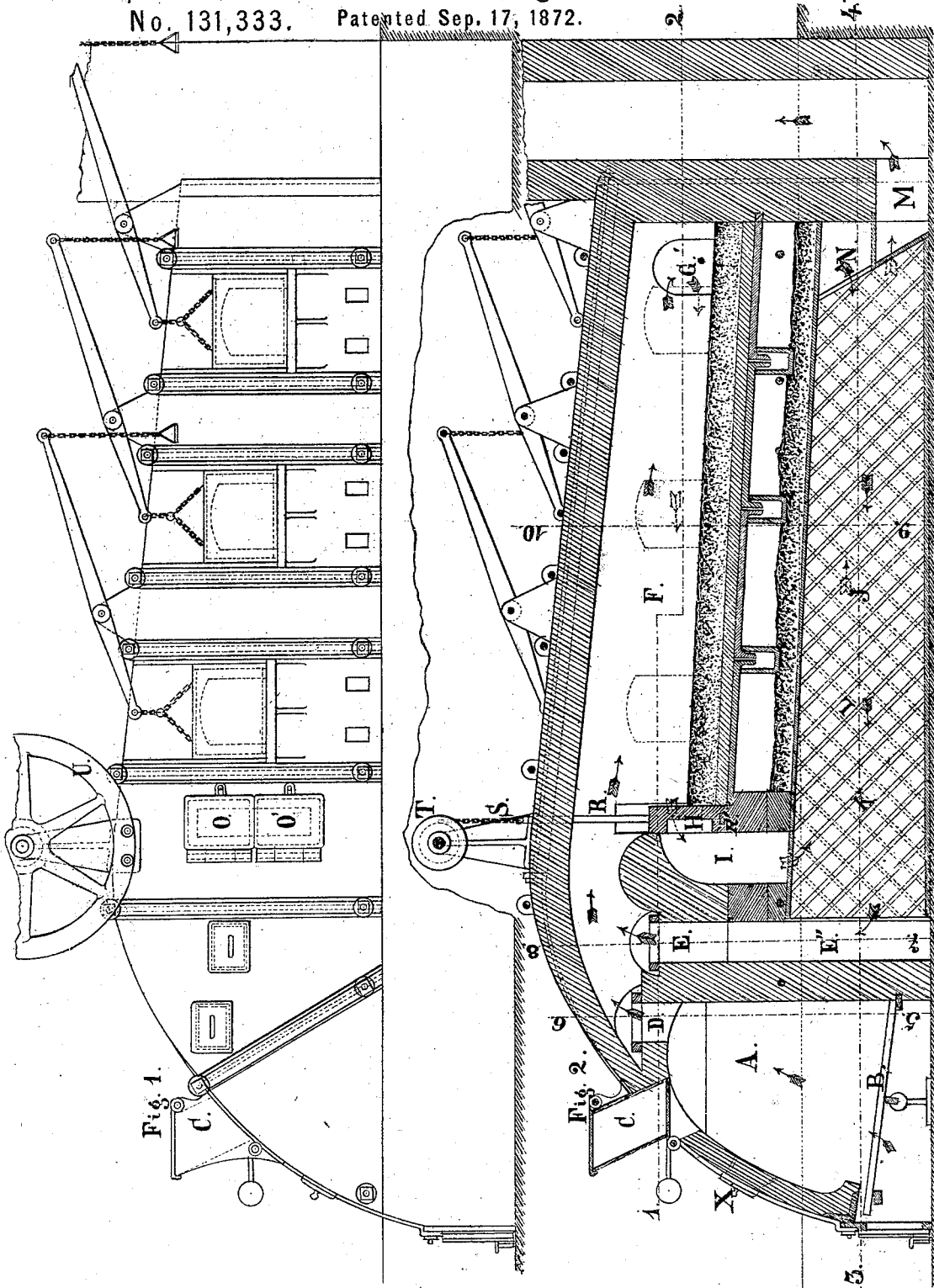


Z. S. DURFEE.

6 Sheets--Sheet 1.

Improvement in Gas-Furnaces for Heating Metals and for other Purposes.

No. 131,333. Patented Sep. 17, 1872.



Witnesses.
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6 Sheets--Sheet 2.

Improvement in Gas-Furnaces for Heating Metals and for other Purposes.

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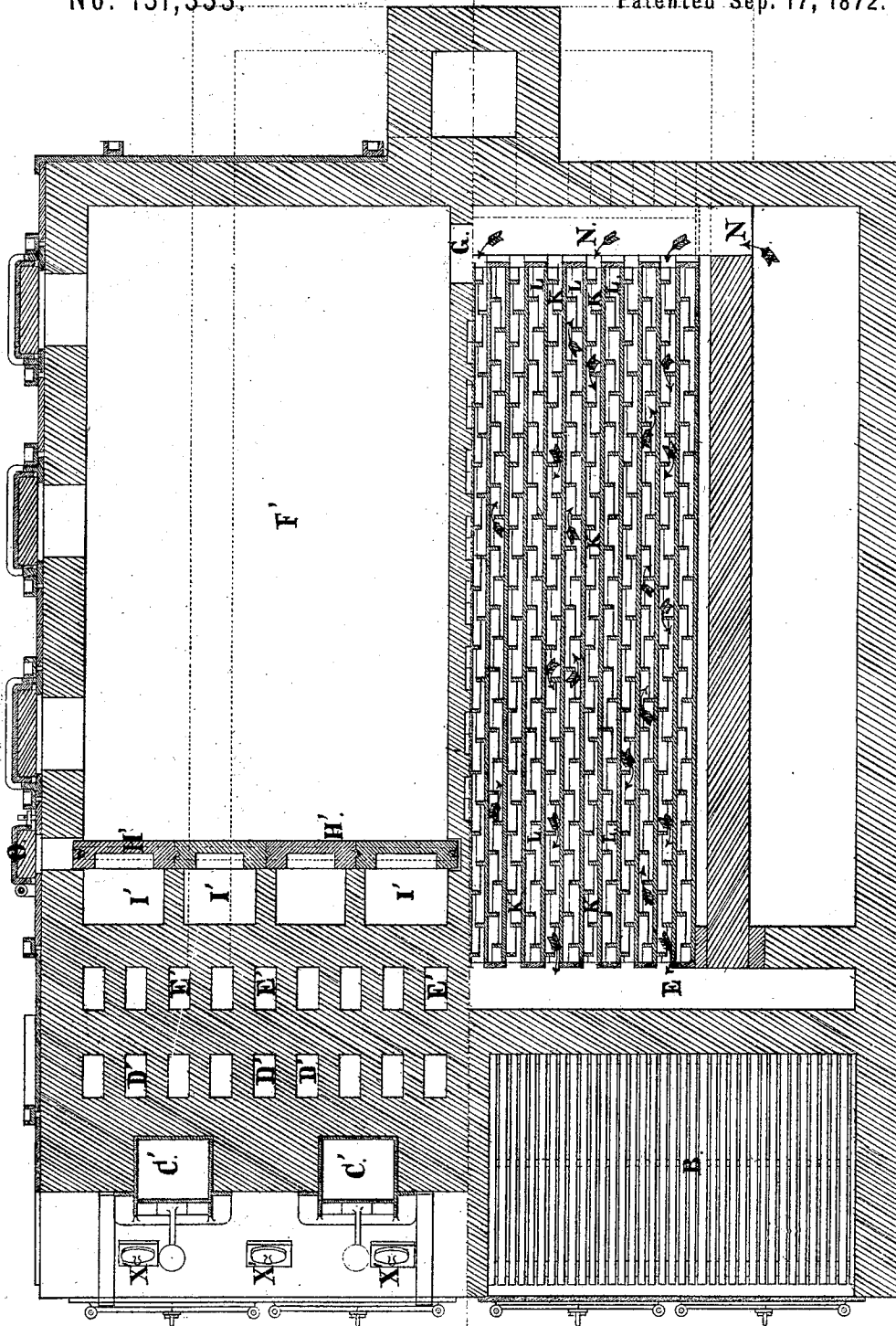


Fig. 3.

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Improvement in Gas-Furnaces for Heating Metals and for other Purposes.

No. 131,333.

Fig. 4.

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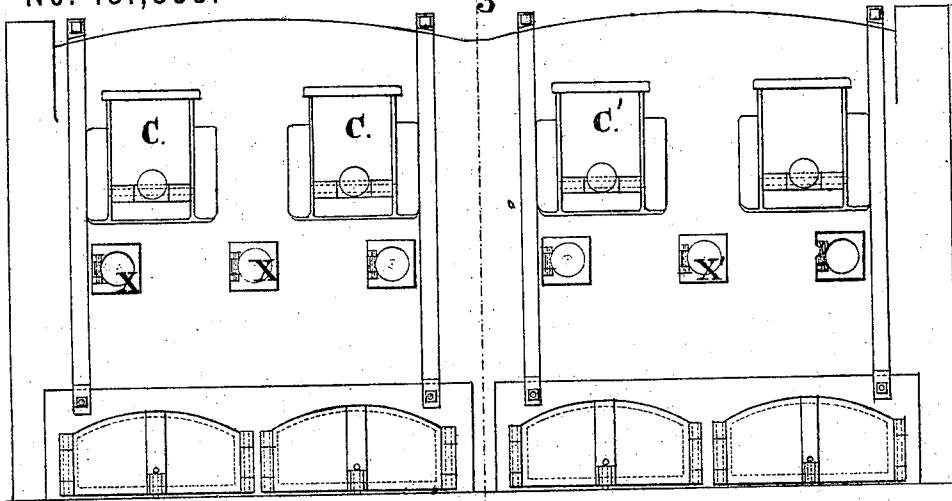


Fig. 5.

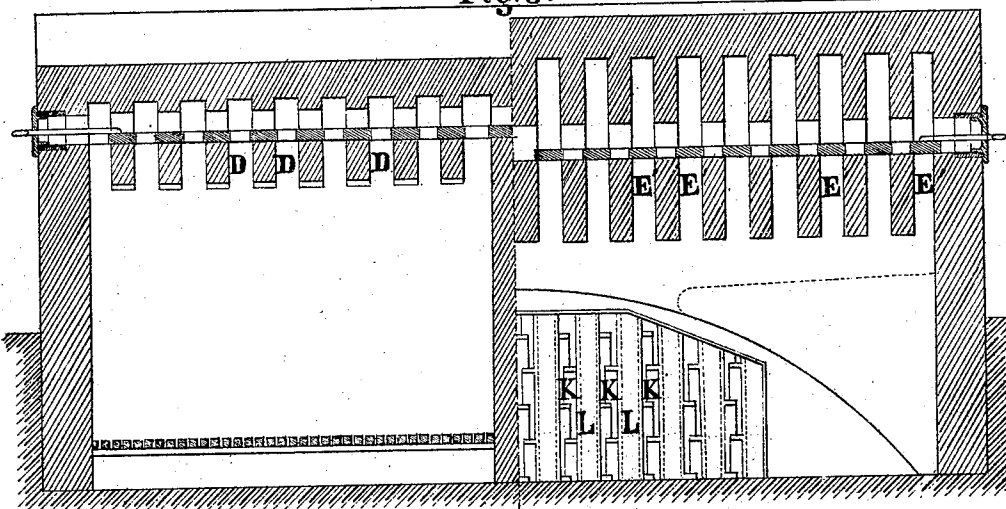
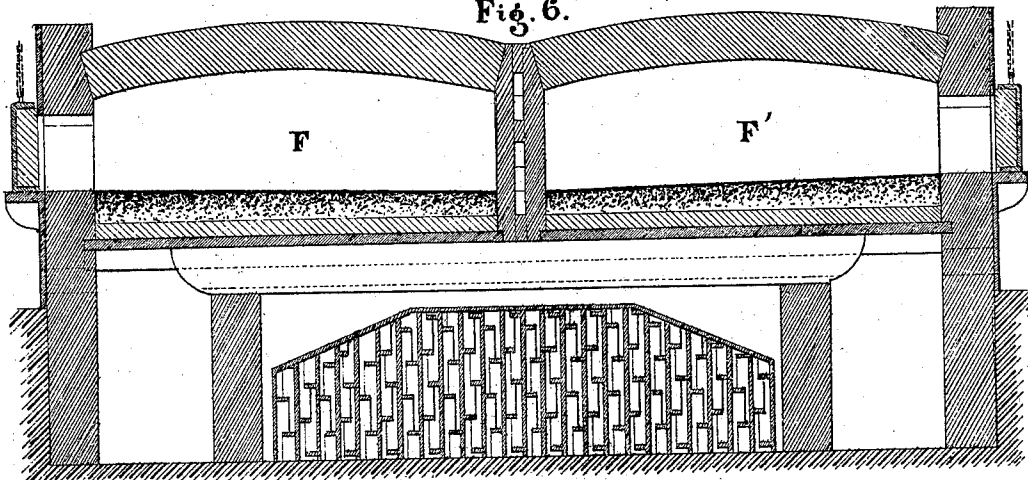


Fig. 6.



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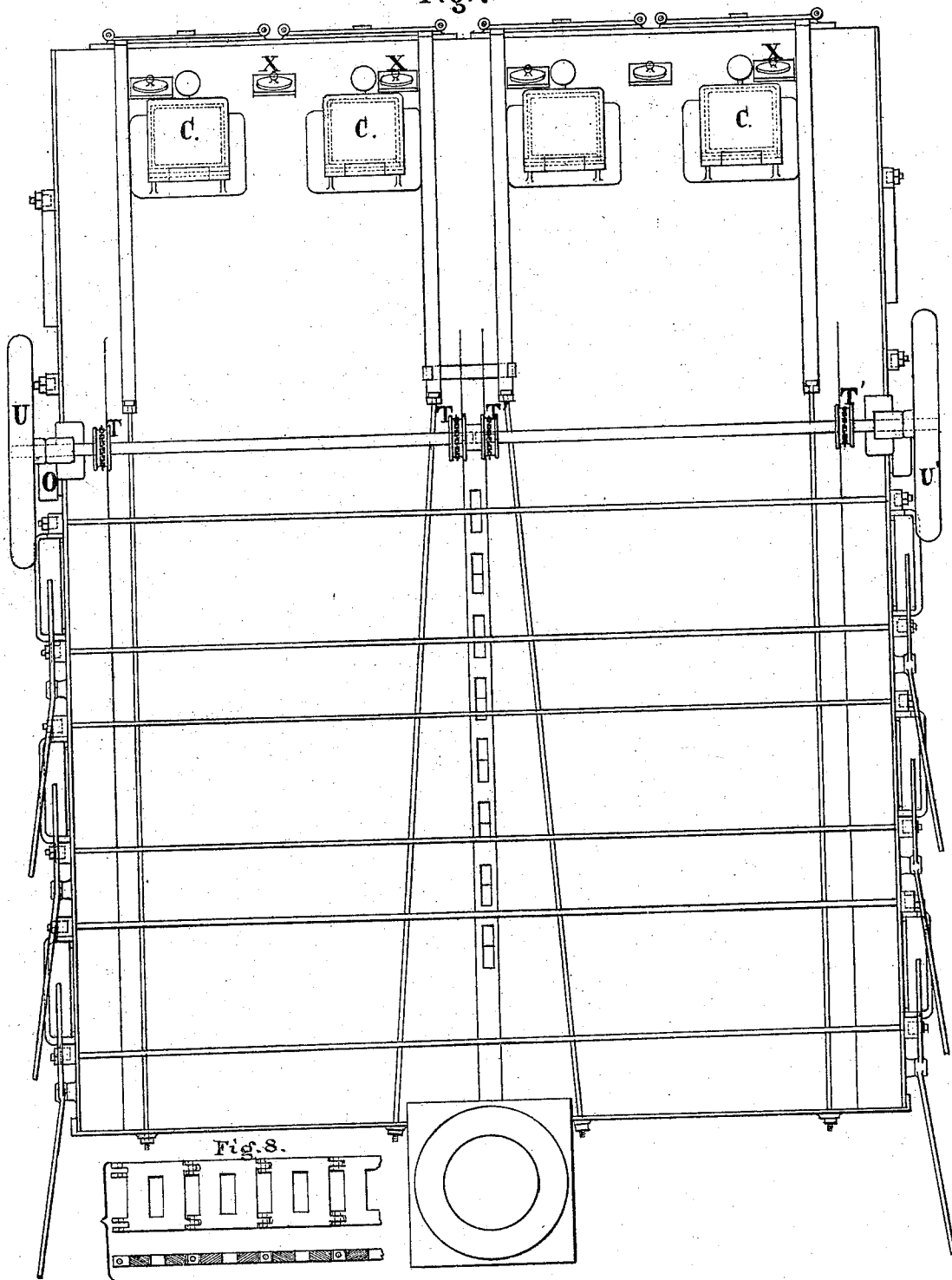
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Improvement in Gas-Furnaces for Heating Metals and for other Purposes.

No. 131,333.

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Fig. 7.



Witnesses.

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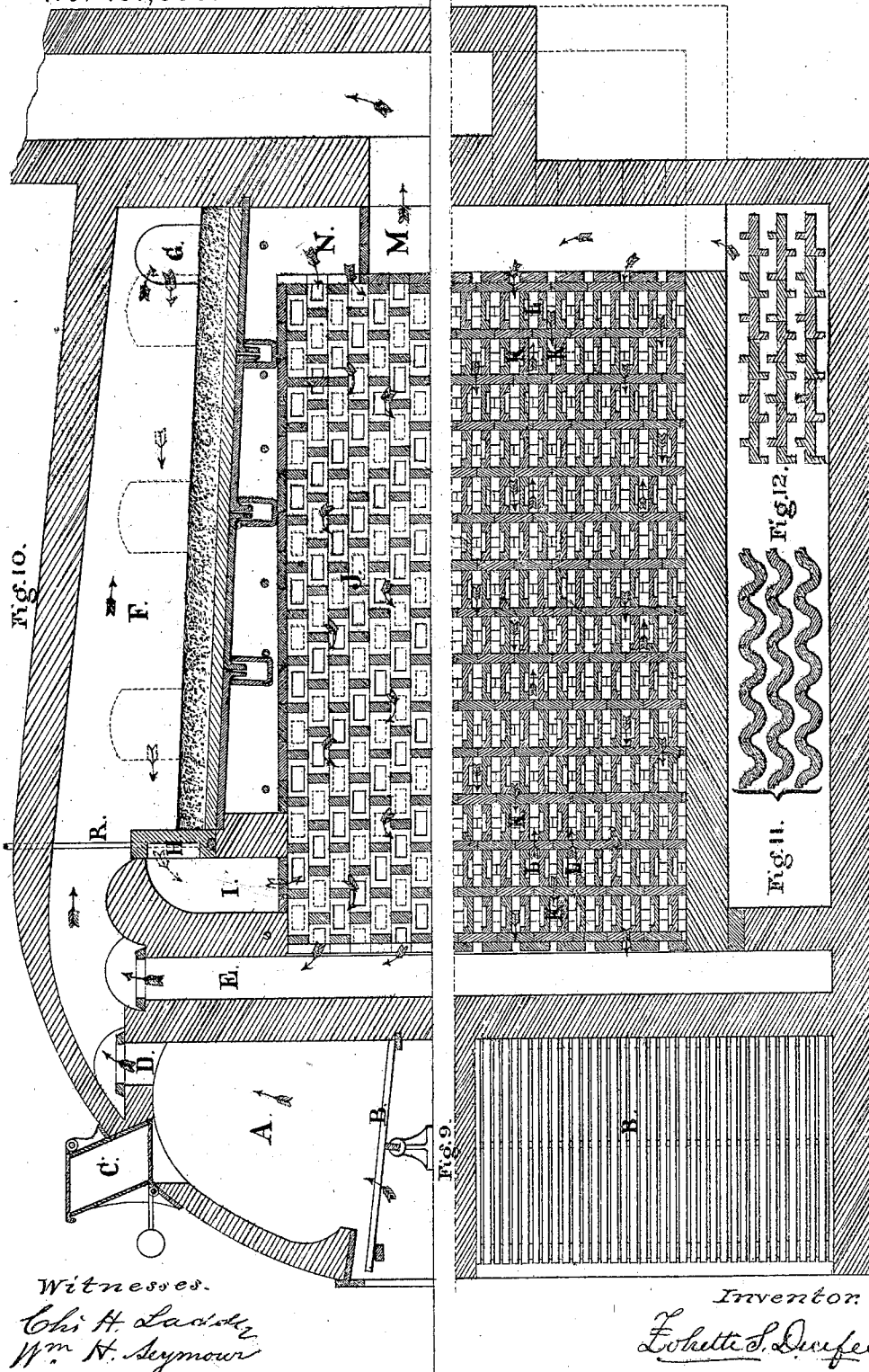
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Improvement in Gas-Furnaces for Heating Metals and for other Purposes.

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Patented Sep. 17, 1872.



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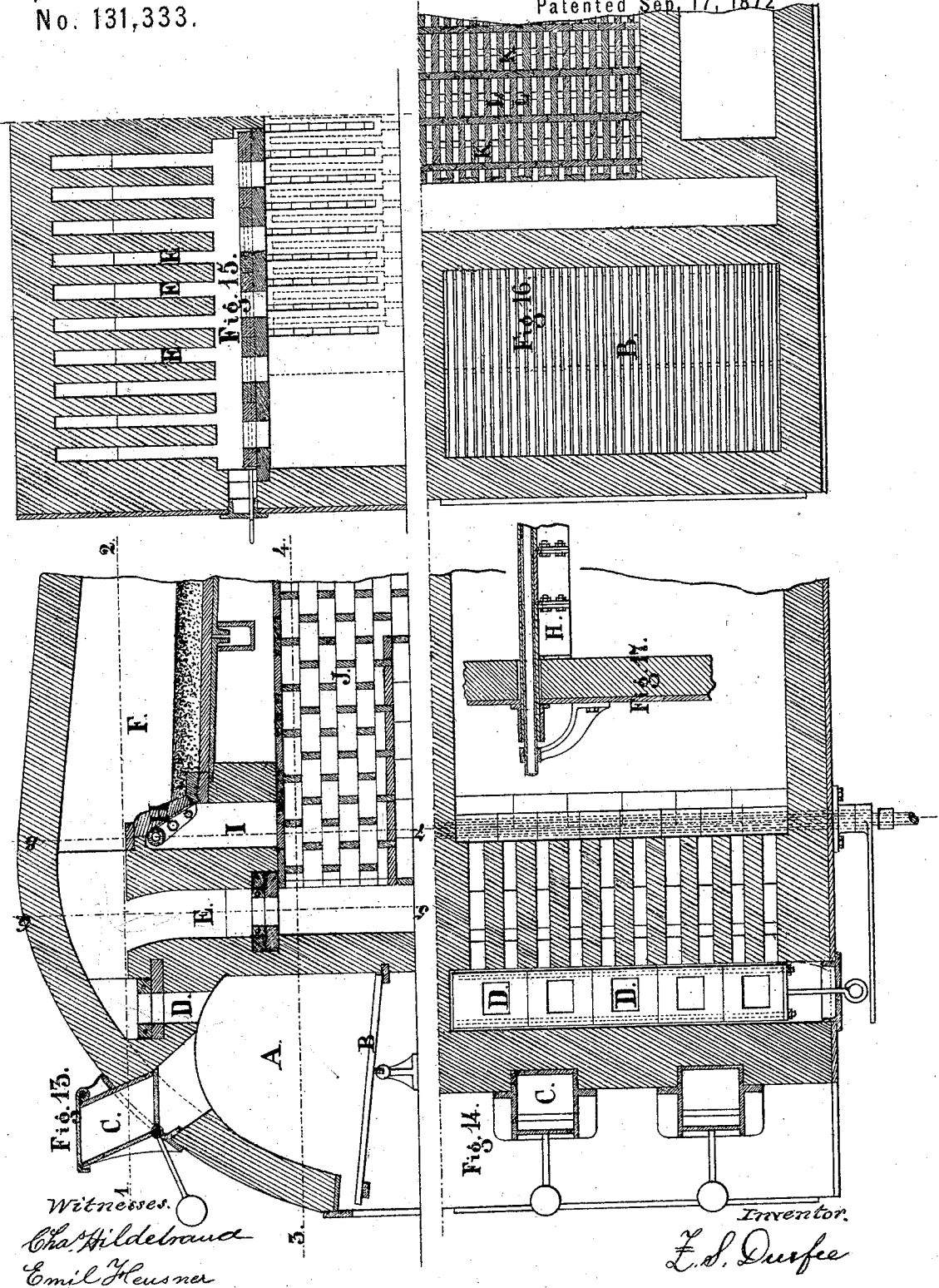
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Improvement in Gas-Furnaces for Heating Metals and for other Purposes.

No. 131,333.

Patented Sep. 17, 1872



UNITED STATES PATENT OFFICE.

ZOHETH S. DURFEE, OF NEW YORK, N. Y.

IMPROVEMENT IN GAS-FURNACES FOR HEATING METALS AND FOR OTHER PURPOSES.

Specification forming part of Letters Patent No. **131,333**, dated September 17, 1872; antedated September 12, 1872.

To all whom it may concern:

Be it known that I, ZOHETH S. DURFEE, of the city, county, and State of New York, have invented certain Improvements in what are commonly known as Gas-Furnaces, which are set forth and shown in the following description and the accompanying drawing.

On Plate I, Figures 1 and 2 show an elevation and a longitudinal vertical section of my furnaces, gas-generators, and heat-restorers. On Plate II, Fig. 3 shows a double horizontal section of the same, the upper half on the line 1 2, and the lower half on the line 3 4 of Fig. 2. On Plate III, Fig. 4 shows a front elevation; Fig. 5, a double vertical section, the left half on the line 5 6, and the right half on the line 7 8 of Fig. 3; and Fig. 6, a vertical cross-section on the line 9 10 of Fig. 3. On Plate IV, Fig. 7 shows a plan of the top, and Fig. 8 details of one of the valves of the furnaces; and on Plate V are a vertical and horizontal section and detailed drawings, showing different arrangements of heat-restorers.

The furnaces are arranged and worked in pairs.

A A are the gas-generators; B B, their grates; C C, feeding-hoppers; D D D' D', valves for admitting the gas, and E E E' E', valves for admitting air, to the furnaces. F F' are the furnaces; G, the opening connecting them; H H', outlet-valves for the waste gases; I, the passage for the waste gases to the heat-restorer J; K K, air-passages; and L L, the waste-gas passages in the heat-restorer; M, the outlet to the chimney; N, the inlet for air, which communicates with the chambers on each side of the heat-restorer, and with the external air by openings in the outer walls of the furnaces, as shown in Fig. 1. O O are double doors for giving access to the valves H H'; R S T U, apparatus for working the valves H H'. The gas-producer has a partial division-wall, which is intended simply to strengthen it, and does not entirely separate its two parts; but the division-wall between the two furnaces causes an entire separation between them except at G. The inlet-valves for air and gas are distinct for each furnace, but both communicate with the gas in the whole gas-generator. The outlet-valves for the waste gases communicate with the same passage to

the heat-restorer, and the passage E'' is common to both air-valves E and E'; consequently the gas from the generator or generators can be burned in either furnace, at will, the air for combustion in both being heated in the common heat-restorer.

The operation of the furnaces is as follows: Fuel is fed in at C C upon the grates B B, where it is decomposed by drafts or blasts of air—preferably by blasts. The gases developed pass off at D D and are mingled with air admitted at E E, and the two combine and give out heat in the furnace F, after which the resulting gases pass through the opening G into the furnace F', and from thence, the valve H' being raised, through the flue I into the passages L L of the heat-restorer, from whence they pass by the flues M to the chimney. Air for combustion enters or is forced into holes in the outer walls of the furnaces, passes into the flues N, and thence through the passages K K of the heat-restorer to the flue E'', whence it passes by the valves E E into the furnace.

In the operation just described the furnace F will contain metal to be fully heated, and F' metal for a preparatory heating; and when the charge in F has been withdrawn the valve H' will be lowered and the valve H raised, the valves D D and E E closed and the valves D' D' and E' E' opened, so that the furnace F' will be heated and the waste gases pass off through the furnace F and valve H, the furnace F being charged anew with metal. When either valve, H or H', is down, I put fire-sand on its top through the doors O O', in order to prevent the valve adhering to the fire-bridge, this sand being cleared off before the valve is raised.

The valves H H' are shown as made of pieces of fire-brick or fire-stone, tongued and grooved together, and supported on a bar of iron, R', by means of which, and the links and chains R and S and the pulleys and hand-wheels T and U, the valves are worked. In order to reduce the weight of these valves I panel them. The valves may, of course, be in one piece, and, if desired, they may be made hollow, of cast or wrought iron, and be kept cool by currents of water, as is usual in such cases; and the bar R' and links R R may

be superceded by iron pipes, through which water may be circulated to keep them cool.

The valves D D' and E E' may be of iron, fire-brick, or stone, soap-stone, or any suitable material, or partly of iron and partly of any suitable refractory material, and each may be in one piece or in sections, as shown in Fig. 8, Plate IV. Soap-stone will be an especially good material for the valve-seats or the surfaces on which the valves slide.

On Plates I, II, III the heat-restorer is shown of cast-iron, being made of plates cast with diagonal ribs on each side, the ribs on one side being at right angles to those on the other, and the plates are fastened together with the ribs, which run in the same direction, facing each other, and so that the passages for air and waste gases are entirely separate. The ribs on the plates alternate in such wise as to break the currents of heated gases and incoming air as much as possible and cause an interchange of temperature between them. The top of the heat-restorer is covered with sand, and it is inclosed by brick walls. I extend wing walls from the outer sides of both furnaces into the flue I, as shown by dotted lines on Sheet III, Fig. 5, to insure the waste gases passing as evenly as possible through all the passages of the heat-restorer. The arrangement of fire-brick heat-restorers, shown on Sheet V, will be understood from the drawing without further explanation.

The drawing shows my plans as adapted to heating-furnaces for heating iron and steel; but my invention may, of course, be applied

to other kinds of furnaces, and be varied in its details, provided its general features are retained.

What I claim as my invention is—

1. Arranging two furnaces side by side in such wise that the gases and air consumed therein may be admitted at one end of one of the furnaces, and being burned in said furnace the waste gases resulting may pass at its other end into the adjoining furnace and back through it to an outlet, heating to a finishing heat in the first furnace, and giving a preparatory heating in the second, the arrangement being such that each furnace may be used alternately as a final heating and preparatory heating furnace.

2. Arranging two furnaces, which are placed side by side, with one or more gas-generators placed across the upper ends of the furnaces in such wise that all the gas from the generator or generators may be admitted to either furnace, substantially as described and shown.

3. Arranging one or more gas-generators and two furnaces in connection with one heat-restorer, substantially as described and shown.

4. The arrangement and mode of working the valves H and H' in connection with the furnaces F and F', substantially as shown.

5. The construction and arrangement of heat-restorers, as shown and described.

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Witnesses:

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WM. H. SEYMOUR.