2 Sheets—Sheet 1.

W. SWINDELL.

Metallurgic Gas-Furnaces.

No. 207,221. Patented Aug. 20, 1878.

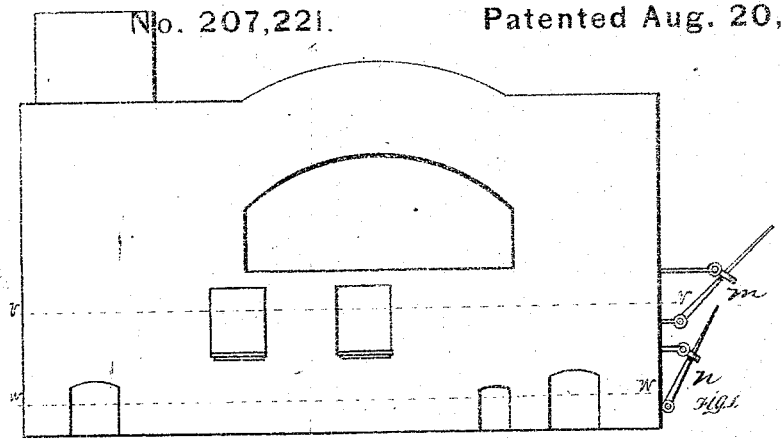

Fig. 1.

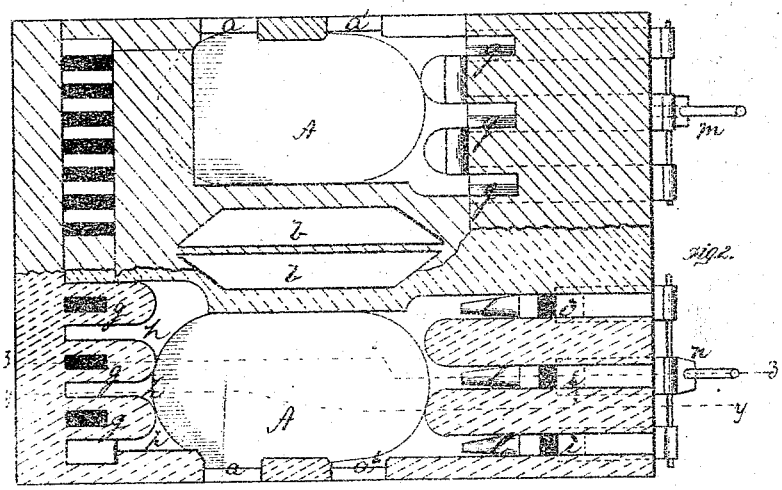

Fig. 2.

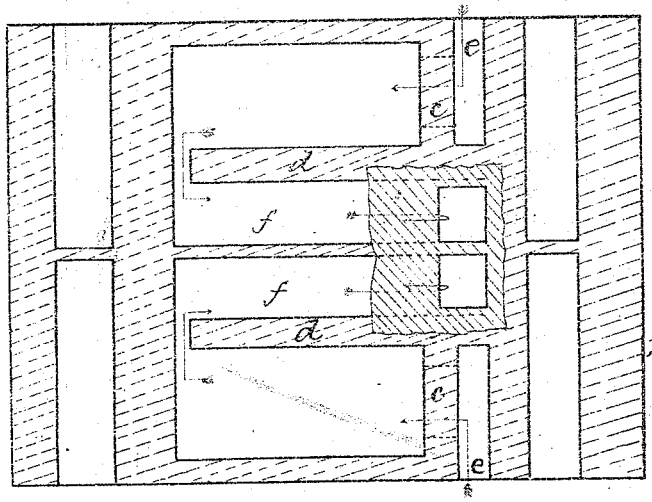

Fig. 3.

Witnesses.
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2 Sheets—Sheet 2.

W. SWINDELL.

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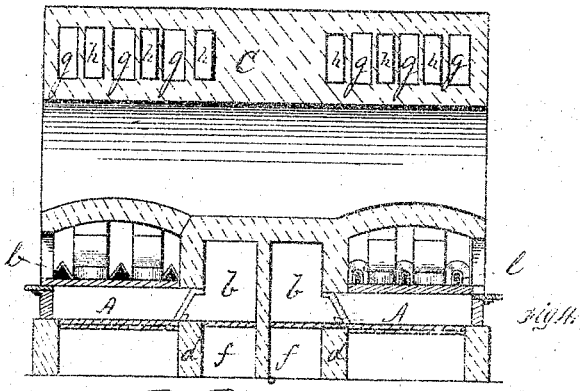

Fig. 4.

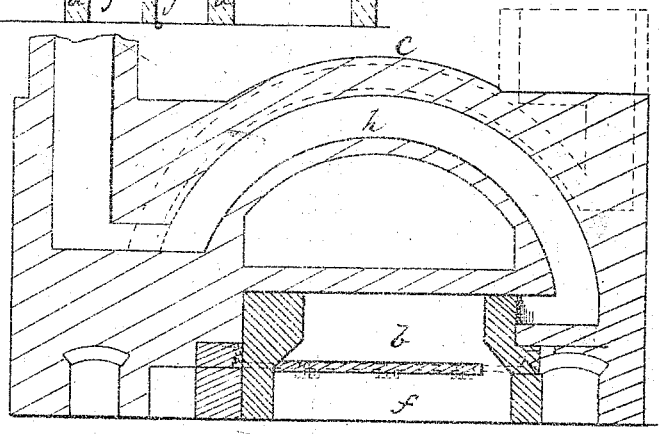

Fig. 5.

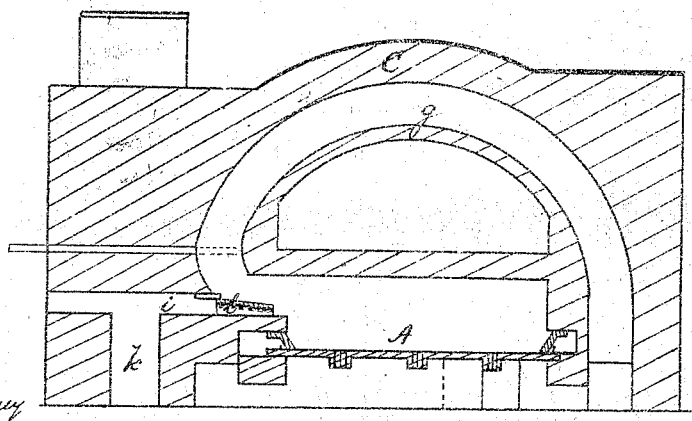

Fig. 6.

WITNESSES

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UNITED STATES PATENT OFFICE.

WILLIAM SWINDELL, OF ALLEGHENY, PENNSYLVANIA.

IMPROVEMENT IN METALLURGIC GAS-FURNACES.

Specification forming part of Letters Patent No. **207,221**, dated August 20, 1878; application filed March 23, 1878.

To all whom it may concern:

Be it known that I, WILLIAM SWINDELL, of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Metallurgic Furnaces; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing, forming part of this specification, in which—

Figure 1 is a side elevation of a metallurgic furnace embodying my invention. Fig. 2 is a horizontal section on the line *v v*, Fig. 1. Fig. 3 is a similar section on the line *w w*, Fig. 1. Fig. 4 is a vertical transverse section on the line *x x*, Fig. 1. Fig. 5 is a vertical longitudinal section on the line *y y*, Fig. 2. Fig. 6 is a similar section on the line *z z*, Fig. 2.

Like letters refer to like parts wherever they occur.

My invention relates to the construction of metallurgic furnaces, is especially adapted to the use of gaseous fuel, and in some respects is an improvement on Letters Patent No. 165,630, granted to me July 13, 1875.

My invention consists in the construction of metallurgic furnaces with hollow bosh and back walls, and connecting the same with the regenerator; in the construction of the gas and air inlets with hoods or nozzles; and in a special arrangement of the dampers, all of which enables space to be utilized and the furnace to work steadily at higher heats without material injury to the structure, as will hereinafter appear.

In the construction of long or double puddling-hearths, the common practice has been to place the working-doors upon opposite sides of the furnace; but such an arrangement interferes to some extent with the proper draft of the furnace, and is disadvantageous to the workmen on account of the crossing and interference of the tools in working the molten metal, and the difficulty of dividing and balling the metal equally, to overcome which objections I place the two working-doors on the same side, and thereby gain the further advantage of being able to double the structure, saving much space. I have also found that where the air and gas enter side by side, or in parallel lines, the combustion is more or less incomplete; and that where the air-supply is cut off at a point distant from the hearth, the air-flues are exhausted of air, and are liable to be injured by the heat; and to overcome these difficulties I have arranged the air-flues so that they dip and discharge around the gas-exits, which are contracted and arranged centrally, and have arranged the dampers of the air-flues at or near their discharge ends, so that, the communication with the exterior being retained, the flues remain filled with air and are in a measure protected.

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

A A represent the hearths of two puddling-furnaces inclosed within the same walls, each hearth being about twice the usual length, or what may be termed a "double hearth," and each provided with two working-doors, *a a'*, located in the same side of the furnace. If desired, a single hearth, A, and its adjuncts may be constructed in the manner hereinafter set forth; but to obtain the best results and conserve the heat, I prefer to build in duplicate, as shown. The back wall of the furnace (or furnaces) is built hollow, as shown at *b b*, and communicates with the spaces around the boshes or hearths A, with the hot-air flues spanning the furnace, and with the space beneath the hearth. The spaces beneath the hearth are divided by cross-walls *c d* in such manner that the air entering port *c* is compelled to travel the length of the hearths and enter return-passages *f f* before reaching the hollow back walls *b b*.

C is an arch spanning the furnace, and divided into alternate air flues or passages *g* and combustion-flues *h*, as described in Letters Patent above recited, and also fully set forth in a second application of even date herewith. The flues *g* communicate at one end with the hollow back walls *b b*, and at the other with the puddling-hearth A, directly over and around the flues for the admission of gas.

The gas employed is conducted from a producer or producers, or from any suitable source of supply, to flue *k*, which delivers it through ports *i* to the exits *l*, in line with the mouth of the air-flues. The exits *l* of the gas-flues are constructed in nozzle form, either by

building in U or V shaped fire-brick or in equivalent way, the object being to divide the air and cause it to envelop the gas at the time the latter enters the furnace, so as to insure a full supply of air to facilitate the combustion of the gas. The ports *i* are provided with suitable dampers *n*, so that the gas from the producers can be regulated as to volume, or cut off entirely, if desired.

At the mouth of the air-ports, and just over the gas-exits *l*, are a series of dampers, *m*, by means of which the quantity of air admitted to the hearth can be regulated and adjusted with relation to the volume of gas, or can be cut off entirely.

The operation of my improved furnace is as follows: The dampers *n* having been set to permit the desired volume of gas to pass from the producer to the hearth, the gas will issue from the nozzles in a thin stream and unite with the air which envelopes it. The air entering ports *e* will circulate beneath the hearth, absorbing heat therefrom, thence into the hollow back wall and around the bosh, after which it will enter flues *g* of the arch, absorbing heat from the waste products (passing off by alternate flues *h*) and finally be delivered onto the hearth around the gas-exits, mingling with the gas to support combustion. The products of combustion escape from the hearth through arch-flues *h*, as before specified.

The advantages arising from my invention are the great capacity of the furnace and the great facility of working the metal in the same; the great durability of the furnace in proportion to cost of construction, and the thorough manner in which combustion takes place.

Having thus described the nature and advantages of my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a metallurgic furnace of the class specified, the hollow back walls and bosh communicating with the regenerator-flues, substantially as and for the purpose specified.

2. The combination, with the hearth or combustion-chamber of a metallurgic furnace, of the air-delivery ports, inclosing the contracted gas-delivery ports, and the dampers *m n*, located with relation to said ports, as specified, and adapted to regulate the admission of air and gas to the hearth, the whole constructed and arranged substantially as specified.

In testimony whereof I, the said WILLIAM SWINDELL, have hereunto set my hand.

WILLIAM SWINDELL.

Witnesses:
F. W. RITTER, Jr.,
A. C. JOHNSTON.