J. R. GROUT.

Cupola Furnace.

No. 56,746. Patented July 31, 1866.

Fig. 5.

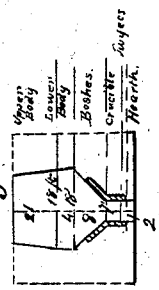


Fig. 6.



Fig. 4.

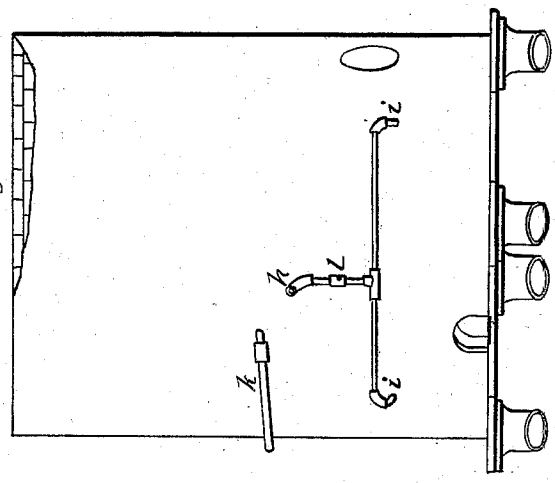


Fig. 3.

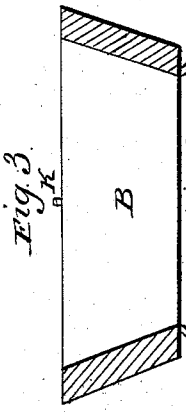


Fig. 2.

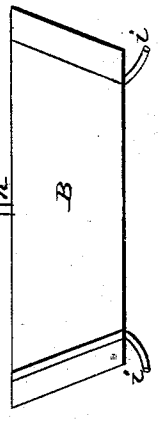
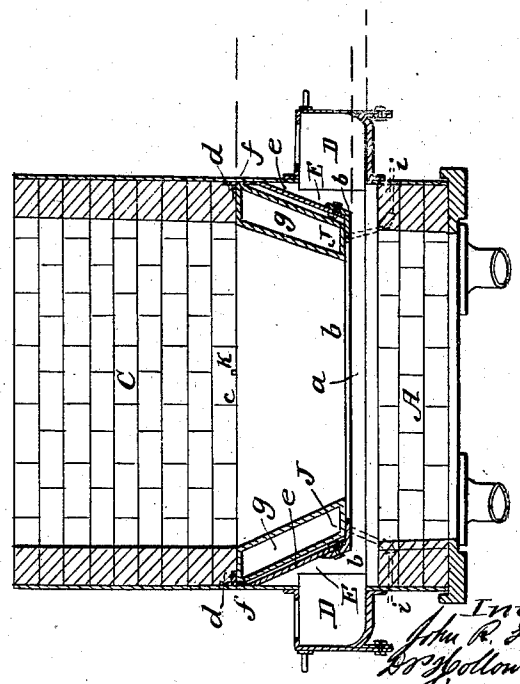


Fig. 1.



Witnesses

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Inventor.

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UNITED STATES PATENT OFFICE.

JOHN R. GROUT, OF DETROIT, MICHIGAN.

IMPROVED CUPOLA AND BLAST FURNACE.

Specification forming part of Letters Patent No. **56,746**, dated July 31, 1866.

To all whom it may concern:

Be it known that I, JOHN R. GROUT, of the city of Detroit, in the county of Wayne, in the State of Michigan, have invented a new and improved mode of protecting and preserving the form of cupola and other blast furnaces above the entrance of the blast or tuyeres against the melting effect of the heat, however intense; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a vertical section of the part of a working cupola-furnace, showing the parts which include the improvement. Figs. 2 and 3 are perspective views of the parts which constitute the improvement. Fig. 4 is a perspective of the lower part of a cupola-furnace. Fig. 5 is a vertical section of the part of a working blast-furnace, showing the application of the improvement; Fig. 6, a vertical section of one of the parts inclosing the water.

The nature of my invention consists in providing, in place of a lining of fire-brick or other refractory material in that part of cupola and other blast furnaces which is subjected to melting heat, a lining of cast or wrought iron fitted to the form of the furnace, and made as a close vessel for receiving and holding water, a current of which is constantly made to circulate through it, which protects the iron from melting and preserves the form of the furnace.

The cupola is constructed after the manner of Mackenzie's patent cupola. An annular iron plate rests upon pillars, supporting the iron casing and the brick-work of the furnace, doors being fitted to the plate to close the opening in the same and form a drop-bottom. It is oval in form, with a bosh for holding up the charge and a horizontal section around the furnace for admitting the blast. It may, if preferred, be circular or rectangular, or without the bosh, and admit the blast by conical tubes or tuyeres.

A, Fig. 1, is the lining of the crucible, which is brick-work, resting upon the annular plate and rising to *a*, the height of admitting the blast. B is the bosh, which is iron-work, resting upon flange *b* and rising from *a*, the section of the blast, to the height of the melting-heat *c*. C is the brick-lining above the bosh, resting on the bosh and the flange *d*. D are boxes bolted to the casing of the furnace, through which the blast is conducted, and E the blast-chamber, continuous around the furnace, in which the blast circulates, entering the charge in a continuous sheet through section *a*, and sweeping, as it enters, the lower edge of the bosh. *b* is a cast-iron flange, continuous around the furnace and bolted to *e*. *e*, the interior shell of the blast-chamber, is boiler-iron, alike continuous, and bolted to the casing at *f*, and flange *d* is in like manner continuous and bolted to the casing.

The bosh B, Figs. 1, 2, and 3, is made of cast or wrought iron, and in one or more parts, according to the size and form of the furnace, the division being vertical, and the parts so made that when in place they fit at the inner face the exact form of the bosh.

Each part forms a close vessel or space, *g*, Fig. 1, for receiving water, the space so formed for this purpose conforming to the outer form of the divisional part, and allowing sufficient thickness of the sides for strength. I am using cast-iron, the inner and lower side being five-eighths ($\frac{5}{8}$) of an inch in thickness, and the outer and upper side half ($\frac{1}{2}$) an inch. Each part is cast with dry-sand core, leaving a hand-hole in the lower side, which is closed in the usual way. I call this part of my furnace, for convenience, the "water-back." Its height is to be from the section admitting the blast to the point where the heat ceases to melt the fire-brick work of the furnace. In the cupola furnace it occupies the height of the bosh. In the blast-furnace shown by Fig. 5 it occupies about two-thirds of the height usually termed the "bosh", and extends down into the crucible to the central section of the tuyeres, so as to protect the upper half of the latter. One of the parts used in the blast-furnace is shown by Fig. 6.

Cold water is conducted from an elevated position by the feed-pipe *h*, Fig. 4, to one or more points, *i*, where, passing through the side of the furnace, it enters into the water-back through the lower side at *j*, Fig. 1, and when the space of the water-back is filled it passes out through the upper side through the waste-pipe K. A constant current of cold water is in this way made to circulate through the

water-back when the furnace is in blast, regulated by a stop-cock, *l*, in the feed-pipe *h*, by which means such quantity of water is at all times admitted as effectively protects the water-back from the heat, and thus preserves the form and the power of the furnace. Similar care is required in regulating the water as in case of the steam-boiler.

My furnaces have been in blast with this arrangement of water-back bosh eight to twelve hours daily for many months under the best Lehigh-coal heat without being impaired in form or injury done to the iron, and have executed work in the most satisfactory manner.

Having fully explained the nature of my improvements, what I claim as my invention, and seek to secure by Letters Patent, is—

1. Constructing the boshes B of a cupola or blast furnace with metallic chambers *g*, so arranged that a current of cold water may flow through them, and without an internal lining of fire-brick or other refractory substance, substantially in the manner and for the purposes set forth.

2. So arranging two or more chambers, *g*, in combination with the flanges *b* and *d* and plate *e*, that the chambers surrounding the boshes may be removed without disturbing the superior brick-work C, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN R. GROUT.

Witnesses:

R. MASON,

JOHN S. HOLLINGSHEAD.