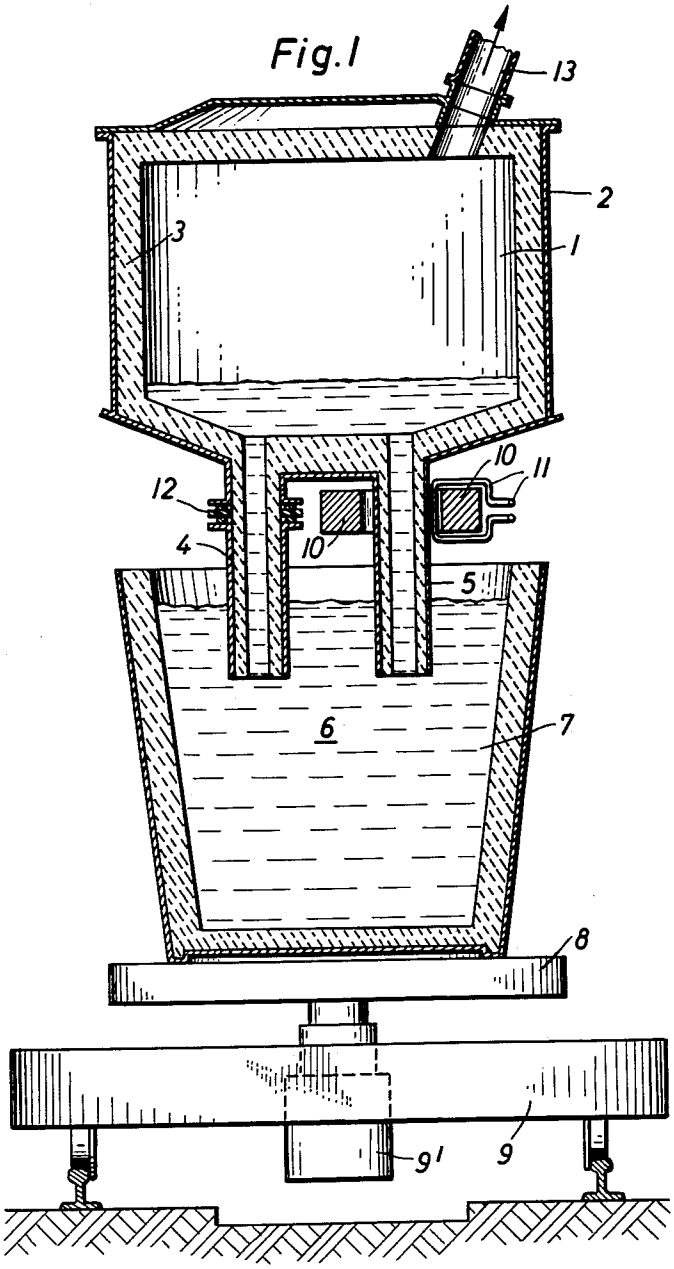
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APPARATUS FOR TREATING METAL MELTS

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Fig. 1

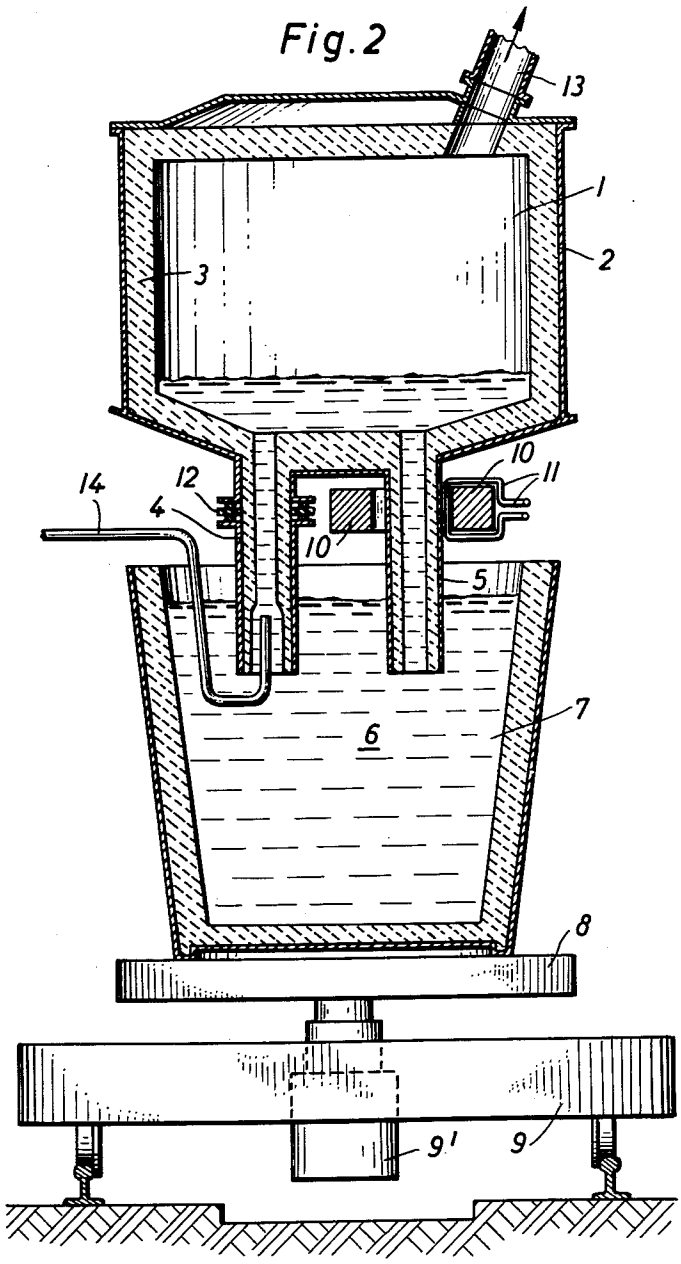


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Fig. 2



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APPARATUS FOR TREATING METAL MELTS

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1 Claim. (Cl. 266—34)

The invention relates to an apparatus having a vacuum chamber for the degasification of metal, e.g. steel melts, which is of particularly simple construction, so that it can easily be incorporated in any steel works. In order to make this possible, the vacuum chamber must be simple, reliable in operation, and yet economically heatable. The invention is mainly concerned with the latter problem.

For degasifying steel melts, an apparatus is known which consists of a degasifying chamber below which is disposed a vessel, e.g. a ladle, which is charged with the metal to be degasified and into which two short pipes leading from the bottom of the vacuum chamber extend at some distance from each other. In this apparatus, the degasification of the steel melt may be carried out either continuously or discontinuously. In the discontinuous method only a portion of the steel melt is introduced each time into the degasifying chamber, is degasified there, and returned through the same pipe into the ladle below the vacuum chamber. The steel is introduced into the vacuum chamber and discharged from it by simply altering the depth of immersion of the short pipe in the steel melt, the latter being raised and lowered for this purpose. This cycle of operations is repeated until a steel of the desired degree of purity is obtained in the ladle below the vacuum vessel.

The same apparatus may also be operated continuously. In this case, the distance between the vacuum chamber and the ladle remains fixed and the "gaslift" principle is used. To carry out this process, an inert or a reducing gas is introduced into one of the pipes which extend from the bottom of the vacuum chamber and dip into the melt which is to be degasified. This gas lowers the specific gravity of the metal in this pipe and the metal is thus caused to ascend into the vacuum vessel. When the metal has been degasified there, it has a higher specific gravity and thus flows back through the second pipe into the ladle below the vacuum vessel. In this way, the metal is caused to circulate continuously between the ladle and the vacuum vessel.

As in all degasification apparatus, so also in this case the necessary heating of the vacuum chamber gives rise to considerable difficulties. It requires considerable electrical equipment which is a source of trouble in the rough conditions in a steel works.

The invention now solves the heating problem in the described apparatus for degasifying steel melts in a particularly simple manner, so that it causes practically no disturbance and the degasification apparatus loses scarcely any of its simplicity. This is achieved by making the liquid metal in the vacuum chamber, in the two pipes and in the ladle the secondary winding of a transformer, the primary winding of which is on an iron core arranged around one of the two pipes extending from the bottom of the vacuum chamber. The two pipes, together with the metal in the vacuum chamber and in the ladle underneath it, then form a channel as in a low frequency furnace. The current flowing through the primary winding of the transformer induces a low voltage current with correspondingly high current intensity in the secondary winding, i.e. in the metal flowing through the pipes, the vacuum and the ladle. The secondary current is converted into heat in the metal and thus heats the metal.

Two constructional examples of an apparatus in accordance with the invention for degasifying steel melts are illustrated diagrammatically by way of example in the accompanying drawings, which show the apparatus in vertical section. In the drawings:

FIGURE 1 shows a degasifying apparatus which operates discontinously, and

FIGURE 2 shows an apparatus which operates continuously by the "gaslift" principle.

In the apparatus shown in FIGURE 1, the degasifying chamber **1** is fixed in position. It consists of a vessel having a steel jacket **2** and a fireproof lining **3**. Two pipes **4**, **5** the lower ends of which are immersed in the metal **6** to be degasified, which is contained in a ladle **7**, open into the bottom of the vacuum chamber. The ladle stands on a platform **8** which can be raised and lowered on a truck **9** by a hydraulic cylinder **9'**. When the distance between the degasifying chamber **1** and the ladle **7** is reduced, a corresponding amount of liquid metal enters the vacuum chamber through the pipes **4**, **5**. When the ladle is lowered, i.e. when the distance between the chamber **1** and the ladle **7** is increased, the metal flows back into the ladle **7** after it has been degasified. This cycle of operations is repeated until the ladle contains a steel of the desired degree of purity.

The steel is heated by low frequency. The iron core **10** of a transformer with the primary winding **11** is arranged around one of the two pipes which extend from the bottom of the vacuum chamber. The secondary winding of the transformer consists of the metal columns in the pipes **4** and **5** and the metal in the vacuum chamber **1** and in the ladle **7**. In order to avoid heating the vacuum-tight metal jacket **2** of the chamber **1**, an insulation **12** is built into the metal jacket of the second pipe **4**. The vacuum chamber **1** is connected to a vacuum pumping plant, not shown, through a short pipe **13** which passes through the arched roof of the chamber.

The apparatus shown in FIGURE 2 for degasifying steel melts is similar in construction to the apparatus shown in FIGURE 1. It is operated continuously by the "gaslift" principle, i.e. with constant circulation of the metal, by introducing an inert or reducing gas through a pipe **14** opening into the bottom of the short pipe **4** into the metal in this pipe **4**. In this case, the vacuum vessel **1** and the ladle **7** can be fixed in position. The "gaslift" principle can, however, also be used in the discontinuous process by introducing the gas into both the pipes **4** and **5**.

The apparatus for heating the steel to be degasified is the same as the apparatus shown in FIGURE 1.

I claim:

Apparatus for degassing molten metal comprising a refractory lined vessel defining a chamber, means for evacuating said chamber to produce a partial vacuum therein, a container for said molten metal disposed below said chamber, a pair of pipes fixed to the bottom of said vessel and opening into the lower end of said chamber, each of said pipes being constructed and arranged to extend into said container and below the surface of said molten metal, said container and said chamber being relatively movable toward and away from each other, so that by decreasing the distance between said container and said vessel molten metal is drawn by said partial vacuum through said pipes and into said chamber, a closed core of ferro magnetic material surrounding one of said pipes, a transformer winding surrounding a portion of said core, whereby the molten metal drawn into said chamber and the molten metal within said pipes and said container forms a closed loop of molten metal linking said core, so that the excitation of said transformer winding in-

duces a secondary current in said loop to heat said molten metal.

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