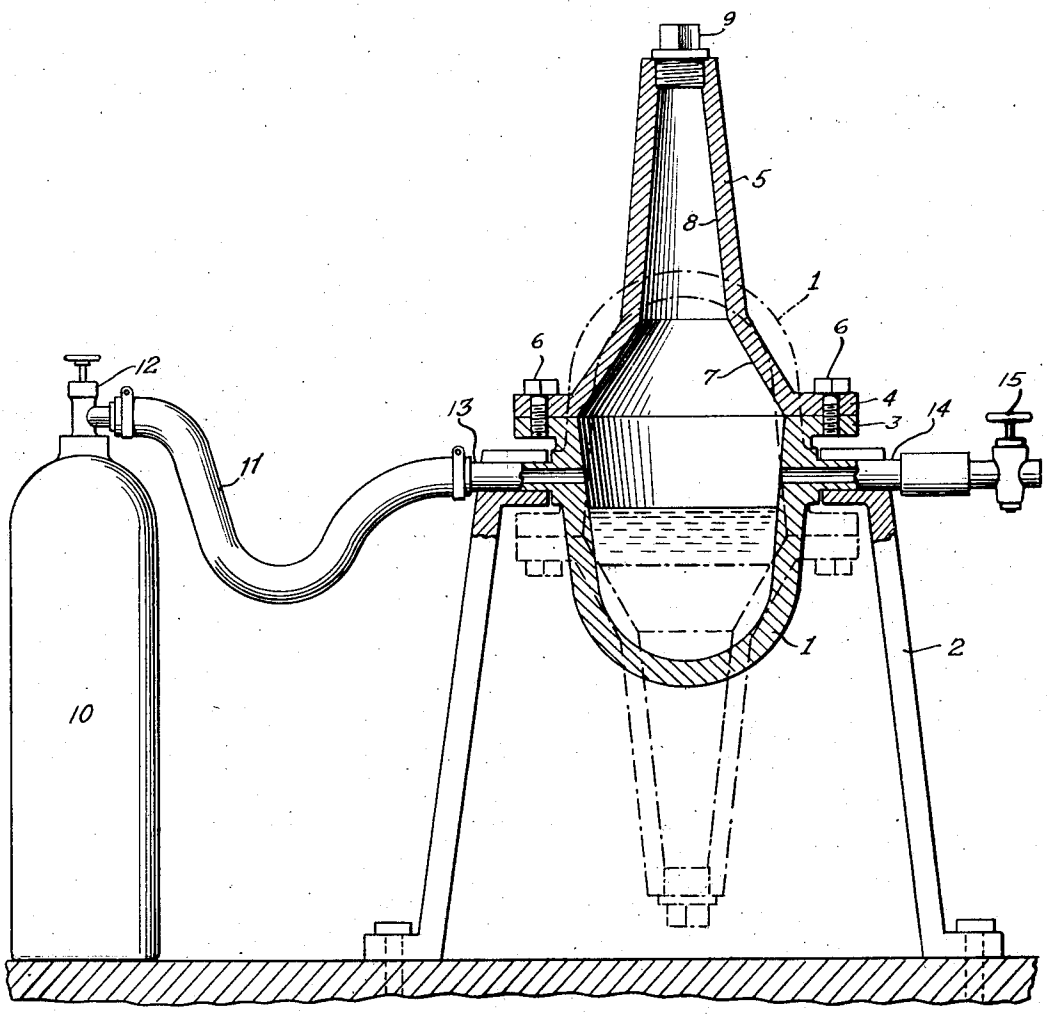
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APPARATUS FOR CASTING ALKALINE EARTH METALS

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APPARATUS FOR CASTING ALKALINE EARTH METALS

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This invention relates to apparatus for casting alkaline earth metals in a purified condition and especially to the casting of purified barium and strontium and the alloys thereof free from a material content of oxides, nitrides or hydrides.

The presence of oxides, nitrides and hydrides in barium and strontium deleteriously affects their malleability and ductility. For example extremely small amounts of these impurities cause a brittleness which will prevent the production of wire in considerable lengths. In the manufacture of these metals into wire of a commercial grade it is economically important that the metals from which the wire is made be produced in a malleable and ductile state, and also in an elongated homogeneous mass, so that a minimum of waste will be encountered when the metals are drawn into the form of wire or ribbon.

Due to the extreme activity of these metals it has been difficult to cast them in the proper state and form for making wire or ribbon, because during the process of melting and casting they react with the oxygen and nitrogen of the air to form the deleterious oxides and nitrides.

Therefore one of the objects of my invention is to produce a purified metal in a convenient and workable form.

One embodiment of my invention is illustrated in the accompanying drawing. The single figure shown therein is a view, partly in section and partly in elevation, of a device constructed in accordance therewith.

A crucible 1, is supported in a suitable manner as here shown by a frame 2. The crucible has a flange 3, to which a similar flange 4, of a mold 5, is secured by means of screws 6. The mold has a funnel shaped mouth 7, leading into a deep tapered cavity 8, which is closed at its outer end by a removable screw plug 9. The crucible and the mold are preferably made of iron or nickel, but they may be made of other metals.

The crucible and the mold form a chamber from which the air may be exhausted and from which the exterior air may be excluded. This may be accomplished by employing one of the gases of the argon group to scavenge the air from the chamber and then maintaining therein an atmosphere of one of said gases at a pressure greater than the exterior air pressure.

To accomplish this purpose I have shown a tank 10, containing one of the compressed gases of the above named group, preferably argon. The tank is connected to the interior of the crucible by means of a flexible tube 11. One end of the tube is connected to the outlet of the valve 12, which controls the flow of the gas from the tank, and the other end of the tube is connected to a nipple 13. The nipple is connected to the interior of the chamber to provide an inlet for the gas. A nipple 14, is connected to the interior of the crucible to provide an outlet for the air and gas scavenged from the chamber. A valve 15, is connected to the nipple 14, to control the escape of gaseous fluid through the nipple.

The crucible is supported in the frame 2, by the nipples 13 and 14, which perform the function of an axis about which the crucible may be revolved, for the purpose of pouring the contents of the crucible into the mold.

The charge capacity of the crucible is limited by the level of the gas inlet and outlet. The capacity of the mold is proportioned in accordance with the limited charge capacity of the crucible so that when the melted charge is poured from the crucible into the mold, the poured level will be below the gas inlet and outlet, as indicated by the dotted line in the drawing.

In this form of the apparatus the pressure within the chamber is maintained greater than that on the exterior. Therefore it is not necessary that the joints of the chamber be made air tight in order to exclude the air from the chamber but it would be desirable when practicable in order to conserve the gas supply.

While I prefer the above means for exhausting and excluding the air from the chamber an alternative means may be employed in which a vacuum producing means (not shown) may be connected to one of the nipples to draw the air from the chamber while

the other nipple is plugged. In this case it is important that the joints of the chamber be made gas tight to prevent the inward leakage of the air.

My process and apparatus are especially useful in treating purified barium and strontium which are coated with a thin coating of an oxide of the metal. However, I have found my process and apparatus also applicable to the treatment of these and the other purified alkaline earth metals and their alloys containing or being coated with oxides, nitrides and hydrides.

In the operation of my preferred form of apparatus the crucible is charged with the metal to a level just below the nipples. The valve 12, is opened to permit the gas to flow from the tank into the crucible and scavenge air from the chamber.

The air is driven out through the nipple 14, and the open valve 15, to the atmosphere.

After the chamber has been thoroughly scavenged of air the valve 15, may be closed or it may be left partially open to allow a continuous flow of gas from the tank through the chamber. The valves 12 and 15, should be so regulated as to maintain a pressure within the chamber greater than that on the outside.

The material in the crucible is heated by any suitable means, until the metal becomes molten. Such impurities as the oxides, nitrides and hydrides of the metals, being lighter than the molten metals, and infusible at the temperature of the molten metal, will rise to the surface of the metal and collect as a scum. The edge of the scum adheres to the side of the crucible. The crucible is then inverted or tilted to allow the molten metal to flow into the mold.

The impurities remain clinging to the sides of the crucible and the mouth of the mold free from the metal in the mold. After the ingot has cooled and hardened the mold is removed from the crucible. The ingot may then be removed from the mold. If necessary the screw plug is also removed to facilitate the removal of the ingot, by the insertion of a punch through the plug hole.

While I have shown the mold secured to the crucible in an inverted position directly above it I do not wish to be limited to this particular construction, as other modifications of this apparatus may be made within the scope of my invention. For example, it is within the scope of my invention to secure the mold to the crucible in any desired angle so that their interiors form a single chamber and that the metal may be poured from the crucible into the mold by tilting the former.

I claim:

1. An apparatus for casting reactive metals, comprising a crucible, a mold having its open end detachably secured to the open end of the crucible to form a closed chamber, a gas inlet and outlet for said chamber and means for replacing the atmosphere of said chamber with an inert gaseous medium, and means for tilting the crucible and the mold to pour the contents of the crucible into the mold.

2. An apparatus for casting reactive metals, comprising a metal crucible, an inverted metal mold having its open end detachably secured to the opened end of the crucible to form a closed chamber, a gas inlet and outlet for the chamber, means for supplying an inert gas under pressure to said inlet and means for controlling the entrance of said gas through said inlet and its exit through said outlet, and means for inverting the crucible and the mold to pour the contents of the crucible into the mold.

3. An apparatus for casting reactive metals, comprising a crucible having two diametrically opposed trunnions on its outer periphery provided with axial openings therethrough communicating with the interior of the crucible; a support for said crucible having bearings cooperating with said trunnions; a mold having its open end detachably secured to the open end of said crucible to form a closed chamber; means for supplying an inert gaseous medium to said closed chamber through the axial openings in the trunnions; and means for rotating the crucible and mold about said trunnions to pour the contents of the crucible into the mold.

4. In an apparatus for casting reactive metals, comprising a metal crucible having two diametrically opposed trunnions on its outer periphery provided with axial openings therethrough forming a gas inlet and outlet for the interior of the crucible, a support for said crucible having bearings cooperating with said trunnions; a mold having a funnel shaped mouth, a projection having a tapered cavity extending from the small end of said mouth, and a removable closure member for the smaller extremity of said tapered cavity; means for detachably securing the mouth of the mold to the mouth of the crucible to form a closed chamber; means for supplying an inert gaseous medium to the interior of the closed chamber through the openings of said trunnions to replace the atmosphere of said chamber; control means for said inlet and outlet; and means for rotating the crucible and mold about said trunnions to pour the contents of the crucible into the mold.

In testimony whereof, I affix my signature.

HUGH S. COOPER.