

(No Model.)

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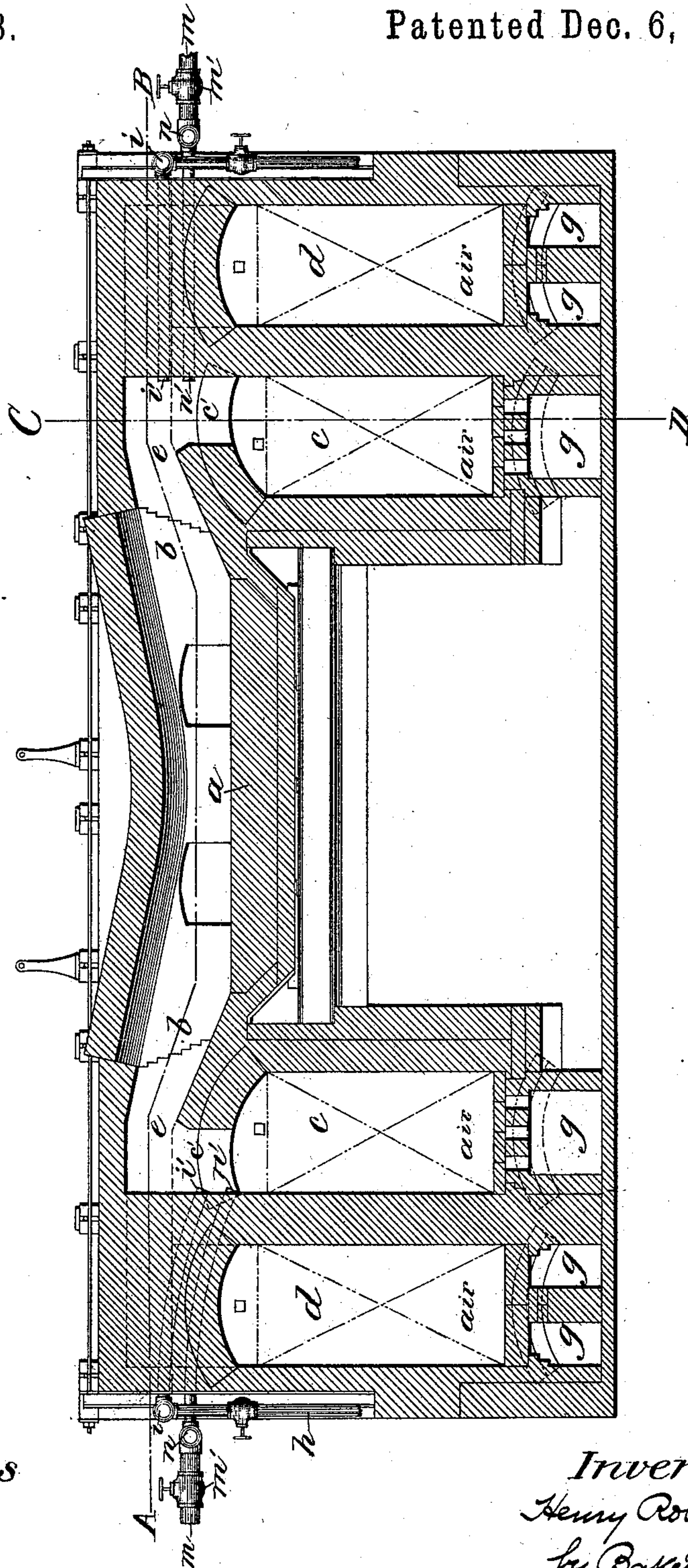
H. ROBERTS.

REHEATING IRON AND STEEL.

No. 374,558.

Patented Dec. 6, 1887.

Fig. 1.



Witnesses
H. L. Gill.
N. B. Corwin

Inventor.
Henry Roberts
by Baskett & Kern
his Attys

(No Model.)

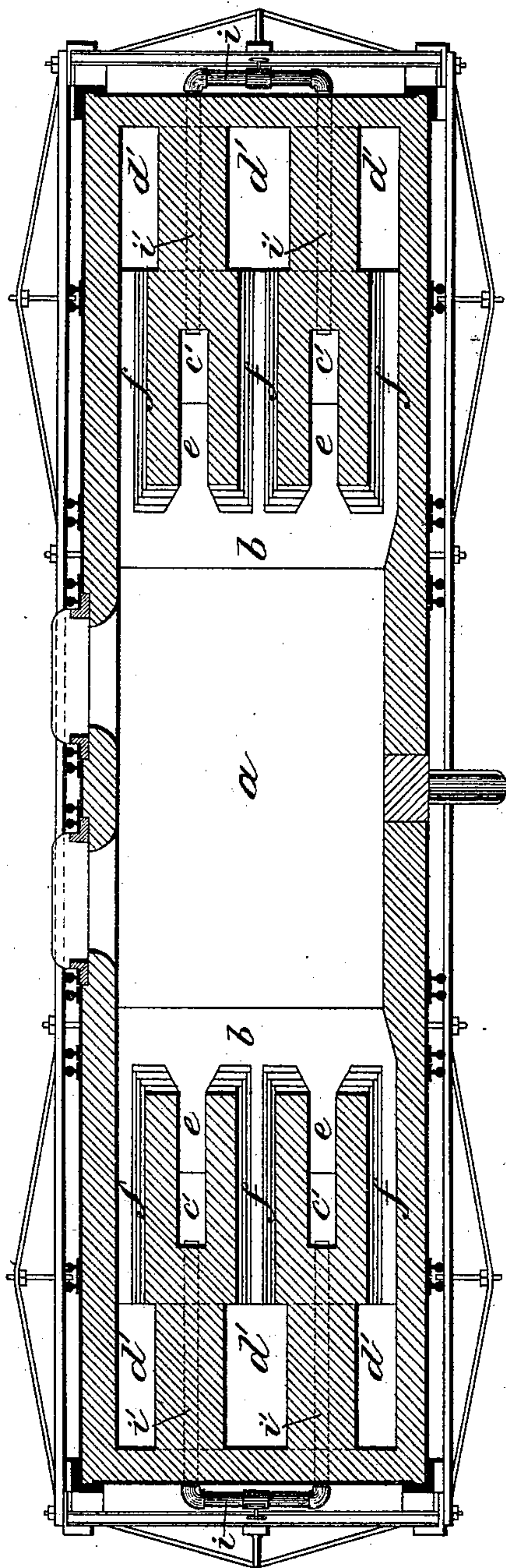
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Fig. 2.



Witnesses.

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(No Model.)

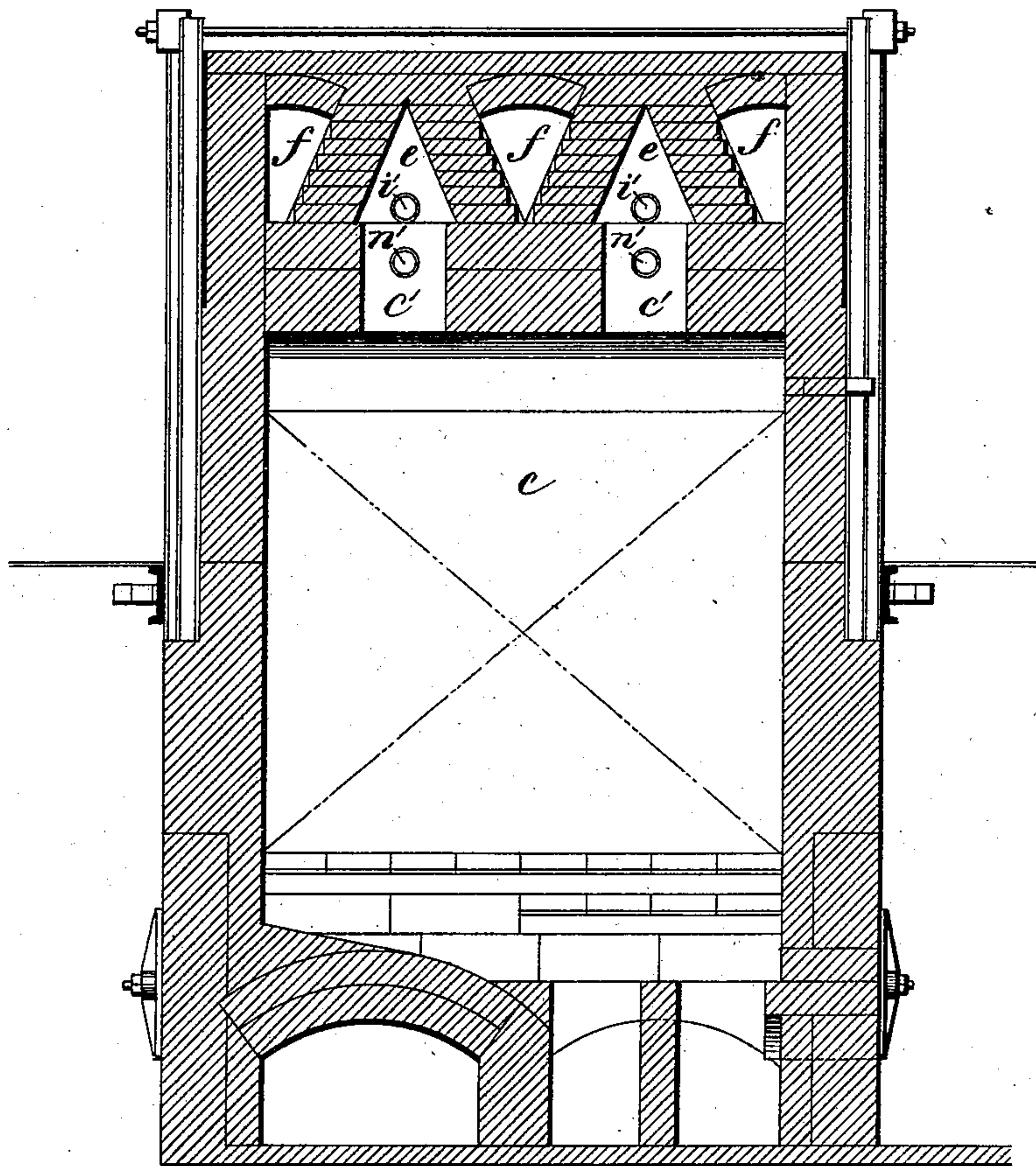
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Fig. 3.



Witnesses.

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Henry Roberts

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UNITED STATES PATENT OFFICE.

HENRY ROBERTS, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR OF ONE-HALF
TO GEORGE T. OLIVER, OF SAME PLACE.

REHEATING IRON AND STEEL.

SPECIFICATION forming part of Letters Patent No. 374,558, dated December 6, 1887.

Application filed June 23, 1886. Serial No. 205,961. (No model.)

To all whom it may concern:

Be it known that I, HENRY ROBERTS, of
Pittsburg, in the county of Allegheny and
State of Pennsylvania, have invented a new
5 and useful Improvement in Reheating Iron
and Steel; and I do hereby declare the follow-
ing to be a full, clear, and exact description
thereof.

In the process of reheating iron as heretofore
10 commonly practiced a considerable portion of
the iron—say about eight to ten per cent—has
been converted into mill cinder by oxidation,
and thus lost.

In heating-furnaces, using gas as fuel, where
15 an excess of air should be commingled with
the gas to produce the best combustion, the
excess of oxygen makes a cutting flame which
quickly attacks and oxidizes the iron, and if
it be attempted to avoid this by lessening the
20 air-supply the gas is imperfectly consumed
and much heat is lost.

The object of my invention is to obviate
this evil and to improve the reheating process
by preventing oxidation, and thereby to lessen
25 the waste and to cheapen the cost of produc-
tion.

It consists in introducing into the bed of the
furnace with the gas and air of combustion a
supply of steam, which, while it permits com-
30 bustion of the gas, so protects the iron in the
working-chamber as to prevent to a large de-
gree the oxidizing influence of the flame there-
on. By practical experience I have found
that the amount of cinder produced is, by the
35 presence of steam, reduced about seventy per
cent. The production of the furnace is corre-
spondingly augmented.

To illustrate my invention I show in the ac-
companying drawings views of a regenerative
40 gas-furnace patented to William Swindell on
January 12, 1886, to which my invention is
applicable. I premise, however, that I do not
limit the scope of my invention to its applica-
tion to this or any other particular kind of
45 heating-furnace, since by proper modifica-
tions, such as will suggest themselves to those
skilled in the art, the invention may be used
with other forms of heating-furnaces using
gaseous fuel.

50 In the drawings, Figure 1 is a vertical
longitudinal section of the furnace. Fig. 2 is

a horizontal section on the line A B of Fig. 1.
Fig. 3 is a vertical transverse section on the
line C D of Fig. 1.

Like letters of reference indicate like parts 55
in each.

The furnace has a bed, *a*, neck or bridge flues
b, double regenerator or air-heating chambers
c d on each side, flues or ports *e*, extending
between the bridge-flues *b* and the upper ends 60
of the regenerator-chambers *c*, and flues or
ports *f*, extending between the bridge-flues *b*
and the upper ends of the regenerator-cham-
bers *d*. The regenerator-chambers *c d* are de-
signed to be filled with checker-work, and are 65
connected with the air-inlet pipes and with
the stack by means of the flues or conduits *g*
in the usual manner of reversible regenerator-
furnaces. The waste heat and gases from the
bed pass for a while through one pair of cham- 70
bers to the stack, heating up the checker-work
therein, while the air passes in through the
other pair of regenerators. From time to time
the course of the currents is reversed, so that
the air may be caused to pass through the 75
heated chambers. This reversal is effected by
means of reversing-valves, which are placed
at the junction of the flues *g* with the air-inlet
and stack flues.

As the construction and arrangement of the 80
reversing-valves and of the air-inlet and stack
flues are the same as in ordinary reversing re-
generator-furnaces and are well known, I will
not describe them.

At each end of the furnace is a main gas- 85
pipe, *h*, controlled by a valve, *h'*, and termi-
nating in a distributing-pipe, *i*, which has any
desired number of branch pipes *i'*, said branch
pipes extending through the walls and termi-
nating at the rear side of the vertical ports *c'*, 90
which lead up from the chambers *c* to the flues
e. The walls through which the branch pipes
i' extend are situate between the vertical
ports *d'*, by which the regenerator-chambers
d communicate with the outer ends of the 95
flues *f*.

At each end of the furnace there is a main
steam-supply pipe, *m*, controlled by a valve,
m', and terminating in a distributing-pipe, *n*,
which has any desired number of branch pipes 100
n', which extend beside the branch gas-pipes
and terminate a little below the latter. As

thus constructed, the gas and steam when discharged from the pipes *n'* and *i'* mix with the hot air from the regenerator-chambers *c* and *d* and all together pass to the bed *a*, the gas
 5 meanwhile uniting and burning with the air and the steam mingling with the burning and consumed products to form a non-oxidizing bath for the iron on the bed. By means of the valves *m'* the quantity of steam supplied may
 10 be nicely regulated. This will of course depend on the amounts and the relative proportions of gas and air used in the furnace; but in any case it will be easy to fix the valve to supply an amount of steam which will permit
 15 a sufficient quantity of air to be used to consume the gas, but will neutralize the oxidizing influence of the air on the heated iron.

In addition to the advantage in the saving of iron, my improvement also produces a better article. For instance, in the manufacture
 20 of wire rods, for which I have it in daily practical operation, the rod comes from the mill in a bright and polished condition, there being little, if any, black oxide on any portion
 25 of its surface. It is necessary before drawing the wire rods down into wire to put them in an acid bath for the purpose of cleaning or removing the oxide from them. Ordinary wire rods have considerable scale upon their sur-
 30 faces and require to remain in a strong bath for a considerable length of time. The rods made from billets heated in accordance with this invention, being almost if not entirely free from scale, require but a short immersion
 35 in a weak acid solution, and the result is that

a saving of time and acid is effected. Moreover, stronger, smoother, better wire is produced from the rods, because often in former rods pieces of scale would extend into the body of the rod, so that when the rod was
 40 cleaned a weak or defective spot would be found, which, when the wire was drawn out, caused it either to break at once or produce a defect in the wire.

I am aware that steam has been extensively
 45 used in the treatment of iron and steel for various purposes—for example, to promote the combustion of the furnace, to oxidize the iron, to oxidize the impurities of iron, and in combination with other gases and reagents for
 50 similar purposes; but steam has never before been introduced into a gas-furnace in the process of reheating iron or steel in such way as to reduce its oxidation. I therefore do not
 55 claim the use of steam generally, and I disclaim the process described in the following Letters Patent: Nos. 88,084, 143,543, 132,456, 182,457, 273,799, and 284,551.

I claim—

As an improvement in the art of reheating
 60 iron and steel, reheating the iron or steel in a gas-furnace in the presence of steam, so as to form a non-oxidizing bath, substantially as and for the purpose specified.

In testimony whereof I have hereunto set
 65 my hand this 21st day of June, A. D. 1886.

HENRY ROBERTS.

Witnesses:

W. B. CORWIN,
 THOMAS B. KERR.