

B. ROGAN.
Puddling and Boiling Furnace.

No. 223,610.

Patented Jan. 13, 1880.

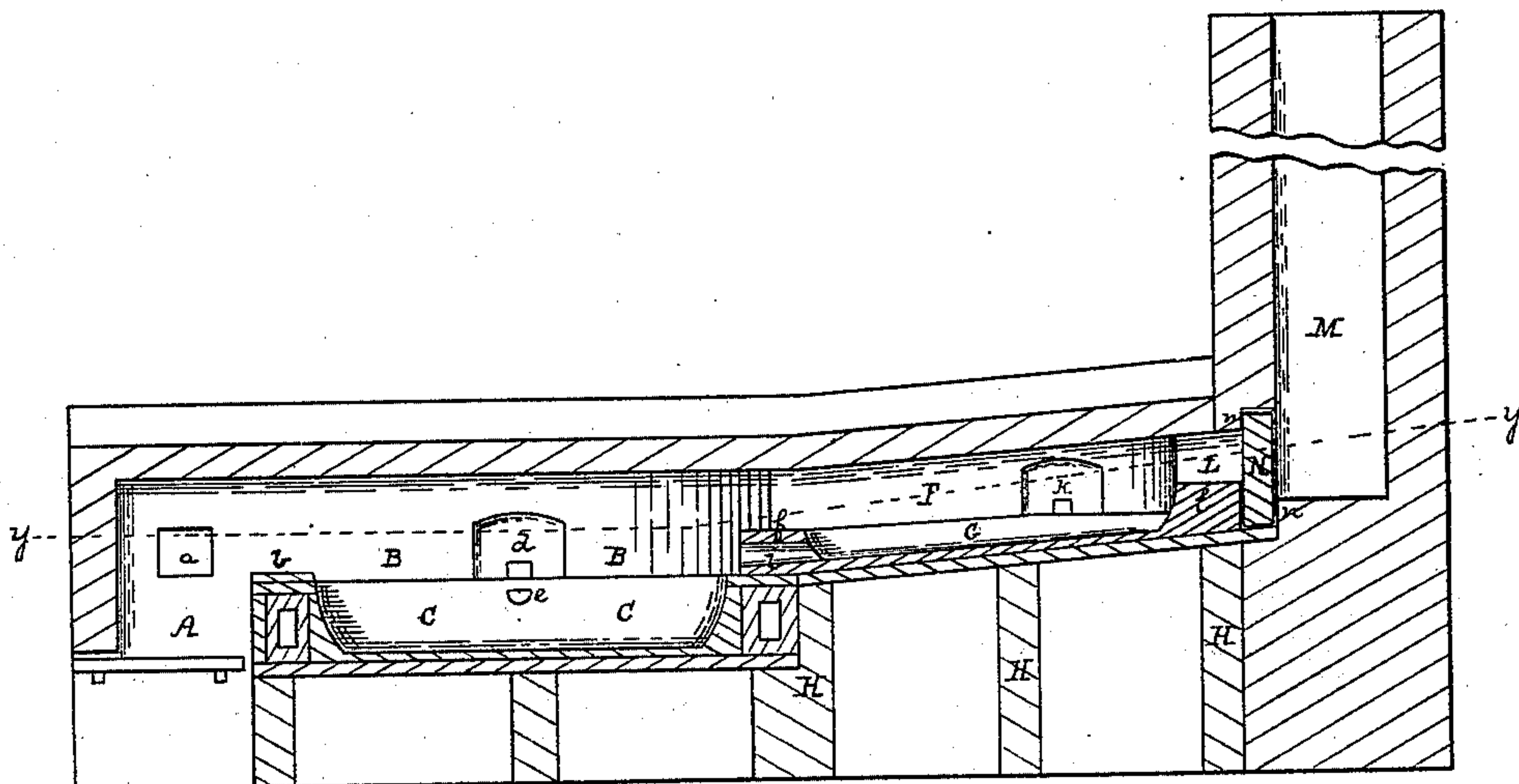


Fig. 1.

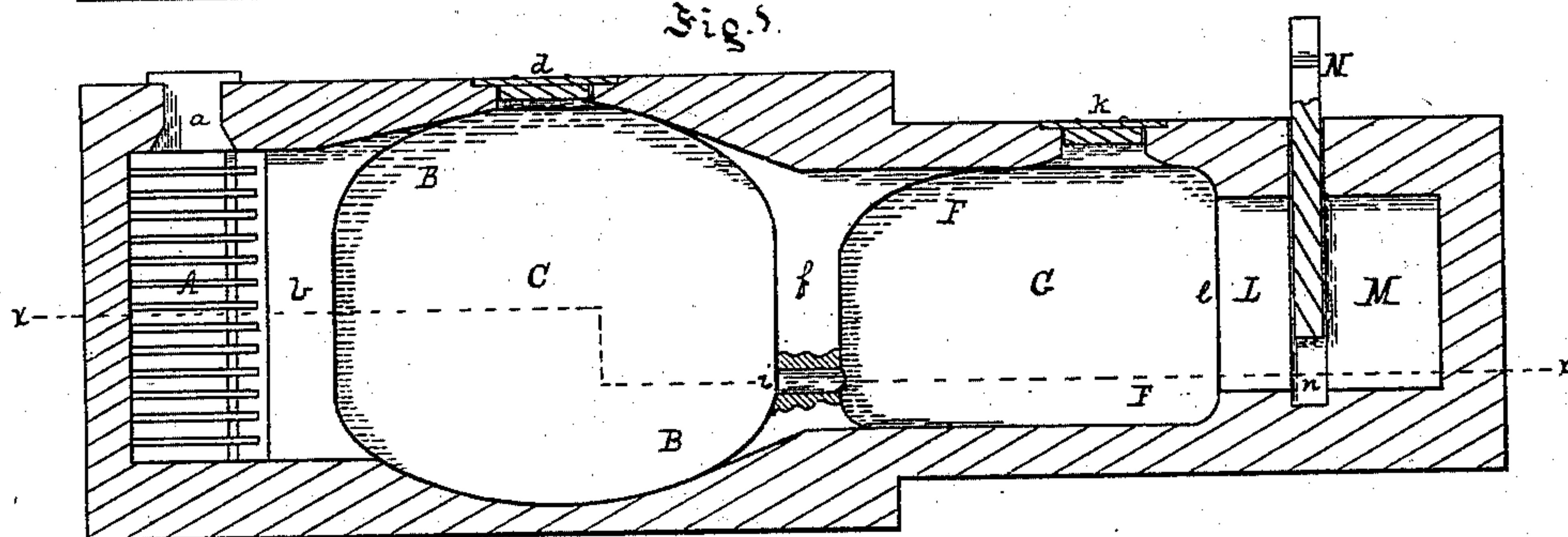


Fig. 2.

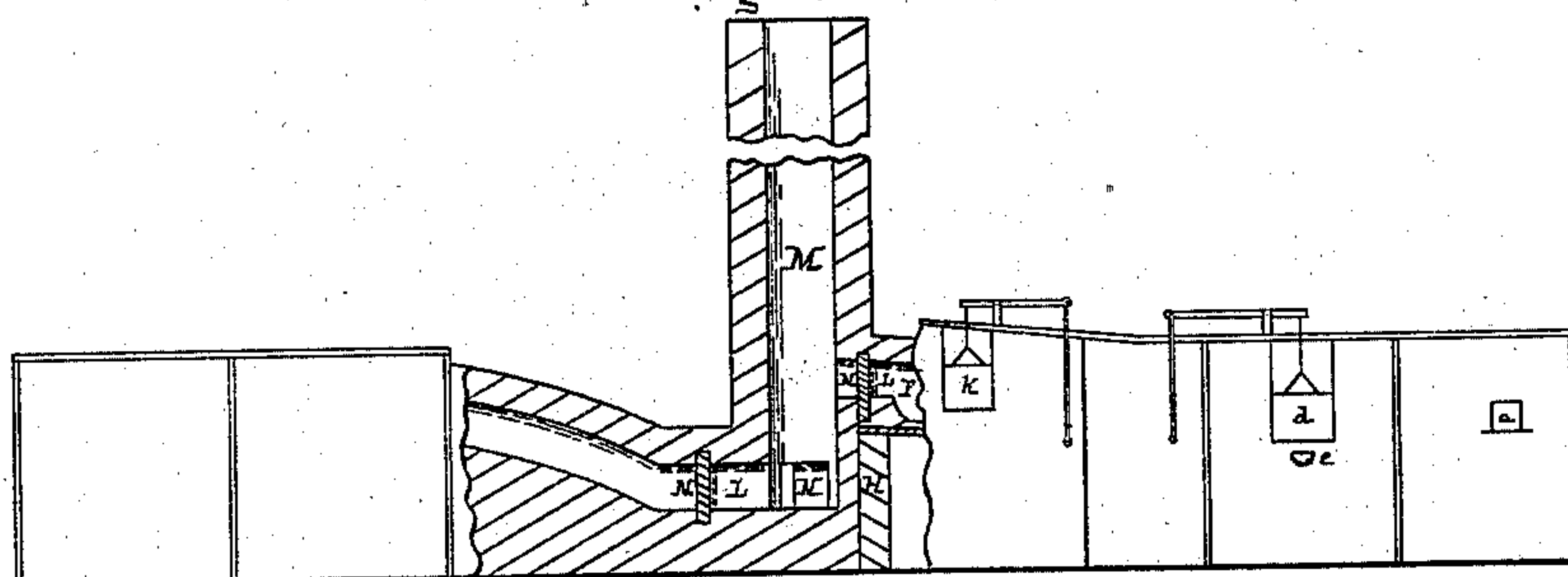


Fig. 3.

Witnesses

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BERNARD ROGAN, OF PITTSBURG, PENNSYLVANIA.

PUDDLING AND BOILING FURNACE.

SPECIFICATION forming part of Letters Patent No. 223,610, dated January 13, 1880.

Application filed April 5, 1879.

To all whom it may concern :

Be it known that I, BERNARD ROGAN, of
Pittsburg, in the county of Allegheny and
State of Pennsylvania, have invented a new
5 and useful Improvement in Puddling and Boil-
ing Furnaces; and I do hereby declare the fol-
lowing to be a full, clear, and exact descrip-
tion thereof, reference being had to the accom-
panying drawings, forming a part of this speci-
10 fication, in which—

Figure 1 is a vertical longitudinal section
on the line *x x*, Fig. 2. Fig. 2 is a horizontal
section on the line *y y*, Fig. 1; and Fig. 3 is a
side view, partly broken away.

15 Like letters of reference indicate like parts
in each.

My invention relates to certain improvements
in furnaces for decarburizing and purifying
cast or pig iron to form it into wrought-iron or
20 malleable iron, generally termed "reverbera-
tory or puddling furnaces." Heretofore these
furnaces have generally been made with a pud-
dling-chamber, in which the pig metal was first
melted and then boiled or puddled, to convert
25 it into wrought-iron, and with a flue leading
downwardly to the stack, the back of the down-
wardly-inclined flue serving to reflect back the
heat into the puddling-chamber. After one heat
was made the metal for the next heat was placed
30 in the puddling-chamber, and about half an
hour was consumed in melting it before it was
ready for puddling. Different constructions
of furnaces have been tried for the purpose of
saving this time consumed in melting the
35 metal, so that the operation of puddling would
be practically continuous. The object of my
invention is to improve the construction of
puddling-furnaces to accomplish this result.

It consists in a puddling-furnace provided
40 with an auxiliary melting-chamber for melting
the pig metal before it is conducted to the pud-
dling-chamber, said chamber being placed in
the neck of the furnace, and separated from
the puddling-chamber by a wall, through which
45 is formed a tapping-hole for conducting the
melted metal from the melting into the pud-
dling chamber, and being raised above and
upwardly inclined from the puddling-chamber
to the stack, and with a sliding damper placed
50 between this auxiliary melting-chamber and

the stack, by which the heat of the furnace is
controlled, and which reflects the heat back
into the melting-chamber and adds greatly to
its heat.

To enable others skilled in the art to make 55
and use my invention, I will describe its con-
struction and operation.

In the drawings, A is the grate or fire cham-
ber of the furnace, which may be of any de-
sired construction, being provided with the 60
usual feed or fire hole *a*. B is the main or pud-
dling chamber, which is separated from the
grate by the fire-bridge *b*.

The bed C of the puddling-chamber may be
formed of plates of cast-iron, and surrounded 65
with water or air tubes, or any other suitable
means for cooling and protecting the metal
from the heat of the furnace, and is covered
with a suitable fix or lining. The main cham-
ber is provided with the working-door *d* and 70
tap-hole *e*. These parts may be of the usual
or any known construction of puddling-fur-
naces, and it is not necessary to describe them
further.

Between the puddling-chamber and stack, 75
in the place usually occupied by the neck, I
form an auxiliary chamber, F, for melting the
iron preparatory to puddling. This chamber
F is raised above the puddling-chamber, and
is upwardly inclined at a slight angle to 80
ward the stack, so that a much stronger draft
is obtained through the melting-chamber than
in the downward or horizontal flue usual in
puddling-furnaces, the chamber F terminat-
ing in the flue L, which is built at about the 85
same upward inclination, so that it will in no
way impede the draft. The bed G of this
chamber is formed of one or more plates of cast-
iron supported on suitable pillars H, and is
raised above the bed of the main chamber, and 90
upwardly inclined at a slight angle toward the
stack, so that the melted metal will flow from
the melting into the puddling chamber. It is
covered with a suitable fix or lining to protect
it from the heat. The sides of the melting- 95
chamber are drawn together, so as to make it
narrower, and the chamber is made shallower
than the puddling-chamber, so that the heat
and blaze, in passing through the chamber
upwardly toward the stack, will be drawn to- 100

gether and thrown against the pig metal to be melted, generating a much greater heat and melting the metal more rapidly than in the downwardly-inclined or horizontal flues.

5 Between the two chambers B and F is built a suitable bridge or wall, *f*, through which water or air pipes for cooling it may be carried, if desired; and at a suitable point in this wall is formed the tapping-hole *i*, through
10 which the melted metal flows from the melting-chamber. This tapping-hole is closed by a ball of fix while the metal is being melted, which can be removed by the poker when the main chamber is to be
15 charged. On one side of the melting-chamber is formed a door, *k*, for charging it with metal, and working the metal when melting. At the end of the chamber F is a fire-bridge, *l*, leading to the flue L, above referred to.

20 The furnace-stack M is built of fire-brick, and, if desired, incased with iron to strengthen it. At the base of the stack, next to the chamber F, is placed the damper N, working in suitable guides *n*. This damper is faced with
25 fire-brick to protect it from the heat, and slides back and forth in the guides across the flue L, so that the flue may be entirely closed or left as far open as desired in regulating the heat of the furnace. By the use of this damper
30 N in the flue between the melting-chamber and stack the heat of the furnace can be regulated without the damper at the top, and when the damper is partially closed it adds greatly to the heat of the melting-chamber
35 by reflecting back the heat in the same manner as the downwardly-inclined flue usual in puddling-furnaces.

The mode of operation of my improved furnace is as follows: The iron is puddled or
40 boiled in the main chamber B in the usual way of carrying on said operation, the heat and flame passing up over the fire-bridge and purifying the iron, the usual flux being thrown in during the operation. In the usual construction of furnaces about half an hour has
45 been consumed in melting the pig metal before the decarburizing process commenced. To save this time, during the puddling of one heat I charge the melting-chamber F with
50 the pig metal or blooms forming the next heat through the working-door *k*, having previously closed the tapping-hole *i* with fix. The heat and flame passing from the main chamber B over the wall *f* on its way through the chamber
55 F to the stack are drawn together by the walls

of the narrow chamber, and thrown against the metal by the low roof, generating a high heat, amply sufficient to melt the metal, the heat being greatly increased by the strong draft obtained through the upwardly-inclined chamber. 60 The metal is gradually melted, the pigs and blooms being worked into the line of draft and heat by the puddler or helper, and the whole charge stirred and worked by him until brought to a perfectly fluid state, and gathering at the base of the chamber near the bridge-wall *f*. As soon as the heat then being worked by the puddler has been removed from the main chamber and the bed prepared for the next charge the fix is removed from 70 the tapping-hole *i* in the bridge-wall *f* by the poker, and the melted metal forming the charge flows from the melting-chamber into the puddling-chamber, the entire charge being emptied from the upwardly-inclined bed 75 G. The puddling or boiling process is then proceeded with in the main chamber without waiting for the melting of the metal, saving at least half an hour during each heat, and the melting-chamber is charged at the 80 proper time with the metal for the next heat.

During the puddling process the heat of the furnace is regulated by the damper N across the flue L. By this damper the furnace can be controlled as accurately as by means of 85 the damper at the top of the stack, and with less labor to the workman.

When the damper is partially closed the heat is reflected back from it into the melting-chamber in the same manner as from the back 90 wall of the downward flue of a puddling-furnace, and greatly intensifies the heat in that chamber.

What I claim as my invention, and desire to secure by Letters Patent, is— 95

In a puddling-furnace, the combination of the puddling-chamber B, the melting-chamber F in the neck of the furnace, between the puddling-chamber and stack, raised above the puddling-chamber and upwardly-inclined 100 toward the stack, and the damper N, placed between the melting-chamber and stack, and sliding in suitable guides *n*, substantially as and for the purposes set forth.

In testimony whereof I, the said BERNARD 105 ROGAN, have hereunto set my hand.

BERNARD ROGAN.

Witnesses:

T. G. KAY,
JAMES I. KAY.