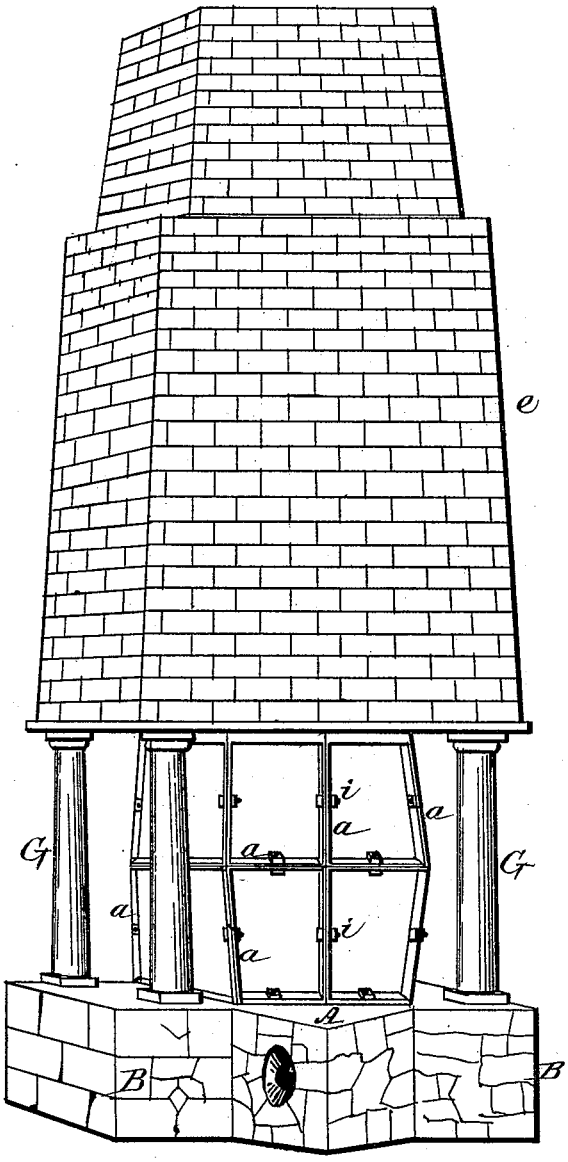
3 Sheets—Sheet 1.

C. BENNETT.

Blast and Reverberatory Furnace.

No. 200,019. **Patented Feb. 5, 1878.**

Fig. 1.



Witnesses:

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Inventor:

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3 Sheets—Sheet 2.

C. BENNETT.

Blast and Reverberatory Furnace.

No. 200,019. **Patented Feb. 5, 1878.**

Fig. 3.

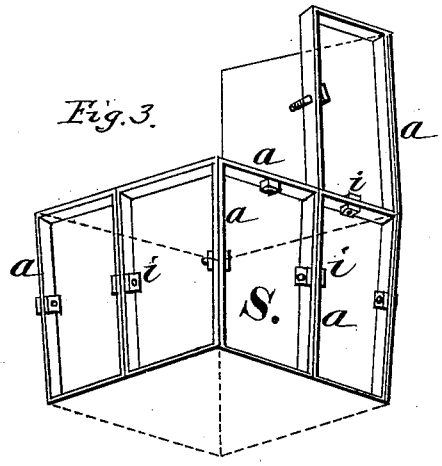


Fig. 4.

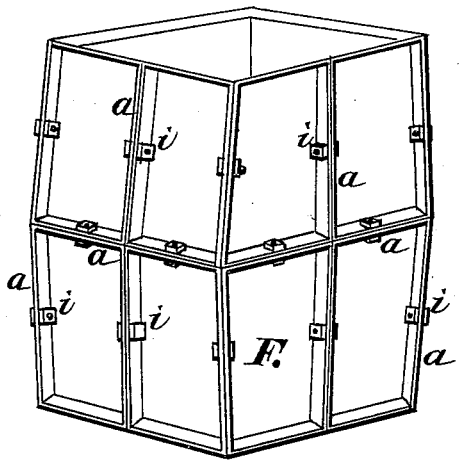
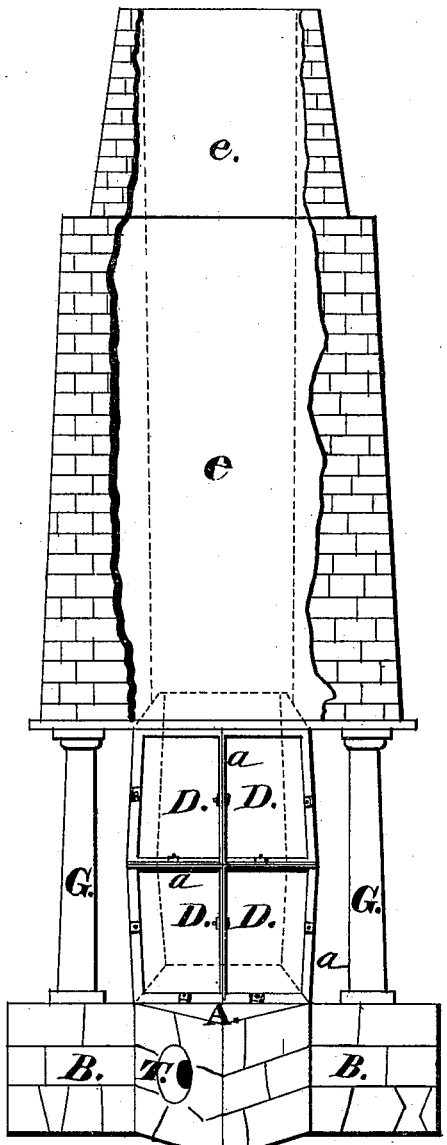


Fig. 2.



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3 Sheets—Sheet 3.

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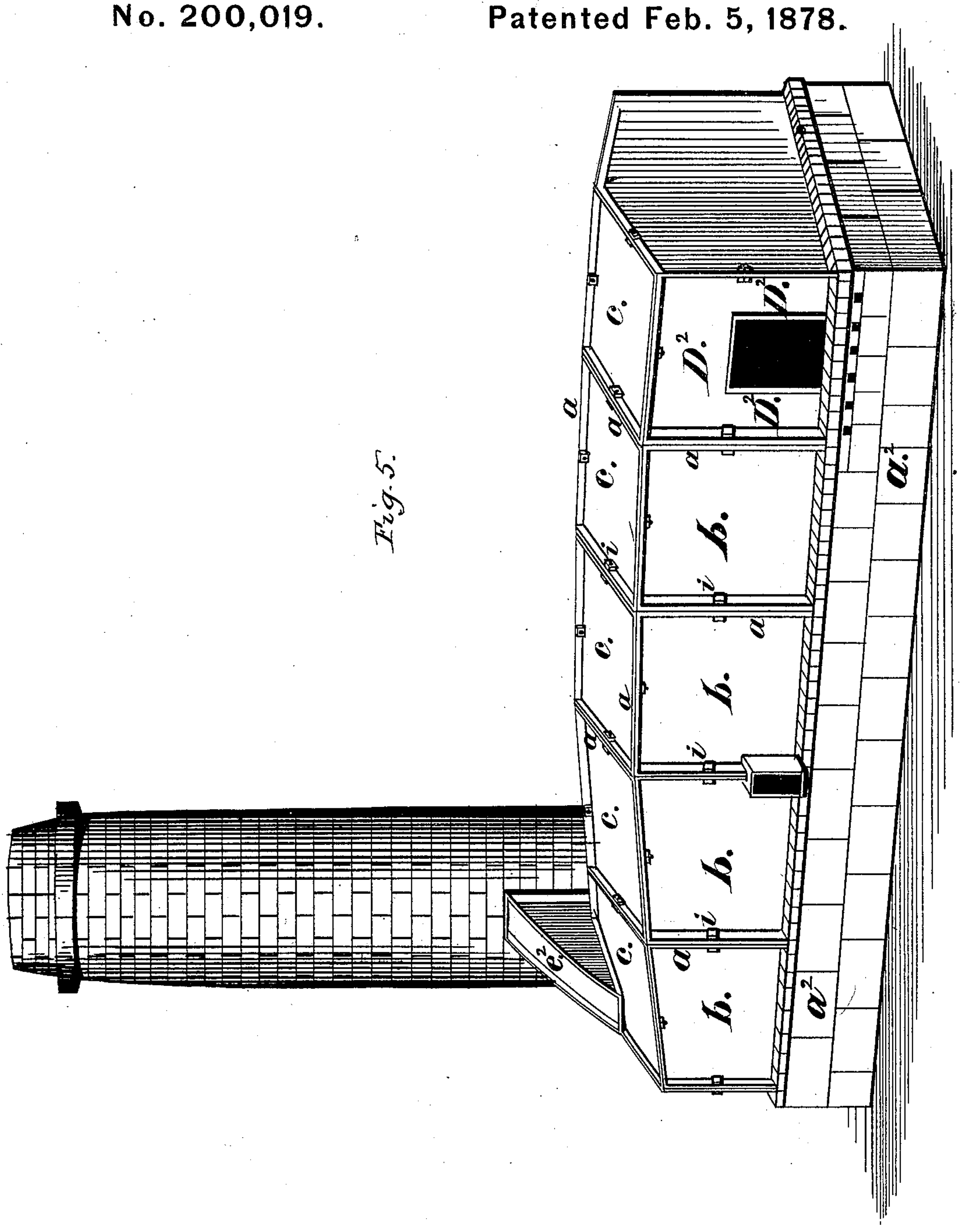
Blast and Reverberatory Furnace.

No. 200,019. **Patented Feb. 5, 1878.**

Fig. 5.



Witnesses:

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UNITED STATES PATENT OFFICE.

CORNELIUS BENNETT, OF CLIFTON, ARIZONA TERRITORY.

IMPROVEMENT IN BLAST AND REVERBERATORY FURNACES.

Specification forming part of Letters Patent No. **200,019**, dated February 5, 1878; application filed November 18, 1876.

To all whom it may concern:

Be it known that I, CORNELIUS BENNETT, of the town of Clifton, in the Territory of Arizona, have invented certain new and useful Improvements in Blast and Reverberatory Furnaces, which improvements are fully set forth in the following specification and accompanying drawings.

I have invented a copper working-chamber for metallurgic furnaces suitable for blast and reverberatory furnaces, and without fire-brick lining—that is to say, a furnace in which the smelting-chamber is constructed of copper.

I have used such a furnace in Clifton, Arizona, with great advantage and the best results.

I find in using a chamber made entirely of copper, that a firm coating of slag is formed on the chamber-surfaces. The slag is not a good conductor of heat, and it protects the copper. In other words, the slag readily adheres to the copper, and becomes a non-conducting lining, rendering the copper working-chamber durable, and requiring less fuel than fire-brick chambers.

The bottom of the chamber is made of ground quartz, thus combining copper wall with a quartz bed.

The fuel is preferably charcoal.

A copper working-chamber so constructed with the outer surfaces exposed to the air is practically fire-proof, and not acted upon by the corrosion of the ores or fluxes.

In new countries it is difficult to obtain fire-brick, and by means of a smelter, with an ordinary furnace, the copper can be made with which to build my new furnace.

In the drawings I have shown two forms of furnaces, viz., the blast and the reverberatory, to which my invention is alike applicable, and in which—

Figure 1 represents a blast-furnace with a copper working-chamber; Fig. 2, a partial vertical section of the same, the copper working-chamber being shown in elevation; Fig. 3, a view of a portion of the copper working-chamber; Fig. 4, the copper working-chamber as constructed to be set in place in the furnace; and Fig. 5, a reverberatory furnace with a copper working-chamber and fire-box.

The furnace may be constructed in any suitable way, as with the foundation, with front hearth A, and hearth-sole B, and the upper brick portion or stack *e*, usual in blast-furnaces.

The foundation, as already said, may be built with a quartz-bed, and the copper working-chamber is secured to the foundation in any suitable manner. The brick shaft or body of the furnace extends from the top or highest point of the smelting-zone of the copper working-chamber, and is supported by iron or brick pillars G, to prevent crushing the copper forming the working-chamber. This chamber may be of any suitable and convenient form and size, and the plates of which it is constructed may be made with flanges *a*, by which to securely bolt them together by screw bolts and nuts *i*, forming a copper chamber of united plates D *b c*. A copper working-chamber, however, may be formed of a single plate, suitably joined at its meeting-edges. Constructed in either of these ways it is open at top and bottom, and, as before stated, joins the stack and bed.

In Fig. 3, S shows the copper working-chamber as it is constructed with flanged plates, and F in Fig. 4 shows such chamber as completed.

Heretofore the working-chambers of metallurgic furnaces have been constructed of iron plates or fire-brick, or have been lined with that material; but I have found that copper plates with their outer walls exposed to the direct contact of the atmosphere, by reason of the formation of the slag lining, as above mentioned, are capable of resisting a sufficient degree of heat to fuse the ores, and make a better working-chamber than fire-brick or cast-iron plates.

In the reverberatory form of furnace shown in Fig. 5 the arch is formed of flanged plates *c*, in the same manner as the sides or vertical walls. The fire-box D^2 is also constructed in the same manner with flanged plates of copper. In this form of furnace, a^2 indicates the foundation. e^2 indicates the point at which the ore passes into the working-chamber, and at which the products of combustion strike the ores or metals directly. The furnace can be charged through the stack, or through a dome, or tunnel-head, or side opening in the stack.

The copper plates of the working-chamber may be constructed with ribs on their outer walls to give them greater strength to support the upper part of the furnace, as necessity may require.

The furnace is provided with all the necessary appliances for operation, and may be of any suitable size. I have had one in successful operation of a size two feet three inches by three feet two inches, inside measurement, with two tuyeres and blower. The copper plates which constitute the working-chamber are three feet six inches high and one inch thick. The nozzles through which the blast passes are two inches in diameter.

The furnace is worked with a charge of forty-five pounds of charcoal to one hundred and sixty pounds of ore, with a product of black copper, each twenty-four hours, of from forty-five hundred to six thousand pounds, according to the quality of the ore; and I have produced by this small furnace alone over one million five hundred thousand pounds of black copper, with comparatively little expense in fuel.

The working-chamber is formed of copper of uniform thickness, to render the function of absorbing and quickly conducting the outside cold uniform throughout the area of the furnace-walls, to counteract the effects of the interior heat.

The high conductivity of copper gives it the power of rapidly conveying and radiating the heat from the inner slag lining, which, in the case of copper, forms a closely adhering and protecting coat, not corroding the metal. There is small tendency to oxidation in copper, and its conduct in contact with the slag is one of its superior qualities.

I claim—

1. A copper working-chamber for metallurgic furnaces in which the chamber-walls are of sheet-copper.

2. A copper working-chamber for metallurgic furnaces in which the chamber-walls of copper are of uniform thickness.

CORNELIUS BENNETT.

Witnesses:

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S. M. ASHENFELTER.