(No Model.) 3 Sheets—Sheet 1.

C. LÉVÊQUE.

PORTABLE REFINING AND OXIDIZING APPARATUS.

No. 290,075. Patented Dec. 11, 1883.

Fig 1.

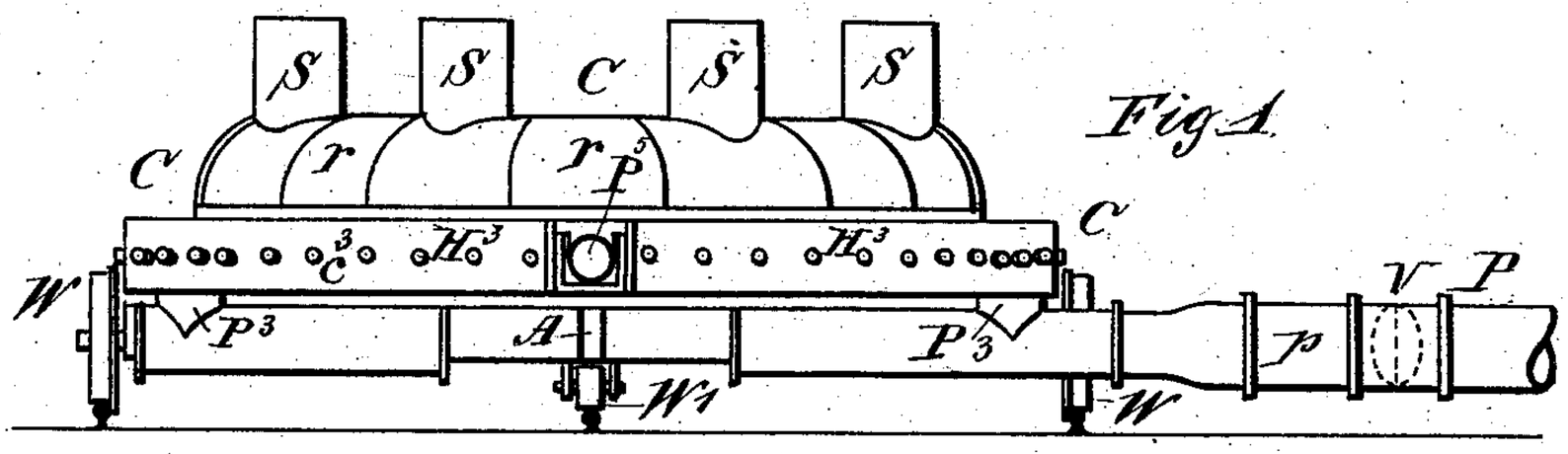


Fig 2.

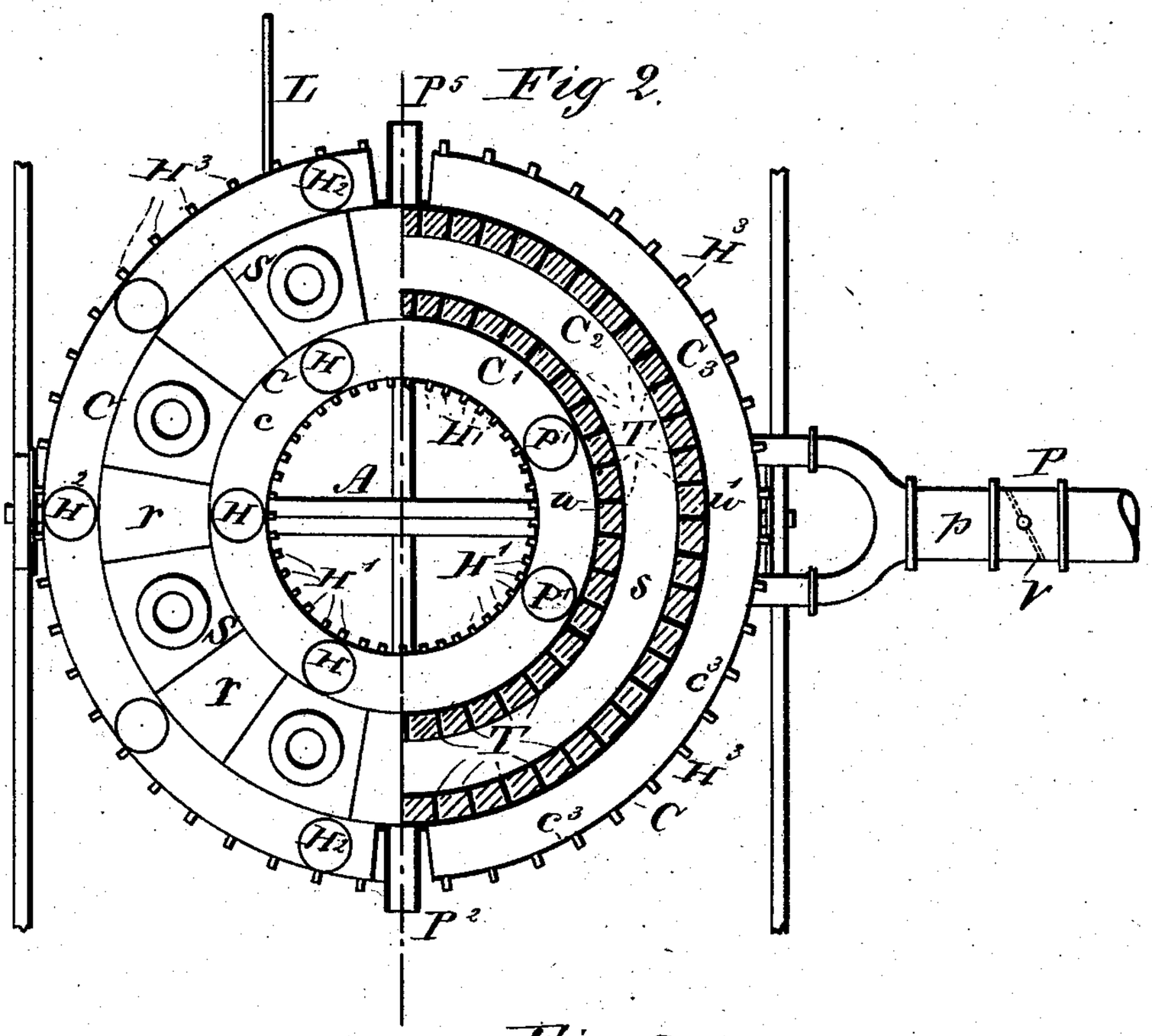
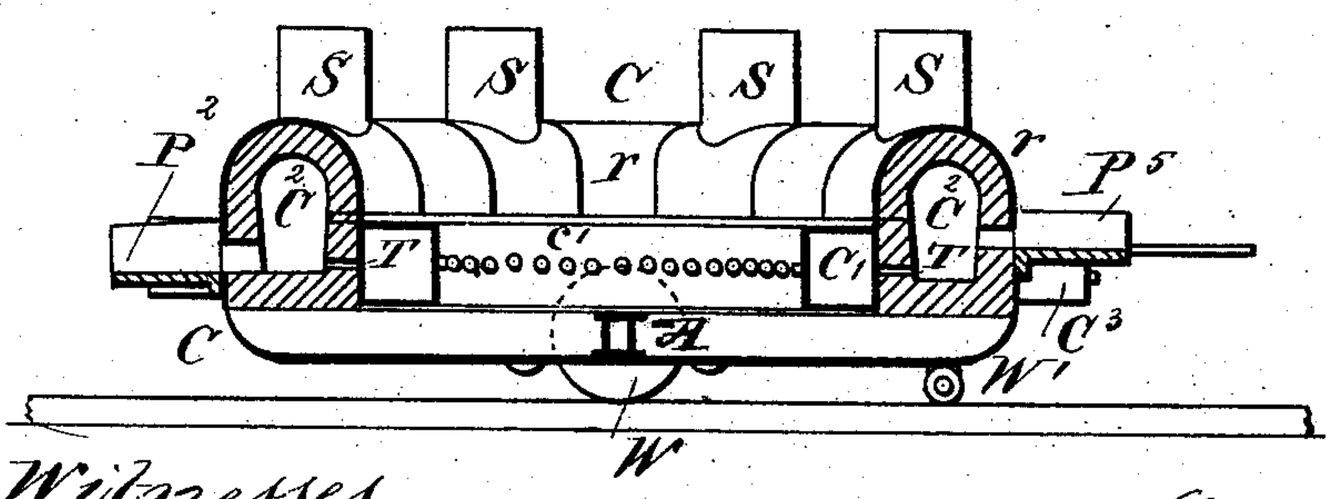


Fig. 3



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Inventor
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per Henry Orth
his att'y

(No Model.) 3 Sheets—Sheet 2.

C. LÉVÊQUE.

PORTABLE REFINING AND OXIDIZING APPARATUS.

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Fig. 5

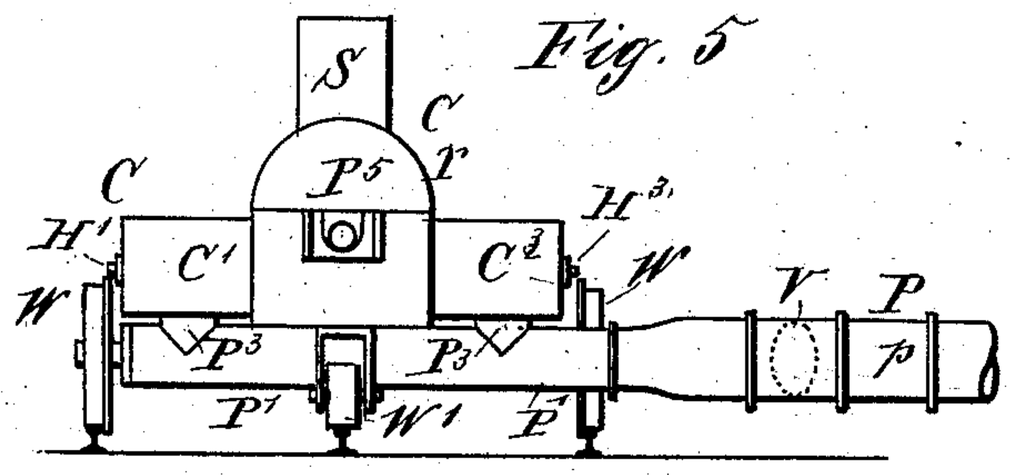


Fig. 8

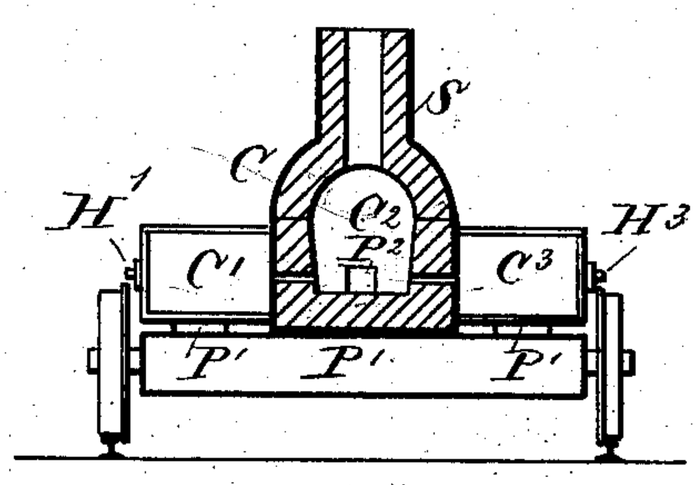


Fig. 6.

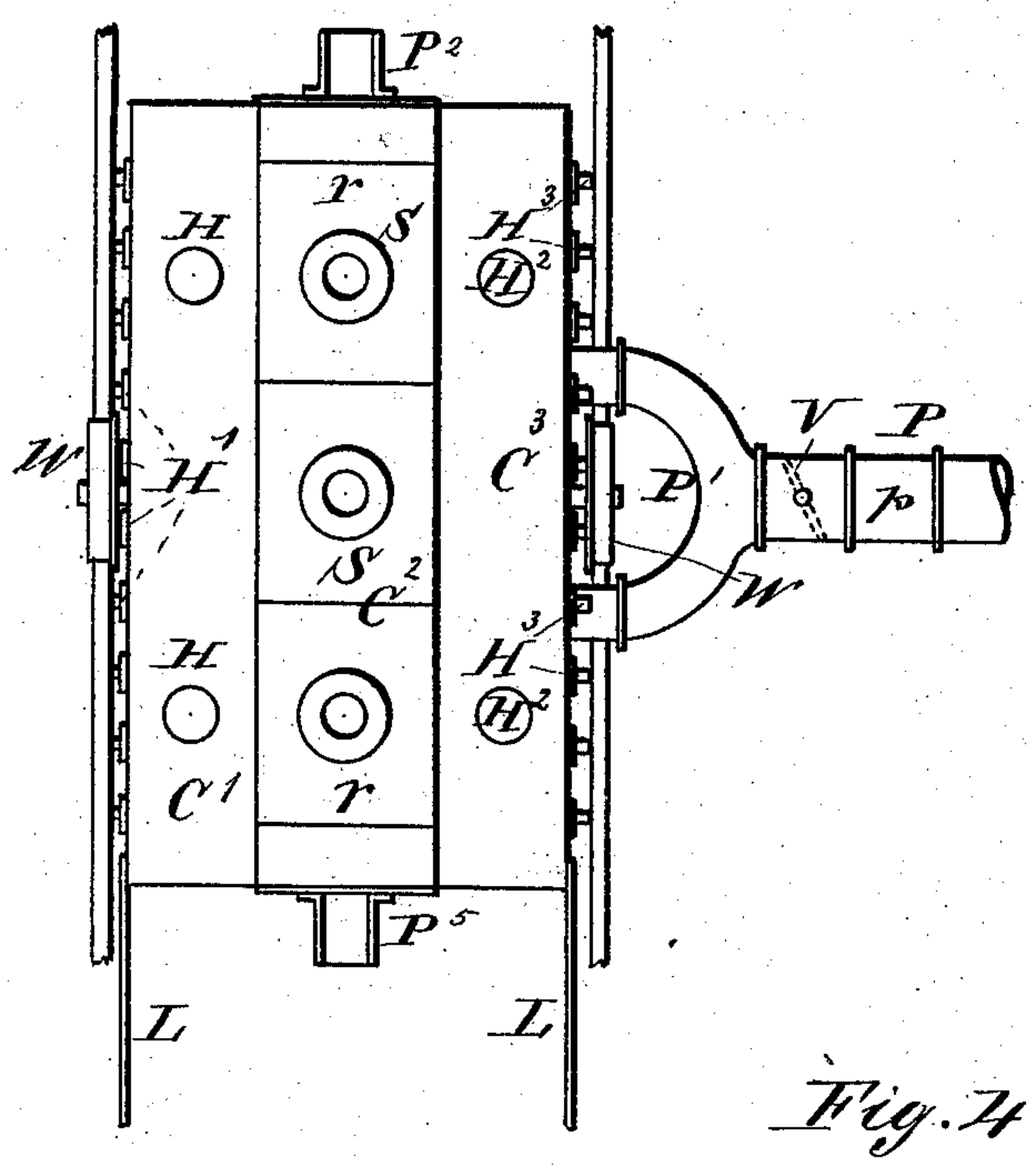


Fig. 7.

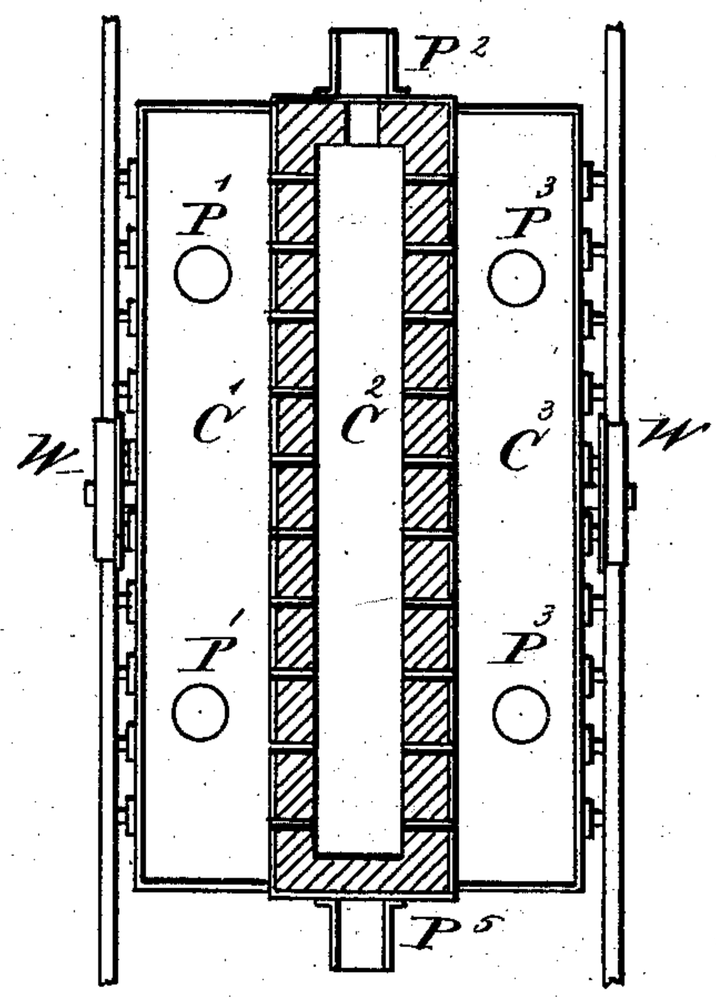
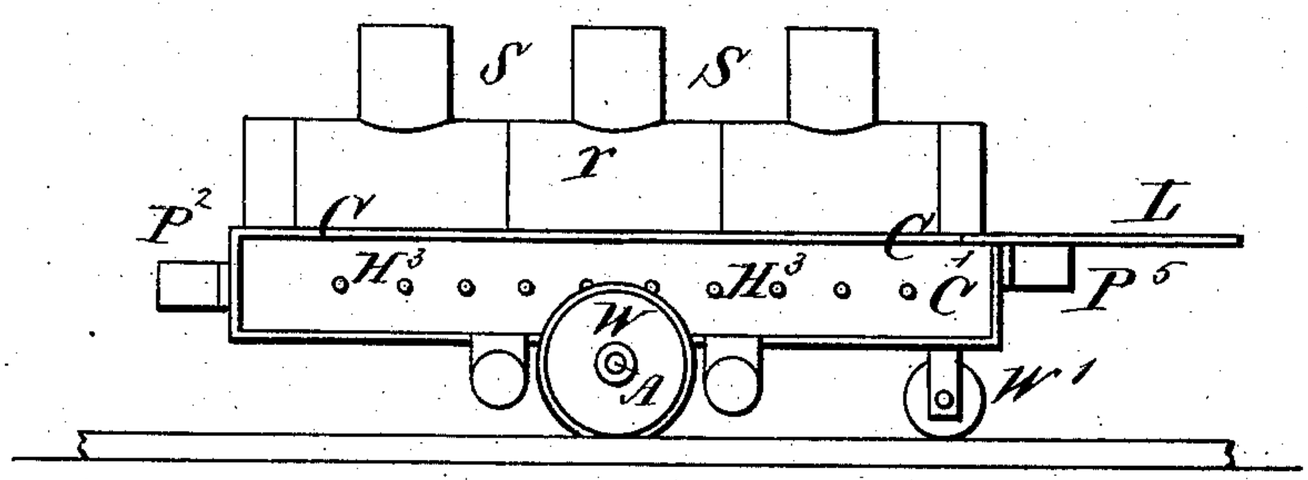


Fig. 4.



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3 Sheets—Sheet 3.

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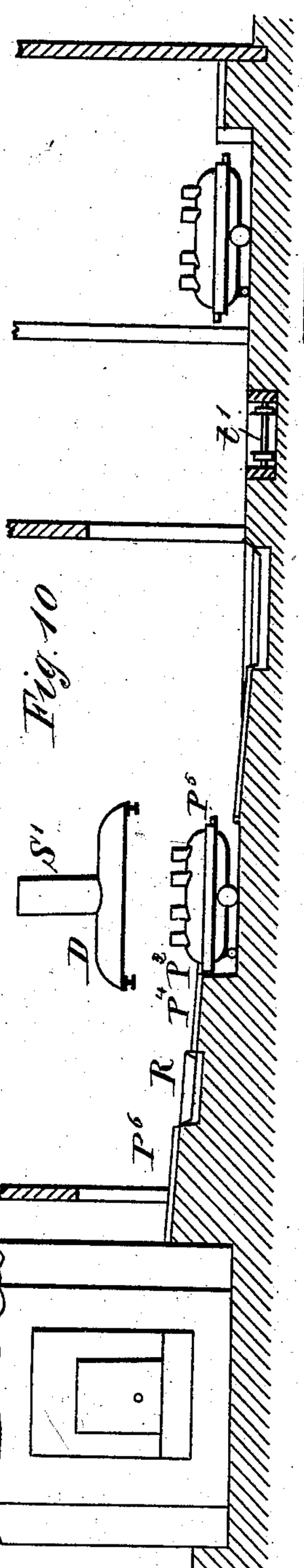

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UNITED STATES PATENT OFFICE.

CAMILLE LÉVÈQUE, OF POUZIN, FRANCE.

PORTABLE REFINING AND OXIDIZING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 290,075, dated December 11, 1883.

Application filed February 13, 1883. (No model.) Patented in France May 13, 1882, No. 149,270; in Belgium October 31, 1882, No. 59,428; in Luxemburg November 4, 1882, No. 232; in Austria-Hungary November 4, 1882, No. 37,736 and No. 253; in England November 6, 1882, No. 5,288; in Spain November 6, 1882, No. 2,827; in Germany November 8, 1882, No. 22,410, and in Sweden November 7, 1882.

To all whom it may concern:

Be it known that I, CAMILLE LÉVÈQUE, a citizen of the French Republic, and a resident of Pouzin, in the French Republic, have invented a certain new and useful Improvement in Portable Refining and Oxidizing Apparatus; and I do hereby declare that the following is 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 the letters of reference marked thereon, which form a part of this specification.

My invention relates to a novel construction of portable apparatus or furnace for refining iron by the Bessemer process, substantially as hereinafter fully described, and as shown in the accompanying three sheets of drawings, in which—

Figure 1 shows my improved apparatus in elevation and of annular form. Fig. 2 is a sectional plan view, and Fig. 3 a vertical transverse section, thereof. Figs. 4 and 5 are side and end elevations; and Figs. 6, 7, and 8, a plan view, a horizontal longitudinal and a vertical transverse section, respectively, of a furnace of rectangular form embodying my invention. Figs. 9 and 10 show by a sectional plan and elevation the connection of the apparatus with a smelting or blast furnace and the means for its removal and replacement by another.

Like letters of reference indicate like parts wherever such may occur in the above figures of drawings.

When, in the Bessemer process, the action of the blast is limited to the period or point of scorification of the molten mass, a white pig-iron is obtained similar to that formerly obtained in refining-furnaces. The erecting of a Bessemer plant with a view to manufacturing steel is, however, very costly, which accounts for the fact that such plants are not generally used in the manufacture of refined metal, for the reason that the expense inherent to the working of such a plant cannot be supported by the profits derived any more than could the expenses inherent to the old Styrian or mazéage process. It would be different if a blast of air could be forced through the molten metal by an apparatus of limited cost and adapted to be worked at little expense.

The object of my invention is to provide a means for obtaining refined metal on the Bessemer plan by means of an apparatus of comparatively small prime cost, easy of repair, and adapted to be worked by means of air-blast derived from any ordinary blowing-engine.

The apparatus consists of a sheet-metal casing, C, mounted upon wheels W, and adapted to rotate upon a horizontal axis, A, or wheel-axles proximate to its center of gravity, and is prevented from tilting by a supporting pulley or wheel, W′.

The apparatus may be of annular form, as shown in Figs. 1, 2, and 3, or of rectangular form, as shown in Figs. 5, 6, 7, and 8.

The apparatus is divided into three chambers or compartments, C′ C^2 C^3. The central compartment, C^2, constituting the oxidizing or refining furnace or chamber proper, is formed by lining the sheet-metal walls *w w′* of the air-chamber with fire-brick, and has a sole, *s*, and arched roof *r*, of like or any other suitable fire-proof material, as shown in Figs. 2 and 3. This central compartment or chamber, C^2, is in communication with the chambers C′C^3 by means of a series of blast-openings or tuyeres, T. The chamber C′ is provided on its upper and vertical walls *c c′* with a series of peep-holes, H H′, normally closed by suitable plugs, and the chamber C^3 has also a series of peep-holes, H^2 H^3, formed in its top and vertical outer walls, c^2 c^3, respectively, which are likewise normally closed by suitable plugs. The chambers C′ and C^3 are connected with the blast apparatus by means of pipes P′ P^3, branched upon the main pipe P, provided with a suitable valve, V. (Shown in dotted lines, Figs. 1, 2, 5, and 6.) The molten metal enters the furnace C^2 by pipe or channel P^2, and the gases escape from said furnace-chamber through a series of short chimneys or stacks, S, which gases may be collected by a hood, D, and conducted to the main or other stack of the foundry S′, as shown in Fig. 10. The

arched roof *r* of the furnace-chamber C^2 is made removable, it being composed of a series of segments or sections, (shown in Figs. 1, 2, 3, 4, 5, 6, and 8,) whereby ready access may be had to any part of the chamber C^2 for any purpose. Of course it will be understood that the roof *r* need not necessarily be made of a series of independently-removable sections, though I prefer this to removing the entire roof each time it becomes necessary to gain access to any one particular part of the refining or oxidizing chamber.

The apparatus, being mounted on wheels, is readily removed when worn and replaced by another one, whereby the work of refining may go on uninterruptedly.

The form and peculiar construction of the apparatus adapt it for use with compressed air obtained from the usual blowing-machines of the blast-furnace.

The fact of being able to use blowers of low pressure, together with the simplicity of construction and manipulation, as well as the low cost of the apparatus, renders it available in such establishments where a Bessemer plant could not be profitably employed, and, in fact, renders it available in all establishments that produce or may produce the fine grades of iron or steel, whether by the acid or basic processes for Bessemer steel, and for all products requiring pig-iron free from sulphur and containing but little silicium.

In practice it will be found convenient to have a number of these apparatuses ready for use, such number depending upon the capacity of the works; and in Figs. 10 and 11 I have shown a convenient plant and arrangement for connecting the apparatus directly with the blast-furnace F, the contents of which are preferably delivered through a channel, P^6, to a receiver, R, called the "measurer," and thence by channels P^4 and P^2 to the oxidizing-chamber C^2. The refined metal is run out by pipe or channel P^5 and channels P^7 into receivers R′. As shown, the portable refining-furnace is located in the casting or blast-furnace room, from which suitable tracks are laid to an adjoining room, in which the furnaces are or may be stored. When one of the apparatuses is to be replaced by another, it is uncoupled from the blast-pipe P, and then run along the track *t* into the adjacent room and another one run out by means of the truck *t′*, Fig. 10, and coupled for operation. The refined metal is removed by running the receivers R′ out on the track t^2.

The operation of refining may be briefly described as follows: The molten metal, after reaching the furnace-chamber C^2, is subjected to the action of a blast of air (by opening the valve V) forced through the metal from opposite sides in a series of jets, when the oxidation of the silicium and other metals at once begins. Gerbs of sparks escape with the gases from the stacks S from the moment the air is forced through the metal to the end of the process, which is characterized by an increased velocity in the current of the gases by finer sparks, by scorified globules carried along by the air and gas current, and accompanied generally by a voluminous reddish smoke, which would be succeeded by a flame becoming more and more white were not at this time the discharge-passage P^5 opened and the metal run into the receivers R′ R′ through the branched channel P^7, in which receivers the metal is chilled or suddenly cooled by contact with water. If the metal is to be used in the unrefined form, it is simply allowed to run into casting-ladles or pockets or molds from the oxidizing-chamber C^2.

In order to entirely empty the oxidizing-chamber, the apparatus is tipped over by means of the levers L L, which operation can be performed without arresting the blast, as the apparatus is coupled to the main blast-pipe P by means of a flexible section of pipe, *p*. When emptied, the blast is continued for a few minutes, when the apparatus is righted and the tuyeres are inspected, and if everything is in proper condition the discharge-gate is closed and the feed-gate opened, and the apparatus is ready for another charge. If there is a considerable lapse of time between each operation, it will be found of advantage to heat the apparatus before running in the metal, either by means of any suitable fuel or by means of the gases from the blast-furnace. Ordinarily, however, the time that elapses between each charge is sufficiently short to keep the apparatus at a proper temperature, and the heating thereof is dispensed with.

The time required for each operation depends naturally upon the nature of the metal treated. A metal poor in silicious constituents is refined in two or three minutes, while iron rich in silicates and graphite requires from fifteen to twenty minutes, and sometimes more.

In an apparatus of the kind described from five to six tons of metal may be refined at each operation, and even more, if a sufficient volume of air is attainable.

Of course it will be understood that the measuring-vessel or receiver R may be dispensed with, and the refining or oxidizing furnace connected directly with the blast or smelting furnace.

Having thus described my invention, what I claim is—

1. A refining or oxidizing apparatus divided into three chambers, the central chamber constituting the refining or oxidizing furnace, and the chambers on opposite sides thereof constituting air passages or chambers, substantially as and for the purpose specified.

2. A refining or oxidizing apparatus composed of two air passages or chambers, an intermediate furnace-chamber in communication with said air-chambers by means of a series of air-passages or tuyeres, and an outer casing of sheet metal, substantially as and for the purposes specified.

3. An apparatus of the class described, com-

posed of two air passages or chambers having sheet-metal inclosing-walls, an intermediate furnace or refining-chamber formed by walls, and a roof of suitable fire-proof material, said roof being exteriorly incased in sheet metal, said central chamber being in communication with said chambers by means of a series of air-passages or tuyeres, the whole being mounted on wheels and adapted for oscillation upon a horizontal axis proximate to the center of gravity of the apparatus, as described.

4. An apparatus of the class described, composed of a central refining chamber or furnace, air passages or chambers on opposite sides thereof, an arched roof for said refining-chamber, composed of removable sections, all formed of sheet metal, the inclosing-walls of the refining-chamber being lined with suitable fire-proof material, and provided with means for the eduction of the gases, the whole being adapted for oscillation upon a horizontal axis proximate to the center of gravity of the apparatus, as described, for the purpose specified.

5. The combination, with the refining or oxidizing chamber C^2, of the air-chambers C' C^3, surrounding said chamber C^2, a series of air-passages or tuyeres, T, and suitable appliances for connecting the air-chambers with a blast apparatus, and for feeding the molten metal to and discharging it from the oxidizing-chamber C^2, substantially as and for the purpose specified.

6. The combination, with the chamber C', having its inclosing-walls lined with fire-proof material, of a roof, r, composed of a series of independently-removable sections, lined likewise with fire-proof material, some of said sections being provided with a sheet-metal stack, S, removable therewith, substantially as and for the purpose specified.

7. The combination, with the refining or oxidizing apparatus, constructed as described, and adapted for oscillation upon a horizontal axis proximate to its center of gravity, of the wheel W′ and the levers L L, substantially as and for the purpose specified.

8. The combination, with the refining or oxidizing apparatus constructed to oscillate upon a horizontal axis proximate to its center of gravity, and a delivery-pipe for delivering compressed air to said apparatus, of the flexible connection p and the levers L L, substantially as and for the purpose specified.

9. The combination, with the portable refining or oxidizing apparatus, of a blast apparatus and blast-furnace, an intermediate measuring-vessel, whereby the quantity of metal fed to the apparatus is or may be regulated, one or more receivers, into which the refined metal is discharged from the apparatus, and detachable connections for connecting the refining apparatus with the measuring-vessel, the receiver, and blast apparatus, substantially as and for the purposes specified.

In testimony that I claim the foregoing I have hereunto set my hand this 10th day of October, 1882.

LÉVÈQUE.

Witnesses:
BOUSGRANIER,
ROCHEGUDE.