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APPARATUS FOR DEGASIFYING LIQUID METAL

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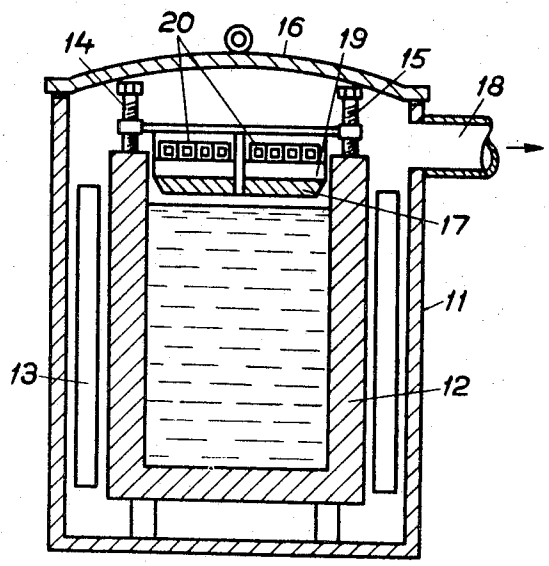

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APPARATUS FOR DEGASIFYING LIQUID METAL

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3 Claims. (Cl. 266—34)

In order to counteract forming of pipes in ingots a device is known which consists of a plate of heat conducting, electrical conducting material, preferably graphite and of a heat insulating, heat resistant coating upon this plate as well as an electrical heating device which rests upon this insulating coating. The whole device can be raised and lowered above the ingot. The purpose of this device is to make it possible for the top of the ingot to be kept above the solidification temperature for a certain predetermined time. The invention is based on the use of this idea within another metallurgical field of use, namely degassing in a ladle.

The invention relates to a ladle or chill which contains molten steel or another metal or metal alloy. In such ladles, for example in connection with degassing of their molten contents, it has usually been difficult to avoid heat losses particularly as it is not practical during degassing to have a heat insulating slag covering the surface of the melt. Close to or beneath the ladle according to the invention an inductive, low frequency stirrer is placed and the invention is characterised in that at the upper part of the ladle a raisable and lowerable cover or a plate of heat conducting, electrical conducting material with good resistance to temperature losses, preferably graphite, is situated, and that on this plate is arranged a heat insulating layer and over and/or in this an electrical induction heating device. The plate or cover should suitably have a shape mainly corresponding to the upper inner section of the ladle. Such an arrangement gives a reduced heat radiation from the molten metal.

The heating from the cover can be of different amounts. With the help of the stirrer the molten surface can continually be renewed and the temperature is kept constant. In this way for example overheating of the molten surface can be avoided. The raisability and lowerability of the cover/plate makes it possible for this to be positioned more closely to the molten surface. The possibility of degassing to a high degree of a melt handled in this manner becomes important, since time is not important to the same extent as previously when the temperature fall in the molten metal was considerable. The stirring, except for the temperature equalising effect, gives an intensified degassing. As is known, vacuum degassing of non-moving molten metal is not so effective in the bottom layers as on the surface layer. With stirring in the ladle the total degassing becomes greater. The drawing shows an embodiment of the invention.

In the accompanying figure is shown schematically a ladle **12**, situated in a gas tight closable tank **11** for molten steel or another metal or metal alloy. From the tank one or more gas evacuation conduits **18** are connected to one or more evacuation pumps, not shown. At the side of the ladle and/or beneath it, a low frequency (0.2–10 cycles per second) multi-phase stirrer **13** of known construction (cylindrical stirrer or one or more plane stirrers) is arranged. Stirring can also be produced from the heating coil described below either through separate windings in this, superimposing of low frequency

current upon the high frequency heating current or by alternately feeding by high and low frequency current. By "high frequency" we mean here a current with a frequency above 60 cycles per second.

Under the upper wall or cover **16** of the tank there is arranged a graphite cover or plate **17** (which can also be of another heat conducting, electrical conducting material impervious to heat up to high temperatures) with a good fit to the upper part of the ladle **12**, raisable or lowerable by means of screw devices **14**, **15**. Above the plate **17** is arranged a heat insulating layer **19** and on this is arranged an electrical heating winding **20**.

Vacuum treatment of molten metal, such as steel, is carried out in the following way:

The ladle **12** with its molten contents is placed in the tank **11**, which is connected and evacuated to less than 50 Torr by the pipe **18** during stirring (from **13**). The cover **17**, **19** with heating dinwings is lowered to a position close to the surface of the molten metal and heating current is switched on by means of which the surface is continually heated and at the same time continuously renewed. This surface becomes degassed and the gasses are evacuated mainly in the space between the plate and the ladle wall. During a part of the degassing time the plate can, of course, be lifted up and possibly turned aside so that the degassing effect is further increased. For such turning the vacuum tank must, of course, be modified from the form shown in the figure. The turning can also possibly be made at intervals with intermediate heating of the molten surface by the plate.

The tapping of molten metal can either be made through a closable tap hole in the ladle and tank bottom or also by tipping the ladle, possibly after lifting it from the tank, but it is, of course, feasible to arrange in a way known per se, tipping under vacuum through a gutter or the like (not shown).

The invention can be varied in many ways within the scope of the following claims.

What is claimed is:

1. Device for refining molten metal such as steel, said device comprising a ladle for said molten metal, a vacuum tank, said ladle being inclosed in said vacuum tank, at least one electromagnetic, multi-phase stirrer for developing frequencies between 0.2 and 10 cycles per second at one side of said ladle, a cover of heat conducting material with good temperature resistivity being positioned at the upper part of the ladle within said vacuum tank, means for raising and lowering said cover, said cover being provided at its upper surface with a heat insulating layer and an electrical induction heating coil, said induction heating coil being positioned adjacent the heat insulating layer.

2. Device according to claim **1**, in which said ladle is positioned in a vacuum-tight closable tank evacuable to a pressure of less than 50 torr.

3. Device according to claim **1**, in which said cover has a form substantially corresponding with the inner section of the upper part of said ladle.

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