3 Sheets—Sheet 1.

H. SWINDELL.

Metallurgic Furnace.

No. 204,392. **Patented May 28, 1878.**

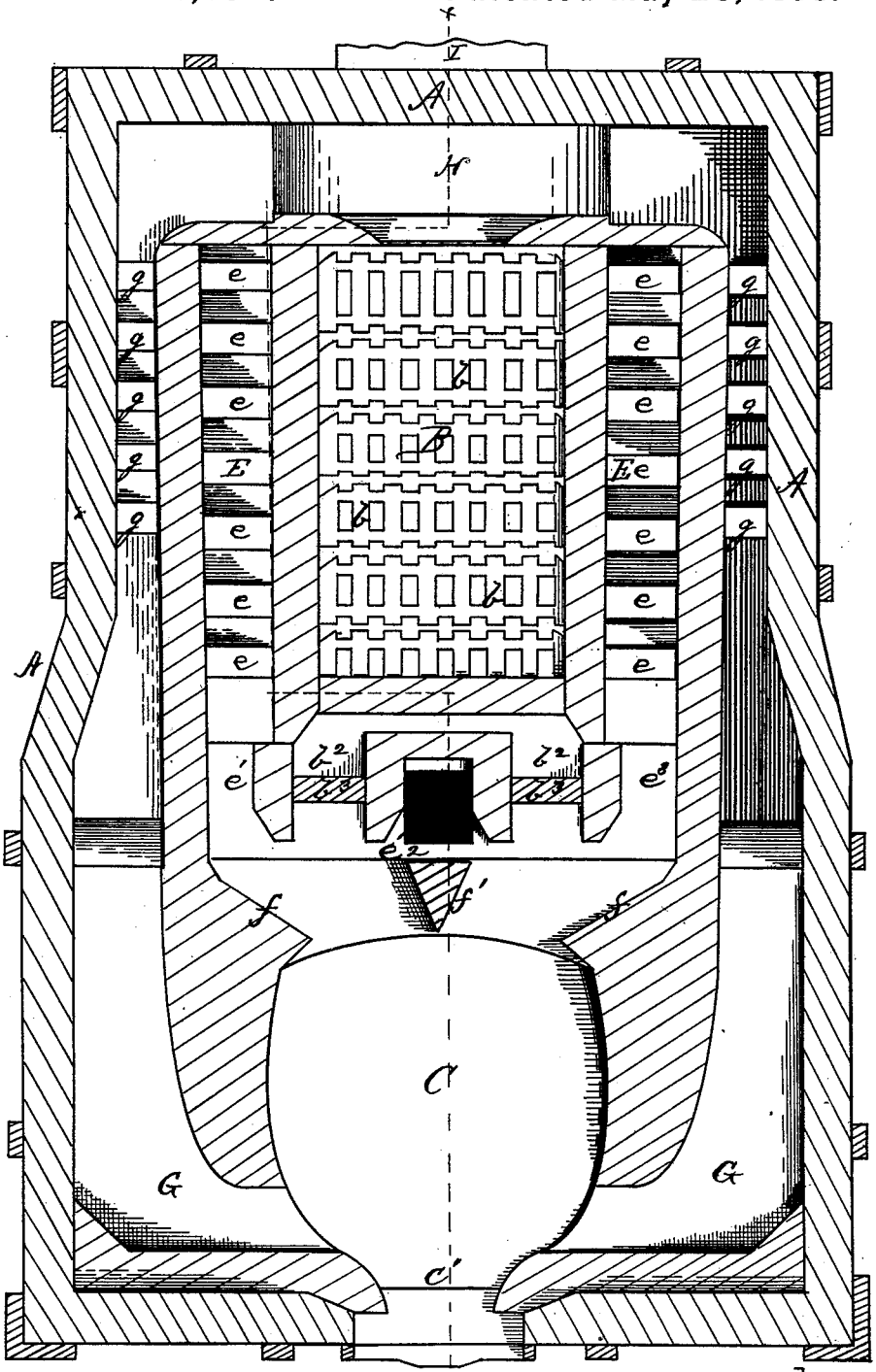

FIG. 1.

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3 Sheets—Sheet 2.

H. SWINDELL.

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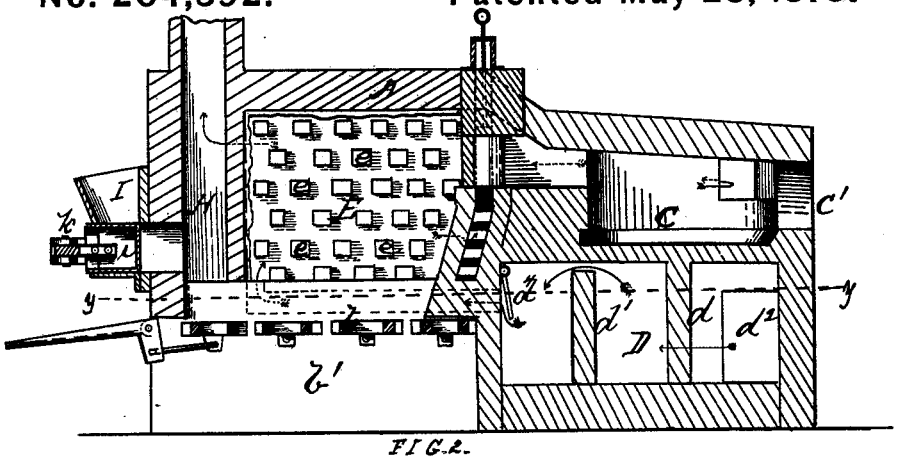

FIG. 2.

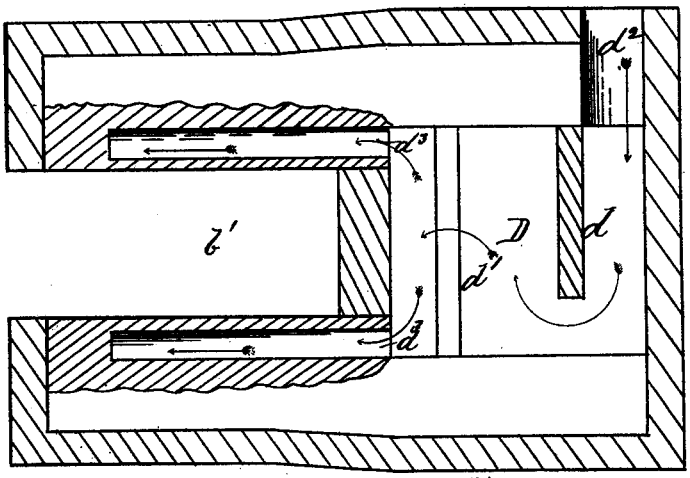

FIG. 4.

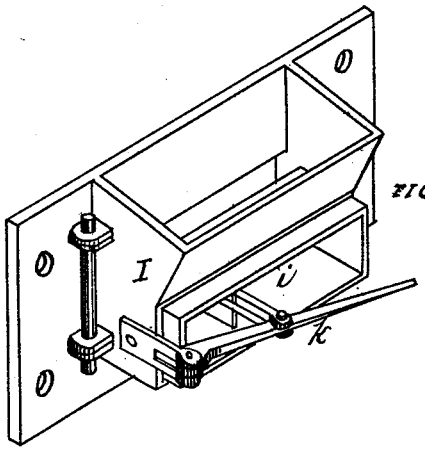

FIG. 5.

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3 Sheets—Sheet 3.

H. SWINDELL.

Metallurgic Furnace.

No. 204,392. **Patented May 28, 1878.**

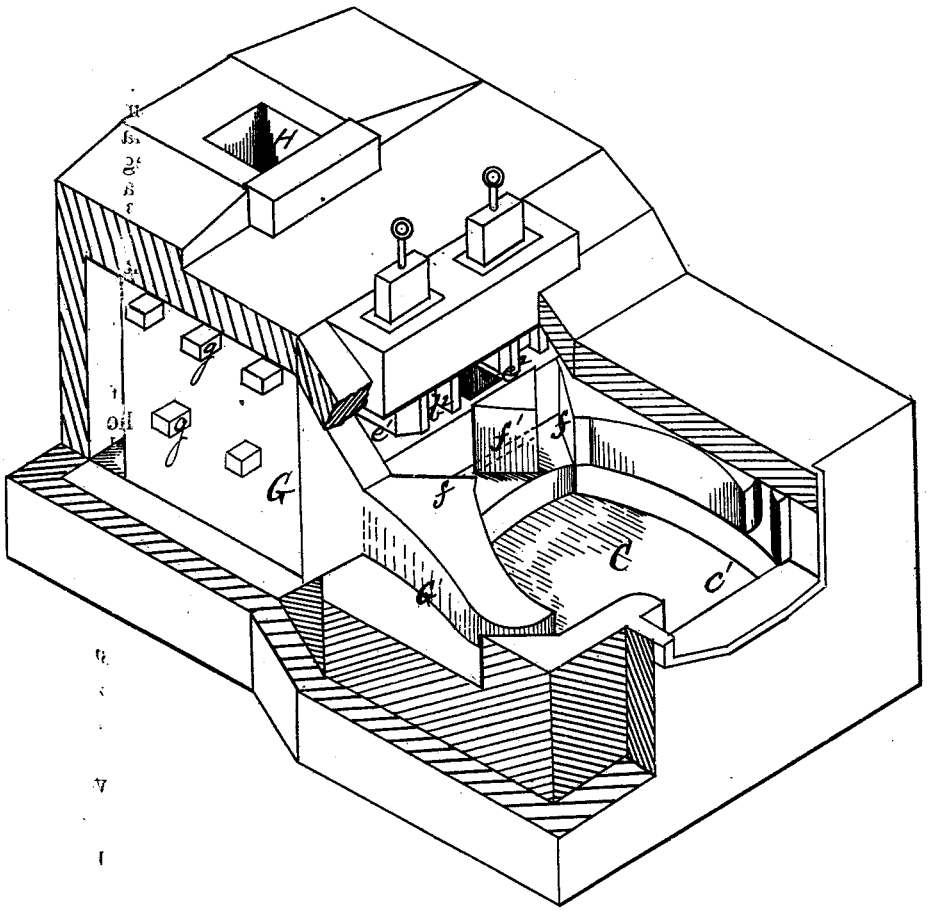

FIG. 3.

WITNESSES.

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UNITED STATES PATENT OFFICE.

HENRY SWINDELL, OF ALLEGHENY, PENNSYLVANIA.

IMPROVEMENT IN METALLURGIC FURNACES.

Specification forming part of Letters Patent No. **204,392**, dated May 28, 1878; application filed March 7, 1878.

To all whom it may concern:

Be it known that I, HENRY SWINDELL, of Allegheny city, 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 top view of a furnace embodying my invention, the crown having been removed to show the interior. Fig. 2 is a vertical longitudinal section on the line *x x*, Fig. 1. Fig. 3 is a perspective view of the furnace, the side wall and part of crown having been broken away to show the interior. Fig. 4 is a horizontal section on the line *y y*, Fig. 2; and Fig. 5 is a detached perspective view of the feed-hopper and plunger.

Like letters refer to like parts wherever they occur.

My invention relates to the construction of metallurgic and similar furnaces; and is directed, first, to a proper and effective heating of the air-supply; secondly, to a thorough and intimate admixing of the air with the gas, &c., at the point of combustion; and, thirdly, to means for supplying the fuel to the producer.

To accomplish the above ends, it consists 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.

A indicates the furnace-walls, inclosing a producer, B, having a suitable grate, *b*, and ash-pit b^1. Inclosed by the same wall, and preferably in line with the producer, is a combustion-chamber, C, which may be a puddling, reheating, or like hearth, as may be desired, and with which the producer communicates by flues or ports b^2, guarded by dampers b^3.

C′ indicates the working-door of the hearth. The space beneath the hearth or combustion-chamber C is divided into a tortuous channel, D, by one wall, *d*, which projects partly across the space, and a second or bridge wall, d^1, which entirely crosses the space, but does not rise to the full height of the chamber, so that air entering by port d^2 traverses back and forward before passing over the bridge-wall, where it comes in contact with the bottom of the working-chamber. This tortuous channel D communicates by ports d^3 with regenerators or heating-chambers on either side and at the end of the producer B. The ports d^2 are provided with dampers d^4 to control the admission of air to the regenerators and furnace.

E E indicate the main air-heating chambers or regenerators, which occupy the space immediately inclosing the sides and end wall of the producer, so as to derive as much heat therefrom as possible. In order to retard the passage of the air and effectually at the same, the chambers E are filled with checker-work composed of cross-studs *e*, arranged to alternate, as shown; and to effect a thorough commingling of the air and gas as they escape from the air-ports e^1 e^2 e^3 and gas-ports b^2, a series of breasts or deflectors, *f f′*, are provided.

G G indicate the return-flues, or flues for the escape of the products of combustion, which flues communicate with the hearth, preferably at points near the working-door, as thereby all cold air entering at the working-door C′ when the same is open is immediately drawn into the flues G, whereby it is prevented from striking and chilling the hearth C. These flues G extend on both sides of the furnace, and inclose both the air-heating chambers or regenerators E and the producer B, finally uniting in the front or end wall of the producer, and delivering it into a suitable stack, H.

Where the flues G inclose the air-chambers E they are narrowed and filled with checker-work or cross-studs *g* in order to retard the passage of the products of combustion and cause them to give up the contained heat.

At a suitable point in the end wall of the producer, preferably below stack H, is placed the fuel-supplying devices, which I construct as follows: I represents a hopper, hinged at one side to the furnace, and provided at the other with a suitable catch, so that the hopper may be swung back to get at the fuel-supply opening, when desired. The hopper is slotted below or has a box-opening, in which fits snugly a follower or plunger, *i*, controlled by a lever, *k*, pivoted on the hopper. By means of lever *k* the follower or plunger *i* can

be retracted to allow the descent of coal into the box opposite the fuel-supply opening, after which the lever is operated to cause the follower to advance, forcing the fuel into the producer, and at the same time the follower acts as a cut-off and checks the descent of fuel in the hopper.

The construction specified enables the fuel to be fed to great advantage, and in case of clogging of the feed, or irregular and unfavorable piling thereof, the same can be easily corrected by swinging back the devices. The hopper and its appurtenances may be swung back at any time an over-draft is desired.

A poke-hole may be formed in the crown of the furnace, over the producer, and any suitable grate may be used, though I prefer and have shown a grate covered by Letters Patent No. 181,221, granted to me on 15th day of August, 1876, as with such a grate the fuel in the producer can be managed to the best advantage.

The operation of my devices is as follows: A fire having been started on the grate of the producer, fuel is added from time to time, as required, by means of the slotted or box hopper and plunger or follower *i*, and the draft is regulated to insure the production of carbonic oxide, &c. The gas thus generated escapes by ports b^2, where it unites with heated air and is consumed in the combustion chamber or hearth C. The air to be heated enters beneath the combustion-chamber or working-hearth through port d^2, traverses tortuous channel D back and forth in contact with the bottom of the working-hearth, (which it assists in preserving,) around portion *d*, and over partition or bridge-wall d^1, entering the main air-heating chambers or regenerators E through ports d^3. At this point the amount of air entering the regenerators can be controlled, or the air can be entirely cut off by means of dampers d^4, according to the character of the flame desired on the hearth. The air in its passage through the chambers E is broken up, and its velocity checked by the checker-work or cross-studs *e* until it has acquired the proper temperature by absorbing heat from the producer on the inside and the escaping products exteriorly, after which it escapes by the ports e^1, e^2, and e^3, meeting the stream of gas from the producer, the currents being deflected, broken up, and caused to intimately mingle by the deflectors *f f'*. The gas and air intimately mingled, as specified, are consumed on hearth C, and the products of combustion escaping by flues G on their way to the stack encircle the chambers E, are retarded by the checker-work *g*, and give up their heat in a great measure to the air circulating through chamber E.

I am aware that the combustion-chamber, hearth, and producers of metallurgic furnaces have heretofore been surrounded by air-passages and passages for the products of combustion in order to utilize the waste heat, and do not, broadly, claim the same; but

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

1. The combination of a working-hearth or combustion-chamber, C, a producer, B, air heating or regenerating chambers E E, provided with checker-work, said air-flues inclosing the producer and inclosed by the escape-flues D for waste products, and tortuous air-channels arranged beneath the working-hearth and communicating with the regenerator, the whole constructed and arranged substantially as and for the purpose specified.

2. The combination of a producer, regenerators or air-heating chambers inclosing the same, a combustion-chamber or working-hearth, and a series of breasts or deflectors, *f f'*, arranged between the producer and hearth and with relation to the flues e^1, e^2, e^3, and b^2, as shown, whereby they are adapted to break up and intermingle the air and gas, substantially as and for the purpose specified.

3. The combination, with a furnace or producer, of the hinged and slotted or box hopper I, provided with a follower or plunger, *i*, substantially as and for the purpose specified.

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

HENRY SWINDELL.

Witnesses:
R. H. WHITTLESEY,
JNO. K. SMITH.