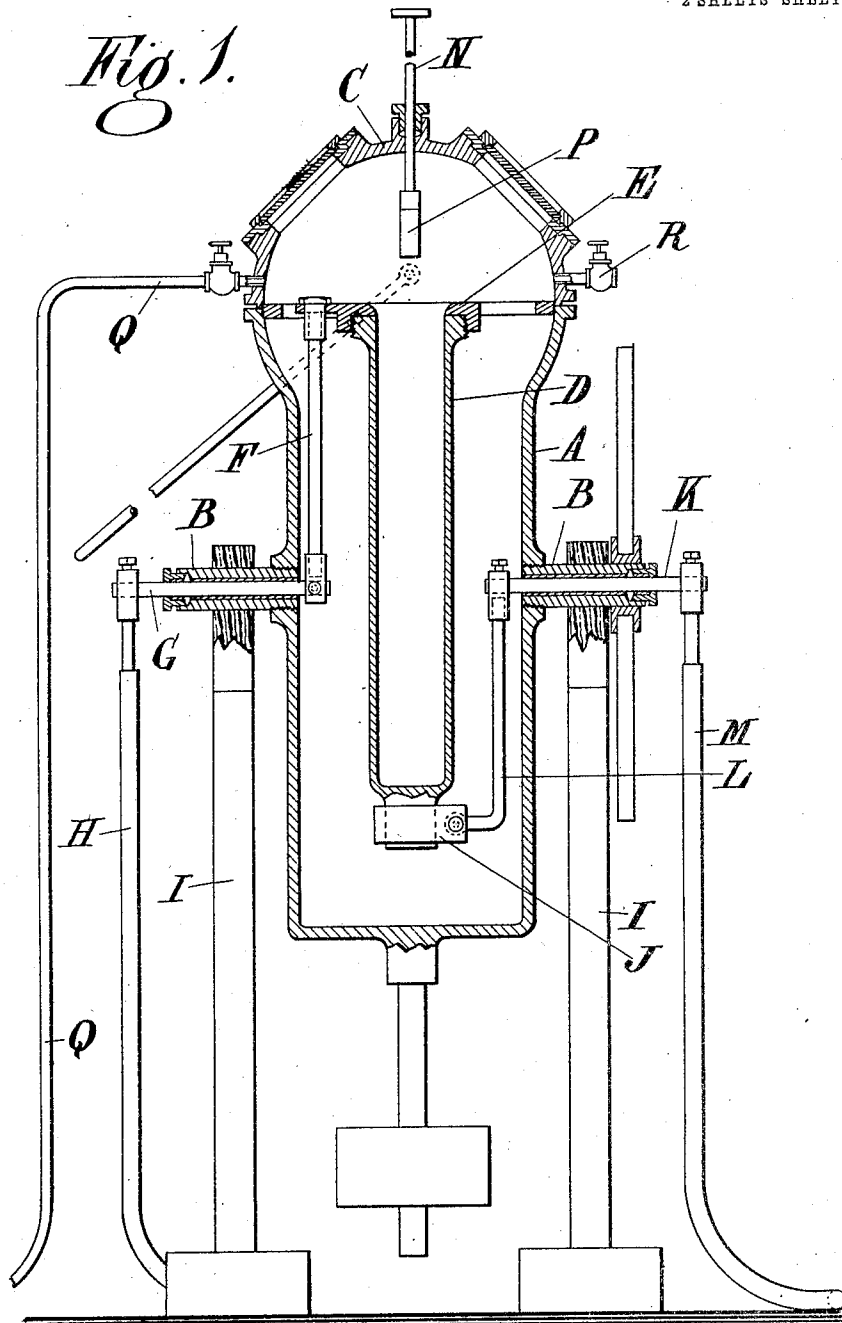


W. S. SIMPSON.
 APPARATUS FOR MELTING AND MIXING METALS IN VACUUMS.
 APPLICATION FILED MAY 5, 1911.

1,015,091.

Patented Jan. 16, 1912.

2 SHEETS—SHEET 1.



Witnesses:

W. B. Keeler
E. S. Kesler

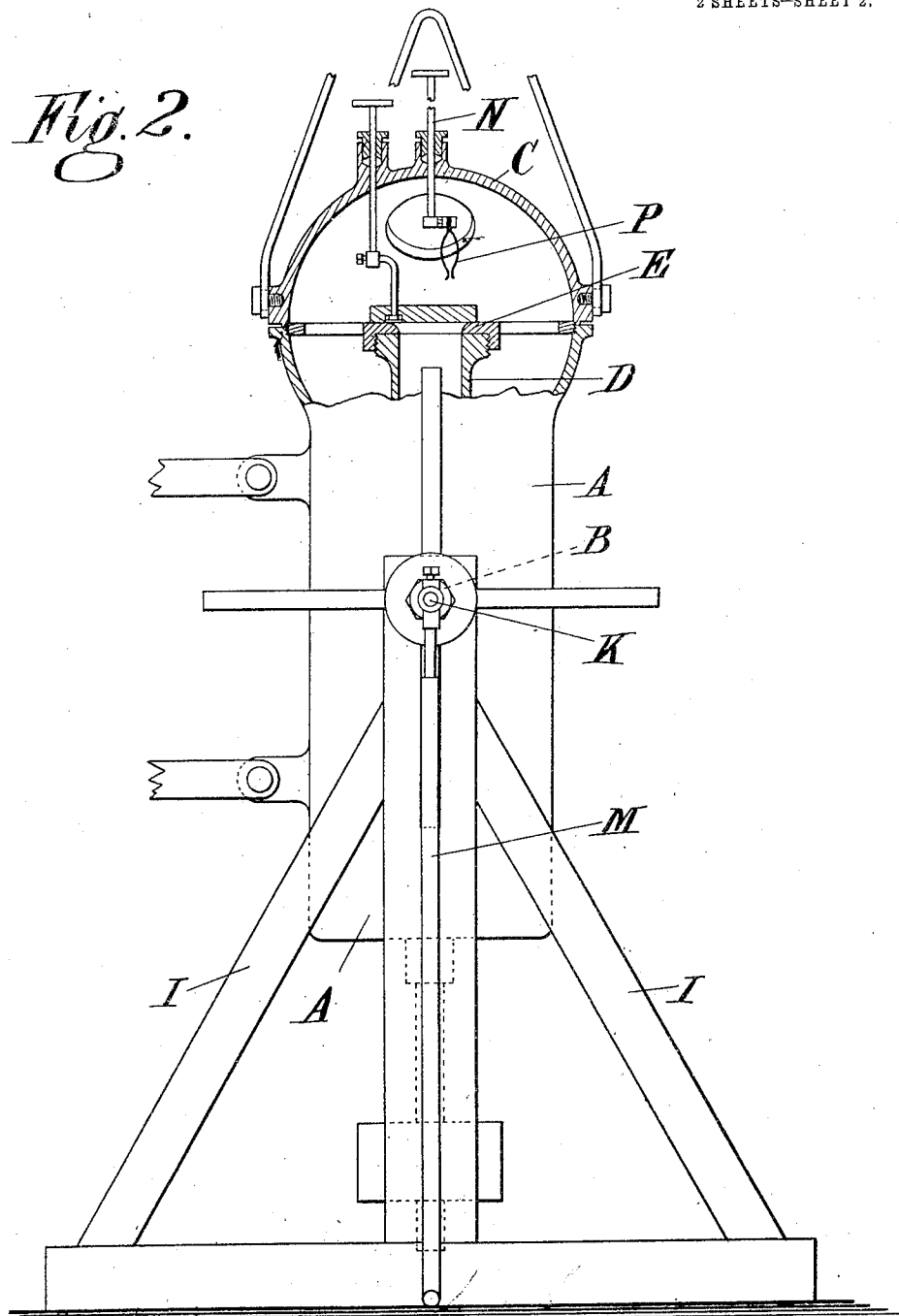
Inventor
William S. Simpson
 by *Amos L. Davis*

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Fig. 2.



Witnesses
[Signature]
[Signature]

Inventor
 William S. Simpson
 by *[Signature]*
 James L. Norris, Jr.

UNITED STATES PATENT OFFICE.

WILLIAM SPEIRS SIMPSON, OF LONDON, ENGLAND.

APPARATUS FOR MELTING AND MIXING METALS IN VACUUMS.

1,015,091.

Specification of Letters Patent.

Patented Jan. 16, 1912.

Application filed May 5, 1911. Serial No. 625,286.

REISSUED

To all whom it may concern:

Be it known that I, WILLIAM SPEIRS SIMPSON, a subject of the King of Great Britain, residing at London, England, have
5 invented certain new and useful Improvements in Connection with Apparatus for Melting and Mixing Metals in Vacuums, of which the following is a specification.

This invention relates to apparatus for
10 melting and mixing metals *in vacuo* of the kind in which electrical heat is used for melting the metals, and the object is to construct an improved apparatus for such purpose and for removing volatilizable impurities from certain metals which are easily
15 oxidizable if fused in contact with atmospheric air such as aluminium, magnesium, calcium and the like with which it is desirable to form useful alloys; by which means
20 also the hitherto unavoidable oxidation and deterioration of such metals while in a molten state is prevented and the effective mixing and alloying thereof under the most favorable conditions is accomplished; the
25 result affording a purified metal or alloy of uniformly superior quality and strength.

In carrying out my invention I construct a receptacle or chamber preferably metallic, of suitable size, shape and dimensions
30 wherein a comparatively high vacuum may be created and maintained by means of a vacuum pump in any convenient manner. Inside such chamber is placed a crucible made of refractory or carbonaceous material
35 for containing the metals to be treated, which metals are heated by means of an electric current applied to the top and bottom of the crucible.

The most effective and economical form
40 of apparatus suitable for my purposes is shown in the drawings hereto attached, Figure 1 being a sectional elevation and Fig. 2 an elevation of the apparatus part sectional.

The exterior of the vacuum chamber or
45 furnace A is made of metal and mounted on trunnions B to allow of its being tilted sufficiently to pour out the contents. A removable top or cover C is provided together with suitable means of hermetically sealing
50 the vacuum chamber or furnace A therewith. Within this chamber A there is placed a receptacle D in the form of a crucible or cylindrical vessel made of refractory material, preferably carbonaceous, such as will afford
55 adequate resistance to electric currents. The space between the exterior walls thereof and

the metallic vacuum chamber is filled with a heat resisting and nonconducting material, such as magnesite. To the open top of this crucible D there is suitably attached
60 a metallic ring E which is provided with means of internal cooling by a circulation of water, which ring E forms one of the battery terminals for the application of electric energy to the crucible and its contents,
65 by means of rods F, G, connecting the ring E and the lead wire H through one hollow trunnion B of the stand I. In similar manner another metallic ring or plate J also internally water cooled is placed under the
70 bottom of such crucible and furnishes the other electric terminal through the rods K, L, connecting such plates J with the other lead wire M. Electric energy is applied
75 through the terminals E and J above described while a vacuum is being maintained within the inclosing vacuum chamber; under which conditions a zone of intense heat is produced midway between the metallic
80 terminals E, J and throughout the circumference of the crucible D and the metallic substances contained therein. The generation of electrical heat is thus effected with great economy of power and the whole operation being carried on *in vacuo* the
85 damage to plant or loss by oxidation of the contents of the crucible or of the crucible itself or the internal component parts of the apparatus is to a great extent obviated.

Means are provided for the mechanical
90 stirring or mixing of the molten metal or metals in the crucible and also for the introduction of purifying substances or any metals required for alloying purposes, by a rod or shaft N introduced through the cover
95 C of the vacuum chamber and suitably fitted to move up and down or in a rotary manner to stir the molten metals in the crucible without breaking the vacuum. To this rod N a clip P is attached for holding any substance
100 required to be submerged in the molten contents of the crucible during the operation.

Q is the pipe connecting the vacuum chamber with the suction pump and R is a pipe
105 for admitting air to break vacuum when required.

S is a cover to the receptacle D capable of being moved to cover or uncover the receptacle by manipulation of the rod T which is connected to it and passes through the
110 cover C, suitable means such as a stuffing box being provided to maintain the vacuum

during movement of the rod T. The removable cover C is preferably provided with suitable pressure-tight observation windows C' and also with a lifting yoke or handle C² whereby the cover may be removed with facility during charging and emptying of the apparatus.

What I do declare as my invention and desire to secure by Letters Patent is:—

10 1. Apparatus for melting, mixing and treating metals embodying a hollow crucible composed of refractory material possessing the property of conducting and offering resistance to the passage of an electric current
15 to thereby convert directed electrical energy into heat energy, the crucible having an open chamber to receive and contain the metals to be treated, means for connecting electrical conductors to the top and bottom of such
20 crucible, and a vacuum chamber inclosing the crucible.

2. In apparatus of the character described, the combination of a vacuum chamber, a crucible inclosed therein having an interior
25 chamber to contain a charge of material to be treated and embodying means for heating it, and an adjustable device operable from the exterior of said chamber and extending into the chamber, said device being provided with means for introducing purifying
30 substances or metals for alloying purposes into said chamber within the crucible and also operative as a stirrer or mixer.

3. In apparatus of the character described,
35 the combination of a vacuum chamber com-

prising a body portion and a cover removably related thereto and adapted to form a fluid-tight connection with the body portion, a crucible contained within the body portion and having a chamber to contain a charge
40 of the material to be treated and having an opening leading thereto, and a device carried by and extending movably through the cover and bearing a clip on its inner end, said device being movable in alinement
45 with and into said opening and chamber in the crucible while the cover is applied to the body portion.

4. In apparatus of the character described, the combination of a vacuum chamber com-
50 prising a body portion having trunnions for mounting it tiltably, and a cover removably applied to the upper end thereof and adapted to form a fluid-tight connection therewith, a crucible contained within and carried by
55 the body portion and having an interior chamber to contain a charge of material to be treated and having its mouth arranged toward the top of the body portion, and means for conducting a heating medium to
60 the crucible through said trunnions of the tiltably mounted body portion.

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

WILLIAM SPEIRS SIMPSON

Witnesses:

H. OVIATT,

RICHARD CORE GARDNER.