A. PONSARD.

REMOVABLE HEARTH METALLURGIC FURNACES.

No. 190,691. Patented May 15, 1877.

Fig. 1.

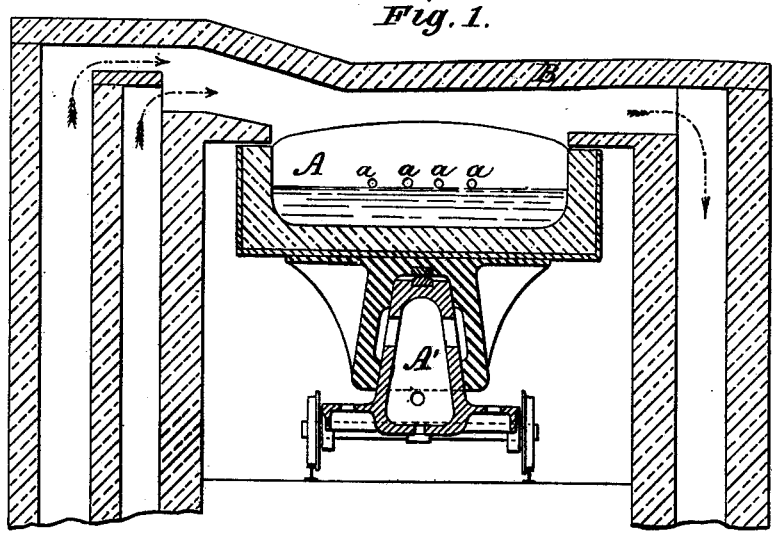


Fig. 3.

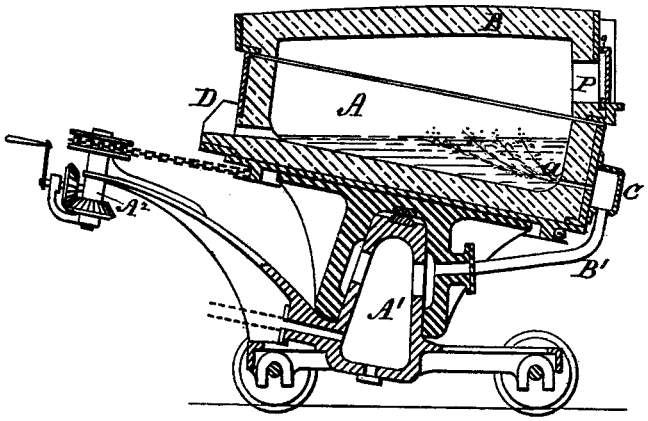
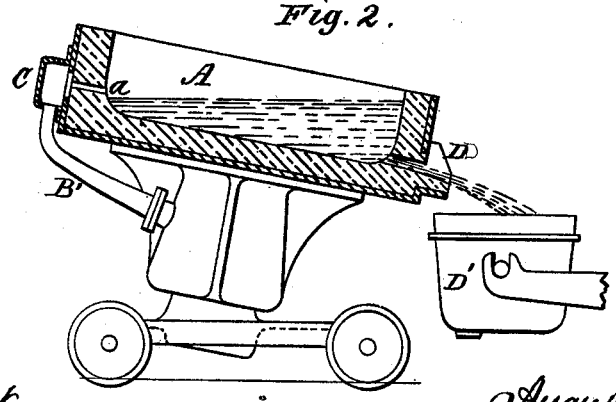


Fig. 2.



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UNITED STATES PATENT OFFICE.

AUGUSTE PONSARD, OF PARIS, FRANCE.

IMPROVEMENT IN REMOVABLE-HEARTH METALLURGIC FURNACES.

Specification forming part of Letters Patent No. **190,691**, dated May 15, 1877; application filed April 18, 1877.

To all whom it may concern:

Be it known that I, AUGUSTE PONSARD, of Paris, in the Republic of France, have invented certain Improvements in Removable-Hearth Metallurgic Furnaces, employed in the manufacture of steel, of which the following is a specification:

The said invention relates to improvements in the manufacture of steel and other metals capable of being cast; and consists, more especially, in the peculiar construction of a converter or apparatus which enables a mixed system of manufacture to be employed combining the advantages resulting in the manufacture of steel by the method known as "Bessemer's process," and by and from the method by reaction.

This apparatus consists of a furnace having a sole or hearth, which is movable and mounted upon an inclined pivotal axis, and is further provided with a series of tuyeres, arranged in such manner at or near the bottom as that a blast of compressed air can be made to pass into and through the fluid metal during the conversion or the treatment of the fused metal, and so arranged as that the tuyeres may be placed above the bath as soon as the blast in the apparatus is stopped.

The process of manufacture employed according to this invention is a mixed process, as previously stated. The melted cast-iron, placed in a furnace with a movable sole, is first submitted to a strong current of air, as in the Bessemer process; then the fluid, kept hot in the furnace, is treated as in the process by reaction—that is to say, the metal is tested and modified by the addition of carbureting or oxidizing substances, as required, and run off when the desired quality is obtained.

The description of furnace employed may consist of a gas-furnace or any other furnace capable of obtaining and sustaining a high temperature—such, for example, as a furnace constructed on the systems known as Ponsard's, Siemen's, or Crampton's, a furnace for burning heavy oils, or a direct-acting furnace with or without a blast; but in all cases it is provided with a movable sole or hearth, pivoting, inclined, and arranged in such a manner that the molten metal may be displaced sufficiently to uncover the tuyeres serving for the blast as soon as the blast of air is arrested in the apparatus.

Figures 1, 2, and 3 of the drawings hereunto annexed illustrate in vertical section a movable pivoting sole or hearth (marked A in the drawings) arranged in an inclined plane and placed under the roof B of a gas-furnace. The gases enter at one end and escape at the opposite end, as indicated by the arrows in Fig. 1.

A current of air supplied by a blowing-engine enters by the pivot A^1 of the hearth, which forms a chamber, and the current is thence conducted by a pipe, B′, placed under the sole or hearth A, into the tuyere-box C. The tuyeres *a a* are arranged at one side, and the tapping-hole D is placed at the opposite side.

By reason of the sole or hearth being inclined all the molten metal becomes accumulated on the side where the tuyeres are situate, as shown in Fig. 3, and in this position the air passing through the metal refines it, as in a Bessemer converter.

When it is considered that the operation is sufficiently advanced the sole A is caused to make half a revolution by the aid of the gearing A^2 or other suitable means, and the fluid-metal flows over to the side at which the tapping-hole D is placed, as shown in Fig. 2. The quality of the metal can then be tested through a man-hole, P, Fig. 3, placed above, as in the ordinary manner. When steel is manufactured on a sole or hearth carbureting or oxidizing substances can be added, and at the desired moment spiegeleisen, ferro-manganese, or other suitable metal, may be introduced, and finally the metal is run off either into a ladle, D′, as from a Bessemer converter, or into a series of molds passing before the tapping-hole.

The cast-iron may be charged either in a fluid state or in a cold condition and melted, and when the cast-iron is melted a portion of scrap may be fused in it, and the refining completed by the blast; or, if desired, cast-iron may be employed alone.

The cast-iron may, as in the Bessemer process, be taken from the blast-furnace, the blowing-engine of which may also be employed for the supply of air or blast by suitably regu-

lating the height of the fluid-metal in the apparatus. The cast-iron may also be placed in the converter when cold, be melted, as in an ordinary reverberatory furnace, and afterward be refined by the blast.

One of the most important features of this system is that it enables all kinds of cast-iron to be treated without distinction—that is to say, that while the cast-iron to be employed in the Bessemer apparatus is required to possess certain qualities which are not suitable for the manufacture of steel on a sole or hearth, such cast-iron may be treated in this appararatus, since the refining is to be effected not by the blast alone, but also by dissolving scrap-iron or other suitable substances in the fluid metal.

Cast-iron which is not suitable for treatment by the Bessemer process—such, for example, as cast-iron deficient in silicon—may also be employed with equal advantage in this apparatus, such cast-iron being heated to the desired point in the furnace before submitting it to the induced current of air or blast. Cast-iron very silicious may also be used by mixing with it a large proportion of scrap-iron.

It should also be observed that in manufacturing steel by the Bessemer process it is difficult to pass into the converter all the bar ends and waste pieces which the manufacture requires, so that the establishment of melting-furnaces becomes a necessary complement to the said process. On the other hand, in the manufacture of steel upon a hearth by reaction, cast-iron can not be treated alone, and it becomes necessary to effect the refining by dissolving a considerable quantity of wrought-iron in the fluid metal—say, about two-thirds or three-fourths of the total weight of the charge, which involves considerable expense.

By means of this invention, however, these two objections are obviated, as it enables all waste and bar ends resulting from the conversion of cast-iron into steel or castings to be dissolved in the fluid-metal, and, moreover, cast-iron may be employed alone.

The facility which this system offers for refining not only admits of all kinds of cast-iron being employed, whether containing manganese or silicon or not, but even impure metal which may be purified by injecting through the tuyere reagents which cannot be efficaciously employed in manufacturing upon a hearth. For example, it is possible to dephosphorize cast metal by producing oxidized scoriæ in as large quantities as may be judged desirable, this system of treatment admitting of substances calculated to recarbonize the metal to the degree required, being introduced into the molten metal, and of the scoriæ formed being discharged by the tap-hole. In like manner iron containing a large proportion of silicon may be employed by dissolving in it when required a large proportion of scrap-iron.

Having now described and particularly ascertained the nature of the said invention, and the manner in which the same is or may be used or carried into effect, I would observe in conclusion that what I consider to be novel, and, therefore, claim as my invention, is as follows:

1. The combination, as described and shown, with a stationary furnace, of a movable sole or hearth capable of revolution upon an inclined pivotal axis, and provided with tuyeres arranged as shown and described, whereby a blast of air, gas, or other matter is admitted either into or over the molten metal according to the position of the said hearth with reference to the axis, substantially as herein shown and set forth.

2. The combination, with a stationary furnace, of a movable hearth or sole, an inclined hollow pivotal axis upon which the hearth is mounted, and may revolve, and blast conveying device, as set forth, the arrangement of the parts being such that the blast of air or gas can be forced into the interior of the converting-chamber through the hollow axis, substantially as shown and set forth.

In testimony whereof I have hereunto signed my name to this specification.

A. PONSARD.

Witnesses:

A. LIGEROT,

J. F. CÉVINE.