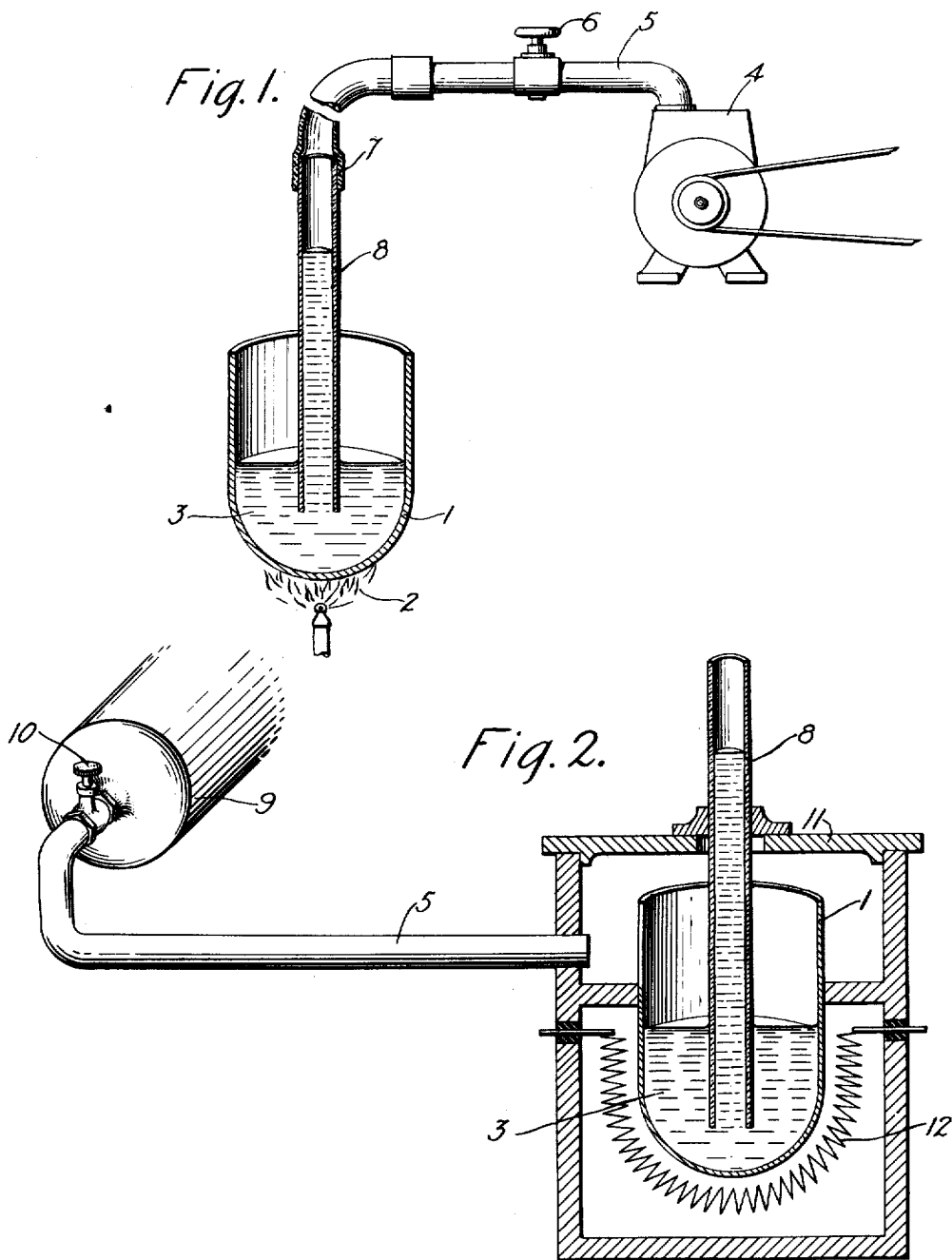


Jan. 16, 1923.

1,442,444

H. T. REEVE.
CASTING HIGH MELTING POINT METAL AND ALLOY.
FILED APR. 23, 1920.



Inventor:
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UNITED STATES PATENT OFFICE.

HOWARD T. REEVE, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

CASTING HIGH-MELTING-POINT METAL AND ALLOY.

Application filed April 23, 1920. Serial No. 375,933.

To all whom it may concern:

Be it known that I, HOWARD T. REEVE, a subject of Great Britain, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Casting High-Melting-Point Metals and Alloys, of which the following is a full, clear, concise, and exact description.

This invention relates to the production of metallic rods of small diameter and particularly to those which possess a high melting point.

Great difficulty has been experienced in satisfactorily producing a uniform rod of small diameter from the higher melting point metals or alloys. Pouring into molds, permanent or otherwise, is attended with premature congelation of the molten material and the inclusion of surface oxidation products. It is common knowledge that in the case of substances having a melting point of say less than 1000 degrees C., a satisfactory product can be obtained by forcing or drawing the molten metal from the melting pot through a duct constructed of a material having a high melting point and which will not react chemically with said substances. If it is attempted to cast an article having a high melting point in this manner, failure will result in that the substance will revert to the solid state during the process, and contaminating alloys will tend to form which will render the finished article unfit for use.

It is an object of this invention to provide a means by which high melting point metals and alloys may be successfully cast into rods of small diameter without encountering the difficulties referred to hereinabove.

Large rods of high melting point metals have been made by a variety of methods; but difficulty has been experienced in forming rods having a diameter of less than one inch, and it has been impossible to form satisfactory rods having a diameter of one cm. or less by any of these methods. This invention provides means for making rods of high melting point metals which have a diameter as small as one mm.

It has been found that tubing constructed of refractory materials is admirably suited as a means for withdrawing the high melting point metals and alloys from the melting pot and further that such tubing may be

successfully utilized as a casting mold. In carrying out the casting according to this invention, quartz tubing, which is the preferred refractory material is heated to a predetermined temperature, and plunged beneath the surface of the molten material. By means of suction applied to the free end of the tube, (or pressure applied to the interior of the melting pot) the molten mass is caused to rise in the tube. After a column of sufficient length has risen, the vacuum produced above is maintained constant while the quartz tubing is withdrawn from the melting pot and cooled. The quartz tubing is then broken and a uniform chemically pure metallic rod is obtained.

Referring to the drawings, Fig. 1 shows the method of withdrawing the molten material by suction means, and Fig. 2 the method of accomplishing the removal by means of positive pressure applied to the surface of the molten material.

In Fig. 1, the melting pot 1, heated by any suitable means 2, which, in the case shown, is a free gas flame, contains the molten material 3. The vacuum pump 4, driven by a motor (not shown), is provided with the pipe line 5 in which is inserted a valve 6, so constructed that when it is closed, it will withstand a comparatively high vacuum. Suitable connecting means 7 is provided which enables an air-tight joint to be made between the pipe 5 and the refractory tube 8. When it is desired to remove the molten material from the bath, either the refractory tube is plunged into the melting pot, or the latter is raised until the tube is immersed to a proper depth. The pump 4 is then started and continued in operation until the desired amount of the metal or alloy has been removed. This may readily be determined by calculation. When this point is reached, the valve 6 is closed and the tube withdrawn, or the pot lowered. After cooling, the refractory tube is broken and the rod of the high melting point metal or alloy recovered.

In some cases it is more desirable to use a positive pressure on the surface of the molten material, thereby forcing the metal up into the tube instead of drawing it up as described above. When the metal or alloy which is being used is one which is affected by the atmosphere at the high temperature required to reduce it to a molten

condition and, therefore, requires treatment in an evacuated or inert gas chamber, the process as described herein may be readily applied. In such a case, after the quartz tubing has been inserted through a specially designed opening, a difference in pressure may be created between the surface of the molten material and the top of the quartz tube. In this manner, the removal of the metal or alloy may be readily accomplished without danger of contamination.

Fig. 2 shows the apparatus which is used when carrying out the process utilizing a positive pressure on the surface of the molten material. Compressed air, or an inert gas, as the case may demand, is released from the tank 9 by operating the valve 10, thus forcing the molten material 3 from the melting pot 1 into the refractory tube 8. In this case a clamped cover 11 is employed in order to allow the accumulation of sufficient pressure. The heating means 12 in this case consists of an electrical resistance element.

This process also enables the withdrawal of molten material from any particular place in the melting pot. The advantage of this will be apparent when carbon containing metals or alloys are being employed.

In referring to high melting point metals and alloys herein, it is intended to include all those which possess a melting point greater than 1000 degrees centigrade. Among the refractory materials which have been used in this connection are: fused quartz tubing, zirconia, alundum, porcelain and the like.

What is claimed is:

1. The method of obtaining high melting

point metals and alloys in the form of rods of small diameter which consists in forcing the molten material into a tube of refractory material, allowing it to cool therein and separating the material from said tube.

2. The method of obtaining high melting point metals and alloys in the form of rods of small diameter, which consists in forcing the molten material into a tube of refractory material, which has been previously brought to a high predetermined temperature.

3. The method of obtaining high melting point metals and alloys in the form of rods of small diameter which consists in forcing the molten material into a tube of refractory material, allowing it to cool therein, and breaking the tube.

4. In an apparatus for casting rods of small diameter from high melting point metals, a melting pot for the metal or alloy, means for heating the metal or alloy, a narrow tube of refractory material inserted in the molten material, and means for forcing the molten material into the tube.

5. In an apparatus for casting rods of small diameter from high melting point metals and alloys, a melting pot for the metal or alloy, means for heating the metal or alloy, a narrow tube of refractory material inserted in the molten material, and means for effecting the balance of the vapor pressure within the tube and the vapor pressure within the pot so that the molten material is forced into the tube.

In witness whereof, I hereunto subscribe my name this 22nd day of April, A. D. 1920.

HOWARD T. REEVE.

Certificate of Correction.

It is hereby certified that in Letters Patent No. 1,442,444, granted January 16, 1923, upon the application of Howard T. Reeve, of East Orange, New Jersey, for an improvement in "Casting High-Melting-Point Metals and Alloys," an error appears in the printed specification requiring correction as follows: Page 2, line 72, claim 5, the word "effecting" should read *affecting*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 13th day of March, A. D., 1923.

[SEAL.]

KARL FENNING,
Acting Commissioner of Patents.