

(No Model.)

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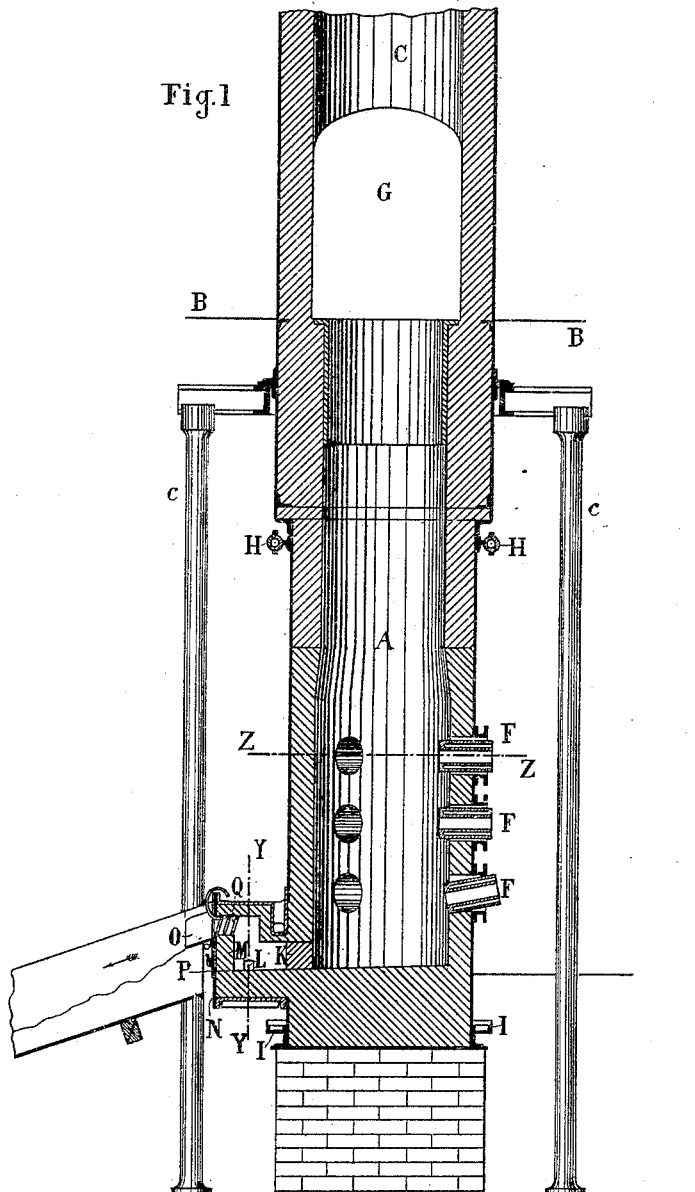
A. P. G. ROLLET, Dec'd.

P. MAURO, Administrator.

APPARATUS FOR THE PURIFICATION OF CAST IRON.

No. 491,508.

Patented Feb. 7, 1893.



Witnesses.

H. L. Gill
C. M. Clarke

Inventor.

Antoine Pierre Guillaume Rollet
by his attorneys
N. P. Bakewell & Sons

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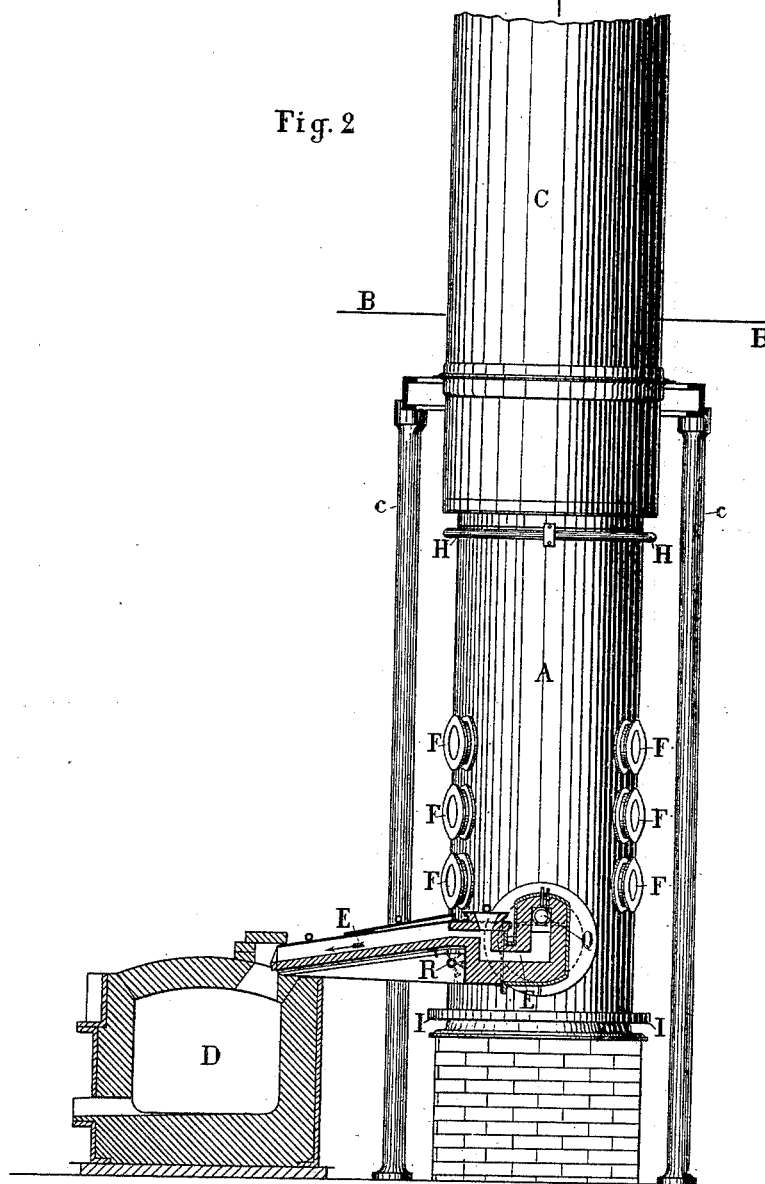
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Fig. 2



Witnesses.

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(No Model.)

3 Sheets—Sheet 3.

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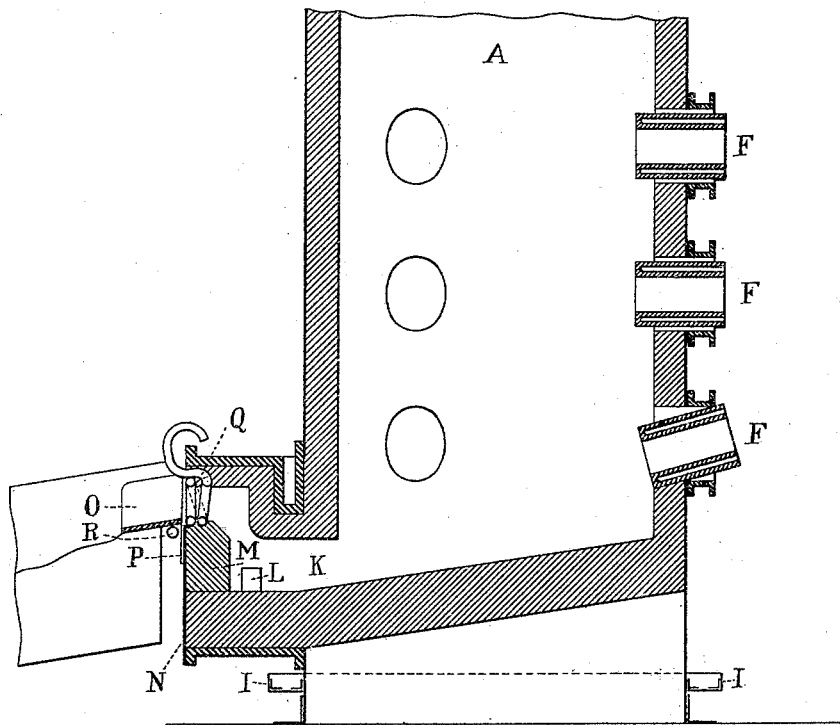
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Fig. 3.



WITNESSES

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INVENTOR

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UNITED STATES PATENT OFFICE.

ANTOINE PIERRE GUILLAUME ROLLET, OF ST. ETIENNE, FRANCE; PHILIP MAURO, OF WASHINGTON, DISTRICT OF COLUMBIA, ADMINISTRATOR OF SAID ROLLET, DECEASED.

APPARATUS FOR THE PURIFICATION OF CAST-IRON.

SPECIFICATION forming part of Letters Patent No. 491,508, dated February 7, 1893.

Application filed August 28, 1889. Serial No. 322,199. (No model.) Patented in France May 10, 1884, No. 162,003; in England October 28, 1884, No. 14,264, and in Germany May 20, 1885, No. 33,386.

To all whom it may concern:

Be it known that I, ANTOINE PIERRE GUILLAUME ROLLET, a citizen of France, residing at St. Etienne, (Loire,) France, have invented certain new and useful Improvements in Apparatus for the Purification of Cast-Iron, (for which I have received Letters Patent in France, No. 162,003, dated May 10, 1884; in England, No. 14,264, dated October 28, 1884, and in Germany, No. 33,386, dated May 20, 1885;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

The object of my invention is to provide suitable apparatus for practicing a process of purification of cast iron, described in another application Serial No. 322,200 for Letters Patent filed herewith, said process involving the treatment at a high temperature, with the aid of carbonaceous fuel and a hot blast, of pig iron with or without the addition of wrought iron scrap, in a neutral medium resulting from the combined action of hot blast, fuel, pig-iron and iron ore in convenient proportions and in the presence of an extra-basic containing but little iron-oxide slag, consisting mainly of lime and fluorspar.

My invention consists in a special construction of a cupola furnace, which is fully represented in the accompanying drawings, in which

Figure 1 is a vertical section on the line $x-x$ of Fig. 2. Fig. 2 is a front elevation partly in section on the line $y-y$ of Fig. 1. Fig. 3 is an enlarged vertical section similar to Fig. 1, showing the details of the slag outlet and metal trough.

Like symbols of reference indicate like parts in each figure.

In the drawings, A is the cupola, the general construction of which is after the usual pattern.

B indicates the position of the elevated stage from which the charge is introduced into the opening G.

C is the chimney supported on four or more columns $c c c$, &c.

H is an annular perforated water pipe, surrounding the cupola at a point above the zone of greatest heat, the purpose of which is to prevent the burning of the sheet metal exterior casing of the furnace. The water which is not evaporated is caught and carried away by an annular gutter I at the base of the cupola.

F F F are tuyeres for the introduction of hot blast in the usual way, and are water-cooled by the ordinary devices for that purpose. These tuyeres are located above the hearth of the furnace in three or more separate tiers, and with any suitable number in each tier as is usual, but their arrangement is peculiar in that the tiers are placed at a greater vertical distance apart than in the ordinary practice, the purpose of which is to extend the depth of the zone of greatest heat on account of the larger proportion of lime and fluorspar to the ton of metal, which is used in my process, so as more effectually to fuse and bring into contact these ingredients which are designed to react on each other, and on the metal under treatment; and another peculiarity of arrangement is that the tuyeres composing the lowest tier have a distinct dip or downward inclination the purpose of which is to prolong the action of the blast on the iron, slag and fuel, until the iron which has been fused and refined together with its slag has been removed from the furnace. This arrangement also avoids too high a carburization of the iron, which otherwise might result from the high temperature employed and the extra basic nature of the slag. The cupola itself is lined in the zone of greatest heat with a thin coating of usual refractory material, which wears away very little, if at all. But after twenty or thirty hours' running, this zone becomes coated with a lining of metallic iron, obviating the necessity of having that portion

of the furnace lined with basic material, the nature of the first coating being thus of no further consequence.

In front of the furnace, at a lower level than the bottom of the hearth of the furnace, is a detached fore-hearth D, constructed of or lined with refractory material. This fore-hearth may be heated in any convenient manner, and is designed to receive and store up the melted metal, which may from time to time be tapped from it. A trough E connects the hearth of the cupola with the fore-hearth, as will be presently described. At the bottom of the hearth of the furnace and below the lowest tier of tuyeres, is the tap-hole K, forming a common exit for the metal and slag, which pass off substantially at the same time, the slag floating on the surface of the metal. Thence the metal free from slag passing by the aperture L ascends in the conduit E, along which it runs into the fore-hearth D. The shape of the passage-way for the metal through the conduit E where it connects with the furnace is shown in Fig. 2. This conduit projecting from the body of the furnace is lined with refractory material, and water-cooled on the outside by pipes R. Above the level at which the metal runs off is a passage O leading off the slag over the dam M outward to the slag trough as shown in Figs. 1 and 3. This dam M is built up of brick cemented with coal tar. Around the opening O, through which the slag discharges, is coiled a pipe Q, through which a current of cold water, from any suitable source, constantly flows. At any suitable point the connections by which this coil is supplied may be flexible, to admit of slight vertical adjustment of the coil in the slag-opening, so that when desirable, the level at which the slag discharges may be varied. This is merely a matter of convenience, and not a part of the invention. The dam M is supported by a movable plate P, which is drawn aside when the dam has to be removed, for putting the cupola out of work. The purpose of all these arrangements is to separate

the metal from the slag as soon as it reaches the bottom of the furnace and gets beyond the reach of the blast. The refined metal flows on one side by a steady continuous run to the fore-hearth D, and the slag flows on the other side, through the hole left inwardly by the coil of the water pipe, in the slag trough. The tapping of the separate fore-hearth D does not interfere at all with the run of the apparatus, and the continuation of the process, which consists of the melting of the pig-iron with or without scrap, its passage through a highly heated neutral medium, resulting from convenient proportions of reducing material like fuel and pig and of oxidizing materials like blast and iron ore, if necessary, in presence of a highly basic slag, composed of lime and fluorspar or equivalent substances, with which the silicon, sulphur and phosphorus unite by chemical reaction resulting in the purification of the metal.

I claim as my invention:—

1. An apparatus for refining and purifying melted pig metal, consisting of a substantially cylindrical receptacle with two or more rows of tuyeres located above the hearth, the lowest row of tuyeres having a dip or inclination inward and downward, while the tuyeres of the other rows are substantially horizontal, and a tap-hole arranged to keep the level of the molten metal below the tuyeres; substantially as and for the purposes described.

2. A cupola furnace, provided with two or more rows of tuyeres located above the hearth, the lowest row of tuyeres being inclined inwardly and downwardly, and a single tap hole arranged to keep the level of the molten metal below the tuyeres; substantially as and for the purposes described.

In testimony whereof I affix my signature in presence of two witnesses.

ANTOINE PIERRE GUILLAUME ROLLET.

Witnesses:

G. DE MESTRAL,
R. J. PRESTON.