(No Model.) 2 Sheets—Sheet 1.

W. W. WAPLINGTON.

METALLURGICAL GAS FURNACE.

No. 259,653. Patented June 13, 1882.

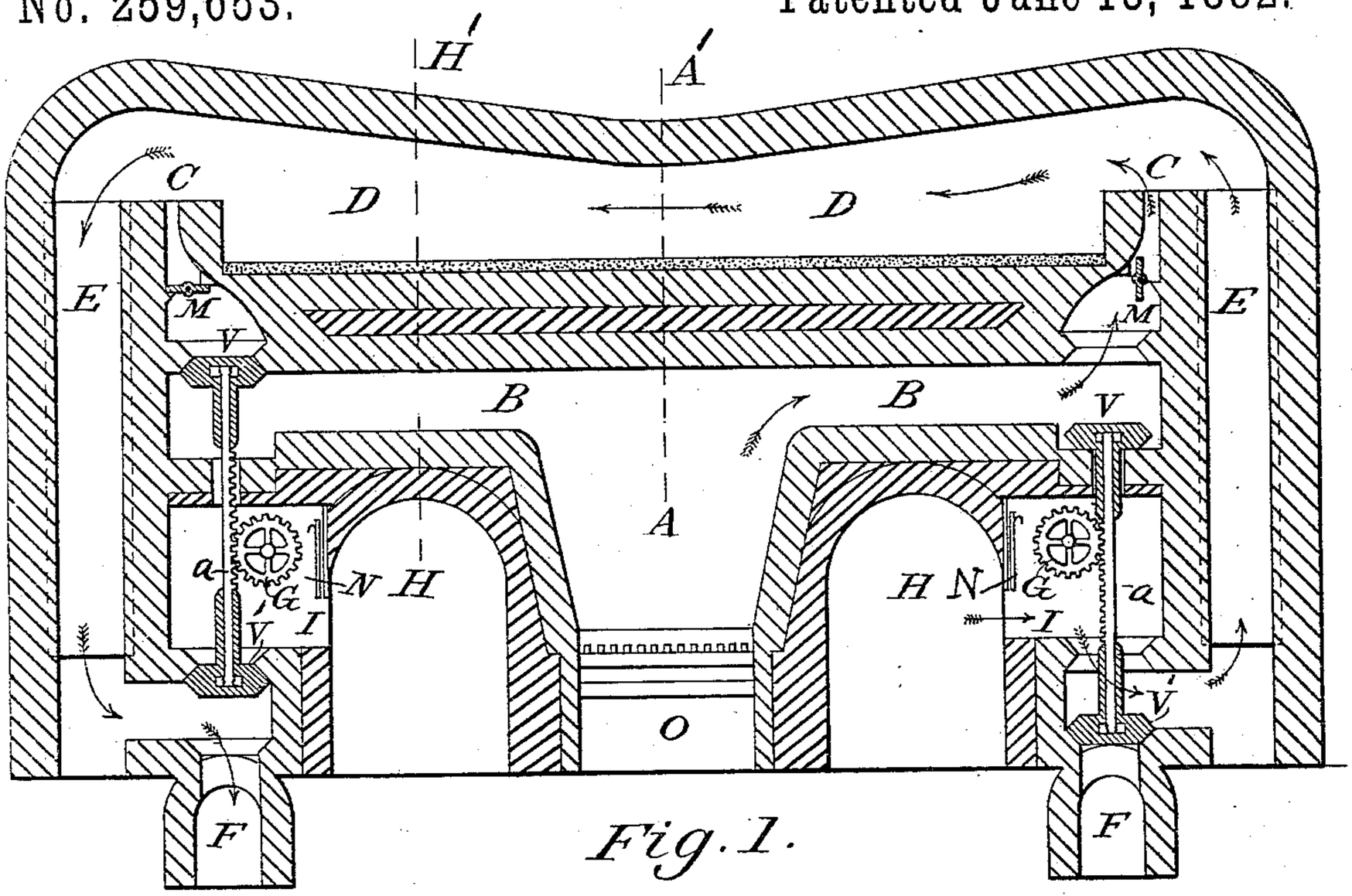

Fig. 1.

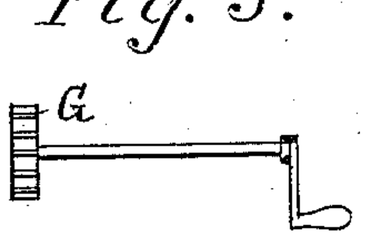

Fig. 2.

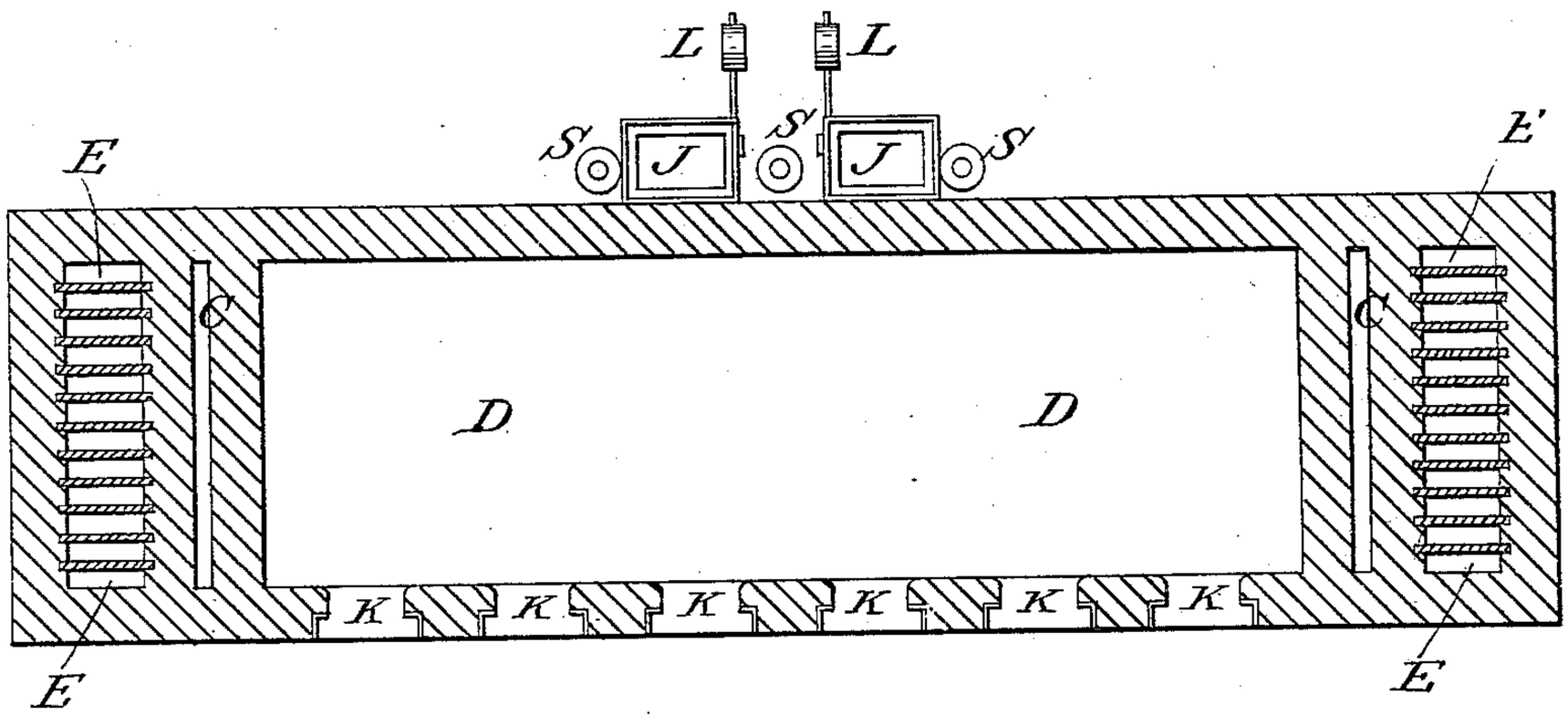

Fig. 5.

Witnesses:
Ingeth Moms.
Chas B. Head

Inventor:
William Wilson Waplington

(No Model.) 2 Sheets—Sheet 2.

W. W. WAPLINGTON.

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Fig. 3.

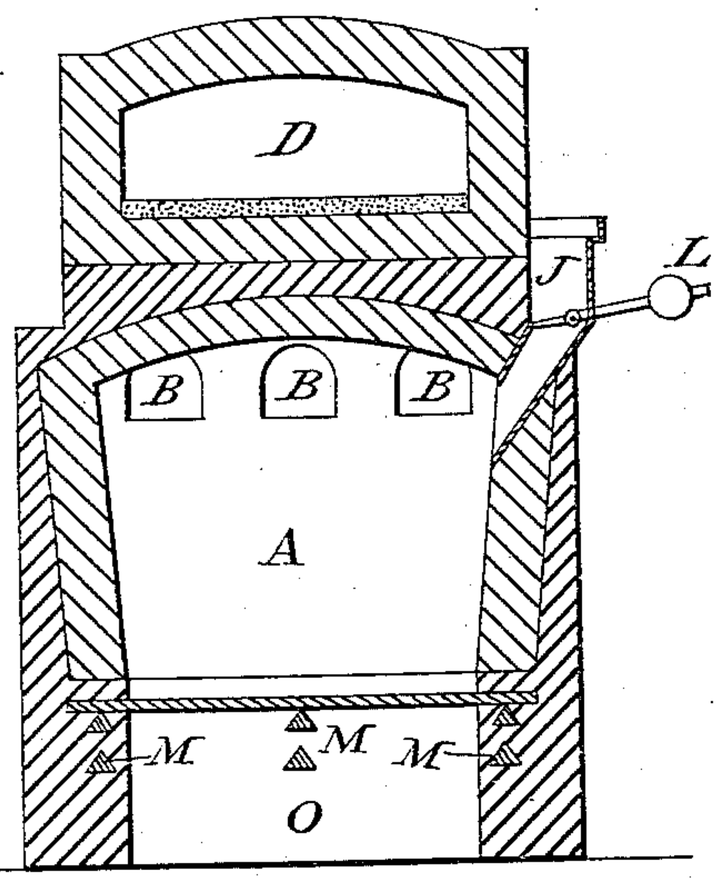
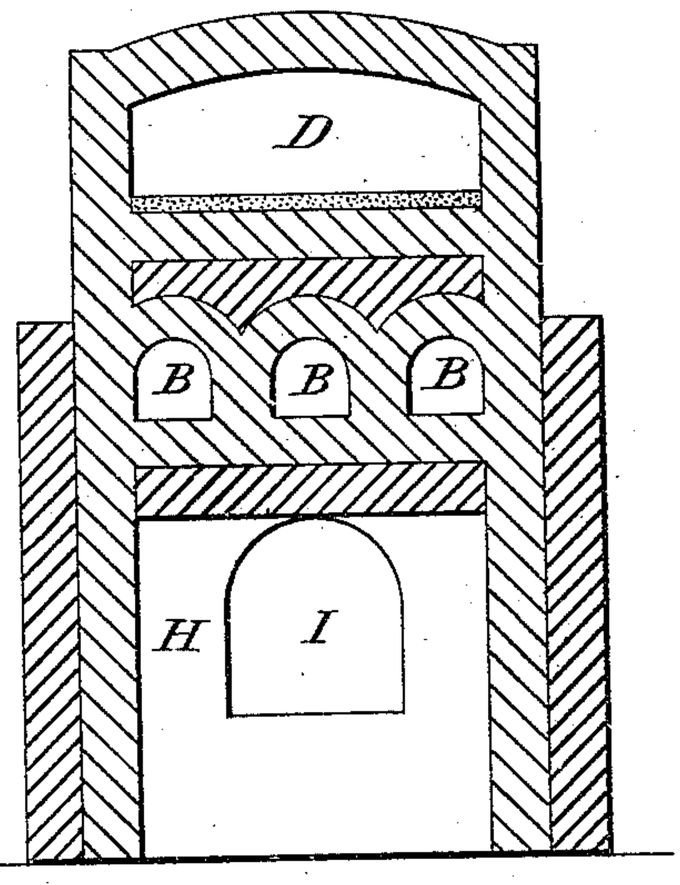


Fig. 4.



Witnesses:
Thayer Moore
Chas. B. Head

Inventor.
William Wilson Waplington

UNITED STATES PATENT OFFICE.

WILLIAM W. WAPLINGTON, OF HALIFAX, NOVA SCOTIA, CANADA, ASSIGNOR OF ONE-HALF TO ARTHUR C. McKEE, OF STEUBENVILLE, OHIO.

METALLURGICAL GAS-FURNACE.

SPECIFICATION forming part of Letters Patent No. 259,653, dated June 13, 1882.

Application filed June 23, 1881. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM WILSON WAPLINGTON, of Halifax, Nova Scotia, Canada, have invented a new and useful Metallurgical Gas-Furnace, of which the following is a specification.

My invention relates to improvements in gas-furnaces for heating, puddling, boiling, steel-melting, and other metallurgical purposes, and for melting glass in pots and in continuous furnaces, in which the gas producer or producers, gas-flues, air-flues, air and gas valves, regulators, heat-retaining flues, and working-chamber are combined in one building or structure; and the objects of my invention are to economize fuel and space, and to obtain an efficient furnace for the purposes above named at a greatly reduced cost, consequent on the simplicity of construction. I attain these objects by devices illustrated in the accompanying drawings, which form part of the specification, in which—

Figure 1 is a longitudinal vertical section of my improvements as applied to a heating-furnace, showing working-chamber, gas-producer, flues, valves, and regulators. Fig. 2 is a view of furnace with top removed, showing working-chamber, gas-flues, heat-retaining flues, doorways to working-chamber, fuel-boxes, and stoke-holes for gas-producer. Fig. 3 is a transverse vertical section at A A′, Fig. 1, showing section of gas-producer, gas-flues, and working-chamber of furnace, also fuel-box and chute for supplying fuel to gas-producer, and grate-bar bearers and ash-hole of gas-producer. Fig. 4 is a transverse vertical section at H H′, Fig. 1, showing sections of working-chamber, gas-flues, arched openings, (giving access to both sides of ash-hole,) and arched recess in same for working-gear of valves and for air-passage. Fig 5 is a detail view, showing a method of operating the pinion gearing into the rack-bar on the shaft of the valves by means of a crank. The light shaded lines from left to right are intended to represent fire-brick work, and the heavier shaded lines from right to left represent common brick-work. The dotted space represents sand.

Similar letters refer to similar parts throughout the several views.

I will now describe my invention, so that others skilled in the art to which it appertains may apply the same.

The working-chamber D D may be formed to best suit the purpose for which it is intended.

A is the gas-producer, built under the center of working-chamber, and of capacity suitable for intended furnace.

From top of producer A are gas-flues B B, through which the gases flow to each end of working-chamber D D alternately, the direction of flow being governed by the position of the gas-valves V V, and the quantity of gas allowed to flow being controlled by the regulating-tiles M M, which are swung and arranged so as to admit of a full flow or any less quantity of gas that may be required.

The gas-flues above the regulating-tiles are contracted in one direction and elongated in the other until they resolve into long narrow slits in the bridge of the working-chamber at C C, forcing the gases to enter the combustion or working chamber in a wide thin sheet, the form most favorable to rapid combustion.

The air necessary for the combustion of the gases enters the arched recess at I I in the arched openings H H, and passes down through the valve-opening into the flue E, thence up said flue into working-chamber D D, where, coming in contact with the sheet of hot gases from the producer, combustion takes place.

The courses of the currents of air and gases are indicated by the short arrows, and the course of the spent gases is indicated by the long arrows, which, it will be seen, pass from the working-chamber down through flues E at the end of furnace and enter into the waste-flue F, which leads to stack or chimney.

V V are the gas-valves. V′ V′ are the air-valves. G G are toothed wheels working into rack-bars *a* for raising and lowering gas and air valves simultaneously. N N are sheet-iron sliding doors for regulating supply of air.

The flues E E are divided into several narrow flues by tiles of fire-brick or other refractory material, extending across the flue in the direction of the length of the furnace and from top of the flue nearly to the bottom of same, leaving sufficient space at bottom for cleaning-out purposes. These tiles are placed loosely in recesses made for the purpose in the flue-walls, their position and arrangement be-

ing shown at E E, Fig. 2. These subdivided flues serve the purpose of heat retainers.

By changing the position of the valves at each end of the furnace the currents of air and gases are reversed, and the heat absorbed from the waste gases in the flues E E is carried back into the furnace by the air-currents.

The gases from the producer enter the working-chamber sufficiently hot to insure rapid combustion by combining with the heated air passing up through the already heated flues E E.

The valves V V′ are on the same rack-bar, and are consequently raised and lowered simultaneously. The valve V′ serves the double purpose of an air-valve and a spent-gas valve. When the valves at either end of the furnace are up the gases from the producer and the air-supply are shut off at that end and the outlet for the waste or spent gases is opened. For heating the furnace one pair of the valves must be up and the other pair down, and the currents may be changed at will simply by changing the positions of the valves. The valves may be worked by a single lever, or by each pair having an independent lever; but I prefer the single lever and connecting-rod between the two toothed wheels, so that one motion of the lever changes the position of all the valves simultaneously.

The arched openings H H may be dispensed with in the case of very short furnaces, and the arched recesses containing rack-wheels and air-regulating doors may be made at right angles to the position shown in drawings. The spent-gas flues F F converge and run into one flue before entering stack or chimney.

The valves, valve-seatings, and gas-regulating tiles are made of fire-clay or other refractory material, and the portions of the rack-bars exposed to heat are protected by sleeves of fire-clay or other refractory material.

Fig. 2 shows more clearly the position and arrangement of gas and air flues.

It will be seen that the air-flues or heat-retainers E E and gas-flues C C extend the whole width of the working-chamber D D. The object of this is to deliver the gases into the working-chamber in a wide thin sheet, and to afford in the flues E E as large an amount of heat-absorbing surface as possible for the absorption of heat from the spent gases. The air passing up through the flues E E, being subdivided and highly heated, enters the working-chamber in the most favorable condition for combining with the gases issuing from the flue C.

The subdivision of the heat-retaining flues by tiles gives facility for repairs, as by removing a portion of the crown of the furnace immediately over the flues any worn-out or burned-out tiles may be removed and new ones substituted.

The fuel-boxes J J may be placed in any position where they will efficiently feed the gas-producer without obstructing any other part of the furnace, but preferably at the back of the furnace. The fuel-boxes may be the ordinary valve-bottom boxes with weighted levers L L.

The sight-holes or stoke-holes S S S may be placed where they can be used to best advantage.

K K are the charging and drawing doorways of furnace. These doorways may be placed to suit the particular kind of furnace required.

Fig. 3 shows vertical cross-sections at A A′ of working-chamber D D, gas-producer A, grate-bar bearers M M M, ash-hole O, fuel-box J, and lever for same, L.

Fig. 4 shows vertical cross-sections at H H′ of working-chamber D D, gas-flues B B, arched openings H, and arched recess I. The gas-flues B B B are so divided as to give a strong support to bottom of working-chamber.

The gas-producer may be the ordinary gas-producer used for gas-furnace; but the outside walls will vary with the size and purpose for which the furnace is intended.

To obtain the best results from this furnace the currents of air and gases must flow into the working-chamber at each end alternately at intervals varying with circumstances; but when the furnace is quite hot the intervals will be about twenty minutes.

I am aware that it is old in metallurgical gas-furnaces to place the gas-generator immediately under the metallurgic furnace, and I therefore lay no claim to such construction, my invention being confined to the combinations of devices set forth in the claims.

What I claim as my invention is—

1. In a metallurgical gas-furnace, the working-chamber D, provided on each side with the flues E C, and valves V V′, also on each side, constructed and connected as described, whereby a movement of the same in one direction opens the induction-ports of the flues and a movement in the opposite direction closes the induction-ports and opens the port of eduction-flue F, in combination with the gas-producing chamber A, arranged under said working-chamber, flues B B, and air-chambers I, substantially as described.

2. In a metallurgical gas-furnace, the working-chamber D, provided on each side with the flues E C, valves V V′, arranged on each side, as set forth, rack-bars *a*, and cog-gears G, in combination with gas-producing chamber A, arranged under the working-chamber, gas-flues B, air-chamber I, and spent-gas flues F, substantially as described.

3. The working-chamber D, provided with the flues E C, alternately closing and opening valves V V′, rack-bars *a*, and cog-gears G, in combination with the gas-producing chamber A, arranged under the working-chamber, gas-pipes B, air-chambers I, and spent-gas tubes F, adapted to receive said valves, substantially as described, and for the purpose set forth.

WILLIAM WILSON WAPLINGTON.

Witnesses:

JAMES S. FRUIT,

FRANK B. TEST.