Nov. 26, 1935. L. H. HOPKINS 2,022,372

LEAD POT

Filed July 24, 1934

Fig. 1

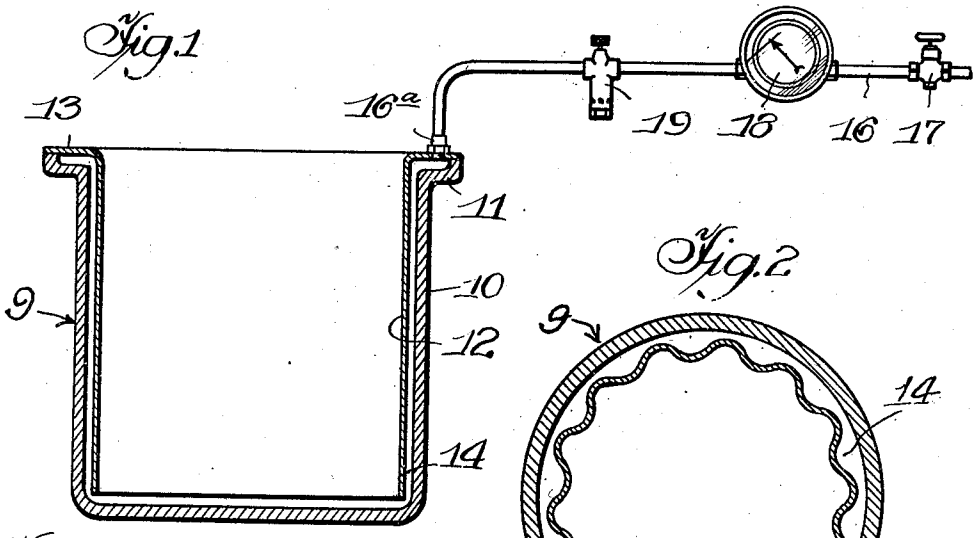


Fig. 2

Fig. 3

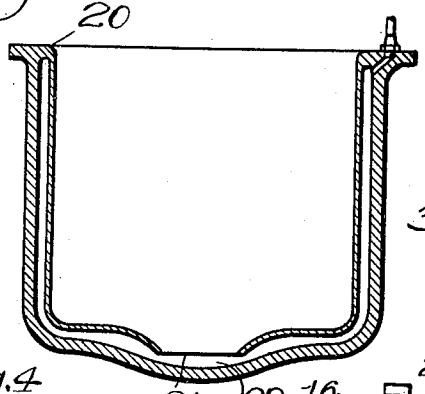


Fig. 5

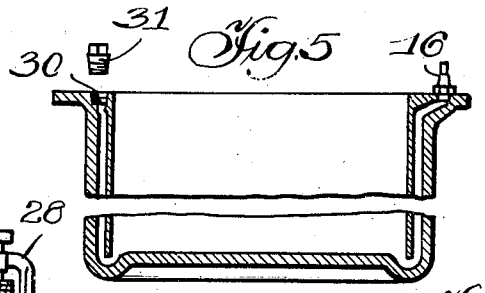


Fig. 4

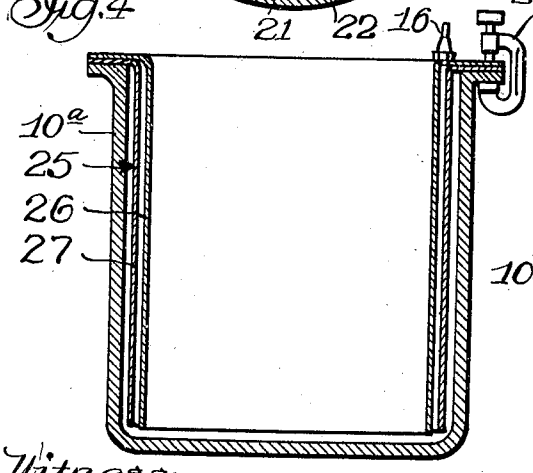
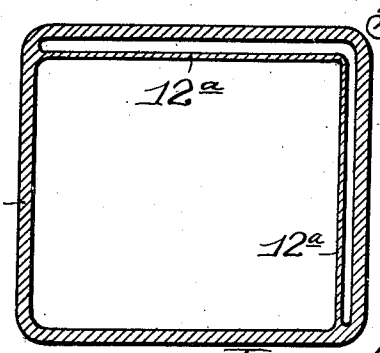


Fig. 6



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UNITED STATES PATENT OFFICE

2,022,372

LEAD POT

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4 Claims. (Cl. 266—39)

This invention relates to improvements in molten bath containers, and more particularly to containers or pots in which a molten lead bath is employed for heat-treating or tempering steel parts. Such containers, although usually made of ferrous alloys, are familiarly known as "lead pots".

Due to the rigorous conditions under which such lead pots are used, they are now generally made of special heat-resisting alloys which, although involving a much higher initial cost, are found to be more economical on account of their much longer life. Such pots, however, are subject to failure due to cracking and breaking, and I have noted that such failures are more likely to occur in cases where the lead pots are not maintained under constant melting temperatures, but have been allowed to cool from time to time so that the lead bath therein becomes solidified and has to be again reheated to a molten state. I explain this, at least in part, by the fact that when heat is reapplied to a cold pot, the high expansion of the lead as compared with that of the ferrous metal of which the pot is made (which is usually in the ratio of about 5 to 1) causes severe stresses between the side walls of the pot, which hasten failure and deterioration of the pot, so as to necessitate frequent replacement thereof.

In carrying out my invention, I provide a new apparatus, and method for protecting lead pots from the effects of unequal expansion of the bath material and the container during intermittent solidifying and reheating of said bath material, which consists broadly in providing a hollow yieldable member overlying one or more upright walls of said container while the bath is being cooled to a solid state, so that when the pot and bath are again reheated the excessive lateral expansion of the bath material is taken up by the yieldable member.

Certain practical methods and devices for carrying out my invention will appear from the following description, reference being had to the accompanying drawing, in which

Fig. 1 is a view in vertical cross section of a lead pot to which an expansion sleeve has been applied as an integral part thereof.

Fig. 2 is a horizontal cross section of the pot shown in Fig. 1.

Fig. 3 is a cross section showing another form of lead pot and a modified form of expansion sleeve.

Fig. 4 is a view in cross section of a lead pot, showing how my invention may be utilized in the form of a detachable inner sleeve, to be applied to an ordinary lead pot only at such times as when the bath is to be permitted to cool.

Fig. 5 is a fragmentary view showing another form of pot, and including also a relatively large auxiliary opening for supplying bath material during the reheating of said bath.

Fig. 6 is a view in horizontal section, showing a modified form of lead pot, in which a yieldable chamber is applied to two sides of a rectangular pot.

Referring now to details of the several embodiments of my invention illustrated in the drawing, a simple form thereof is shown in Figs. 1 and 2 in which a cylindrical lead pot 9 having a flanged upper rim 11 may be made of a heat-resisting steel alloy in the usual manner. To this pot is fitted a metal inner shell or sleeve 12 having a flange 13 around its margin and welded along its periphery 13a to the flanged rim 11 of said pot. The sleeve 12 is spaced from the side walls 10 of the pot so as to form a continuous chamber 14, and the lower edge 15 of the sleeve extends almost to the bottom of the pot, as shown, only enough opening being left along the bottom to permit the molten bath material to flow readily from the chamber 14 into the main body of the pot, and vice versa. In the form shown in Figs. 1 and 2, the inner sleeve 12 is corrugated in cross section as clearly shown in Fig. 2. Means for supplying gas or air to the chamber 14 is also provided, herein consisting of a supply pipe 16 connected by nipple 16a to the upper end of the sleeve chamber 14. Said inlet pipe 16 may have a control valve 17, pressure gauge 18 and a pressure relief valve 19 therein, as shown in Fig. 1.

The use and operation of the apparatus shown in Figs. 1 and 2 are as follows:

When it is desired to permit the lead bath to cool and solidify in the pot, a fluid such as ordinary city gas, or air, is admitted under pressure through the supply pipe 16 into the top of chamber 14. City gas may be preferably for this purpose because it is less likely to cause oxidation of the lead. The pressure of the fluid is such as to force all the molten lead out of the bottom of the chamber 14 into the main body of the pot. The pressure which is registered on the gauge 18 is maintained so as to equalize the static pressure of the molten lead, any additional pressure causing escape of the fluid in the form of bubbles through the main body of the pot. This condition can be controlled, if desired, by regulating the pressure-relief valve 19 at the proper predetermined adjustment for maintaining the re-

quired pressure until the lead cools and becomes solid. The molten lead is thus prevented from re-entering the chamber 14, and it all solidifies in the main body of the pot. The fluid pressure can then be released, and the pot can be laid aside until it is to be used again.

Now, when the pot is to be again put into use, it is reheated, while the pressure is relieved in the chamber 14 as by opening the relief valve 19. The initial expansion of the solid lead will then be taken up by the inner sleeve 12 which is free to flex outwardly as required, thus relieving the high lateral stresses which otherwise would be effective against the side walls of the pot.

In the form of apparatus shown in Fig. 3, the upper margin 20 of the sleeve is shown as being welded to the inner face of the flange, and the lower portion of the sleeve is extended inwardly to a restricted opening 21 extending downwardly into a centrally disposed depression 22 formed in the bottom of the pot.

Another method of use and application of my invention is illustrated in Fig. 4, in which a separate sleeve 25, having spaced inner and outer walls 26 and 27, is closed at the top but open at the bottom, as shown. Said sleeve is arranged to be detachably fitted into a pot 10^a of standard construction and suitably secured thereto as by a plurality of clamps 28, engaging a flange 29 integral with said sleeve. With this arrangement, the sleeve 25 may be applied to the pot only at such times as it is found necessary to permit said pot and its bath to cool, and said sleeve may then be entirely removed from the pot as soon as the bath is reheated to its normal molten state. In other respects, the sleeve is employed in the same manner as previously described.

Fig. 5 illustrates a modified form of apparatus in which an auxiliary opening 30, normally closed by plug 31, is provided, having sufficient size to permit an auxiliary charge of molten lead to be introduced in, and partially fill, the chamber 14 at the time the pot is being reheated. With this arrangement, the added lead fills the chamber 14 so as to afford greater conductivity of heat from the side walls of the pot and through the sleeve to the lead in the body of the pot and hasten the melting thereof, but the molten lead added to the chamber 14 as described, is free to rise in said chamber so as to permit the desired excessive expansion of the solid lead mass within the pot during the initial heating thereof.

Fig. 6 illustrates another application of my invention, as it may be utilized in a rectangular pot 10^b. In this form, only two of the upright walls of the pot are provided with yieldable partitions 12^a, 12^a, but said partitions will generally be sufficient to afford the desired protection from the effects of lateral expansion of the lead while it is being reheated.

Although I have shown certain forms and methods of application of my invention, it will be understood that I do not wish to be limited to the specific forms or methods of use thereof disclosed herein, but that other modifications may be employed without departing from the spirit and scope of my invention as defined in the appended claims.

I claim:

1. In combination with a container adapted to hold a molten bath, means forming a hollow, laterally yieldable chamber overlying one or more interior upright walls of said container and communicating with the latter adjacent the bottom thereof, and means for expelling said bath from said chamber under pressure while in liquid state to protect said container from effects of unequal expansion of said bath while the latter is being heated from solid to liquid state.

2. In combination with a container adapted to hold a molten bath, a partition supported yieldably in spaced relation to an upright interior wall of said container to form a chamber communicating with the interior of said container adjacent the bottom thereof, and means for supplying fluid under pressure to said chamber.

3. The method of protecting molten bath containers from effects of the unequal expansion and contraction of the bath material during intermittent solidifying of said bath by cooling and reheating thereof, which consists in applying fluid under pressure to a chamber formed by a partition yieldably supported in spaced relation relative to one or more upright walls of said container, said chamber being open at the bottom of said container, so as to expel the molten bath from said chamber into the body of said container before said bath is cooled to a solid state.

4. The method of protecting molten bath containers from effects of the unequal expansion and contraction of the bath material during intermittent solidifying of said bath by cooling and reheating thereof, which consists in applying fluid under pressure to a chamber formed by a partition yieldably supported in spaced relation relative to one or more upright walls of said container, said chamber being open at the bottom of said container, so as to expel the bath molten from said chamber into the body of said container, and maintaining said pressure until the bath has been cooled to a solid state.

LUTHER H. HOPKINS.