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Wernli

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[54] **CONVERTER FOR TREATMENT OF MOLTEN DUCTILE CAST IRON WITH VAPORIZABLE ADDITIVES**

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[51] **Int. Cl.** **C21c 5/46**, C21c 7/00

[58] **Field of Search** ..... 266/34 T, 36 P

[56] **References Cited**

UNITED STATES PATENTS

3,666,449 5/1972 Alt ..... 266/34 T

Primary Examiner—Gerald A. Dost

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[57] **ABSTRACT**

A vessel, which can be tipped, is formed with an internal separate chamber which has openings therein, so located that the direction of the openings converge. The vessel has a closable charging opening, for the addition of a vaporizable additive into the chamber, the converging openings having central axes which are directed towards the closable opening. Preferably, the central axis of the charge opening to the chamber bisects the central axes of the communication openings so that, when a vaporizable substance is introduced through the charge opening into the chamber, molten iron within the vessel will penetrate within the chamber to contact the additives in the chamber upon tipping of the vessel.

6 Claims, 2 Drawing Figures

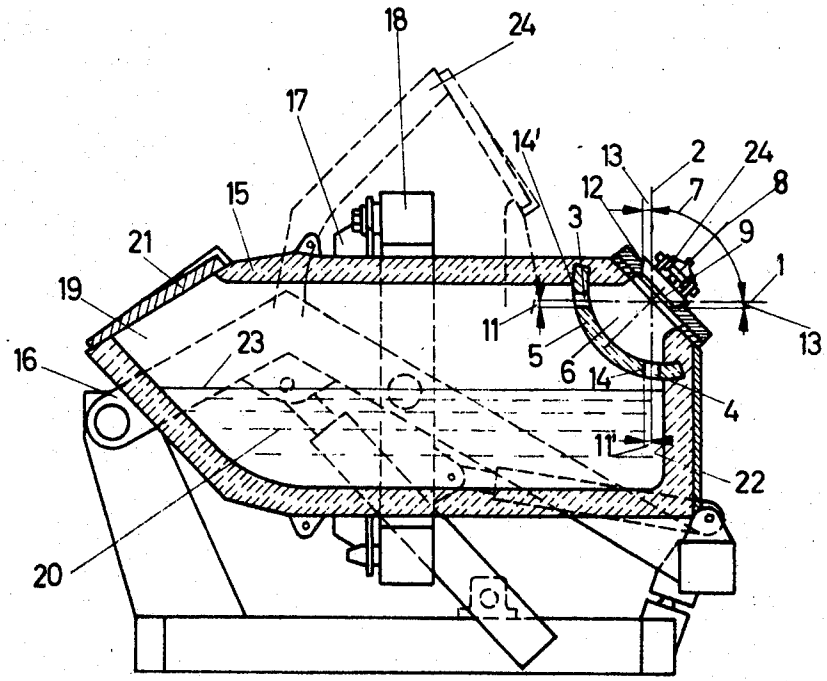


Fig. 1

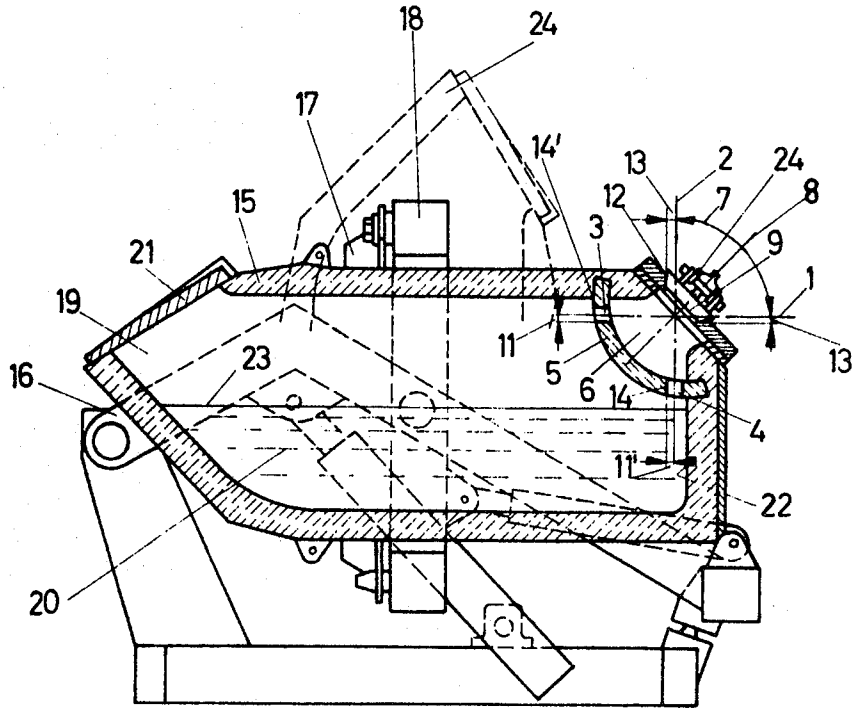
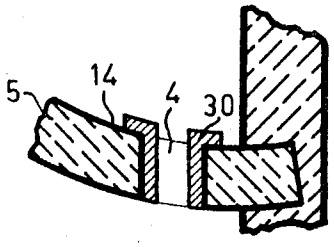

18
24
17
14'
13
2
24
8
15
12
7
3
9
21
1
19
11
13
5
6
14
16
23
4
11'
22
20

Fig. 2


5
14
4
30

CONVERTER FOR TREATMENT OF MOLTEN DUCTILE CAST IRON WITH VAPORIZABLE ADDITIVES

Cross reference to related application: U.S. Ser. No. 247,741, filed Apr. 26, 1972.

The present invention relates to a converter for molten ductile cast iron with vaporizable additives, particularly pure magnesium. The converter is formed with a separate chamber within the converter vessel itself, accessible from the outside through a charge opening. The chamber is in communication through communication openings with the interior of the converter vessel, the openings being spaced from each other so that, when the entire converter is tipped, molten cast iron will contact the additives within the chamber.

Converters of this type are used in processes in which vaporizable substances, particularly magnesium, are to be added to a melt of ductile cast iron. Upon tipping of the converter, the vaporizable substances are brought beneath the surface of the molten iron within the converter, to initiate the vaporization thereof. The additives are located in a separate chamber within the converter, the chamber wall being formed with communication openings for the molten iron within the converter vessel. Introducing magnesium into molten iron is technologically the most reliable and economically best way to manufacture ductile cast iron articles having graphite solidified in generally spherical form. Various other additives than magnesium may be used, which have a sufficiently low melting point so that they will vaporize if placed in contact with a cast iron melt, such as calcium, rare earth metals, and others.

Apparatus have been proposed which are formed with an internal receptacle, accessible from the outside, so that additives can be placed therein, the receptacle being located within a region of the base of the interior of the converter. The separating wall of such a receptacle is formed with a plurality of openings. The outside or charge opening to charge the receptacle chamber with additives is closed by means of a plug. Such arrangements have the disadvantage that the opening in the receptacle is not readily accessible from the outside of the converter chamber and that the communication openings with the melt cannot be cleaned readily, without damage to the charge opening itself.

It is an object of the present invention to provide a converter for treatment of molten ductile cast iron which is so arranged that all communication openings for the melt with the additives are accessible from the outside of the charge opening to the chamber for the additives itself.

SUBJECT MATTER OF THE PRESENT INVENTION

Briefly, the converter vessel has an opening in the outer walls thereof to provide a charge opening for additives. Opposite the opening, an inner wall partitions off a portion of the interior of the vessel to form a chamber for the additive charge. Communication openings are located in the interior wall, so arranged that their central axes converge and are directed towards the closable charge opening in the outer wall of the converter. Preferably, the angle formed by the axis of the charge opening in the wall of the converter bisects the angle formed by the central axes of the communication openings. The communication openings themselves may have replaceable inserts therein, so

that their size can be changed, or so that damaged wall portions of the communication openings can be replaced.

The invention will be described by way of example with reference to the accompanying drawings, wherein:

FIG. 1 is a schematic longitudinal cross-sectional view of a converter which is provided with a tipping apparatus to tip the converter; and

FIG. 2 is a fragmentary view, to an enlarged scale, illustrating an insert element for the opening.

Converter **15** has a tipping apparatus **16** associated therewith. A holding flange **17** is secured to converter **15** which is removably connected to a carrier frame **18.** Carrier frame **18,** in turn, is rotatably connected with the tipping arrangement **16.** The metal melt **20** is introduced through opening **19,** which is closed off by means of tiltable cover **21.** The opening **19** functions both as a fill, as well as a removal opening. When the converter **15** is in horizontal position, then the melt **20** therein will have a level indicated at **23.**

A chamber **6** is located within a portion of the base surface **22** limiting the space within the converter vessel. Space **6** is intended to receive a charge of vaporizable additives. The chamber **6** is defined by a wall **5,** for example part-circular, which is pierced by openings **3, 4.** This chamber **6** is so formed that, when the converter **15** is horizontal, the interior of chamber **6** is out of contact with the melt **20** within the converter, that is, it is located above the level **23** of the melt. To mix the melt **20** with the additives, converter **15** is tipped into the vertical position, shown schematically in broken lines at **24.** Chamber **6** is accessible from the outside through a charge opening **9** which is closed off by a cover, preferably having a quick-release closure, which may include a toggle arrangement.

The central axis of the charge opening **9** is preferably so arranged that it bisects the angle of the axes **1, 2** of the communication openings **3, 4.** This angle is indicated at **7.** The charge opening **9** is so dimensioned that the distance **13** of the axis **1,** or **2,** respectively, to the wall **12** of the charge opening **9** is equal to or greater than the distance **11,** or **11'**, respectively, of the axes **1, 2,** to their respective wall portions **14, 14'** which define the openings **3, 4** in the wall **5.** The openings **3, 4** may be so dimensioned that inserts, preferably replaceable inserts **30** (FIG. 2) can be placed therein. Various sized inserts, or complete closure plugs can be provided, so that the diameter of the communication openings can be selected as desired. In accordance with another feature of the invention, the inserts **30** may be made of the same material as the additives to be placed within the chamber **6;** these inserts may then be formed as solid plugs, which will melt upon contact with the molten cast iron mass **20** within the converter upon tipping thereof, thus providing access to the charge within chamber **6.**

The present invention has the advantage that the openings in the wall **5** defining the chamber **6** are easily accessible through the charge opening **9** for the additives, so that the cross-sectional area of the communication openings **4, 5** can be readily controlled and checked before each charge is added to the chamber **6.** Thus, reliable charging and treatment of the melt **20** within the converter is ensured. Additionally, the communication openings can easily be inspected visually each time that a new charge is to be placed in the converter so that any reductions in the cross-sectional area

of the communication openings 3, 4 can readily be noticed, and corrective measures then taken.

Various changes and modifications may be made within the inventive concept.

Details of the tipping mechanism for the converter are disclosed in applicant's cross referenced application Ser. No. 247,741, filed Apr. 26, 1972.

I claim:

1. Converter for treatment of molten cast iron with vaporizable additives, comprising

a vessel defined by outer walls (15);

interior wall means (5) connected to the outer walls (15), forming a separate chamber (6) within the vessel and having communication openings (3, 4) formed therein to effect fluid communication between the chamber (6) and the interior of the vessel, the outer walls being formed with a closable opening (9) opposite the chamber (6) to provide access to the chamber for placement of vaporizable additives therein and the chamber being located within the interior of the vessel in such position that molten iron therein will penetrate into the chamber to contact additives placed therein upon tipping of the converter vessel;

and wherein the communication openings (3, 4) in the interior wall means (5) defining the chamber

(6) have central axes (1, 2) which are converging and are directed towards the closable opening (9).

2. Converter according to claim 1, wherein the central axis (8) of the closable opening (9) bisects the angle (7) formed by the axes (1, 2) of the communication openings (3, 4).

3. Converter according to claim 1, wherein the distance (11, 11') between the axes (1, 2) of the communication openings (3, 4) and the wall portions (14, 14') of the interior wall means (5) and defining the communication openings are substantially equal, or less, than the distance (13) between the axes (1, 2) of the communication openings (3, 4) and the wall portion (12) of the outer wall (15) defining the closable opening (9).

4. Converter according to claim 1, wherein replaceable insert means (30) are insertable into the communication openings (3, 4).

5. Converter according to claim 4, wherein the insertable insert means are of the same material as the interior wall means (5) defining the chamber (6).

6. Converter according to claim 4, wherein the replaceable insert means are of the same material as the vaporizable additive to be placed within the chamber.

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