2 Sheets—Sheet 1.

W. SWINDELL.

Metallurgic-Furnace.

No. 210,369. Patented Nov. 26, 1878.

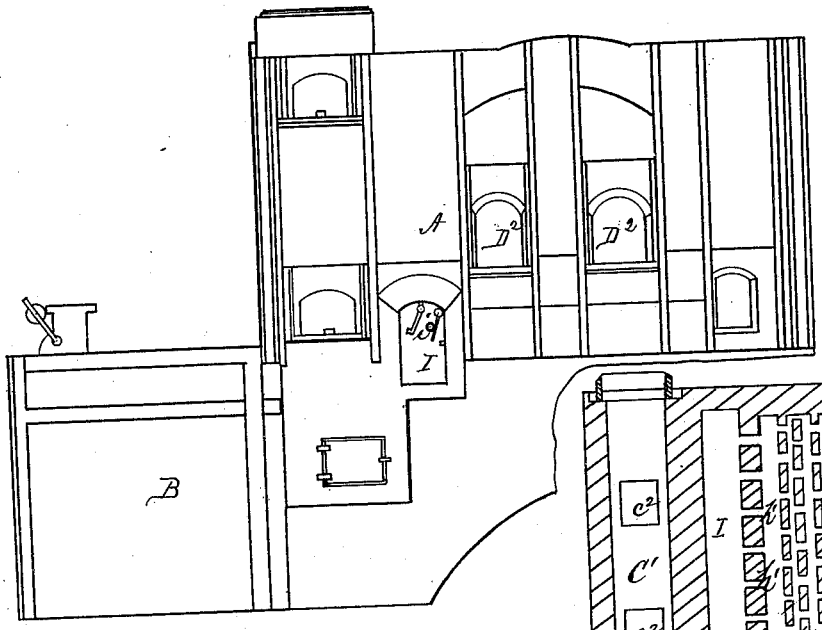

Fig. 1.

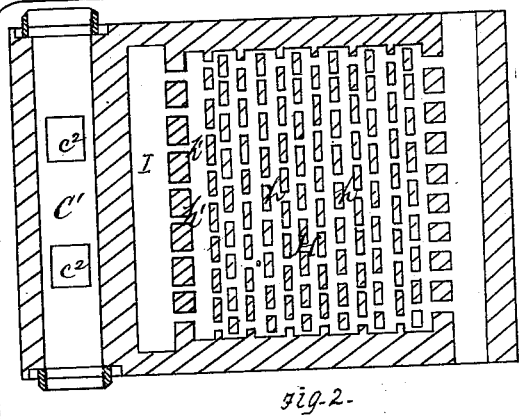

Fig. 2.

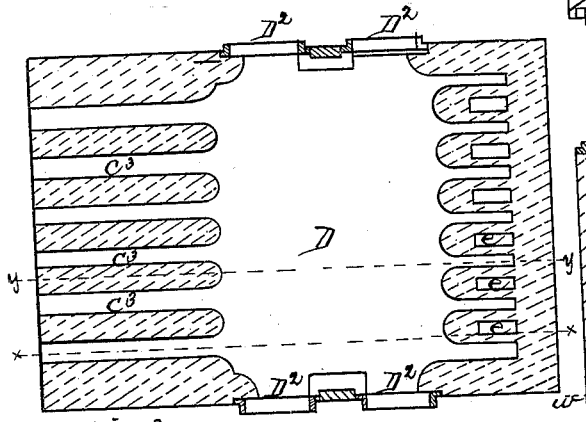

Fig. 3.

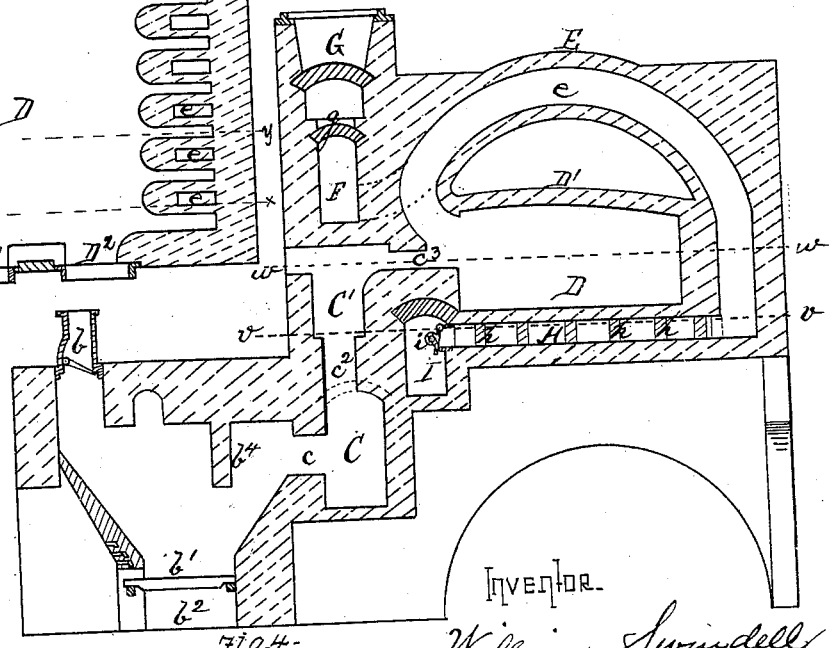

Fig. 4.

Witnesses.
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2 Sheets—Sheet 2.

W. SWINDELL.

Metallurgic-Furnace.

No. 210,369. Patented Nov. 26, 1878.

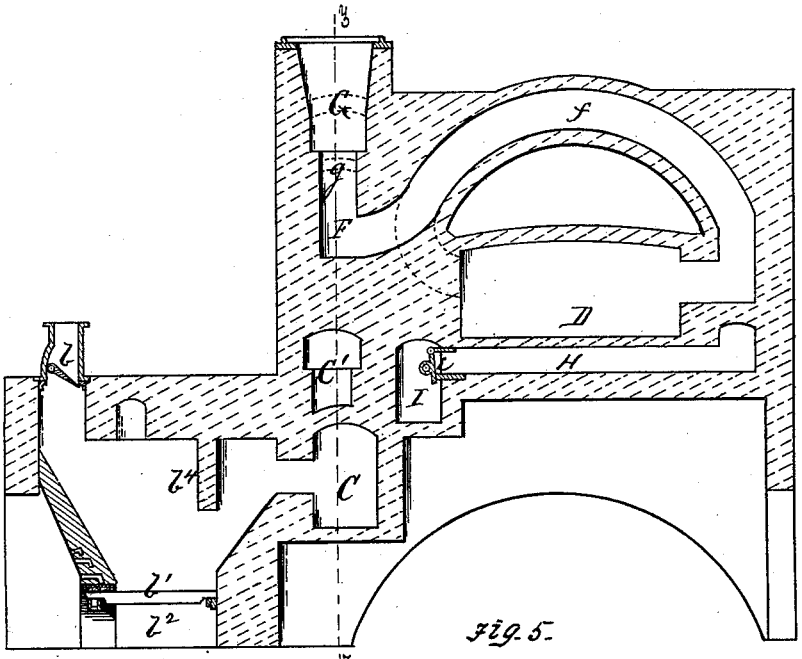

Fig. 5.

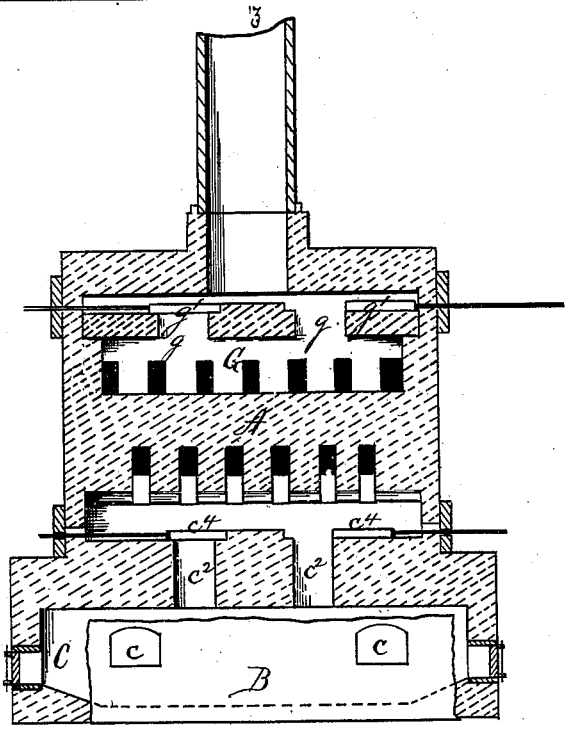

Fig. 6.

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UNITED STATES PATENT OFFICE.

WILLIAM SWINDELL, OF ALLEGHENY, PENNSYLVANIA.

IMPROVEMENT IN METALLURGIC FURNACES.

Specification forming part of Letters Patent No. **210,369**, dated November 26, 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 furnace embodying my invention. Fig. 2 is a horizontal section on the line *v v*, Fig. 4. Fig. 3 is a horizontal section on the line *w w*, Fig. 4. Fig. 4 is a vertical section on the line *x x*, Fig. 3. Fig. 5 is a vertical section on the line *y y*, Fig. 3. Fig. 6 is a vertical transverse section on the line *z z*, Fig. 5.

Like letters refer to like parts wherever they occur.

My invention relates to the construction of that class of metallurgic furnaces wherein gaseous fuel is employed, and the waste-heat from the products of combustion, &c., is utilized to heat either the air or gas, or both, on their way to the hearth or combustion-chamber, and is an improvement on Letters Patent No. 165,630, granted to me July 13, 1875.

It consists, first, in the arrangement of a series of dampers between the producer and regenerator or hearth, and between the latter and stack, whereby the flame, heat, &c., can be directed to either side of the hearth or regenerator at will and as indicated; secondly, in providing the producer with one or more deflecting curtains or septa, whereby the gases accumulating near the crown or top of the producer are compelled to travel over close to or through the fuel before their escape from the producer; and, finally, in details of construction, hereinafter more specifically set forth.

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

In the drawing, A indicates the furnace proper, and B B the producers, preferably at one end and in line with the furnace. The producers B may be, in general construction, of any desired form, with feed-hoppers *b*, grates b^1, and ash-pit b^2. The arches or crowns of the producers are provided by me with pendent walls or curtains b^4, which should hang down sufficiently low to nearly, if not quite, touch the fuel in the producer. These curtains or deflectors cause the descent of such gas as would otherwise pass near the roof or crown, so that the gas generated in the producers is subjected to a proper heat before escaping and the quality of the gas is uniform. The producers B communicate at one end, by ports *c*, with a gas-flue, C, arranged transversely to and at the base of furnace A, and this in turn, by ports c^2, with a second transverse flue, C′, from which gas-flues or delivery-ports c^3 discharge the gas into the combustion-chamber or onto the hearth. The ports c^2 between the transverse flues C C′ are guarded by dampers or valves c^4, which can be manipulated separately to control or shut off the gas-supply, and to direct it to either one or the other side of the hearth.

D indicates the hearth or combustion-chamber, provided with a crown, D^1, and working doors D^2. Over the roof or crown D is sprung an arch, E, in such manner as to leave a space between the roof and arch, to permit the circulation of air for the preservation of the parts.

The arch E is divided into a series of air-flues, *e*, which communicate at one end with the space beneath the hearth or combustion-chamber, and at the other with the hearth or combustion-chamber at a point near the gas-ports c^3, said flues alternating with a second set of flues, *f*, which receive the products of combustion from the hearth and deliver them to a transverse flue, F, which discharges into a stack, G, through ports *g*. The ports *g* are guarded by dampers *g′*, which can be operated separately to direct the draft through the combustion-flues of either half of the arch E. The dampers *g′* are usually opened or closed to correspond with dampers c^4, and according to the direction in which the draft is desired across the hearth.

The chamber or space H below the combustion-chamber or hearth D is divided up by checker-work *h*, which not only serves to support and strengthen the hearth, but also retards, divides up, and disseminates the incom-

ing air, causing it to pass in contact with the bottom of the hearth and effectually heating it.

The chamber H communicates with the air-flues *e* of the arch at one end, and at the other, by means of ports *h'*, with a flue or tunnel, I, which opens through the walls of furnace A, said ports being guarded by valves or dampers *i*, by means of which the amount of air entering the furnace can be regulated.

The operation of my device is as follows: Fire having been started in producers B, fuel added as required, and the combustion regulated to cause the production of carbonic-oxide gas, any gases rising to the roof of the producer will be deflected by pendent walls or curtains b^4 and caused to travel through or close over the surface of the fuel in the producer, thus insuring the yield of an uniform fixed gas.

The gas from the producer passes by flues C, ports c^2, and flue C' to the delivery-ports c^3, leading to the hearth, the quantity and direction of the gas being regulated by adjusting-dampers c^4.

The dampers *i* being properly set, air enters through ports *h'*, circulates through chamber H, absorbing heat from the hearth and checker-work *h*, passes thence into flues *e* of arch E, absorbing heat from the products of combustion, and finally unites with the gas from the producers at its junction with gas-port c^3. Combustion takes place on hearth D, and the waste products escape by flues *f* of the arch, giving up their heat to the air entering through alternate flues *e'*.

After the waste products leave flues *e'* they enter transverse flue G on their way to the stack, and accordingly as the dampers *g'* (one or both) are opened or closed will be the direction of the draft across hearth D.

The skilled workman will, without further direction, readily understand how to set the dampers to produce the quality of flame desired on the hearth or in the combustion-chamber, and also how to direct the flame to one or other side of the hearth, as desired.

The advantages of my improved combined producer, regenerator, and furnace are compactness, uniformity in operation, the ready manner in which the temperature, working-flame, and direction of the flame can be controlled, the support afforded the combustion-chamber or working-hearth, and the thoroughness with which the hearth is protected, as well as the waste-heat thereof utilized.

I am aware that a fuel-chamber wherein coal is placed and subjected to a sweating or coking process has been employed in conjunction with a fire-chamber in metallurgic furnaces, and that in such construction a division-wall separated the two chambers, compelling the gas given off in the coking-chamber to pass through the incandescent coke in the fire-chamber.

I am also aware that an arch has been used at the feed-chute of a producer to limit the height of the fuel in said producer, and do not herein claim such subject-matter.

Furthermore, I am aware that two furnaces have been arranged side by side, and provided with a series of dampers and valves, whereby air and gas could be admitted at one end of one furnace, and, being burned in said furnace, the waste gases resulting could be passed through the second furnace, giving a preparatory heating therein, and that, by means of the dampers, the operation specified could be reversed; nor do I herein claim such subject-matter, as my devices are neither constructed nor adapted to so operate.

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

1. The combination, with the roof or arch of the producer, of the deflecting-wall, adapted to cause the dip of the gas, which accumulates near the roof before its escape from the producer, substantially as specified.

2. The combination of the producer, the working-hearth, the arch spanning the hearth and divided into air and combustion flues, and the two sets of dampers interposed between the producer and hearth, and the combustion flues and stack, substantially as and for the purpose specified.

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

WILLIAM SWINDELL.

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