as follows: The proper foundation being prepared, a series of

parallel walls is built (the two outer walls being of greater thickness) about fifteen feet long and about eighteen inches apart, and carried to a proper height for the top of the flue B. A floor of tiles is then laid over the whole, the edges of the tiles meeting on the middle of each wall. The spaces between the walls thus covered constitute the fire-places A, having grates and ash-pans below. Rows of furnace-blocks are then laid upon the floor of tiles, one row over each of the walls, and forming an upward continuation of the same, and the whole is again covered with tiles. The spaces thus covered form the first tier of ore-spaces, C. Furnace-blocks are again laid and covered with tiles as before, thus forming the second tier of ore-spaces, D. The tiers E and F, and more if desired, are formed in a similar manner.

It is preferable to make the spaces in the upper tiers somewhat higher than those in the lower tier by the use of the higher furnace-blocks or their equivalent.

In laying the floors of tiles a certain length of tile is omitted at alternate ends, leaving openings connecting the different tiers, and allowing the upward passage of gases and the downward transfer of ore. A transverse flue, G, is then constructed, the tiles covering it being supported by detached blocks or columns, each resting on the corners of four tiles below and supporting the corners of four tiles above. This allows the gases from the different sections to mingle in the common flue.

In the drawings the flue G extends only about half-way from the front to the back of the furnace; but when the number of sections is large the required flue capacity may be obtained by extending the flue from the front to the back of the furnace. The flue G leads to one side of the furnace and connects with a sulphuric-acid chamber, either directly or through intervening dust-chambers, arsenic-flues, &c. The joints at the top of the furnace are covered and made tight by proper means. The joints in the interior need not be tight either between the different sections or between the different tiers. In fact, the whole structure may be supported by detached blocks or columns instead of continuous rows of blocks; but it is preferable to have the joints closely matched to secure strength and smoothness of the interior and to facilitate the use of furnace-tools.

The front and back walls, which are supposed to have been built simultaneously with the interior above described, are provided with the apertures S T S¹ S², communicating with the ore-spaces. Each of these apertures, except S¹, S², and T, allows access of tools to two tiers. These apertures are closed by doors, which may be provided with registers to regulate the amount of air admitted, and may also be slotted to allow them to be nearly closed while the tools are being used. The pipe H, which may be of clay, extending through the flue G, represents a mode of in-

troducing ore from any suitable charging arrangement or hopper above.

The heaters L M N consist of a series of return-bend cast-iron pipes, M, connected with the horizontal pipes L N. The pipe L, Fig. 2, extends outside the furnace to receive cold air, and the pipe N terminates in the uptake O, through which the heated air reaches the ore-spaces. Any suitable form of heater may be used.

In the drawings a separate heater is shown for each section; but they may be combined.

The underground transverse flue V receives the gases from the fires after they have passed the heaters and conducts them to a chimney.

In operating the furnace, the fires are so managed as to keep the furnace at a uniform temperature, and as the ore reaches the lower tier, C, (already at a high temperature, partly owing to the oxidization of the sulphur,) this tier may be maintained at a red heat, even though the heat due to the fuel in the fire-place A has to be conducted through tiles of moderate thickness. The temperature in the half of the spaces C nearest the door S², Fig. 4, where the ore receives its final heat, may be such as to decompose the sulphates formed and leave only oxides, or such as to leave certain sulphates in a condition suitable for lixiviation.

Referring to Fig. 1, S² represents the door of the fire-chamber, and S¹ the exit for the roasted ore. S S³ S⁴ represent doors governing passages upon opposite ends, each of which allows the operator access to two flues or hearths alternately.

The products of combustion from the fire-box A pass through the flues B into the chambers holding the pipes L M N, and escape through a proper chimney, V. Air is admitted at N, which, circulating freely through the pipes M and becoming heated, passes from the pipe L into the passage O, thence to the several alternate hearths, and escapes, as has been shown, through the lateral passage G.

The hearths being all of a heat sufficient for the purpose, the ore is fed through a proper hopper at H, and falls upon the hearth of the chamber F, from whence it is forced by a proper tool inserted through the door T a little past midway of that hearth. The operator, through the door S³, then draws it forward until it falls upon the hearth of the chamber E, from whence, through the doors S and S⁴, it is forced over the hearths of the chambers D and C, and is made to exit through the door S¹.

The modification shown in Figs. 3 and 4 is constructed as before described, except that no air-superheater is used, however, and the products of combustion are allowed to come into direct contact with the ore. The flues B are not connected with the chimney directly, but open into the spaces C, and the products of combustion are taken off at the top after passing over the ore. The ore is introduced into the flue B, and is drawn off roasted through the openings I, just within the bridge-wall, into

a cross-channel, K, into which all the said openings empty. The manner of operating is similar to that described with reference to Figs. 1 and 2.

I claim as my improvements in ore-roasting furnaces or kilns—

1. In combination with hearths divided into narrow sections, and lying one above the other, as shown, the inlet-pipe N, pipe L, leading to the ore-chambers, and the connecting arched pipes M, for transferring the heat from the products of combustion to the desulphurizing air entering the furnace, as herein specified.

2. A furnace constructed in sections and tiers, consisting of front and rear walls, a number of parallel walls extending from front to rear and forming the sections and floors of slabs or tiles, spanning without arching the distance between the said parallel walls, and arranged one above the other to form a series of tiers in each section, the tile floor being omitted for a suitable distance alternately at the front and rear, and the several tiers in each section communicating by the openings thus left with each other alternately at opposite ends, substantially as described.

3. A furnace constructed in sections, side by

side, and tiers, one above the other, and communicating alternately at opposite ends, and provided at the top with a transverse flue connecting the different sections, and allowing the gases therefrom to mingle in and be carried off by the common flue, substantially as described.

4. The combination, with a furnace constructed in tiers or ore-spaces C D E F, one above the other, and communicating with each other alternately at opposite ends of a fire-place and flues, B V, connecting it directly with a chimney, the floor of the lowest ore-chamber forming the roof of the flue leading from the fire-place, of an air-heater, L M N, arranged to be heated by the products of combustion from the fire-place, and connected by an uptake, O, with the ore-spaces, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WM. E. GIFFORD.

Witnesses:

W. COLBORNE BROOKES,
H. A. JOHNSTONE.