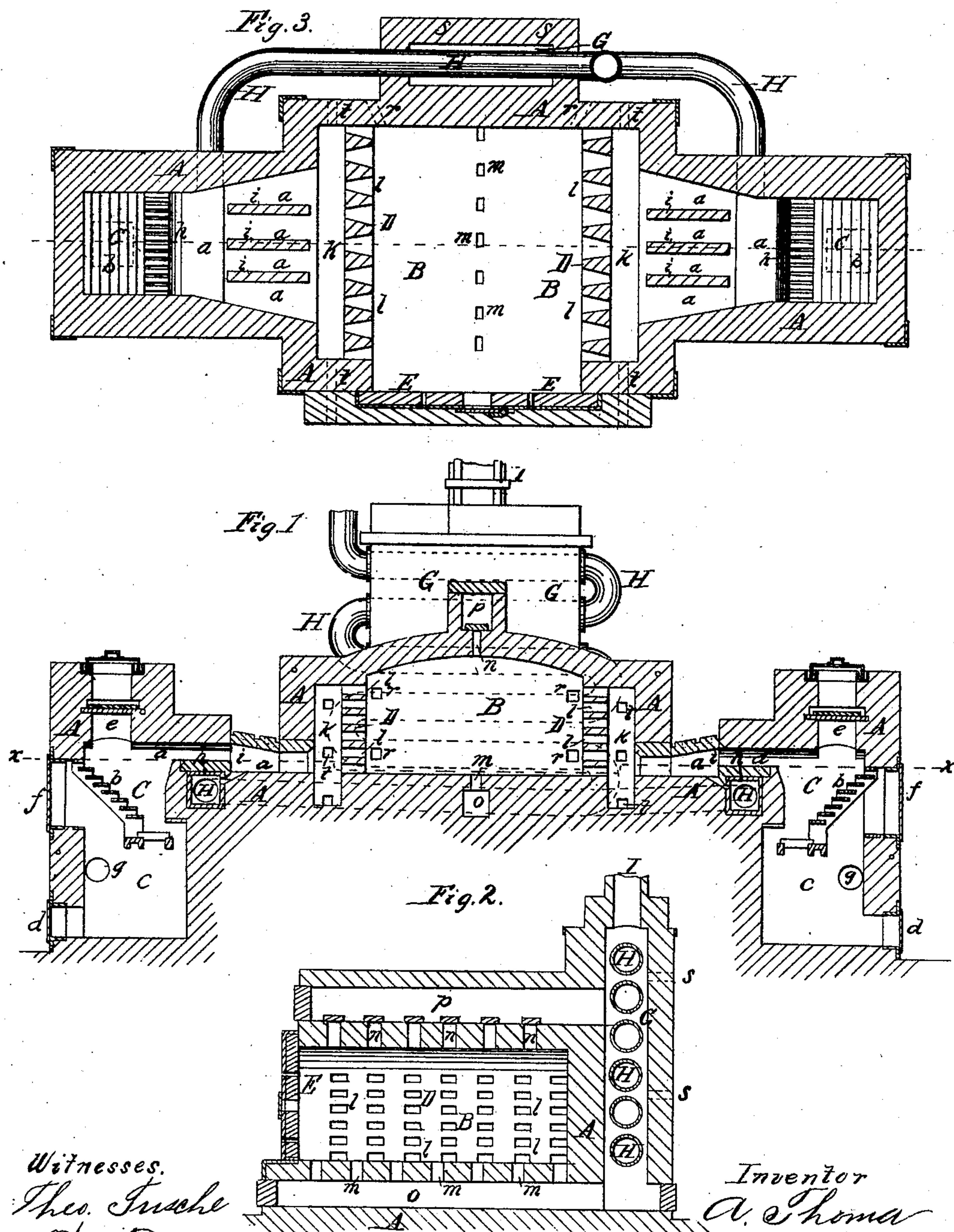


A. THOMA.
FURNACE FOR DECARBONIZING PIG IRON FOR THE PRODUCTION
OF STEEL.

No. 75,078.

Patented Mar. 3, 1868.



Witnesses.
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ALOIS THOMA, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF, S. BROMBERG, AND A. W. WILDER, OF SAME PLACE.

Letters Patent No. 75,078, dated March 3, 1868.

IMPROVED FURNACE FOR DECARBONIZING PIG-IRON FOR THE PRODUCTION OF STEEL.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, ALOIS THOMA, of New York, in the county and State of New York, have invented a new and improved Furnace for Decarbonizing Pig-Iron for the Production of Steel; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

Figure 1 represents a longitudinal vertical section of my invention.

Figure 2 is a vertical cross-section of the same.

Figure 3 is a horizontal sectional view of the same, the plane of section being indicated by the line *xx*, fig. 1.

Similar letters of reference indicate corresponding parts.

This invention relates to a new process of converting ordinary white-iron, or any other suitable kind of pig-iron, into steel of such quality that it may be used for cutting-tools, and for all purposes for which the best quality of steel is required.

This invention consists in creating, by combustion of gases, heated carbonic-acid gas, and by forcing the same against the pig-iron, thereby not only heating the same, but also converting it into steel, without melting it. The heated iron gives up a large portion of its carbon to the carbonic-acid gas, and is thus converted into steel.

By this process, steel of the best quality, and of any suitable kind, for all suitable purposes, even for the best cutting-tools, can be produced from any suitable kind of iron.

Such iron which contains sulphur, phosphorus, or silica, must be freed of the same before it is placed into the decarbonizing-furnace, but it is evident that thereby the iron would lose much of its carbon.

By all the methods now in use, white-iron, having but a small quantity of carbon, cannot be converted into steel, even not by the Bessemer process, and therefore a purification of such impure iron is not admissible. For that reason only the best Swedish or Rhenish iron can be used to produce steel by the Bessemer process, while by the use of my invention the steel can be produced from the common white-iron.

Any suitable kind of fuel may be used for creating the gases.

The operation is so easy and simple that every mechanic or laborer will be able to attend to the furnace, and to keep it in successful operation.

The process is very cheap, and the steel can be produced at a cost which will make it hardly more costly than iron.

The steel can be used for direct operation, or can be molten and cast, and will then be of the finest quality of cast steel.

A represents a furnace, built of brick, or other suitable material. In its interior is formed a chamber, B, of square or other suitable form, with an arched roof, as shown. This furnace communicates by means of channels, *a a*, with two fireplaces, C C, in each of which a suitable grate, *b*, ash-box, *c*, and ash-door, *d*, are arranged.

The fireplaces are arranged at the ends of the furnace, as shown in fig. 1.

The grates may be of suitable construction, and should be adapted to the fuel used, which may be wood, coal of any description, charcoal, or peat, as may be desired.

ee are channels, arranged above the grates through which the fuel is introduced. *ff* are doors in the ends of the furnace, to allow the cleaning of the grates. *gg* are pipes, through which a suitable blast of air is introduced below the grates to supply the fire with oxygen.

hh are chambers, arranged between the channels *a*, and communicating with the said channels, as shown in fig. 1. These chambers receive a blast of heated air, and the same is thus brought into the channels to be mixed with the products of combustion arising from the fire-chambers.

The channels *aa* are widening towards the chamber B, as shown in fig. 3, and their inner ends, that is those ends which are nearest to the said chamber B, are, by narrow partitions *ii*, fig. 3, subdivided into three or more channels. It is of importance to completely burn the gases, and for that purpose the gases, while they are

mixed with the hot-blast from the chambers *h*, by which their combustion is facilitated, should be made to pass through a large chamber which is provided by the interior widening of the channels *a*.

The partitions *ii* are easily heated to white heat as they are not very thick, and thus they aid in quickly burning the gases.

Between the inner ends of the channels and the interior of the chamber *B*, are erected walls *D D*, perforated by a number of comparatively small holes, as shown in figs. 2 and 3, and also in fig. 1. The chambers *K K*, between these walls *D* and the inner ends of the partitions, serve to cool the burnt gas, which, by the burning, has been converted into carbonic-acid gas, and if the gases are too hot, water may be introduced through holes *tt* into the chambers *K*. The gas is spread in the chambers *K*, and enters in equal streams through the holes in the walls *D* into the decarbonizing-chamber *B*.

The iron to be decarbonized is placed into the chamber *B* through suitable doors *E E*, arranged in the sides of the same. The gas entering the chamber *B*, surrounds the iron, and decarbonizes the same, leaves the said chamber through the holes *m* and *n* arranged in the bottom and cover of the chamber *B* respectively, as is clearly shown in fig. 1. Through these holes it is conducted into channels, *o* and *p*, through which it is conducted to a chamber, *G*, arranged on one side of the furnace, as shown in figs. 2 and 3. Through this chamber passes a pipe or pipes, *II II*, in zigzag lines, so as to be thoroughly heated by the gas entering the chamber. These pipes *II* lead to the chamber *h*, and conduct the blast of air to the channels *a*, to facilitate the burning of the gases arising from the fireplaces. Thus, the gas escaping from the decarbonizing-chamber *B*, serves to heat the air which is needed to burn the gas that is to enter the decarbonizing-chamber. From the chamber *G* the gas escapes through a suitable chimney, *I*.

The size of the holes *m* and *n* should be regulated by suitable dampers or otherwise, so that the discharge of the gases may be regulated, it being important that the chamber *B* be always filled equally with carbonic-acid gas.

rr are openings through the sides of the furnace to allow the inspection of the interior of the chamber *B*. *SS* are similar holes in the sides of the chamber *G*.

When operations are to commence, the pig-iron bars are placed into the chamber *B*, and are so piled up therein that air-spaces are left between them. The doors *E* are then closed, and all crevices well closed by any suitable substance. The fires are then kindled, and the furnace is held at an equal temperature, great care being taken that the gases in the channels *a* are completely burned, that is, that the carbonic oxide is completely converted into carbonic-acid gas. Only if the latter rule is carried out, can the decarbonizing process be satisfactorily carried out. If the iron should get too hot, so that it begins to melt together, the gas is cooled by introducing water through the channels *t* into the chambers *K*; thereby water-gas is produced which also has a very good effect upon the decarbonizing process.

When the process is completed, the doors are opened and the steel bars removed. The furnace may then be at once recharged.

The steel thus produced is of the most excellent quality, and of perfectly equal texture. If it is molten it will furnish the best cast steel. Instead of other fuel, the gases discharged from the smelting-ore furnace may be used in the decarbonizing-furnace.

It will be noticed that the iron is at the same time heated and decarbonized by the action of the carbonic-acid gas.

Having thus described my invention, I claim as new, and desire to secure by Letters Patent—

1. The arrangement of the partitions *ii* in the channels *a*, for more thoroughly heating and burning the gases on their passage to the decarbonizing-chamber, as set forth.
2. The perforated walls *D D*, arranged between the ends of the channels *a* and the chamber *B*, to allow the gases to gather in the chambers *K* thus created, and to be cooled therein, as set forth.
3. Conducting the gases from the chamber *B* to a chamber, *G*, through which the pipes *II* are laid, in which air is conducted to the channels *a* to aid the combustion of the gases in said channels, so that by means of the gas discharged from the furnace the air entering the same is heated, as set forth.
4. The channels *a*, partitions *i*, air-chambers *h*, chambers *K*, perforated walls *D*, decarbonizing-chamber *B*, channels *o* and *p*, chamber *G*, and pipes *II*, all arranged as described, in combination with each other, and all operating substantially as and for the purpose herein shown and described.

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Witnesses:

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