4 Sheets-
Sheet 1.

C. E. Detmold.

Furnace.

No. 3176

Patented July 15, 1843.

Horizontal Section of Puddling Furnace

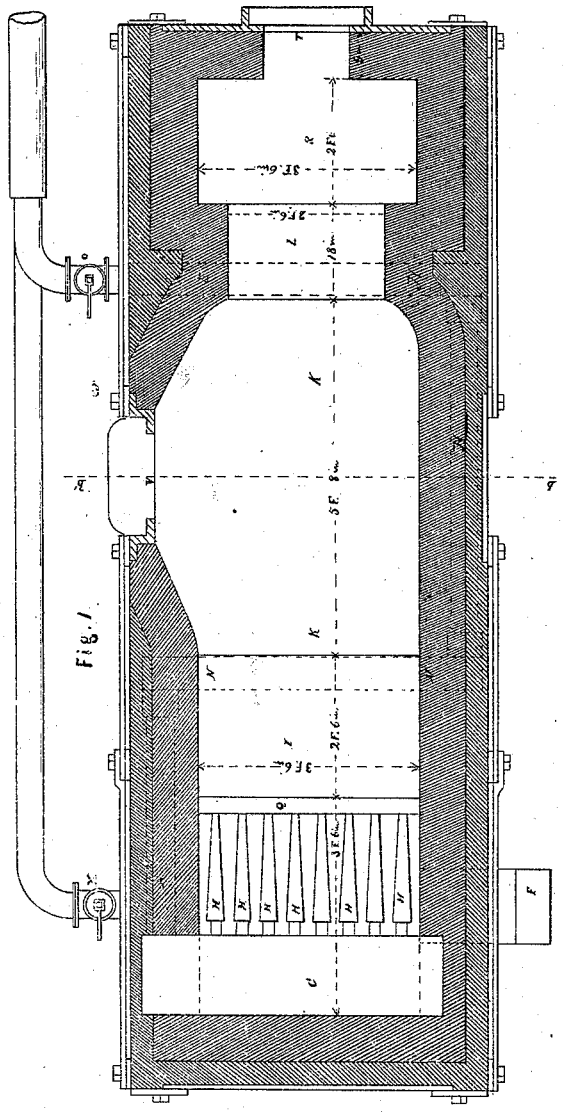
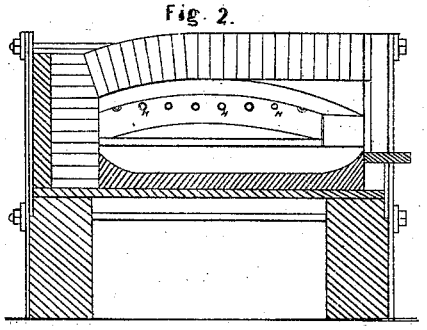


Fig. 1.

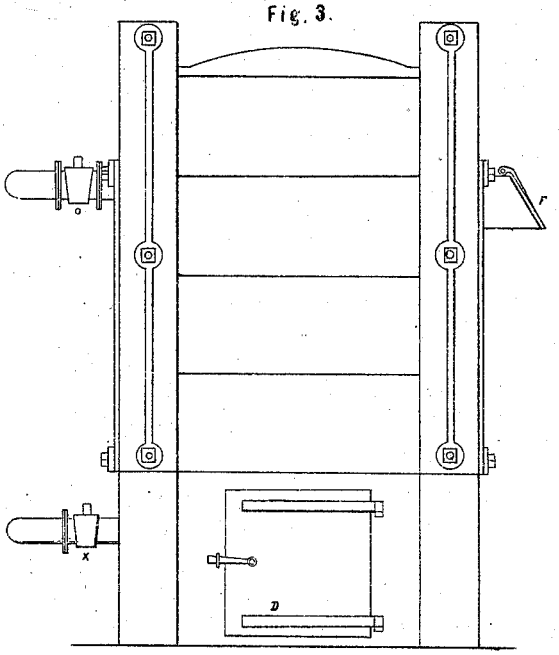
Vertical cross section on line t.t.

Fig. 2.



End View

Fig. 3.



Witnesses:

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H. C. Moore

Inventor

C. E. Detmold

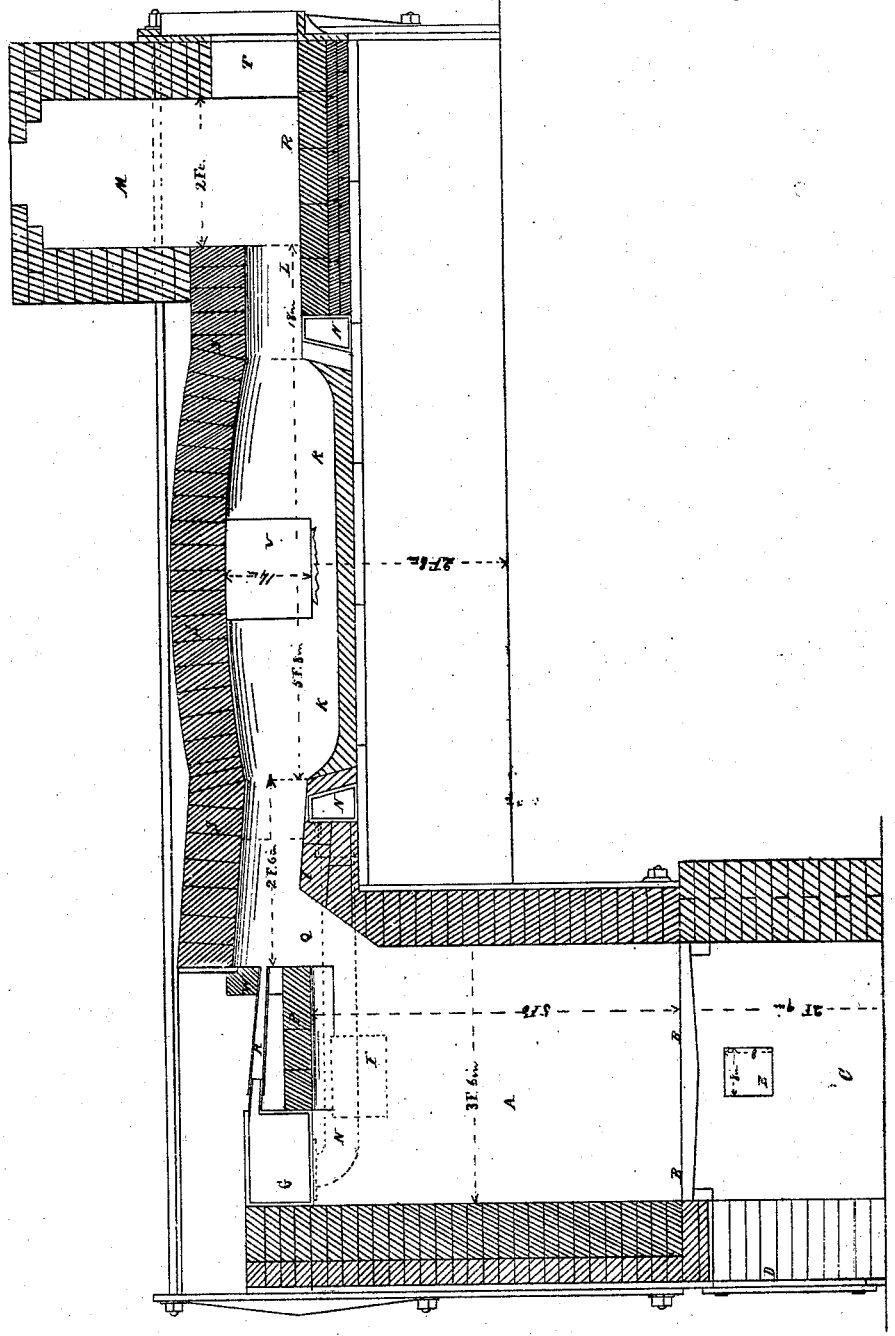
4 Sheets.
Sheet. 2.

C. E. Detmold

Furnace.

No. 3176

Patented July. 15. 1843.



Longitudinal Vertical Section of Puddling Furnace

Witnesses

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4 Sheets.
Sheet 2.

Furnace.

No. 3176

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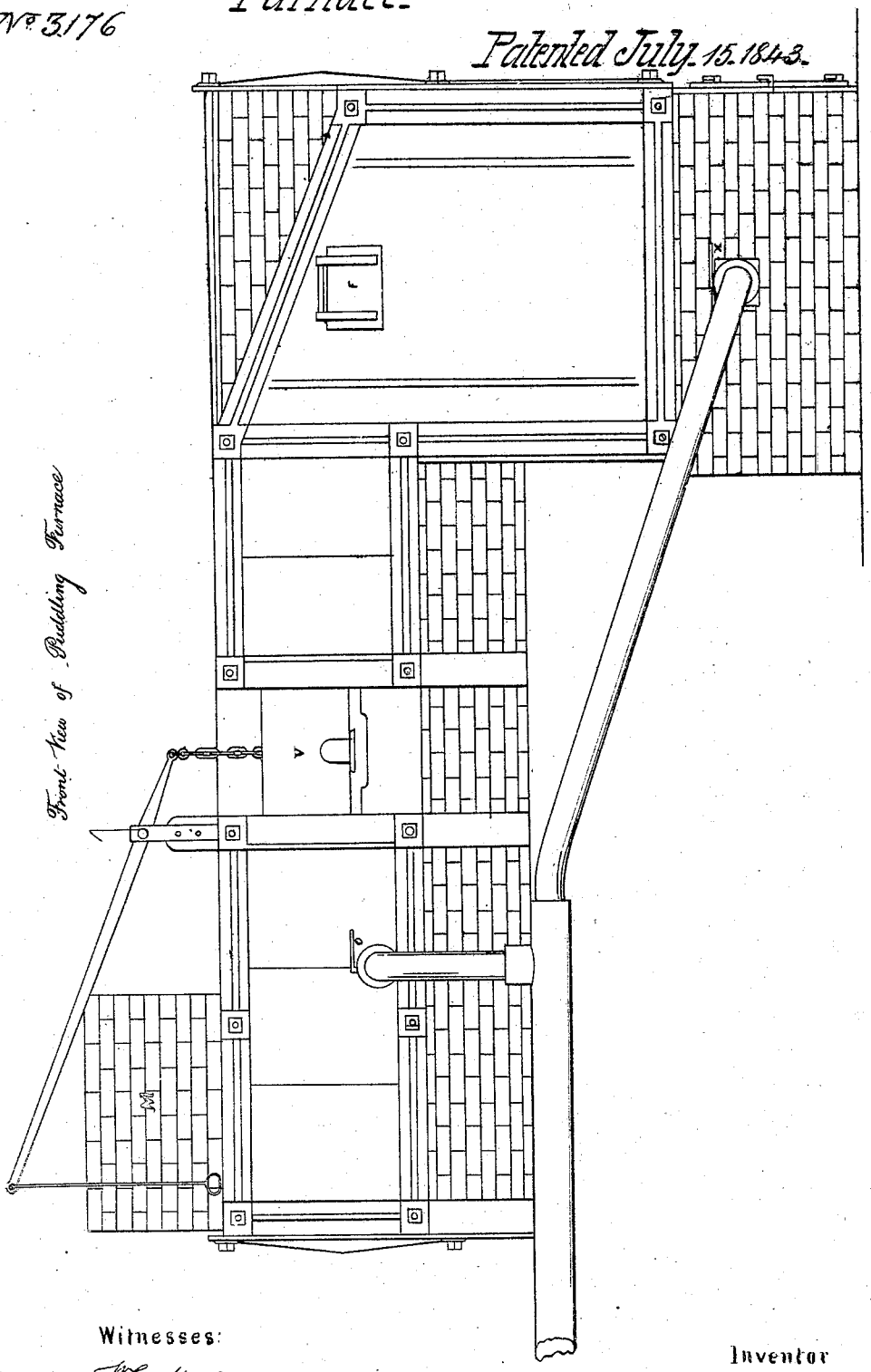

Front View of Puddling Furnace

Witnesses:
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H. C. Moore

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4 Sheets-
Sheet. 4

Furnace.

No 3176

Patented July 15. 1843.

Fig. 1 *Longitudinal Vertical Section*

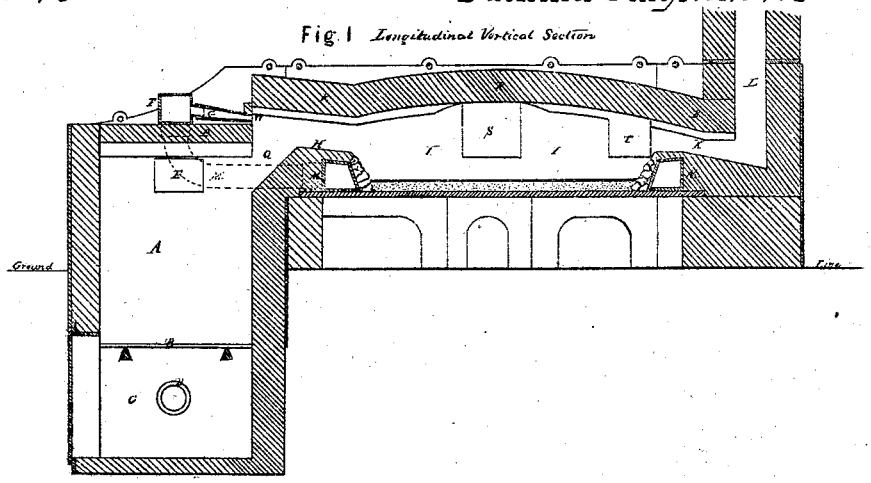
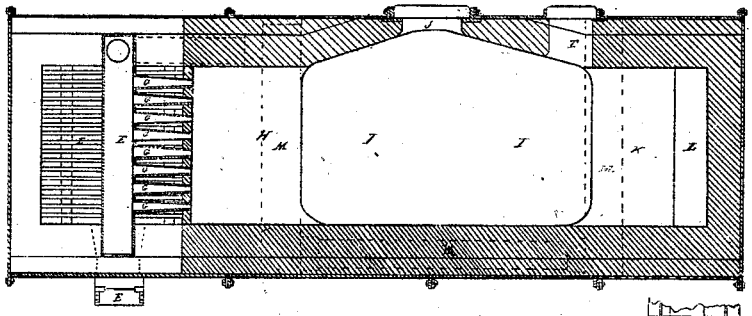
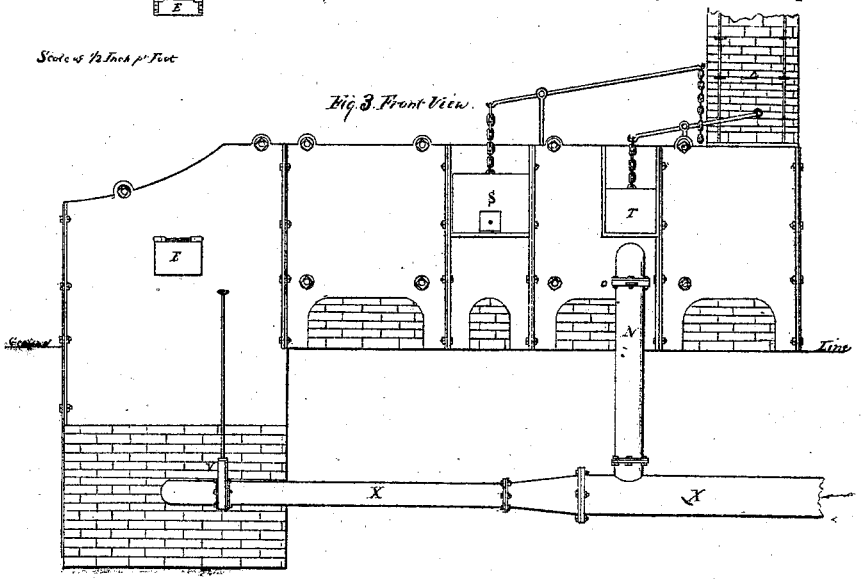


Fig. 2 *Horizontal Section*



Scale of ½ Inch per Foot

Fig. 3. *Front View.*



UNITED STATES PATENT OFFICE.

C. E. DETMOLD, OF NEW YORK, N. Y.

IMPROVEMENT IN THE CONSTRUCTION AND HEATING OF FURNACES FOR ALL KINDS OF METALLURGIC OPERATIONS.

Specification forming part of Letters Patent No. **3,176**, dated July 15, 1843.

To all whom it may concern:

Be it known that I, CHRISTIAN EDWARD DETMOLD, civil engineer of the city of New York, have invented a new and useful Improvement in the Construction and Heating of Furnaces for all Kinds of Metallurgic Operations, and which is applicable also to the heating of steam-boilers, ovens, and to various other purposes requiring a high temperature, of which the following is a full and exact description.

My invention is intended as an improvement on the process of and apparatus for applying the gas from blast and other furnaces to the manufacture of bar-iron, and to other purposes, invented by W. De Faber du Faur, and for which Letters Patent of the United States were granted to me as the assignee of the said De Faber; and it consists in the arrangement and combination of an apparatus for the special purpose of generating combustible gases from any kind of fuel, by the combustion of which gases the furnaces or other structures are to be heated; and of a hot-air chamber, blow-pipes, &c., as hereinafter described.

To explain more fully my improvement and to enable those skilled in the art to use it, I proceed to describe it more particularly as applied to a puddling-furnace for converting cast into malleable iron, it being understood that the same arrangement is applicable to all other kinds of furnaces, ovens, boilers, forges, &c., reference being had to the annexed drawings, in all the figures on which the same letters refer to the same parts throughout.

Plate I, Figure 1, exhibits a plan or horizontal section of a puddling-furnace; Fig. 2, a vertical cross-section; Fig. 3, end view of puddling-furnace; Plate II, longitudinal vertical section; Plate III, front view.

A is a chamber built of fire-brick, which may be about five feet in depth or height and three and one-half feet square, within which the combustible gases are to be generated.

B is the grate, upon which the fuel rests.

C is the ash-pit, which has a door, D, in front, by which it may be closed entirely.

E is an opening in one of the sides of the ash-pit, through which atmospheric air is blown into the ash-pit by means of any ordinary blowing-machine.

F is a charging-door for filling the chamber A with fuel.

G is the hot-air chamber, which is situated on top of the gas-generating chamber A, and from which issues a row of blow-pipes, H H H H H H. As represented, there are six such pipes; but a greater or lesser number may be employed.

I is a fire-bridge, over which the combustible gases and the streams of heated and compressed air become mixed and combustion effected.

K K is the main chamber of the furnace, where the iron is puddled.

L is the flue or throat of the furnace.

M is the chimney or stack, through which the products of the combustible gases finally escape.

N N N N is a cast-iron pipe, either square or round, which is built all around in the walls of the furnace, and connects with the hot-air chamber G. This pipe serves to protect the sides of the furnace; also for the purpose of heating the air, which is forced into it at O, and, passing around through the pipe N N, enters the hot-air chamber G, having become sufficiently heated in its passage to effect the intense combustion of the gases upon the fire-bridge. The air may also be heated by causing it to pass through a coil of pipe in the chimney or in any other convenient way.

O is a valve or cock, by means of which the quantity of hot air to be mixed with the combustible gases is regulated.

P is an arch of fire-brick, which forms in part the top of the gas-generating chamber, but serves chiefly to protect the blow-pipes from the action of the fire. The manner in which I arrange and protect these pipes is of essential importance to the successful application of this apparatus. This manner of arrangement and protection of the blow-pipes consists, in the above-named arch, of fire-brick under them, leaving the pipes themselves entirely exposed to the action of the air, their nozzles or mouths being inserted through a range of fire-brick or fire-clay, as shown at W, which connects the roof S S with the arch P. I have essayed other modes of protecting the blow-pipes from the action of the heat, but have not found any equally efficient with that above described; and upon the due action and

preservation of these pipes it is manifest that the value of this apparatus is in great measure dependent.

Q is the passage through which the combustible gases pass over the fire-bridge into the main chamber K K.

S S S is an arched roof of fire-brick, covering the whole furnace.

R is an oven or forewarming-chamber, in which the pig or cast iron is heated red-hot previous to charging it into the puddling-chamber K K.

T is a door through which the pig-iron is charged into the oven or forewarming-chamber.

V is the working-door of the puddling-chamber.

X is a throttle-valve or cock for regulating the supply of cold air under the ash-pit.

The mode of operating with a furnace of this description is as follows: The gas-generating chamber A is filled with any kind of fuel or carbonaceous substance, which is iguited in the ordinary manner. By means of any blowing-machine air is blown into the ash-pit C through the aperture E, and causes the combustion of the stratum of fuel immediately upon the grate. The combustible gases evolved by the heat, as well as the gas which is formed by the absorption or volatilization of the solid carbon of the fuel by the carbonic-acid gas resulting from the combustion of the lower stratum of fuel upon the grate, by which it is converted into carbonic-oxide gas, are burned upon the fire-bridge by being mixed with a number of continuous streams of highly heated and compressed atmospheric air blown in through the blow-pipes, thus producing a very high degree of temperature in the main chamber of the furnace. The pipes through which the air is forced into the ash-pit for the generating of the combustible gases, as well as into the hot-air chamber for their subsequent combustion, being provided with valves or throttles, the quantity of gas to be generated or the intensity of its combustion can be accurately regulated by admitting a greater or less quantity of air through these valves. As the combustion in furnaces of this kind is produced entirely by means of an artificial blast, no high chimneys are required for creating a draft. I have thus given an exemplification of the manner in which I arrange and combine the respective parts of this apparatus when applied to a puddling-furnace, and from this description any competent engineer will be able to adapt it to other purposes to which it may be desired to apply it, the principle of action remaining unchanged, however the arrangement may be varied.

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

1. The combination of a chamber of combustion for the sole purpose of generating combustible gases, with refinery, puddling, heating, or other furnaces, with those of steam-boilers, ovens, or any other apparatus for generating heat, said combination being made substantially in the manner above described.

2. The particular arrangement and combination of the hot air-chamber, the blow-pipes, the arch of fire-brick, and the range of fire-brick or fire-clay over the gas-generating chamber, by which the blow-pipes are protected from the effects of the heat. I do not claim to have invented the use of combustible gases for the heating of furnaces, in combination with streams of heated and compressed air, nor the application of the blow-pipe to furnaces, this being known as De Faber's invention; but I do claim the above-described manner of arranging and combining the chamber for generating the combustible gases, the hot-air chamber, blow-pipes, and the fire-proof arch for their protection, when applied to any kind of furnace or other apparatus for generating heat.

New York, June 14, 1843.

C. E. DETMOLD. [L. S.]

Witnesses:

W. C. MOORE,

H. C. MOORE.