

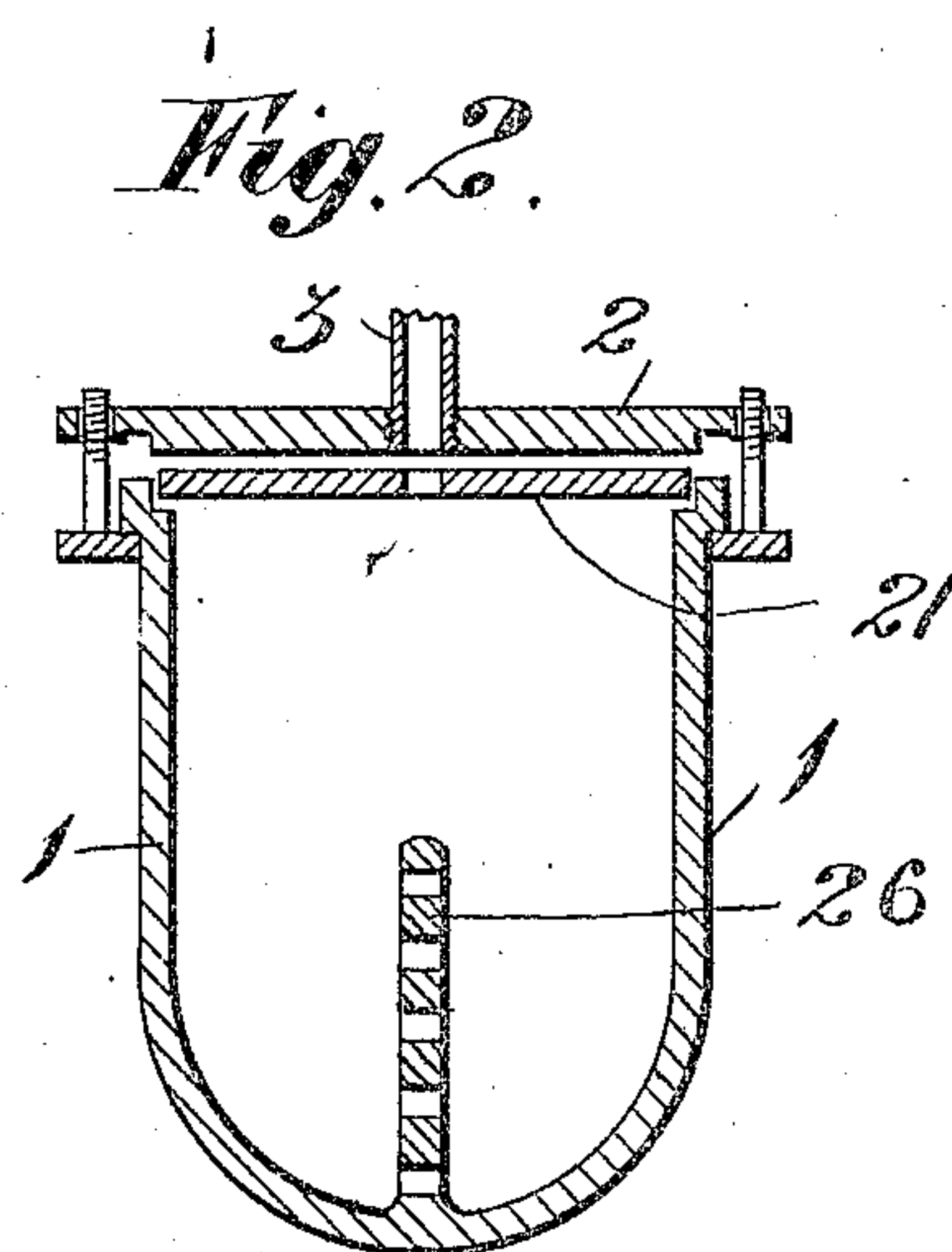
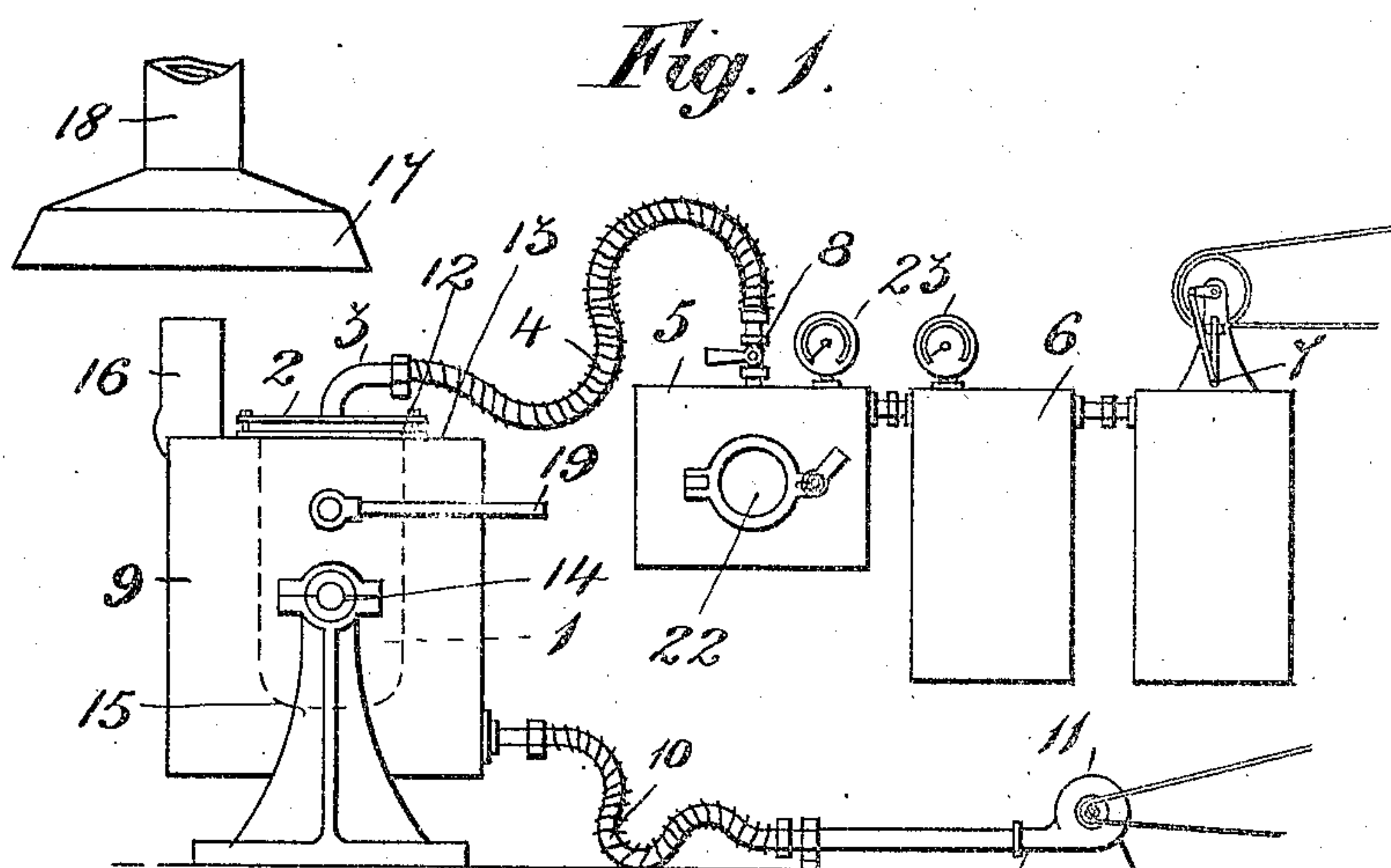
No. 828,142.

PATENTED AUG. 7, 1906.

W. S. SIMPSON.

APPARATUS FOR TREATING, REFINING, AND PURIFYING METALS.

APPLICATION FILED DEC. 15, 1905.



Witnesses



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UNITED STATES PATENT OFFICE.

WILLIAM SPEIRS SIMPSON, OF LONDON, ENGLAND, ASSIGNOR TO THE
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APPARATUS FOR TREATING, REFINING, AND PURIFYING METALS.

No. 828,142.

Specification of Letters Patent.

Patented Aug. 7, 1906.

Application filed December 15, 1905. Serial No. 291,908.

To all whom it may concern:

Be it known that I, WILLIAM SPEIRS SIMPSON, a subject of the King of Great Britain, residing at 49 Battersea Park road, London, England, have invented certain new and useful Improvements in Apparatus for Treating, Refining, and Purifying Metals, of which the following is a specification.

The object of this invention is to construct apparatus for treating, refining, and purifying iron, copper, and other metals while in a molten state and also at the same time by agitation, concussion, and augmentation of heat to improve their character, fiber, or texture for certain uses and purposes in accordance with the process set forth in my United States patent application filed on September 25, 1905, under Serial No. 280,070.

My invention will be clearly understood from the following description, aided by the accompanying drawings, in which—

Figure 1 is an elevation of the apparatus. Fig. 2 is a sectional elevation of a crucible or vessel for melting or treating metal.

I will describe my present invention as carrying out the process set forth in the before-recited patent application.

The metal to be treated or refined is placed in a crucible or vacuum vessel 1. A gas-tight lid 2 is luted or otherwise fastened on, in the center of which a pipe 3 is fixed of a suitable length in regard to space and premises, such pipe 3 being connected to a flexible pipe 4, communicating with an auxiliary vacuum-chamber 5, which forms a residue-chamber, and to other chambers 6, which communicate in turn with an air-pump 7, working in water. Just before the charge is placed in the crucible or vessel 1 the valve 8 between the vacuum-chambers 5 and 6 and the flexible pipe 4 is closed and the pump 7 is started, so that by the time the charge is placed in the crucible or vessel 1, the lid 2 luted or otherwise fastened on, the crucible 1 lowered into the furnace 9, and the flexible pipe 4 attached to the stiff pipe 3, fixed in the crucible lid 2, and a flexible blast-pipe 10 attached to the furnace 9, conveying air from a blower 11, there is a good vacuum in the chambers 5 and 6. The valve 8 is then opened again between the flexible pipe 4 and the chamber 5, which soon exhausts the air in the crucible or vessel 1, and the pump 7 is

kept going all the time while the metal is melting or being treated, so that it is melted or treated *in vacuo*. There is preferably a rim 12 or other attachment to the top of the crucible or vessel 1, which prevents it sinking below the cover 13 of the furnace 9, which is preferably made of two slabs of fire-clay, so that one can be withdrawn for the introduction of coke, if wanted, which in that way can be packed round the crucible 1 to quicken the melting or treating, or a door may be provided to the furnace, and to this rim 12 the lid 2 is bolted, so as to prevent the luting being disturbed. The furnace consists of a cast-iron or, if preferred, wrought-iron exterior hung on two trunnions 14, resting in bearings of standards 15 and thickly lined with fire-clay. To the furnace is attached a short chimney 16, which delivers the products of combustion into a hood 17, from which another chimney 18 carries them off into the open air. Producer or other gas may be employed for heating the crucible or vessel instead of coke. The furnace is hung upon trunnions for the purpose of being rocked, this rocking being effected by hand through the medium of the handle 19 or mechanically. It must be remembered that during the whole of this stage the vacuum is maintained. The metal is melted and treated *in vacuo*. The furnace 9 is rocked while the melted metal is *in vacuo*, and the vacuum is maintained or not while the metal is cooling and solidifying either in the crucible or vessel or in vacuum-molds or in molds *ex vacuo* into which the molten metal has been poured. In some cases it may be found desirable to introduce the charge in a molten state into the crucible or vessel and then to superheat and finish the treatment *in vacuo*, as described. The effect of the rocking is that the molten metal in the crucible or chamber is agitated and that as long as the rocking is continued the liquid metal is never at rest and new surfaces are continuously being exposed to the action of the vacuum. The object of the whole of this stage, considered as a separate process, is to liberate any gases—such as nitrogen, carbon monoxid, or hydrogen—which may have been contained in the metal and to disentangle any volatile substances, such as sulfur, and enable them to escape, and also either by agitation or con-

cussion, or both, to improve and regenerate the metal so treated.

22 is a door to the chamber 5, and 23 gages to indicate the degree of vacuum in the chambers 5 and 6 and in the apparatus.

The pump 7 and the blower 11 are operated from any prime mover.

The crucible or vessel is provided with a holed mid-rib 26 or diaphragm, this during the rocking causing the metal to pass through the holes from one compartment to the other, and thus insure a rapid and more perfect mixing and agitation of the mass; but more than one perforated diaphragm may be employed, and at the upper end of the crucible or vessel a recess is provided, into which a fire-clay plug 21 fits, this plug being luted or otherwise fastened on before the cover is put in place, this being necessary to prevent the metal contained in the crucible from coming in contact with the lid.

What I claim, and desire to secure by Letters Patent, is—

1. Apparatus for heating refining and purifying metals by subjecting the molten metal to an agitation by rocking the vessel con-

taining same, and creating a vacuum in the metal-container during the heating and cooling of the metal, consisting of a pivotally-mounted furnace, means for rocking said furnace, an air-tight crucible or metal-container having a perforated flanged mid-rib and situate within the furnace, flexible means connecting the crucible with vacuum-chambers, an air-exhauster communicating with the vacuum-chambers, a blower and flexible blast-pipe leading to furnace to support combustion, substantially as set forth.

2. An apparatus for heating, refining and purifying metals *in vacuo*, comprising a receptacle provided with a perforated wall forming thereby a compartment on each side of the wall, and means for rocking the receptacle for the purpose set forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WILLIAM SPEIRS SIMPSON.

Witnesses:

RICHARD CORE GARDNER,

LYNWOOD FERDINAND GARDNER.