Jan. 3, 1933. E. L. MESSLER ET AL 1,893,207

HOT TOP

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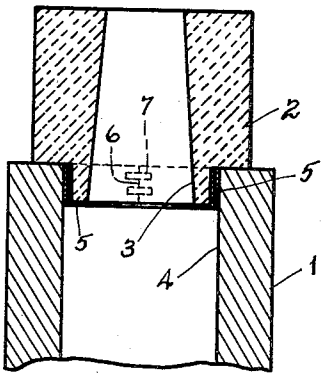


Fig. I

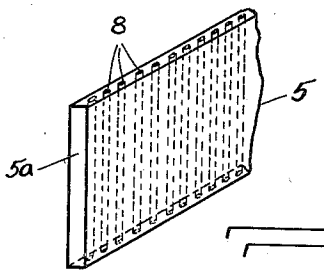


Fig. II

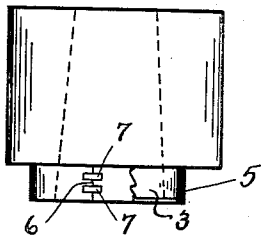


Fig. III

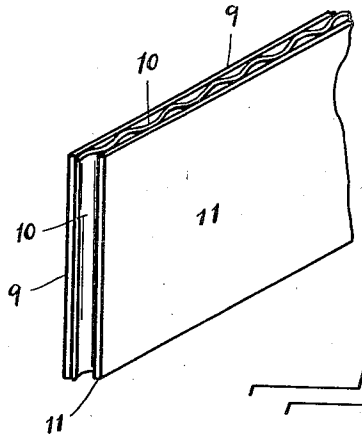


Fig. IV

INVENTORS.
Eugene L. Messler and
John J. Isherwood
by Christy & Christy and Wharton
their attorneys

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UNITED STATES PATENT OFFICE

EUGENE L. MESSLER AND JOHN J. ISHERWOOD, OF PITTSBURGH, PENNSYLVANIA; SAID ISHERWOOD ASSIGNOR TO SAID MESSLER

HOT TOP

Continuation of application Serial No. 564,498, filed September 23, 1931. This application filed January 22, 1932. Serial No. 588,064.

This invention relates to a hot-top, that is, to that piece of heat-refracting equipment which ordinarily is installed upon the open end of an ingot mold.

In most cases the hot-top comprises a hollow body of refractory material which is adapted to extend upward from the ingot mold with which it is associated, to provide a heat-insulated continuation of the mold cavity. The general structure and advantages of hot-tops are well known in the art, and they will not be repeated herein, save in the following particulars: A hot-top ordinarily includes a neck portion which in service extends downward into the cavity of the ingot mold; the function of the neck portion is to provide a joint between the hot-top and the mold, such that, when the mold and hot-top are filled with molten metal, escape of metal between the hot-top and mold is prevented. Obviously, it is desirable to provide a nice fit between the neck of the hot-top and the mold; otherwise, metal will escape, and even when such escape of metal is prevented, there is the disadvantage that molten metal works itself up into the interval between the neck and the wall of the mold cavity, and therein forms an annulus of metal around the neck of the hot-top. Such annulus of metal will, upon cooling and solidifying, contract upon the neck, so that the lower edge thereof will be embedded in solidified metal, whereupon the neck of the hot-top is broken, leaving fragments of refractory material secured to the ingot, when the hot-top is removed from the mold. In general it is impractical to chip out this embedded refractory material; as a result (when the ingots are placed in the soaking pits to condition them for rolling) the refractory material melts and runs to the floor of the pits where it constitutes a nuisance, requiring from time to time that the pits be shut down and cleaned. Of course, hot-tops which are so broken upon removal from the molds are unfit for further use.

Furthermore, unless the hot-top is "blocked-up" on the ingot mold and the blocks removed after teeming, it will be manifest that the annulus of metal in shrinking around the neck of the hot-top will cause a hanging ingot.

For years we have been experimenting with various means for insuring the desired fit between an ingot mold and its associated hot-top. We have discovered that a packing which is manually installed between the assembled hot-top and the mold is impractical. Reasons for this are that the labor cost of installation is prohibitive, and (due to the fact that the ingot molds in service are at a high temperature) workmen are endangered in doing the job. Additionally, experiments have proven that a gasket member of plain one-ply paper-board, when preformed and organized between the hot-top and the mold, is unsatisfactory. For example, prior to our present invention we were unable to secure a board having sufficient compressibility to accommodate the irregularities between the ingot mold and the neck of the hot-top. In using a gasket of uninterrupted body between the hot-top and the mold, we discovered that, upon teeming the mold, gases were generated by combustion of the gasket member, and these gases resulted in what are called "blow-outs"; that is, small explosions were caused within the mold. These explosions tended to destroy the gasket member, dislodge the hot-top from its desired position, and in general to create an imperfect ingot. In general the gasket members or packings, whether combustible or non-combustible, which have been known heretofore, have not proven commercially practical or successful in service.

We have discovered that a gasket member including in its structure a plurality of air cells, pockets, or air passages may be organized upon the outer neck surface of the hot-top in such manner that, when the hot-top is placed upon the mouth of an ingot mold, the region between the neck of the top and the inner wall of the mold will be effectively stopped with packing material. Included with the packing are preformed air cells, pockets, or passages. Tests on a commercial scale have conclusively proven that such a packing is a solution of the problem. The tests have proven furthermore that the

mold and hot-top may be completely filled with molten metal without interrupting the teeming when the level of the metal within the mold reaches the edge of the hot-top. It may be explained that hitherto such interruption during teeming was necessary to permit the metal to chill and to form a seal between the hot-top and the mold. Of course, this advantage saves time in the casting of a "heat" of metal. The temperature during teeming manifestly will be more even; there is a higher temperature of the metal at the finish of the teeming operation, and these factors tend to minimize oxidation and the formation of scabs, slivers and other imperfections on the upper end of the ingot. It may be added that since it is unnecessary to interrupt the teeming of an ingot partway of the operation, as explained, there is no splashing of molten metal over the top of the hot-top and upon the outer faces of the mold, it of course being known that the "plugging" of a hot metal ladle causes a momentary splashing of molten metal.

The object of our invention is to provide a gasket member which includes in its structure a plurality of air cells, such that (when the gasket is placed between a hot-top and an ingot mold) results of the nature indicated will be obtained. In providing the gasket member, we aim to compensate for such variations as usually are found between the contour of the mold and the adjoining face of the hot-top. We prevent "hanging" ingots, without the necessity of "blocking-up" the hot-tops in the usual manner. In preventing metal from working its way up between the hot-top and the ingot mold, we minimize the tendency of the hot-top to crumble at its lower end. Accordingly, each hot-top may be used for the casting of several ingots.

In Fig. I of the accompanying drawing we illustrate fragmentarily an ingot mold, showing a hot-top, provided with a gasket in accordance with our invention, installed upon the upper end of such mold; Fig. II is a fragmentary view, to larger scale, illustrating a material of which the gasket member may be formed; Fig. III is a view, partly in vertical section and partly in side elevation, of a hot-top provided with an air-celled gasket member; and Fig. IV is a view, comparable with Fig. II, showing a gasket member of modified structure.

The reference numeral 1 is applied to the ingot mold shown in Fig. I. Associated with the mold is a hot-top, comprising a body 2 and a neck 3. The hot-top is formed of refractory material; there are many known refractory compositions of which the hot-top may be formed, and the advantages attending the use of a hot-top, are well known. Our invention is directed to means for insuring a snug fit between the neck 3 and the wall 4 of the mold cavity; that is to say, the invention concerns means for insuring such a fit, without producing "blow-outs" (or creating any other unsatisfactory condition) in service. More specifically our invention resides in a particular gasket member, and in its organization upon the neck 3 of the hot-top. The gasket member comprises a cellular strip 5 of either combustible or non-combustible material. For example, the cellular strip 5 may be composed of paper pulp or asbestos; the consistency of the material is such as to admit of compression and flexing. Preparatory to service, the strip is wrapped upon the neck of the hot-top, the flexibility of the strip readily admitting of such wrapping. The ends of the strip 5*a*, are brought to abutment, as indicated at 6 in Figs. I and III, and means are provided to secure the strip in such position. A band of tape or wire may be passed around the strip to serve as the means for securing it in place. We have found that particularly effective and inexpensive means for retaining the gasket in place comprises one or more strips of gum or glue paper 7. The gum strips 7 are moistened and placed over the abutting ends of strip 5 in the manner indicated in Fig. III.

The compressibility of the cellular strip permits the hot-top to be readily set in position upon the mold, and accommodates irregularities between the neck 3 and the mold, insuring a snug fit between the hot-top and the mold throughout the periphery of the neck 3. Advantageously the strip 5 includes a plurality of air compartments, cells, channels, or pockets. In Fig. II one form of strip is shown fragmentarily in perspective. In this case the strip includes a plurality of air channels 8 which are so disposed in the strip as to extend vertically with respect to the hot-top as shown in Fig. I. In larger installations, the air channels may extend horizontally instead of vertically, and with equal efficacy will afford the desired results. Indeed we are of the opinion that the air chambers within the strip 5 need have no particular shape or extent. As a matter of fact we have discovered that one of the least expensive and most satisfactory materials of which to form the gasket member is corrugated board, cf. Fig. IV. Such board has the characteristics essential to obtain the desired results. The corrugated board may comprises a backing sheet 9 to which a corrugated sheet 10 is applied. Additionally, a facing sheet 11 may be included in the corrugated board structure.

When a gasket of combustible material, such as the cellular board mentioned, is used we find that the lower edge of the gasket becomes charred upon engagement with molten metal, thus effecting a deposit of carbon upon the neck of the hot-top. The carbon in so applying itself to the neck of the hot-

top enhances the desired tight, heat-insulating joint between the hot-top and the mold, and prevents the flow of any appreciable amount of metal into the region between the hot-top and the mold. Indeed, our tests have shown that the necks of the hot-tops are absolutely free of metal when removed from the cast ingots.

In case a given corrugated board chars too excessively, we dip it in a fireproofing solution, such for example, as a solution of calcium chloride. It may be mentioned that a cellular board which has been treated with paraffin or other oily substance which volatilizes upon heating cannot be satisfactorily employed.

The above specification and the appended claims constitute a continuation of our application for Letters Patent Serial No. 564,498, filed September 23, 1931. To facilitate expression in the following claims, we define a gasket member, having the characteristics described in the foregoing specification, as cellular in structure. Paper pulp, asbestos, or other such combustible or noncombustible material of which the gasket member may be formed, is termed pulpous.

We claim as our invention:

1. In combination with a hot-top including a neck adapted to project into an ingot mold, a gasket member for installation between the hot-top and the mold, said gasket member comprising a strip of cellular material and adapted to be secured upon the outer face of said neck.

2. In a hot top adapted to be orginized with an ingot mold, to provide a continuation of the mold cavity, which hot top includes a surface area which, in assembly with the mold lies adjacent the face of the mold, the combination of a gasket member located against said surface area, said gasket member being formed of pulpous material and being cellular in structure, so as to provide a plurality of air cells between said surface area and the adjacent face of the mold.

In testimony whereof we have hereunto set our hands.

EUGENE L. MESSLER.
JOHN J. ISHERWOOD.