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CASTING APPARATUS

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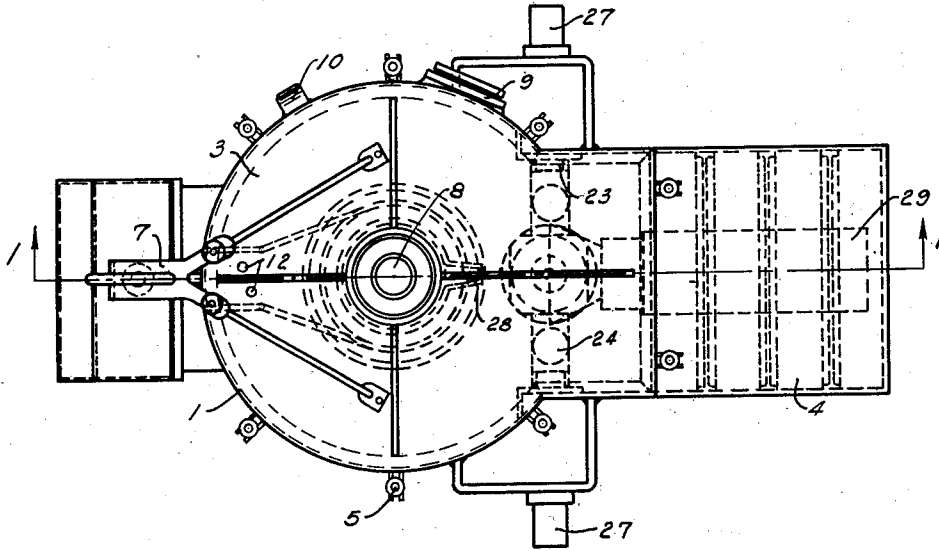


FIG. 2

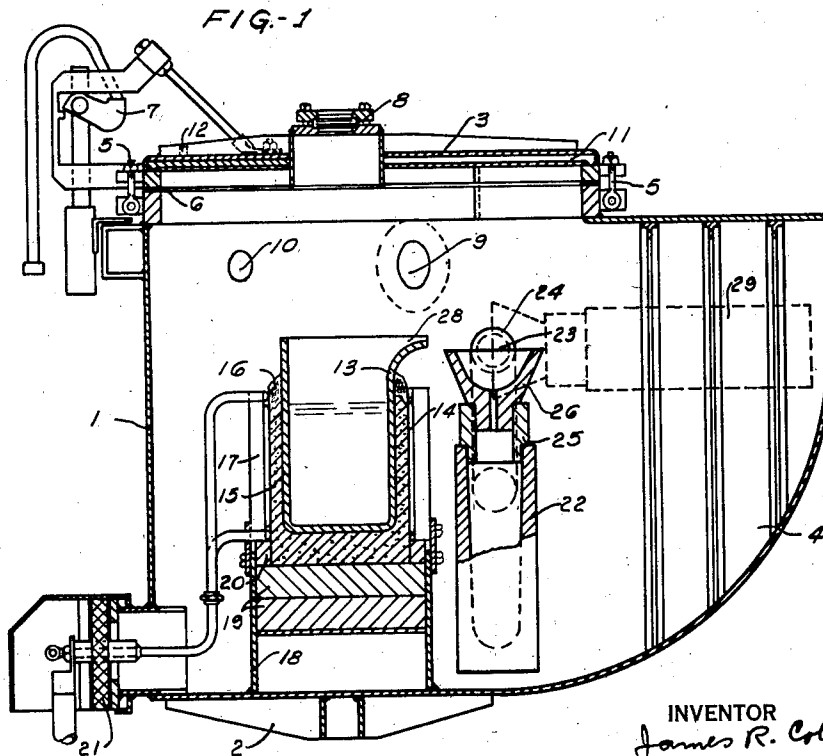


FIG. 1

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CASTING APPARATUS

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3 Claims. (Cl. 22-79)

This invention deals with the casting of metals and has to do with a device for melting and pouring metal in a vacuum or under pressure of a preferred atmosphere.

A purpose of the invention is to provide, within a sealed chamber, a means for pouring a molten charge from a furnace into a mold with substantially the same mechanical effect as is obtained in normal open casting practice.

A further purpose is to provide, within a sealed chamber, a melting furnace and a mold and means for maintaining an axis of the mold in a vertical position as the assembly as a whole is tilted for pouring the furnace charge into the mold.

A further purpose is to provide, in a sealed chamber, a melting furnace and a mold and means for maintaining the mold in a fixed position as the assembly as a whole is tilted for pouring the furnace charge into the mold.

Two figures have been used to illustrate the invention.

Fig. 1 is a sectional elevation view of a melting and casting mechanism embodying the apparatus claimed. The section is taken through plane I—I of Fig. 2.

Fig. 2 is a plan view of the apparatus of Fig. 1. Casting metal in a vacuum or sealed chamber, at best, is a difficult operation. In addition to the usual difficulties of maintaining the proper atmosphere, of supplying heat to the furnace, of selectively loading the scrap to be melted, of making additions or refining the bath, the pouring of the charge into a sand or ingot mold has been an item requiring much study. In most instances heretofore the mold and furnace have been rigidly mounted in the assembly in such relation that when the assembly as a whole is tilted the molten metal will flow into the mold. In some instances, the mold is held stationary and the furnace is tilted by means of arms passing through stuffing boxes and affording a degree of manipulation from outside of the assembly. Still other methods utilize magnetic trip or balance devices or motor operated devices within the vacuum or pressure shell.

In general, it is desirable to keep a mold stationary while pouring an ingot or casting, to prevent premature solidification or cooling of the metal on the side of the mold; to prevent a redistribution of molten metal, which would result if the mold were oriented as the charge is being poured; to eliminate as much as possible any vibration or motion of the mold during solidification of the metal, and to allow manipulation of

the furnace independently of the mold proper.

The present invention is believed to be an improvement of considerable value over previous methods of casting within sealed chambers. With the apparatus described, most of the benefits of external stationary mold practice can be achieved in a sealed chamber without endangering the sealing of the assembly as by stuffing boxes, or the inclusion of complicated or costly magnetic and motor devices within the vacuum or pressure assembly.

The primary feature of the present invention is that the mold is arranged to swing about a pair of trunnions in such manner that as the assembly as a whole is tilted the mold remains stationary and in position to receive the full furnace charge of molten metal. By the construction hereinafter described, the molten metal may be poured into the mold and the assembly returned to its original position without changing the procedure, so far as the ingot or casting is concerned, from general open casting practice.

The operation and construction of applicant's device can best be learned by referring to the figures.

In the figures, a vacuum or pressure chamber 1 having a rigid bottom 2, and a removable cover 3 is adapted with a protuberance or mold space 4. The sides and walls of the chamber are made mechanically strong, usually of reinforced non-magnetic steel, to withstand the required vacuum or pressure conditions. Bolts 5 hold the cover against a gasket 6 rendering the assembly gas tight during operation, but readily accessible at other times. The usual cover lifting mechanism is shown at 7. Openings, provided with glass or quartz discs, are provided in the cover at 8 and in the chamber wall at 9 for viewing the metal during melting and pouring operations. One or more vents are provided as at 10 for evacuating the chamber or for providing the desired atmosphere. Usually, a safety diaphragm is included in the wall assembly to protect against danger from explosion.

The chamber cover is shown with a double wall, providing a space 11 for the circulation of cooling water, and nipples 12 for connection of the water supply and drain.

An induction furnace and mold assembly is shown in position within the chamber. The furnace proper, comprising a crucible 13, inductor coil 14 and refractory insulation and topping 15 and 16 respectively, is rigidly fastened by supporting means 17 to a pedestal 18. Refractory blocks 19 and ring 20 space the furnace

coil from the supporting structure and chamber sides. The furnace inductor is made of hollow copper tubing which is led through the tank wall by a gas tight and insulating bushing 21. Control valves and switches for passing water and electrical power through the inductor are supplied from outside.

The mold assembly comprises a mold 22 suspended by bearings 24 which are adapted to pivot about trunnions 23 attached to the inside chamber wall. A refractory hot top 25 and pouring funnel 26 are located as customary in the top of the mold. The mold assembly described may be replaced by a special cradle which is adapted similarly to engage the trunnions and to hold a standard mold.

The tank assembly is adapted with trunnions 27 located on an axis passing near its center of gravity about which the assembly may be tilted to pour the furnace charge. These trunnions, and the bearings about which the mold is adapted to swing, have their axes in line so that as the chamber assembly as a whole is tilted the position of the mold remains the same.

In operation, the crucible is so placed in the furnace coil that its pouring spout 28 will direct molten metal into the pouring funnel over the mold from the beginning to the end of the pour. Since the mold remains stationary the procedure is substantially identical to general open casting practice. The molten metal forms a pool in the pouring funnel and passes directly to the bottom of the mold. It cannot run over and cut or wash the mold side as in constructions where the furnace and mold are placed together rigidly. As pouring of the metal continues, the chamber assembly is rotated around its trunnions and the mold takes the relative position 29 shown by the dotted lines in the figures.

When the pour has been completed, the chamber assembly is returned to its original position and the metal in the mold, still undisturbed, is allowed to become solidified. After solidification, the vacuum or pressure conditions in the chamber may be relieved and the chamber opened to withdraw the mold and newly formed ingot.

The mold may be removed from the chamber assembly by lifts attached around the mold support arms.

Although applicant has described but one em-

bodiment of his invention it is obvious that the advantages disclosed can be gained even though the construction features vary from those illustrated. For example, it is not necessary that the axes of the chamber and mold trunnions coincide or that the furnace and mold be located exactly as indicated.

In view of his disclosure applicant requests that U. S. Letters Patent be granted to him for all that is claimed, as follows:

1. In a melting and casting device a melting crucible rigidly mounted within a sealed chamber, a mold within said chamber positioned to receive molten metal from said crucible when the chamber is tilted said mold being pivotally supported within said chamber whereby it may remain relatively stationary while the chamber and crucible are tilted.

2. In a melting and casting device, a sealed chamber, a crucible rigidly mounted within said chamber, trunnions extending outwardly from opposite sides of said chamber on a common axis about which the chamber may be rotated to pour a charge from the crucible, a second pair of trunnions extending inwardly from opposite sides of the chamber on the same axis as the external trunnions, a mold pivotally supported on said internal trunnions having its center of gravity below the axis of its supporting trunnions and having a top opening located substantially under the pouring lip of the crucible when the latter is in position for pouring a charge.

3. In a melting and casting device, a sealed chamber, a crucible rigidly mounted within said chamber, trunnions extending outwardly from opposite sides of said chamber on a common axis about which the chamber may be rotated to pour a charge from the crucible, a second pair of trunnions extending inwardly from opposite sides of the chamber, on a common axis parallel and close to the axis of the external trunnions, a mold pivotally supported on said internal trunnions having its center of gravity below the axis of its supporting trunnions and having a top opening located substantially under the pouring lip of the crucible when the latter is in position for pouring a charge.

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