

(No Model.)

G. W. GOETZ.
TAPPING HOLE FOR FURNACES.

No. 334,015.

Patented Jan. 12, 1886.

Fig. 1.

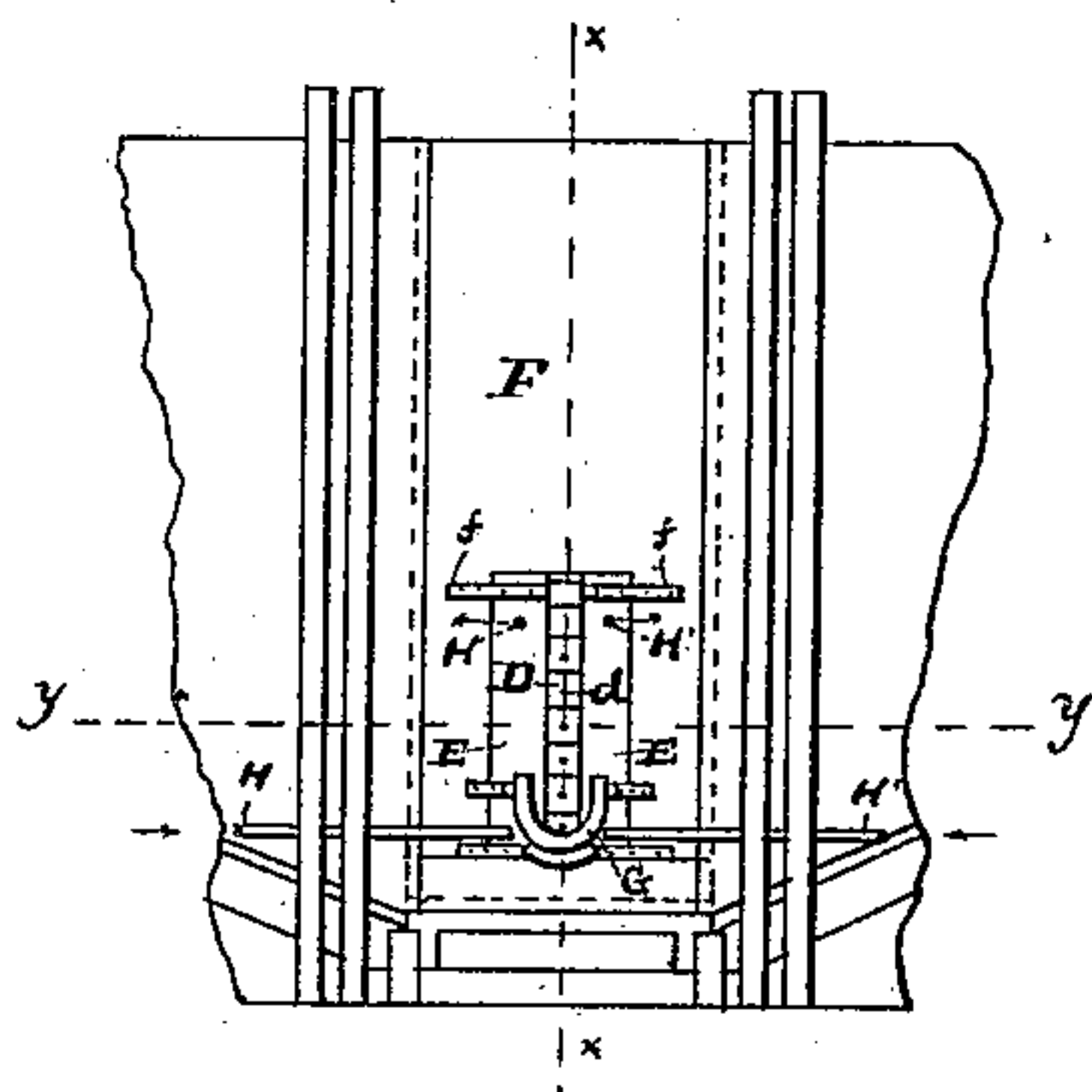


Fig. 2.

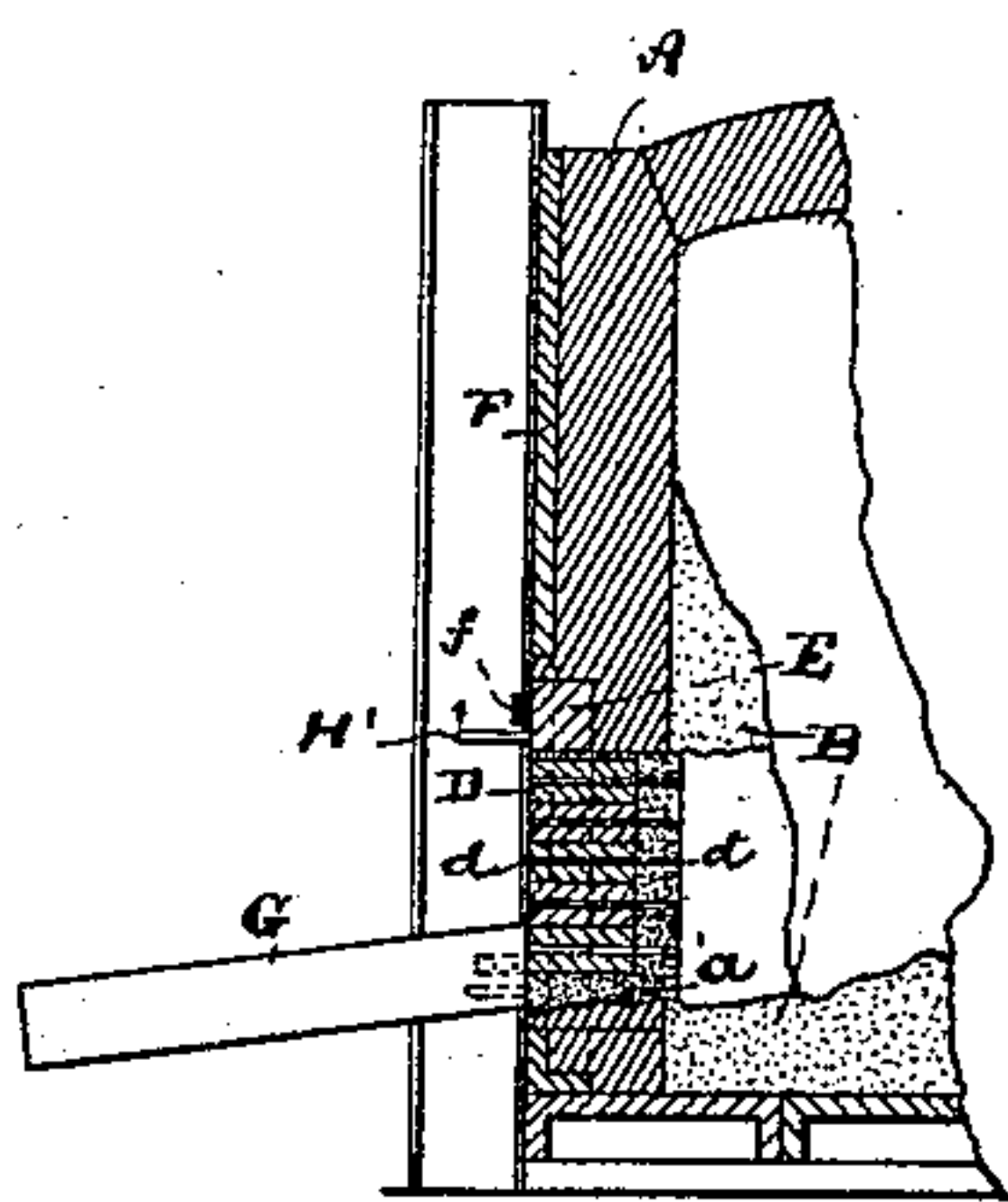
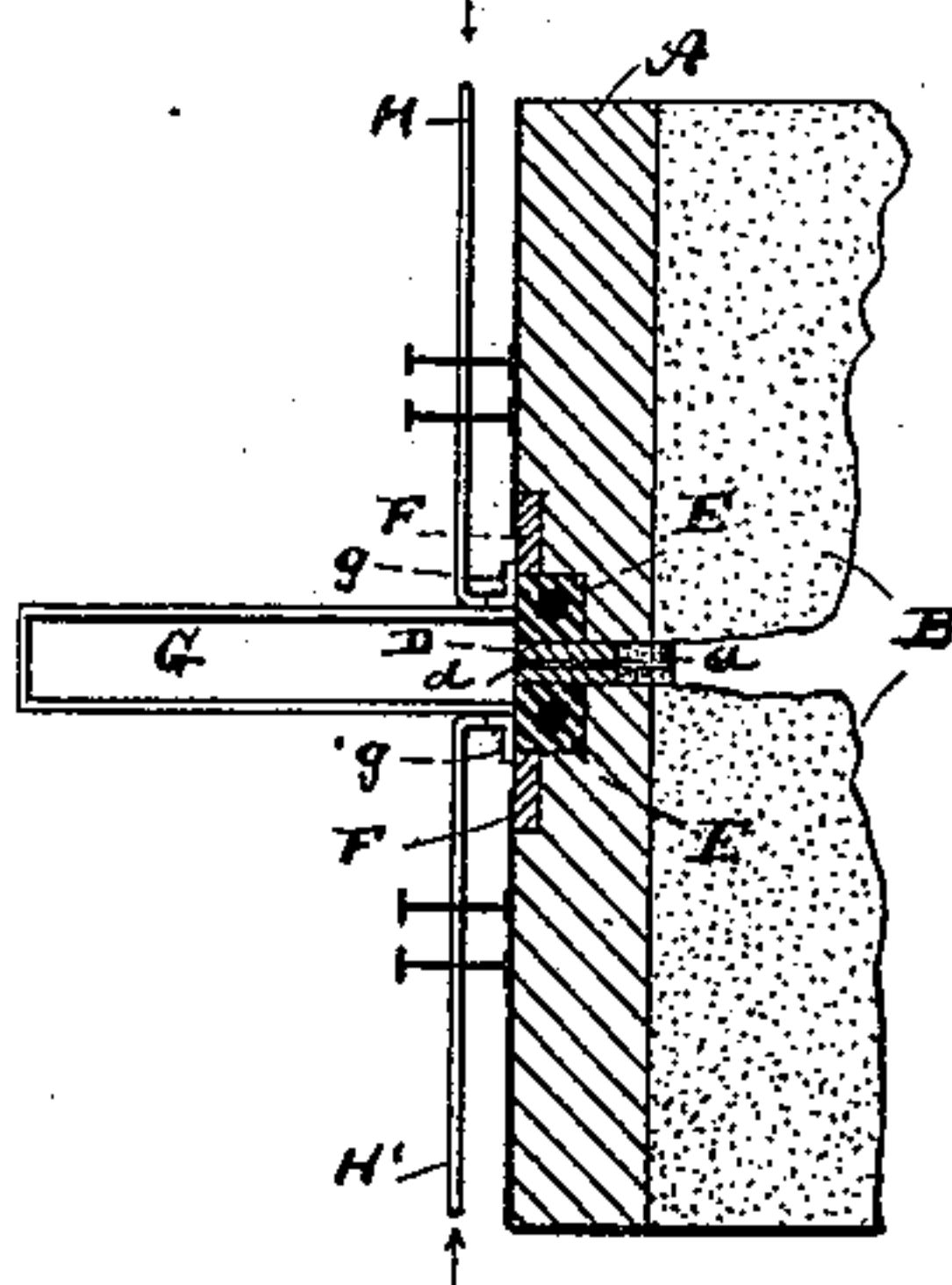


Fig. 3.



WITNESSES
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UNITED STATES PATENT OFFICE.

GEORGE W. GOETZ, OF CLEVELAND, OHIO.

TAPPING-HOLE FOR FURNACES.

SPECIFICATION forming part of Letters Patent No. 334,015, dated January 12, 1886.

Application filed March 7, 1885. Serial No. 158,090. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. GOETZ, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Tapping-Holes for Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to improvements in tapping-holes designed more especially for open-hearth steel-melting furnaces, having for its object a series of tapping-holes arranged, respectively, in separate bricks, the one above another, to the end that in tapping the furnace and drawing off the metal intermittently a hole next below the surface of the molten metal may be used, and when it is required to stop the flow of metal by reason of the low head of metal above such tapping-hole the hole may be plugged without difficulty in the usual manner, and in case this tapping-hole becomes "cored" and inoperative the next hole below, or, in fact, any of the lower holes, is available, and may be tapped as required.

A further object is to provide water columns or blocks in front and next adjacent on either side of the series of brick containing, respectively, the tapping-holes, to the end that in case the molten metal finds its way through the seam of this brick-work a contact with these water-blocks will chill the molten metal and prevent a leakage.

With these objects in view my invention consists in certain features of construction, and in combination of parts hereinafter described, and pointed out in the claims.

Furnaces for melting steel are usually of large size, and a great quantity of steel (usually several tons) is melted at one time. With the ordinary construction a tapping-hole is arranged at the bottom, so as to drain the furnace. When it is desired to draw only a small quantity of metal, or a quantity much less than the full charge, owing to the great pressure of metal above it is found to be difficult, if not impossible, to plug the hole and stop the flow of metal, at least by such means as will admit of the hole being retapped to draw off the balance of the charge. I have therefore

devised a series of bricks arranged one above the other, each brick containing a tapping-hole, and a space below the lower brick filled with clay, through which a tapping-hole may be made to drain the furnace, and the arrangement of parts such that in case a portion only of the metal is to be drawn off a tapping-hole is selected that will discharge approximately the amount of metal required, leaving only a limited head of molten metal above such hole at the end of the discharge, in which case the hole is easily plugged in the usual manner, and if the tapping-hole first selected should not furnish the required amount of metal, the next hole below may be tapped, and so on throughout the series. If the metal is to be drawn off in small quantities, the upper hole is usually first selected, and by reason of the small head of metal above this hole it may be plugged and retapped as often and as many times as required. When the metal that will discharge through this hole has been exhausted, of course the next hole below may be tapped, and so on. In case a hole becomes cored—that is, metal becomes chilled in the hole so as to render it inoperative—the next hole or any of the holes below may be used.

In the accompanying drawings, Figure 1 is a front elevation of the portion of the furnace to which my improvements are attached, showing a series of brick with tapping-holes and other attachments embodying my invention. Fig. 2 is a vertical section through a portion of the furnace on the line of *x x*, Fig. 1. Fig. 3 is a horizontal section on the line of *y y*, Fig. 1.

A represents the outer wall, constructed usually of silica brick, and B the sand lining. On the side of the furnace where the metal is drawn off a narrow opening is left through the brick-work and sand lining, about four inches (more or less) in width, and extending from the bottom of the furnace, where the metal rests, up some distance to, or about to, where the molten metal will extend when the furnace is full-charged. At the bottom of this opening is placed a layer of clay and sand, *a*, or such other material as may be found suitable and that can be conveniently pierced with a tapping-iron. Above this layer the said opening is filled with the fire-bricks D, each of which

has a tapping-hole, *d*, through the center end-
wise, about one and one-quarter inch (more or
less) in diameter. These bricks are fitted nicely
into the said opening in the furnace-wall and
5 to each other, and a thin layer of clay or other
suitable material is used in the joints, the
object being to make this part of the device
as secure as possible as against leakage of the
molten metal, that will readily find its way
10 through any imperfections in the work.

To guard against any possible leakage, water-
blocks *E* are arranged on either side of the
bricks *D*, and next in front, as shown in Fig.
2. These blocks may be of any suitable ma-
15 terial—such as iron or steel, &c.—but are pref-
erably of phosphor-bronze, are made hollow,
and a continuous stream of cold water is made
to flow through them. Any of the molten met-
al that finds its way between the wall *A* and the
20 bricks *D* would come in contact with one of
these blocks and be chilled, so that in place of
a leakage the parts would be likely to be ren-
dered more secure. These water-blocks also
form guards and supports laterally for the
25 bricks *D*, so that the latter are less liable to
be broken in “tapping out,” and the bricks
are thereby rendered much more durable, and
less care and time is required in “tapping” or
“barring out.” The water-blocks are secured
30 to the cast-iron plate *F* by the bars *f*, that are
bolted to the plates. The spout or trough *G*
is also secured to the part *F* by means of the
angle-iron *g*.

H and *H'* are water-pipes leading to and
35 from the water-blocks.

I am aware that it has been before proposed
to make a number of holes in a vertical line
in the wall of a refining-furnace, for drawing
off the slag at a gradually-increasing height,
40 as shown in Griffith's English Patent No. 1,509
of 1883. It will be observed, however, that
the arrangement and method of operation of
this improvement differs materially from mine.
The tapping-holes in my furnace are formed
45 in separate bricks built up in vertical line

from the bottom of the furnace. The Griffith
tap-holes are used for drawing off slag, and
are closed one after the other from the bottom
upward as the slag mounts to the one above.
The tap-holes in my furnace are opened one 50
after the other from the top downward as the
metal runs out, so that when it is desired to
run out a small quantity of metal the hole
nearest the surface at the time may be opened,
and after the proper amount of metal has run 55
out may be closed with little difficulty.

I am also aware that it has been before pro-
posed to employ pipes for circulating water
around the tapping-holes of blast and other
furnaces; but I am not aware that separate 60
water-blocks built up around the tapping-
holes, as I have described, have been before
employed.

What I claim is—

1. In a melting-furnace, the combination of 65
a slot or opening in the side wall and lining
extending from the bottom of the furnace up-
ward, and a series of bricks arranged in said
opening one above the other, said bricks hav-
ing a series of tapping-holes therethrough 70
one above the other, so that one after another
said holes from the top downward may be
tapped, substantially as and for the purposes set
forth.

2. In a melting-furnace, the combination, 75
with a lateral opening or slot in the wall and
lining of the furnace, and a series of bricks ar-
ranged therein, and tapping-holes arranged
in the said bricks, of water-blocks arranged
at the outer end and on either side of and in 80
contact with the said bricks, and suitable
means for passing water through the water-
blocks, substantially as set forth.

In testimony whereof I sign this specifica-
tion, in the presence of two witnesses, this 11th 85
day of February, 1885.

GEORGE W. GOETZ.

Witnesses:

FREDK. KINSMAN,
G. W. SHUMWAY.