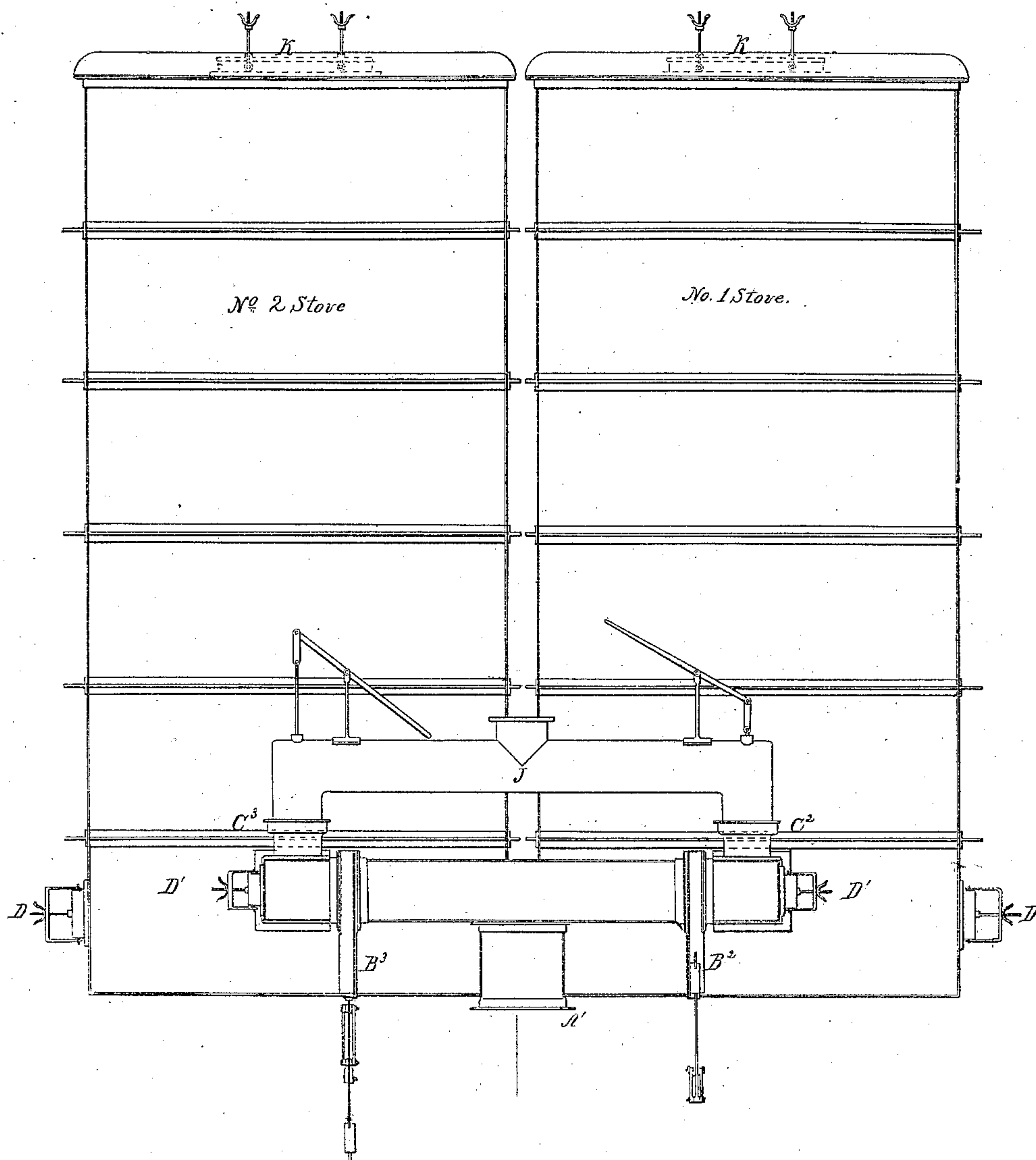


T. WHITWELL.  
HOT BLAST OVEN.

No. 66,543.

Patented July 9, 1867.



Witnesses  
John W. Allen  
Robert Thomas

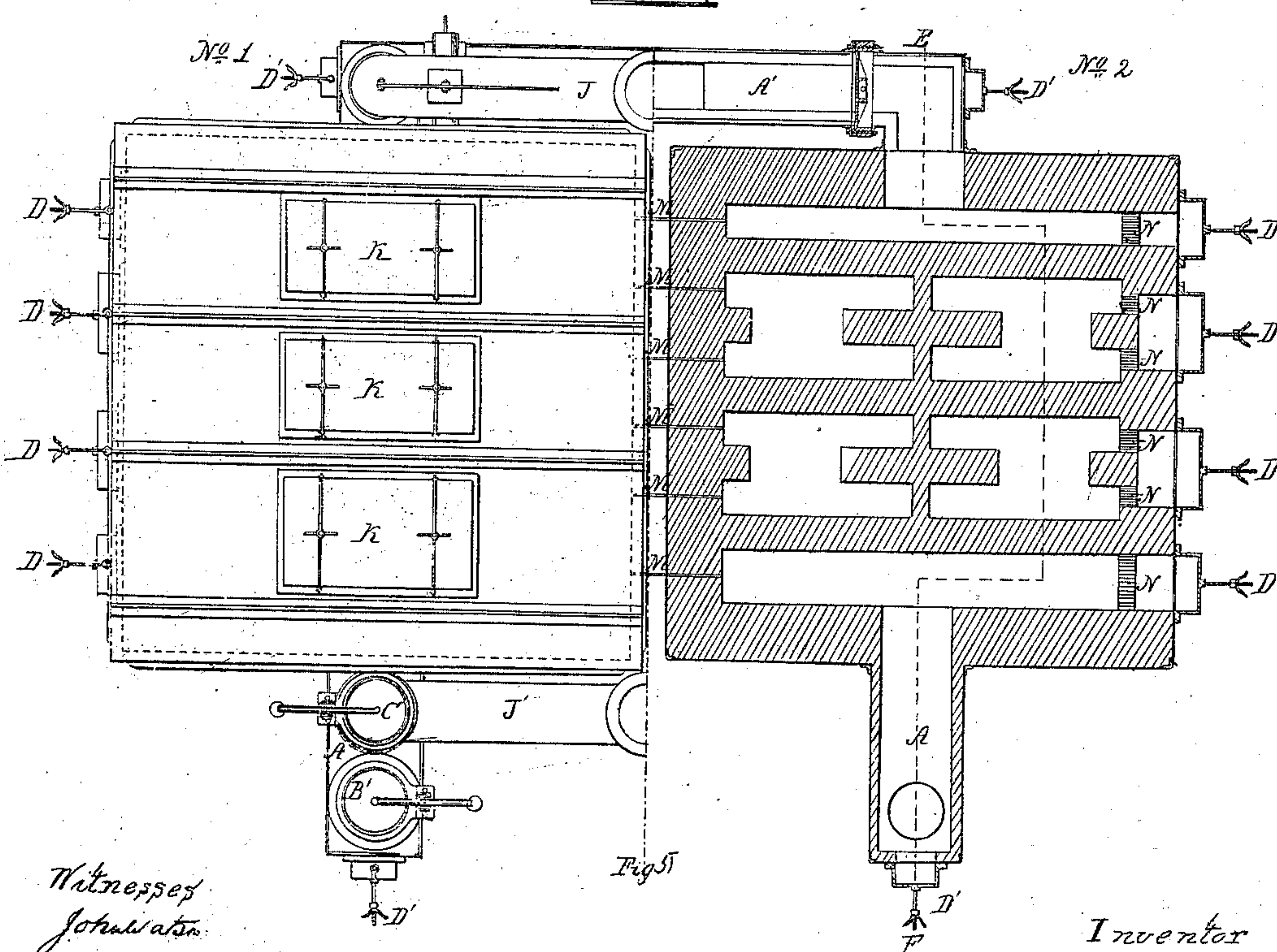
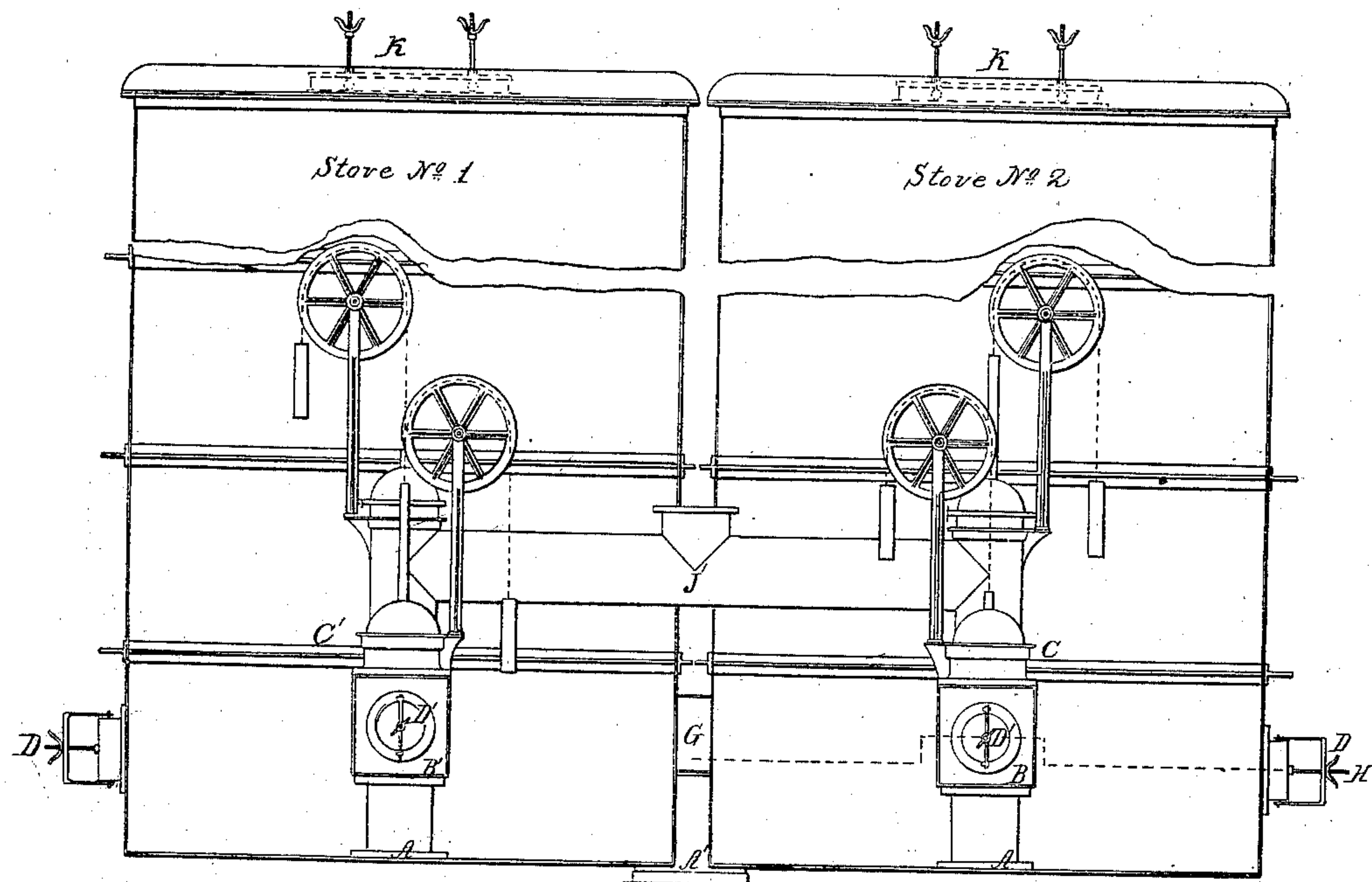
Inventor  
Thomas Whitwell

T. WHITWELL.  
HOT BLAST OVEN.

No. 66,543.

Patented July 9. 1867.

Fig. 2



Witnesses  
John Watson  
Robert Thomas

Inventor  
Thomas Whitwell



T. WHITWELL.  
HOT BLAST OVEN.

No. 66,543.

Patented July 9, 1867.

Fig. 3

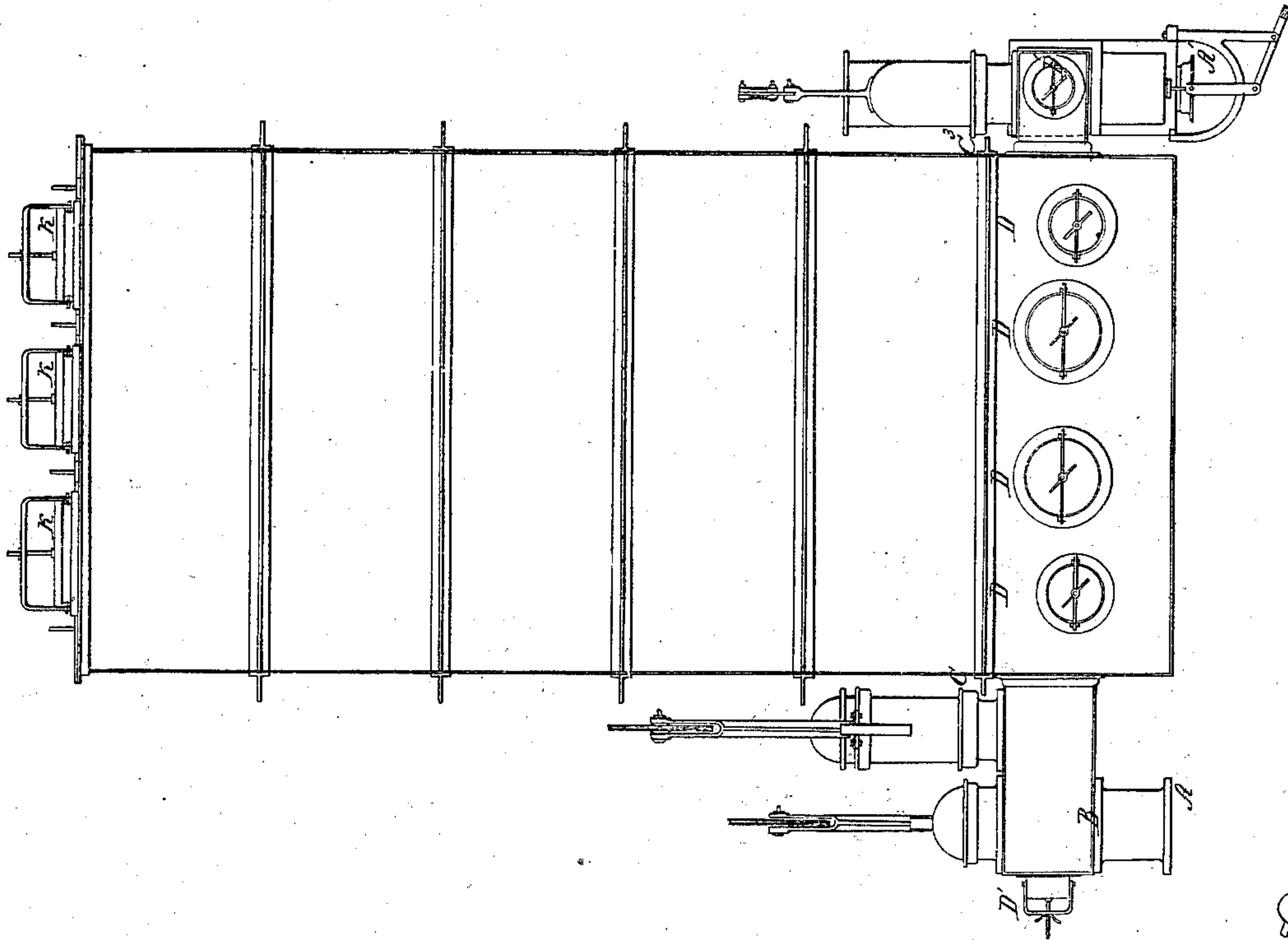
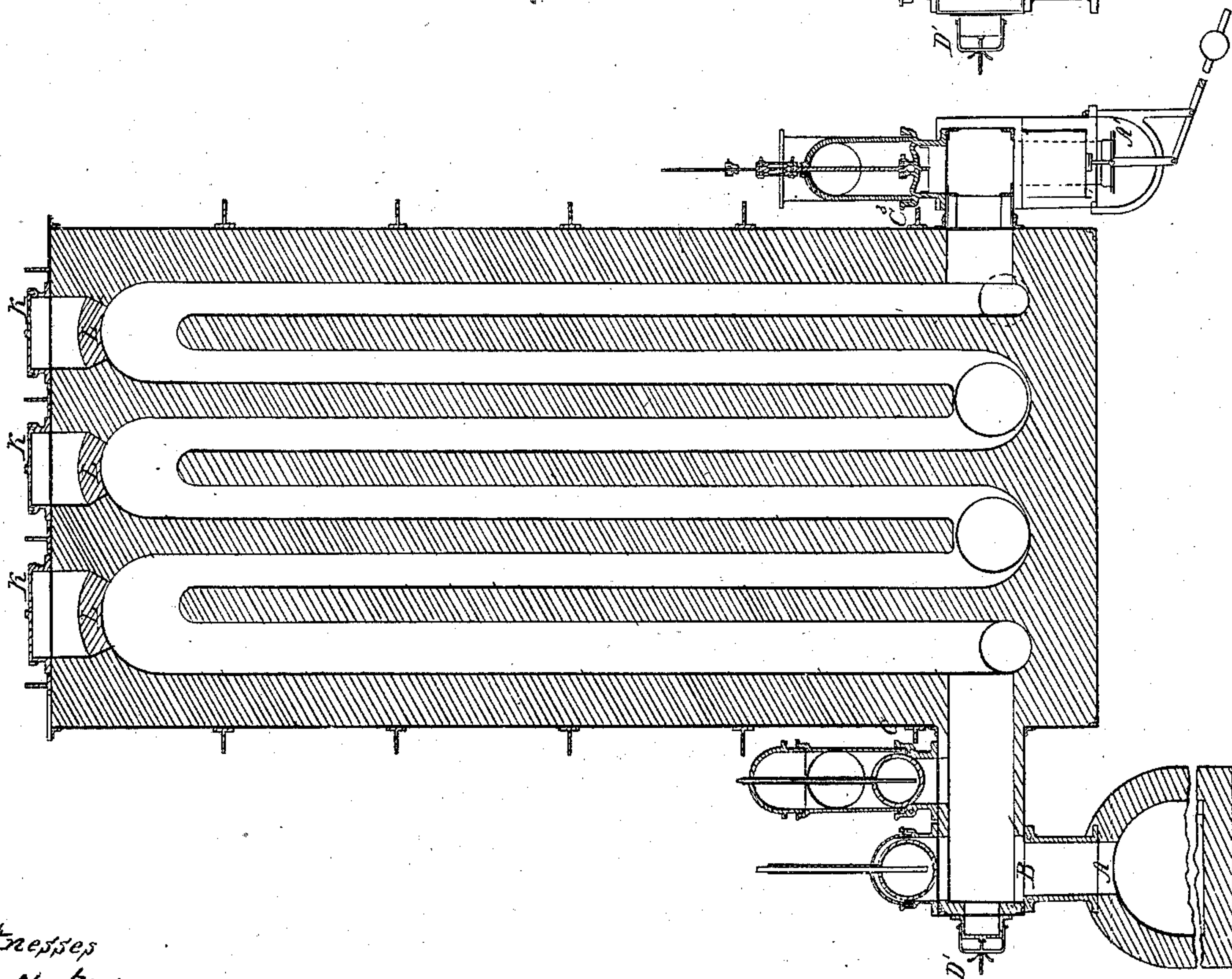


Fig. 4



Witnesses  
John H. Allen  
Robert Thomas

Inventor  
Thomas Whitwell



# United States Patent Office.

THOMAS WHITWELL, OF STOCKTON-ON-TEES, ENGLAND.

Letters Patent No. 66,543, dated July 9, 1867; patented in England November 10, 1865.

## IMPROVEMENT IN OVENS OR FURNACES FOR HEATING THE BLAST OF BLAST-FURNACES.

The Schedule referred to in these Letters Patent and making part of the same.

### TO ALL TO WHOM IT MAY CONCERN:

Be it known that I, THOMAS WHITWELL, of Stockton-on-Tees, in the county of Durham, England, Iron-master, a subject of the Queen of Great Britain, have invented or discovered new and useful "Improvements in Furnaces for Heating the Blast for Blast-Furnaces;" and I, the said THOMAS WHITWELL, do hereby declare the nature of the said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof; that is to say—

This invention has for its object improvements in furnaces used for heating the blast for blast-furnaces. For these purposes, two similar furnaces, ovens, or heating-chambers are employed, which are alternately heated by burning therein gas supplied or emitted from blast-furnaces during the process of smelting, and the blast to be heated is alternately directed into, and is caused to pass through, these two furnaces, ovens, or chambers. Each furnace, oven, or heating-chamber is enclosed by walls, and is divided by upright parallel partitions or walls into several narrow compartments. These walls are formed of fire-brick, gannister, fire-stone, or other suitable refractory material. The top and bottom of each furnace, oven, or chamber, is formed similarly to the walls. The partition walls are alternately constructed with openings at top and bottom, so that the burning gas, and also the blast, in passing through an oven or chamber, pass through each of the narrow compartments, and alternately under and over the partition walls in succession. And my improvements consist in forming such furnaces, ovens, or heating-chambers, with such openings in their tops and sides as hereinafter mentioned for facilitating the cleansing of the interior surfaces of their walls from the dust deposited by the gas burnt therein. For this purpose I form the top of each furnace, oven, or heating-chamber, with an opening above each of the partition walls, which does not ascend to the top, and I make the opening of a proper shape and dimensions to enable a workman to introduce a convenient instrument, and use it for the purpose of detaching the dust from the surfaces of the narrow compartment at each side of the partition wall. These openings, when the blast is passing through the furnace, oven, or chamber, and also when burning gas is passing through it for the purpose of heating it, are covered by plugs of refractory material, but the plugs are removed when the interior surfaces of the walls are being cleaned. I prefer to cover the exterior of the oven with iron, and to attach the plugs above mentioned to doors of iron. At the lower part of each furnace, oven, or chamber, I form other openings of suitable shapes and dimensions, through which the dust detached from the interior surfaces of the walls when cleaning the furnaces may be discharged. Through these openings atmospheric air may be introduced to ignite the gas to be burnt in the chamber for heating it. At the opposite sides of each furnace, oven, or chamber, are introduced pipes, with suitable valves, the pipe on one side communicating with the narrow compartment at that side, and the pipe at the other side communicating with the narrow compartment at such last-mentioned side. These pipes are used for supplying gas to one side of each furnace, oven, or chamber, during the heating thereof by the burning gas, and for allowing the products of combustion of the gas to pass off from the opposite side of the furnace, oven, or chamber, to a chimney. Those pipes are also used for conducting the blast to be heated into one side of the furnace, oven, or chamber, and out of it at the opposite side thereof; but when the blast is passing through a furnace, oven, or chamber, it is caused to flow in the opposite direction to that in which the gas has been previously caused to flow through the furnace, oven, or chamber, when heating it, and this is accomplished by the valves, which are worked in such manner as to cause the blast to enter at the side of the furnace, oven, or chamber, where it is connected with the chimney, and to cause the heated blast to pass off by the pipe, which had been previously used as the supply pipe for introducing the gas into the furnace, chamber, or oven. If desired, the atmospheric air necessary for supporting the combustion of the gas may be supplied to each furnace, oven, or chamber, otherwise than by the openings at the bottom of the furnace, oven, or chamber.

Having thus stated the nature of my said invention, I will proceed more fully to describe the manner of performing the same.

#### *Description of the Drawings.*

Figures 1 and 2 show two side elevations of apparatus, constructed and combined according to my invention.

Figure 3 shows an end elevation of one of the furnaces, chambers, or ovens.

Figure 4 shows a transverse section of one of the two furnaces or chambers which compose the complete apparatus; and

Figure 5, a plan of the two furnaces, chambers, or ovens, one being shown in section.

In each of these figures the same letters of reference are used to indicate the same parts.

The apparatus shown in the drawings consist of two similar furnaces, chambers, or ovens, which are, by



preference, of a rectangular form, but that form is not essential, provided that the furnaces, chambers, or ovens are constructed of sufficient strength to support the internal pressure. The two furnaces, chambers, or ovens, are of like construction, and each is enclosed by four walls of fire-brick, or other suitable material, (capable of bearing a high temperature,) strengthened by external iron plating. Each furnace, chamber, or oven, is divided by upright walls, which are constructed in such manner that the alternate walls are open at top and bottom, so that the blast of air entering on one side of one of the furnaces, chambers, or ovens, near the bottom, is, by the construction of the walls, caused to ascend, then to descend, then to ascend, and so on, till the blast of air gets away near the bottom of the opposite wall of the same furnace, chamber, or oven; or the arrangement of the internal walls or partitions may be varied, so long as these walls are arranged to be cleansed as herein described. At the top of each furnace, chamber, or oven, are iron doors K K, which are lined with fire-bricks, or lumps L L, which fit the openings in the tops of the chambers or ovens. These openings in the tops of the furnaces, chambers, or ovens, are formed over the walls, which do not come to the top of the furnaces, chambers, or ovens. By thus having openings over the shorter walls, the surfaces of the walls of the narrow compartment to the right hand, as well as those of the narrow compartment to the left hand, directly below the opening, can be cleaned with facility. These openings, when the air-blast is passing through a furnace, oven, or chamber, are kept closed. In the arrangement shown there are three of the shorter walls in each of the furnaces, chambers, or ovens; but the number of shorter and higher walls used in a furnace, oven, or chamber, may be varied according to the extent of surface over which it is desired the air-blast shall pass. At the lower parts of the walls, which ascend to the tops of the furnaces, chambers, or ovens, there are openings for the passage of the air-blast. Two furnaces, ovens, or chambers, are used in combination, in order to maintain a regular stream of hot-blast. Gas from a blast-furnace is supplied to one furnace, chamber, or oven, to heat the same, whilst the air-blast is passing through the other chamber or oven. And the arrangement of the passages and valves, in connection with the furnaces, ovens, or chambers, is such that the air-blast passes through the furnaces, ovens, or chambers, in the opposite direction to that in which the gases from the blast-furnace pass through the furnaces, chambers, or ovens. The passages from the furnaces, chambers, or ovens, where the products of the combustion of the gases pass off, are during that time caused to be in communication with a chimney. By these means the air-blast is gradually heated as it ascends and descends the compartments within either of the furnaces, chambers, or ovens, and the air-blast receives its greatest heat from the hottest parts of the walls in the furnaces, chambers, or ovens, immediately before leaving them. The dust carried by the gas accumulates on the walls, and requires to be scraped or removed from time to time. The scraping or removal from the walls is performed by proper tools, introduced through the top openings above described, and the dust is removed from the bottom of each chamber or oven, through the openings covered by the doors or valves D D, by means of rakes or other convenient tools. The gas from a blast-furnace is introduced by the pipe A, and passes either to the one or the other of the two furnaces, chambers, or ovens. Say, for instance, the gas is introduced, first, into No. 1 furnace, chamber, or oven, through the valve B<sup>1</sup>, the other valve B being closed, as also the blast-valve C'. The gas is ignited by air supplied through the cleaning openings D, protected from the heat by movable perforated bricks N N, by which the heat of the gas burned in the compartments or spaces between the walls in the furnace, chamber, or oven, causes the walls to become very highly heated. The products arising from the burning of the gases pass off through the valve B<sup>2</sup> into the pipe A', and thence into the chimney. The interior of No. 1 furnace, chamber, or oven, is thus made ready to receive the air-blast to be heated. The supply of gas from the blast-furnace is then passed into the oven or chamber No. 2, through the valve B, the other valve B<sup>1</sup> being closed, as also the blast-valve C', and the gas is to be ignited by air supplied through the openings at D; and the burned gas pass off by the valve B<sup>3</sup> to the chimney. The air-blast, when the furnace, chamber, or oven No. 1, has been heated, is introduced by the pipe J through the valve C<sup>2</sup>, the valve C<sup>3</sup> being closed, and the air-blast is caused, as before stated, by the arrangement of the valves to pass through the heated chamber in the opposite direction to that followed by the gas, and the heated blast will pass off through the valve C<sup>1</sup> into the pipe J'. So soon as the air-blast ceases to be sufficiently heated, it is shut off from the furnace, chamber, or oven No. 1, and turned on through the furnace or chamber No. 2, which has become highly heated during the time that the air-blast has been passing through No. 1 furnace, chamber, or oven, and the cold air is admitted by the pipe J, and flows through the valve C<sup>3</sup>—the valve C<sup>2</sup>, and also the gas-valve B<sup>3</sup>, being closed. The heated air-blast passes off by the valve C into the pipe J'. During the time that the air-blast is passing through the furnace, chamber, or oven No. 2, the chamber or oven No. 1 will be again heated, and thus may a continued highly-heated air-blast be maintained. The gas pipes A A' can be cleaned through the openings closed by the valves D' D'. In place of supplying air through the cleaning openings D for the combustion of the gas, openings may be made such as are indicated at M M.

Having thus described the nature of my invention and the manner of performing the same, I would have it understood that I claim the construction of furnaces, ovens, or chambers, with internal walls or partitions for heating the blast for blast-furnaces, with openings at the top capable of being closed by means of plugs or doors, and also with openings at bottom of the sides thereof, capable of being closed by means of doors or valves, and the whole acting substantially as herein described, for the purpose of cleansing the interior of such furnaces, ovens, or chambers from dust, as hereinbefore described.

THOMAS WHITWELL.

Witnesses:

G. F. WARREN, }  
THOS. BROWN, } Both of No. 17 Gracechurch Street, London, E. C.  
JOHN HARRISON, Notary Public.