Oct. 30, 1951 L. DREYFUS ET AL 2,573,319

INDUCTIVE STIRRING

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Fig.2

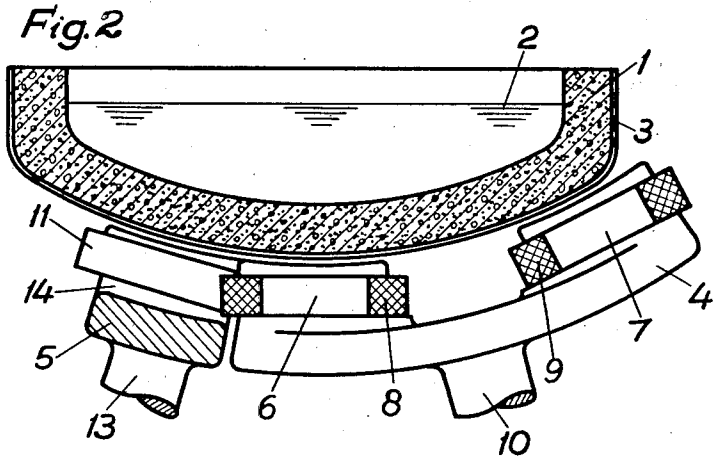


Fig.3

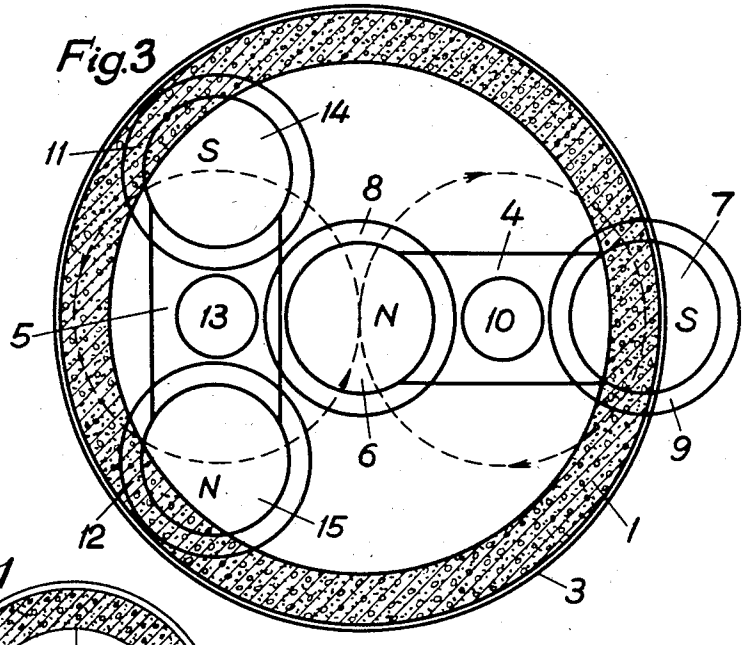
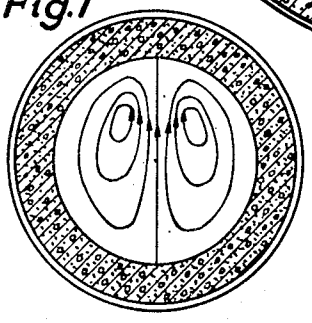


Fig.1



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INDUCTIVE STIRRING

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1 Claim. (Cl. 13—26)

1

This invention relates to electric furnaces having means for electro-dynamic stirring of the charge or bath.

In previously known arrangements for this purpose it is known to mount two-phase or polyphase stirring windings provided with an iron core beneath the bottom of the furnace, in such a manner that the windings produce a flux which penetrates the furnace bottom and the walls and induces eddy currents in the bath. The electrodynamic force components will then produce a whirling motion of the bath.

The most appropriate form of such a motion will be that which is obtained when the bath is forced diametrically across the central part of the furnace, preferably in an accelerated manner. After striking the wall of the furnace the charge is turned aside in each direction along the wall with a retarding motion due to the friction with the wall. Such a whirling motion will bring about the mixing of the upper and lower layers of the charge which is necessary for obtaining fully satisfactory metallurgical results, on the one hand by mixing of the different parts of the bath, and on the other hand by bringing the molten metal into intimate contact with the covering slag, which is the real purpose of the stirring.

The aforementioned arrangements of the fixed stirring windings, however, necessitated a rather expensive motor converter, as the stirring is effected by currents of very low frequency. The present invention relates to means by which the employment of such a converter can be entirely avoided.

According to this invention, a separate stirring eddy current is induced by means of two or more magnetic systems each comprising two or more poles, mounted beneath the bottom of the furnace, which systems are caused to rotate about axes, the extensions of which pass through the charge.

The invention will be further described with reference to the accompanying two drawings in which:

Fig. 1 shows the desired ideal current field of the bath as described above.

Figs. 2 and 3 show a vertical and a horizontal section respectively of an arrangement consisting of two magnetic systems rotating in opposite directions.

2

An effective arrangement is attained by combining two or more rotating systems having few poles which are arranged beneath the bottom of the furnace. An arrangement of this kind is shown in Figs. 4 and 5 showing two sections of the furnace 1 which is charged to a relatively small degree with the bath 2. The furnace is covered by a sheet covering 3. Under the bottom of the furnace, which preferably constitutes a part of the surface of a sphere, the covering sheet is made of non-magnetic material beneath which two magnetic systems 4 and 5 are arranged. In the form shown, each magnetic system consists of two direct current magnetized poles 6, 7 and 14, 15 respectively, having pole pieces which are shaped in such manner that an approximately constant air gap is obtained between the pole pieces and the bottom of the furnace. The rotational axes of the magnetic systems are directed to about the centre of the spherical surface. The poles 6, 7, 14, 15 are provided with coils 8, 9, 11, 12 respectively, fed from a direct current source in any manner known per se, magnetizing the poles according to the symbols N (north pole) and S (south pole) in the drawing. The magnetic systems are supported by a spindle 10 for the poles 6, 7 and a spindle 13 for the poles 14, 15. The spindles are rotated by any suitable means, for instance gears, belts, separate motors. These means are not shown in the drawing. The current supply to the coils 8, 9, 11, 12 is also not shown, as it may be performed in any way used in the art.

The distances between the rotational axes of the magnetic systems at the bottom of the furnace, as well as the coupling of their rotary motion, is chosen so as to permit the poles of one system to gear or mesh into the pole-gaps of the adjacent system, or adjacent systems. By this means the bath will be subjected to two rotary forces interfering with each other, and the charge will be accelerated and decelerated in substantially the same way as shown in Fig. 1. By giving the bottom layer of the bath a stronger accelerated motion than the top layer a very efficient mixing will be attained between these layers. The speed of rotation of the magnetic systems may profitably be chosen to give a frequency of as low as 1 or 2 periods a second.

We claim as our invention:

An electric furnace with the charge contained

in a shallow hearth and having means for melting the charge and separate means arranged beneath the bottom of the furnace for eddy current stirring of the charge by inducing a low frequency current in the charge, said stirring means comprising at least two eddy current-inducing rotary magnetic systems, each system comprising at least two poles, the poles of one system extending into the pole gaps of the adjacent system, and said systems being so arranged that an extension of the axis of rotation of each of said systems passes through the furnace charge.

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