Oct. 20, 1936. H. R. FREUND 2,058,378

METAL POT FOR LINE CASTING MACHINES

Filed March 29, 1935 2 Sheets-Sheet 1

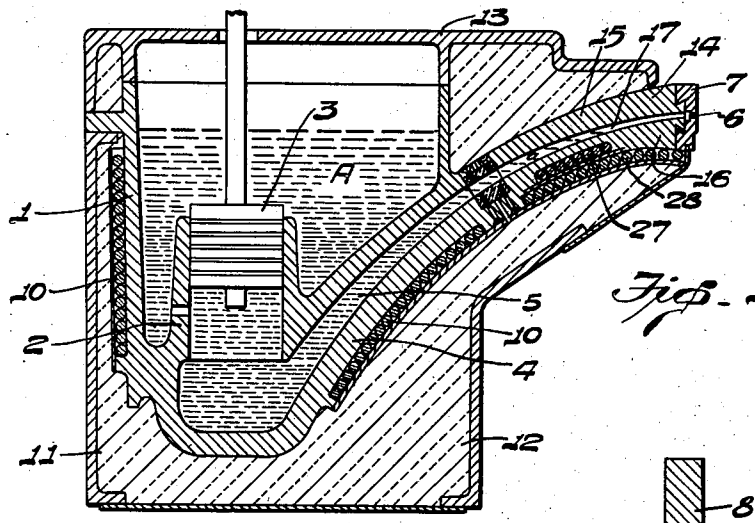


Fig. 1.

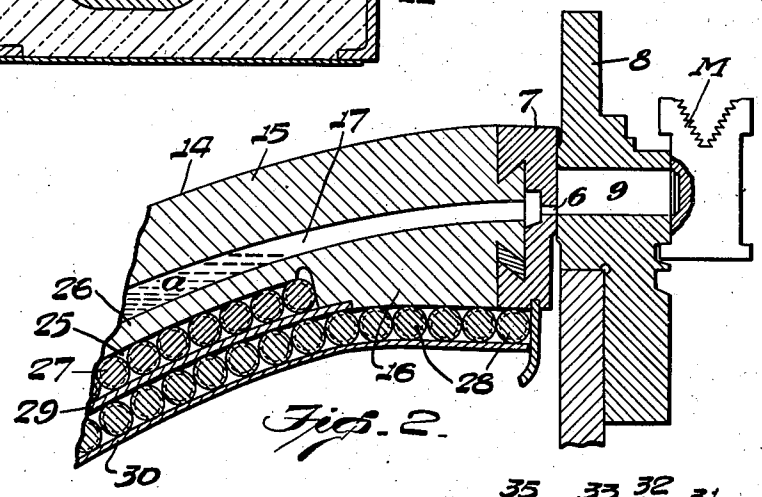


Fig. 2.

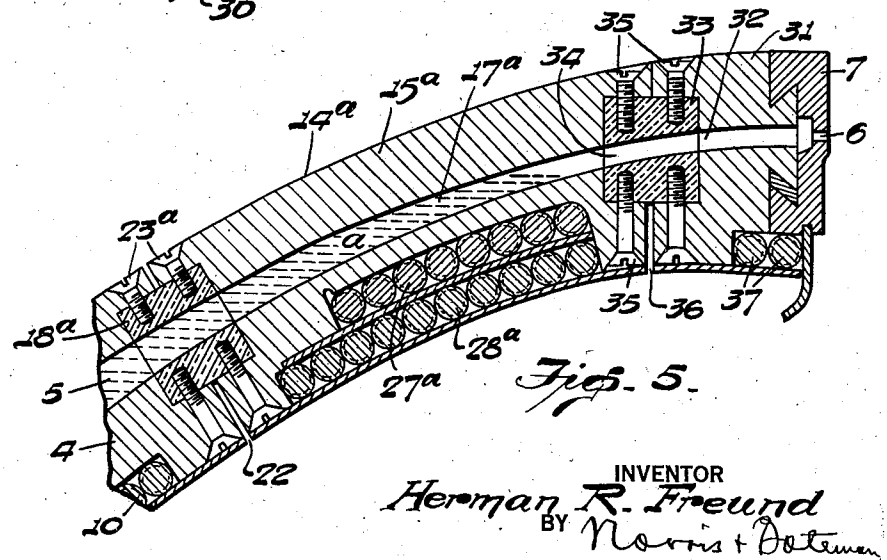


Fig. 5.

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Fig. 3.

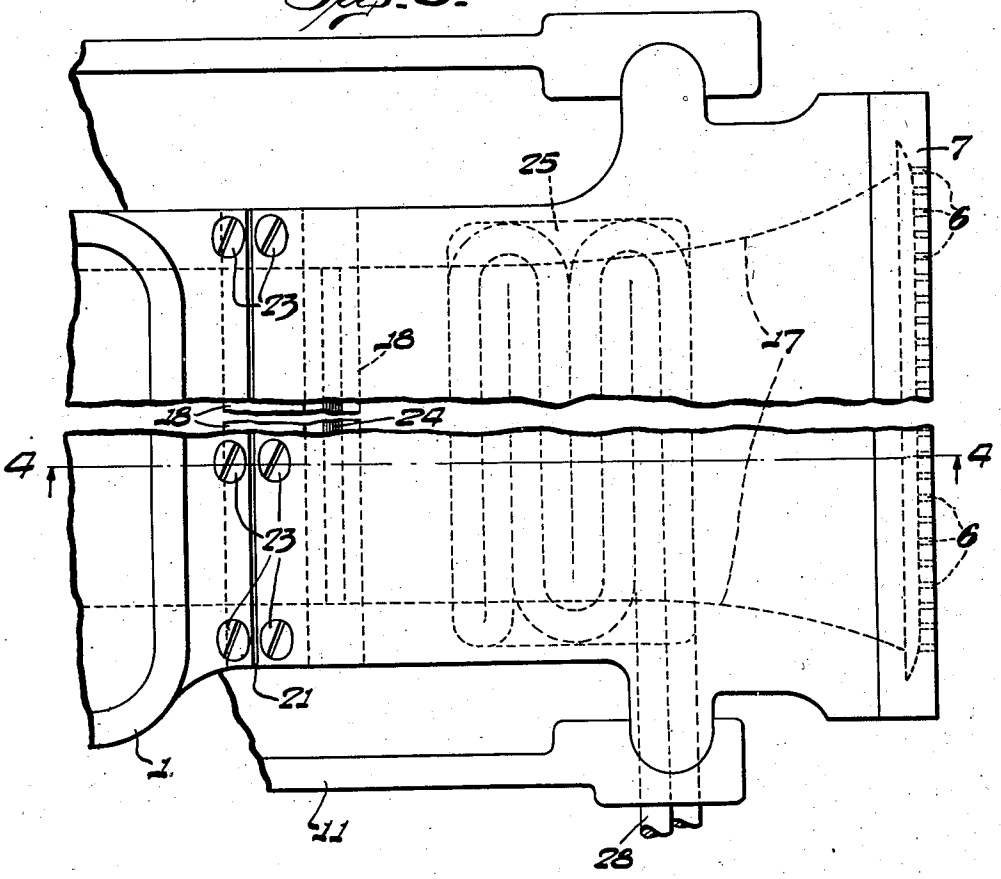
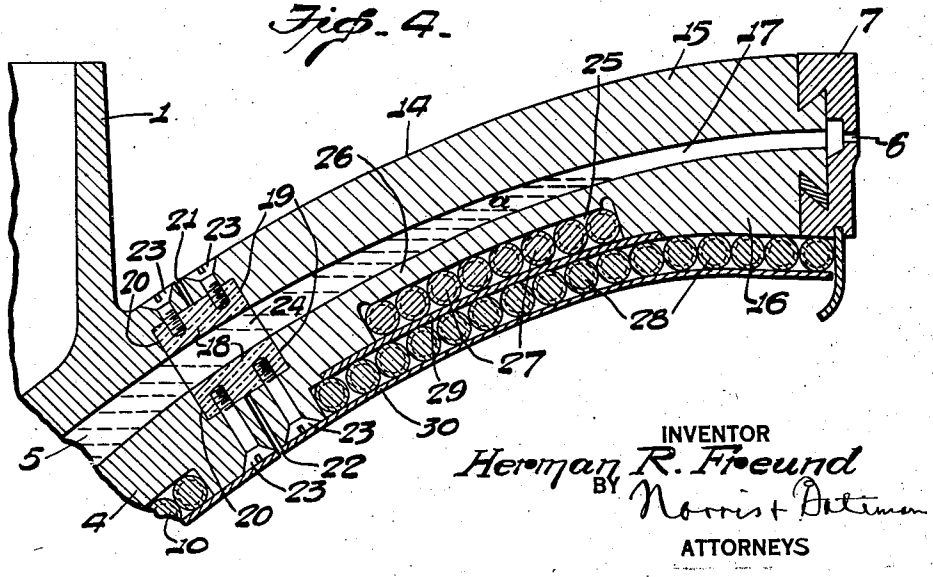


Fig. 4.



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METAL POT FOR LINE CASTING MACHINES

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Application March 29, 1935, Serial No. 13,754

8 Claims. (Cl. 22—70)

The present invention relates to line casting machines of the general class disclosed for example in U. S. Letters Patent No. 436,532, granted September 16, 1890, wherein composed lines of character bearing matrices are presented to the front of a slotted mold into which molten metal is forced from the mouth of a metal pot alined at the opposite side of the mold slot to cast therein type bearing slugs which are subsequently ejected from the mold, after which the matrices are returned to their places of storage in the machine.

The present invention relates more particularly to improvements in the metal pot for machines of this general class or similar machines for casting type slugs, whereby the temperature of the molten type metal may be controlled more effectively than heretofore and thus enable the casting of slugs which are more perfect with respect to solidity of the body portion thereof and quality of the type face thereon, irrespective of differences in speed of casting or shape and size of the slugs.

The usual form of metal pot now employed for machines of this general class comprises a main cast iron or other metallic reservoir adapted to contain a supply of type metal and having a pump well fitted with a piston for ejecting molten type metal from the pot and an integral molten metal conducting throat communicating with the pump well and extending upwardly therefrom, the throat having a molten metal conducting passage which is relatively shallow vertically and flared laterally beyond the width of the pump well to a width corresponding to the maximum length of mold intended to be used in the machine. Gas burners or electric heating elements are usually employed, either within or around the outside of the reservoir and also along the throat, particularly near the ejecting mouth at the upper outer end thereof for maintaining the type metal in molten state.

Since the metal reservoir and throat of the usual metal pot are integral or at least metallically connected parts, it is difficult in practice to maintain the proper heat conditions throughout the pot. For example, when casting at high speeds or producing large slugs, the heat applied to the mouth of the throat must be reduced because sufficient heat is then supplied to the throat by absorption from the greater amount of molten metal being used. When casting slowly or producing small slugs, more heat must be applied to the mouth of the throat because less molten metal is then being pumped through the throat and consequently less heat is absorbed thereby from the molten metal. Excessive heat cannot be supplied to the molten metal in the reservoir to compensate for slow casting and deficient heating at the mouth of the throat because the tin constituent in the molten type metal deteriorates rapidly if the temperature is too high; and the temperature of the molten metal in the reservoir cannot be reduced to compensate for rapid casting and excessive heating at the mouth of the throat since such would result in inferior quality of the type face on the slugs.

The primary objects of the present invention are to overcome such objectionable conditions and to facilitate production of good quality slugs on machines of the general class referred to and also to enable the heating of the metal pot to be accomplished more economically. To these ends, the invention provides a metal pot having a reservoir section and a separate throat section thermally insulated from the reservoir section, these sections being provided with means for supplying heat thereto from independent sources. The invention further provides a metal pot having a throat section and a metal injecting mouth constructed as separate thermally insulated parts, each of these parts having means for heating it separately so that the temperature of the mouth of the throat and that of the throat section between the throat mouth and the reservoir may be more accurately or closely controlled if desired.

By so constructing the metal pot the body of molten metal normally lying in the throat section near the upper end thereof while the machine is idle may be maintained at the most suitable temperature for the casting of solid slugs with a good quality of type face, it being understood that upon each metal injecting stroke of the piston in the pump well, the molten metal lying in the throat near its upper end is used in casting the slug. By providing a separate throat section thermally insulated from the reservoir portion, a hot spot or independently heated area can be maintained for heating the metal lying in the throat to the most desirable temperature for casting good quality slugs, irrespective of whether the slugs are being cast rapidly or slowly or whether large or small slugs are being produced, and the amount of heat supplied to the reservoir portion of the pot may be reduced to a minimum or to an amount merely sufficient to keep the metal therein in a fluid state. Moreover, the improved metal pot provided by the present invention enables all of the heat supplied to the heat insulated and independently heated throat section to be ab-

sorbed effectively by the relatively shallow body of molten metal lying in the throat instead of being conducted away from the throat by the reservoir portion, as would occur if the latter were integral with the throat, and heat supplied to the independent reservoir portion will be entirely absorbed thereby for heating the large body of type metal in the reservoir without being conducted away by the throat section as would occur if the latter were integral with the reservoir.

To these and other ends, the invention consists in certain improvements and combinations and arrangements of parts all as will be hereinafter more fully described, the features of novelty being pointed out more particularly in the claims at the end of this specification.

In the accompanying drawings:

Figure 1 is a vertical section of a metal pot for line casting machines, constructed in accordance with one embodiment of the present invention;

Figure 2 is a vertical section, on an enlarged scale, of the mouth of the metal pot as shown in Figure 1, the throat mouth being shown in contact with the back of a slug casting mold and a line of matrices closing the front of the mold;

Figure 3 is a top plan view, on an enlarged scale, of a portion of the metal pot shown in Fig. 1, the jacket cover being removed;

Figure 4 is a vertical section taken on the line 4—4 in Fig. 3; and

Figure 5 is a view similar to Fig. 4 but showing another embodiment of the invention.

Similar parts are designated by the same reference characters in the several figures.

The present invention is applicable generally to the metal pots of line casting machines and it is shown in the present instance as applied to a metal pot of the type usually employed in machines of this class. It is to be understood however that the invention is not restricted to the precise construction shown since equivalent constructions are contemplated and such will be included within the scope of the claims.

In the present instance the metal pot as shown in Figure 1 is similar to that commonly employed in commercial line casting machines, it comprising a type metal reservoir 1 containing a pump well 2 in which operates a reciprocatory plunger or piston 3 which is lowered in the well in the well known manner to force molten metal therefrom, an elongated throat 4, usually cast integral with the metal reservoir extending upwardly therefrom and having a molten metal delivery passage 5 therein which communicates at its lower end with the pump well, this metal delivery passage being usually flared laterally to provide a widened mouth which communicates with openings 6 in a mouthpiece 7 secured to the upper end of the pot throat. The mouthpiece 7 is adapted as usual to contact with and close against the rear side of the mold 8 and thus close the slug casting slot or cavity 9 therein at its rear side, when the metal pot is advanced preparatory to the casting operation in the usual way, and the front of the mold is adapted to contact with a line of character bearing matrices M the characters on which are adapted to aline with the mold slot and the mold slot being closed at the front by the matrix line, when the mold is advanced in the usual way preparatory to the casting operation, the parts being shown in casting relation in Fig. 2. When the plunger 3 is forced downwardly in the pump well 2, the molten type metal is forced upwardly through the metal delivery passage 5 and through the openings 6 in the mouthpiece into the mold, in the usual well known manner.

The present invention is applicable to metal pots which may be supplied with heat in different ways. As shown in the present instance, the metal pot is heated electrically, the molten metal reservoir 1 and the lower portion of the throat 4 being provided with an electric heating element 10 which may extend around these parts as shown, the metal pot being inclosed within a jacket 11 which may contain a suitable heat insulating material 12, and the top of the jacket and metal pot may be closed by a removable cover 13.

The level of the molten metal A is always such that the portion thereof in the throat of the pot will lie somewhat back from the mouthpiece to avoid spilling, and it will be seen from Figs. 1 and 3 that the slug is always cast from some of the shallow body of metal *a* lying in the upper end of the throat. Since the quality of the slug body and type face are directly affected by the temperature of this body of metal, it is desirable to accurately control the temperature conditions at this point in the pot throat and to maintain such temperature conditions as uniform as possible and at the temperature best suited to the size of the slugs and the speed at which they are being cast.

In metal pots of the usual construction, the entire throat and reservoir are integral in the sense that they constitute a unitary metallic structure, but according to the present invention, the throat portion of the pot is formed separately from the reservoir portion and is thermally insulated therefrom, thus enabling the temperature conditions, particularly at the upper end of the throat containing the body of molten metal used at each stroke of the plunger for casting to be more accurately controlled by avoiding loss of the heat supplied to the throat through conduction therefrom, as occurs when the throat and reservoir portions of the pot are metallically connected parts, as heretofore. Accordingly and as shown in Figs. 1 and 4, the present invention provides a separate throat section 14 comprising upper and lower walls 15 and 16 which are either integral or joined together at the sides to provide a throat passage 17 at the upper end of which may be secured the mouthpiece 7. The separate throat portion 14 containing the throat passage 17 may be secured to the reservoir portion of the pot in any suitable manner that will thermally insulate it therefrom. In the present instance, a bar 18 of any suitable hard heat insulating material such as commercial "Transite", a composition composed of a mineral cement, asbestos fiber and magnesia, is employed for this purpose, the lower end of the upper separate throat section 14 being formed with a recess 19 and the upper end of the metal delivery throat section 4 being formed with a recess 20, these recesses extending above and below the metal passages 5 and 17 and receiving portions of the width of the insulating bar 18, the depth of the respective recesses being such that when the insulating bar is inserted in place, gaps 21 and 22 will be left between the upper throat section 14 and the throat section 4 which extends from the pump well in the reservoir, to avoid conduction or transfer of heat that would result from metallic contact between these parts. Suitable means is provided for securing the parts 4, 14 and 18 together, screws 23 being shown for this purpose in the present instance which extend partially into but not through the insulating bar 18, and the latter is formed with a slot 24

which extends through it in continuation of the metal delivery passage 5 and throat passage 17, thus providing a continuous walled throat from the pump well 2 to the mouthpiece 7.

Means is provided for heating the body of molten type metal *a* normally lying in the throat passage 17 of the throat portion 14, and in order that such heating means may be more effective in maintaining this body of metal at a uniform temperature and cause such body of metal to respond more quickly to desired changes in the temperature thereof, the outer side of the bottom wall 16 of the throat portion 14 is provided with a recess 25 which provides a relatively thin wall 26 between the throat passage 17 and a heater. In the present instance, an electric heater embodying suitable electric heating coils 27, is inserted in this recess, the heating coils lying against the relatively thin wall 26. The heater 27 in the recess 25 affords means for heating the body of metal *a* normally lying in the throat passage 17, and this heater may be controlled by a separate rheostat or the like for varying the heating effects thereof, the relatively thin wall 26 enabling changes in the heating effect of the heater 27 to quickly alter the temperature of the body of metal *a* lying above it, as desired, according to the size of slugs to be cast. The heater 27 thus serves in effect to produce a hot spot across the floor of the separate throat passage 17 on which the body of metal *a* normally lies.

In order to provide for adequately heating the entire upper throat section 14 comprising the walls 15 and 16 and the sides connecting them, as well as the mouthpiece 7, a heater 28, which may comprise electric heating coils as shown, is provided, this heater preferably extending along the entire extent of the underside of the separate throat section 14, the heater 28 being separated from the heater 27 by a metal shield 29, and a cover plate 30 being preferably provided which is suitably secured to the outer side of the throat section 14 to retain both heaters in place and to hold them firmly in contact with the surfaces of this throat portion.

Another embodiment of the invention is shown in Figure 5 wherein the upper throat section is thermally insulated from the reservoir portion of the pot, and the mouth of the upper throat section, instead of being integrally or metallically united therewith is thermally insulated at a point adjacent to but back of the mouthpiece to enable independent control of the temperature of the mouthpiece and increase in the efficiency of the hot spot area in the throat by entirely isolating it thermally along the bottom of the throat. For example, a throat section 14^a may be employed which is connected to but thermally insulated from the section 4 by an insulating bar 18^a and securing screws 23^a, this throat section 14^a being provided with independent electric heating coils 27^a and 28^a, and the mouthpiece 7 may be secured to a short throat section 31 having a metal passage 32 therein which is a continuation of the metal passage 17^a in the throat section 14^a. The throat sections 14^a and 31 may be recessed to receive an insulating bar 33 similar to the insulating bar 18 or 18^a, the insulating bar 33 having a slot 34 extending therethrough and forming a continuation of the metal passages 17^a and 32, screws 35 extending into the insulating bar 33 but not passing through it and securing the throat sections 17^a and 31 and the insulating bar 33 together. In order to partially isolate the throat section 14^a thermally from the short mouthpiece section 31, a gap 36 is provided at the underside of the heat insulating bar 33 which joins these sections but in order to permit adequate conduction of heat into the upper wall 15^a of the throat section 14^a, metallic contact is provided between this wall and the short throat section 31 at the upper side of the heat insulating bar 33. Heat may be supplied to the wall 15^a of the throat section 14^a as well as to the short throat section 31 from a suitable heater such as an electric heating unit 37 provided along the underside of the mouthpiece.

By thermally insulating the throat of the metal pot from the reservoir thereof, as herein described and providing the independently controllable hearters 10 and 27 and 28 or 27^a and 28^a, the proper amount of heat may be supplied to maintain the body of metal *a* at the proper temperature to cast solid slugs with a good quality of type face, whether the slugs are large or small. The provision of a throat heater for the thermally insulated throat section and the arrangement of such heater against a relatively thin wall along the bottom of the metal passage in the throat enables the body of metal *a* to respond quickly to temperature changes as may be desired to maintain the quality of slugs cast at different casting speeds. Moreover, the thermally insulated throat section may be maintained at a temperature considerably higher than that of the metal pot reservoir so that as new metal replaces that at the point *a* in the throat, due to the successive casting of slugs, such metal may be instantly supplied with the required amount of heat from the hot spot zone or area across the underside of the throat under the influence of the heater in the thin walled recess beneath it. By providing such a hot spot zone in the metal pot throat to bring the metal to the appropriate casting temperature, the temperature of the main body of metal A in the reservoir may be maintained relatively low or sufficient merely to keep this large body of type metal in a fluid state.

By separating the mouth section of the throat from the section thereof intermediate the mouth and the reservoir and providing separately controlled heaters for the intermediate throat section and the mouth section, a further refinement of temperature control may be obtained, this arrangement affording maximum facility for altering temperature conditions as the requirements change for casting slugs of maximum and minimum sizes at different speeds.

I claim as my invention:—

1. In or for a slug casting machine, a metal pot comprising a reservoir for molten metal, a pump well contained in said reservoir to receive molten metal therefrom, and a passage leading from said well and reservoir for conducting molten metal therefrom, said passage comprising a plurality of sections thermally insulated one from another.

2. In or for a slug casting machine, a metal pot comprising a reservoir for molten metal, a pump well contained in said reservoir to receive molten metal therefrom, and a passage leading from said well and reservoir for conducting molten metal therefrom, said passage comprising a plurality of sections thermally insulated one from another and providing smooth continuous surfaces for the uninterrupted flow of molten metal from one section to the other.

3. In or for a slug casting machine, a metal pot comprising a reservoir for molten metal, a pump well contained in said reservoir to receive

molten metal therefrom, and a passage leading from said well and reservoir for conducting molten metal upwardly to a discharge point above the level of metal in the reservoir, said passage comprising separate metal sections, and connecting members joining said sections together, said connecting members having thermal insulating characteristics and being provided with metal conducting passages contiguous with the walls of the passages in the separate metal sections.

4. In or for a slug casting machine, a metal pot comprising a reservoir for molten metal, a pump well contained in said reservoir to receive molten metal therefrom, a passage leading from said well and reservoir for conducting molten metal therefrom, said conducting passage comprising a plurality of sections thermally insulated one from another and extending to a point remote from the reservoir, and means for heating said sections separately.

5. In or for a slug casting machine, a metal pot having a reservoir to contain molten metal and a pump well contained within said reservoir to receive molten metal therefrom, and a throat extending upwardly from said well exteriorly of the reservoir and at a side thereof for conducting molten metal from said well, at least one wall of said throat comprising a section thermally insulated from the remainder of the throat and the pump well and reservoir.

6. In or for a slug casting machine, a metal pot having a reservoir to contain molten metal and a pump well within said reservoir to receive molten metal therefrom, and a throat extending upwardly from said well exteriorly of the reservoir and at a side thereof for conducting molten metal from said well, at least one wall of said throat, at a point along its exteriorly extending portion, having a thermally-insulated connection with the remainder of the throat.

7. In or for a slug casting machine, a metal pot having a reservoir to contain molten metal and a pump well within said reservoir to receive molten metal therefrom, and a throat extending upwardly from said well exteriorly of the reservoir and at a side thereof for conducting molten metal from said well, at least one wall of said throat, at a point along its exteriorly extending portion, having a thermally-insulated connection with the remainder of the throat, and independent heating means for the portion of the throat at the side of the thermally-insulated connection remote from the reservoir.

8. In or for a slug casting machine, a metal pot having a reservoir to contain a supply of molten metal and a pump well within said reservoir to receive molten metal therefrom, a throat extending upwardly from said well exteriorly of the reservoir and having a molten metal injecting mouthpiece at its upper end, the throat comprising an intermediate section adjacent to the mouthpiece having a thermally-insulated connection between at least one wall thereof and the mouthpiece and having a thermally-insulated connection with the portion of the throat extending from the pump well, and means for separately heating the reservoir and said intermediate section of the throat.

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