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CASTING APPARATUS

Filed May 26, 1928

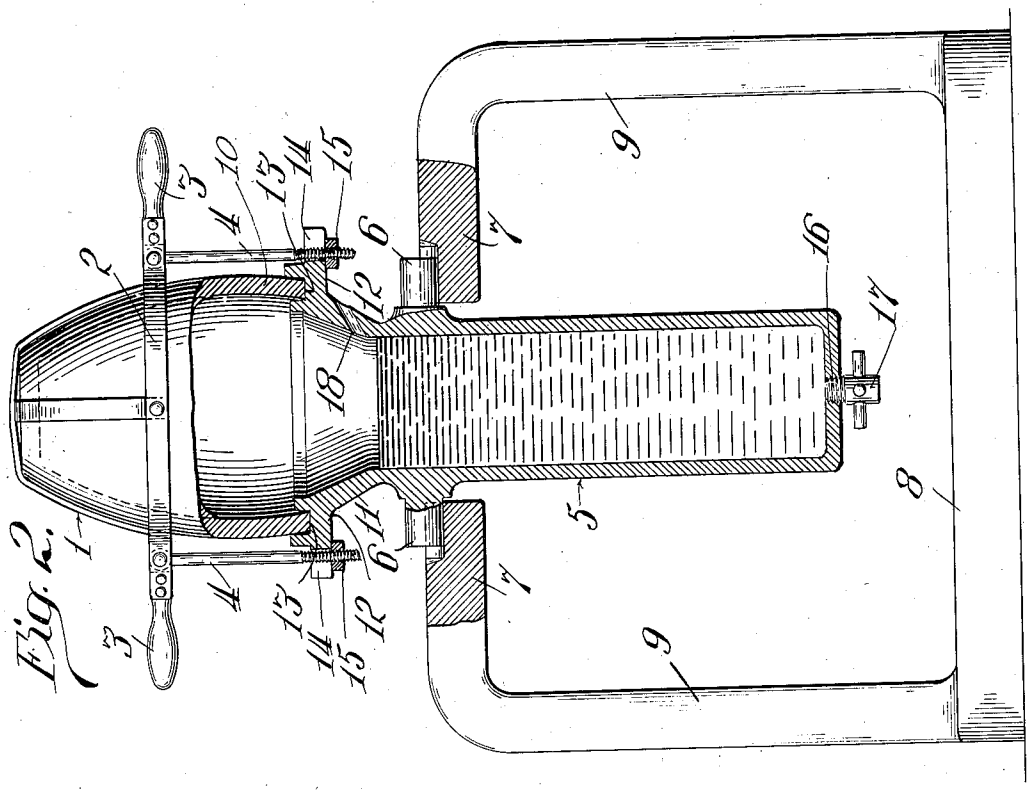


Fig. 2.

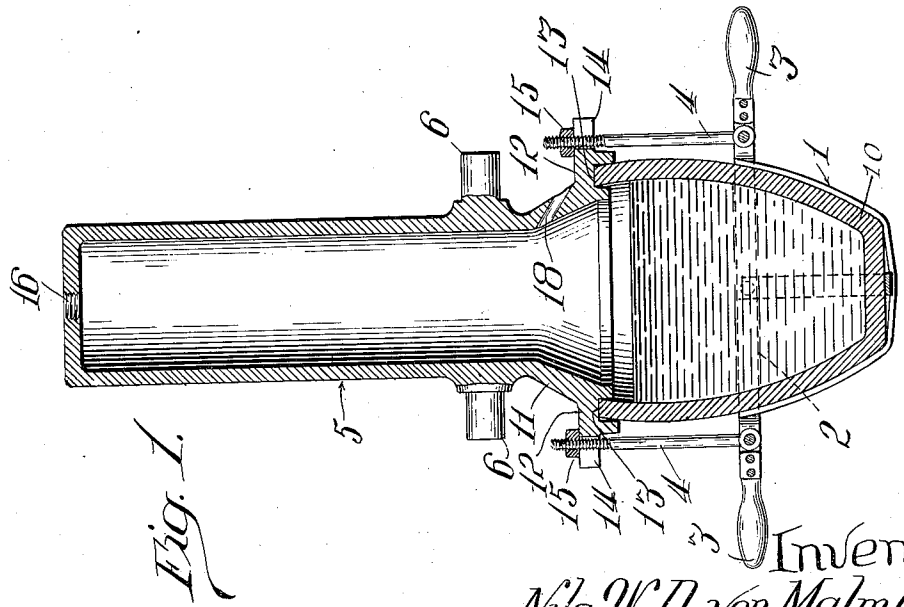


Fig. 1.

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CASTING APPARATUS

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This invention relates to the art of producing sheet metal and more particularly to the art of producing ingots of such metal which are adapted to be subsequently rolled into sheet metal and produce a product of that character which is far more uniform than is at present produced by existing methods.

The present invention is applicable particularly to aluminum, aluminum alloys, bronze, brass and other of the higher grade metals as distinguished from iron and steel.

It is well known that many metals or alloys, and particularly those containing aluminum will, if subjected to appreciable agitation while being poured into molds, form a considerable amount of dross if, during the pouring of the molten metal, it is exposed to the air and thus subjected to oxidation. It is also well known that aluminum oxide thus formed during the pouring of the metal has a strong tendency to remain suspended in the molten metal and is brought to the surface only with difficulty if at all as any stirring or agitation of the molten metal while still in the crucible or furnace or in the mold is very liable to loosen from the walls thereof further oxide or other foreign matter as the oxides formed during the melting of the metal usually collect on and adhere to said walls if the metal is not stirred or agitated appreciably when pouring the same to produce castings.

A very important feature of the present method consists, therefore, in excluding air from the crucible or furnace and the mold as soon as the metal has attained the desired liquid state ready for casting to produce, primarily, ingots thereof or other castings. Thus, when the metal is ready to be poured, the flask or mold which is to receive the same and which is provided with one or more air vents, is secured to the crucible or about the outlet of a tiltable furnace or the like to produce a hermetically sealed joint between said parts. The flask or mold is then permitted to remain in place in inverted position relatively to the crucible or furnace with its outer, and therefore, uppermost vent open to thus allow the gases from the metal and its container to expel all air contained in the mold and preheat the latter. During this short interval, those vents in the flask or mold which are apt to permit fresh air to enter the same while the air originally contained therein is being expelled, are plugged sufficiently loosely to permit the plugs to easily blow out after the metal has been transferred to the mold in case sufficient gas pressure is generated in the mold and crucible or furnace to be dangerous.

As soon as the flask or mold so associated with the crucible or furnace has attained the desired temperature, the vent through which air has now been expelled, is plugged and the respective positions of the flask or mold and the crucible or furnace reversed so that the latter becomes positioned to deliver the metal into the former, this motion being sufficiently gradual to permit smooth flow of the metal into the flask or mold without such agitation as will tend to loosen oxides or other foreign matter from the walls of the crucible or furnace and this position of the latter and the flask or mold is maintained until the metal has solidified in the latter.

Preferably the volume of molten metal in the crucible or furnace will be only slightly greater than that required to fill the flask or mold in order that there may be no "freezing" of metal in the outlet from the crucible or furnace and the outlet from the latter is preferably also made so large as to permit of free flow of metal therefrom and reverse flow of gases displaced from the flask or mold by the inflowing metal as such freedom will prevent any bubbling of such gases through the metal during the pouring of the latter.

The foregoing method will be more clearly understood by reference to the accompanying drawings illustrating a conventional crucible, an ingot mold of the form required to carry out the said method and means for associating the mold with the crucible, the last-mentioned elements constituting illustrations of a suitable embodiment of my invention in so far as the latter relates to mechanism as distinguished from method or process. In said drawings:

Fig. 1 shows in central vertical section, a crucible associated with a flask or mold and

a tiltable support for the latter and the crucible constructed in accordance with the invention.

Fig. 2 is a view similar to Fig. 1 showing the parts in inverted position relatively to Fig. 1.

The mechanism illustrated in the said drawings comprises a skeleton basket-like structure 1 composed of strips of sufficiently heavy sheet metal including a hoop 2. At diametrically opposite points, the latter is equipped with handles 3 and inwardly of said handles the lower ends of a pair of eye-bolts 4 are suitably secured.

The flask or mold 5, which in the instance illustrated, is an ingot mold, is equipped with trunnions 6 for pivotally supporting the mold upon the arms 7 of a supporting frame or member 8, the vertical portions 9 of the arms 7 being sufficiently spaced from each other to permit the crucible 10 and supporting basket therefor to be received therebetween.

The mouth of the mold 5 is flared as at 11 and equipped with an annular lip or flange 12 which is provided with an annular groove 13 to receive the rim of the open end or mouth of the crucible 10, said flange being also equipped with pairs of lugs 14 bordering recesses into which the threaded ends of the bolts 4 are passed, the nuts 15 being then turned to draw the mold and crucible together to provide a leak-proof joint therebetween. A suitable non-combustible packing ring may, obviously, be mounted in the groove 13 though such packing is not illustrated.

In the bottom wall of the mold 5, I provide a vent opening 16 which is adapted to receive a suitable plug 17 and in the flared portion 11 of the mouth of the mold 5, I provide a small vent opening 18 which, preferably, is closed by means of a slip-plug of suitable material.

In use, after the metal in the crucible is in condition for pouring, the crucible is disposed in the basket 1, the mold 5 associated therewith and this assembled structure then transferred by means of a crane or the like to the supporting frame 8 as shown in Fig. 2. The mold may be preheated before association with the crucible if so desired, and while being so associated, the small vent 18 will be closed and vent 16 remain open. The intense heat from the crucible and gases from the latter will quickly expand and discharge air from the mold 5 through the vent 16 which is then closed and then inverted sufficiently gradually to cause a smooth flow of the metal therefrom into the mold, the direction of rotation of the mold being preferably such that the metal does not pass over the vent 18.

After transfer of the metal to the mold, the vent 18 may be opened or the plug therein loosened sufficiently to relieve gas pressure in the mold and crucible, the latter remaining associated with and in inverted position until the metal in the mold has cooled sufficiently to obviate further oxidization by contact with the air or until said metal has become solidified.

Obviously other types of molds may be substituted for the ingot mold shown.

The invention may be applied to sand molds provided that preheating thereof is not carried to the point at which the superficial sand is loosened from the body thereof and thus becomes admixed with the metal.

Obviously in the embodiment shown, the crucible will primarily maintain the mold in inverted position by gravity and, after inversion of the mold, the latter will maintain the crucible in inverted position by gravity.

The invention is intended and best adapted for the production of ingots that are free from dross, oxidized particles or other foreign matter so that they are adapted to produce sheet metal of absolutely smooth surface and uniform texture or, in other words, sheet metal which is free of flaws or imperfections of any kind.

I claim as my invention:

Apparatus for producing metal castings which comprises a mold having a mouth portion, means for engaging bolts with the mouth portion of said mold, means at the said mouth portion for receiving the rim of the mouth of a crucible for effecting a hermetically sealed connection between said mold and said crucible, air vents at opposite ends of said mold, a pair of trunnions thereon adjacent the mouth portion thereof, a supporting frame equipped with bearing formations to receive said trunnions, said mold being rotatable in said bearing formations to inverted position, a crucible receiving and supporting structure having manually engageable members for transporting the same, bolts pivotally secured to said members and adapted to engage the first-mentioned means to firmly associate the mold with a crucible mounted in said structure, said air vents being sealable to permit inversion of said crucible after association with the inverted mold to effect transfer of the contents of the crucible to the mold.

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