July 23, 1929. G. R. GREENSLADE ET AL 1,721,994

POT

Filed March 14, 1928

Fig. 1.

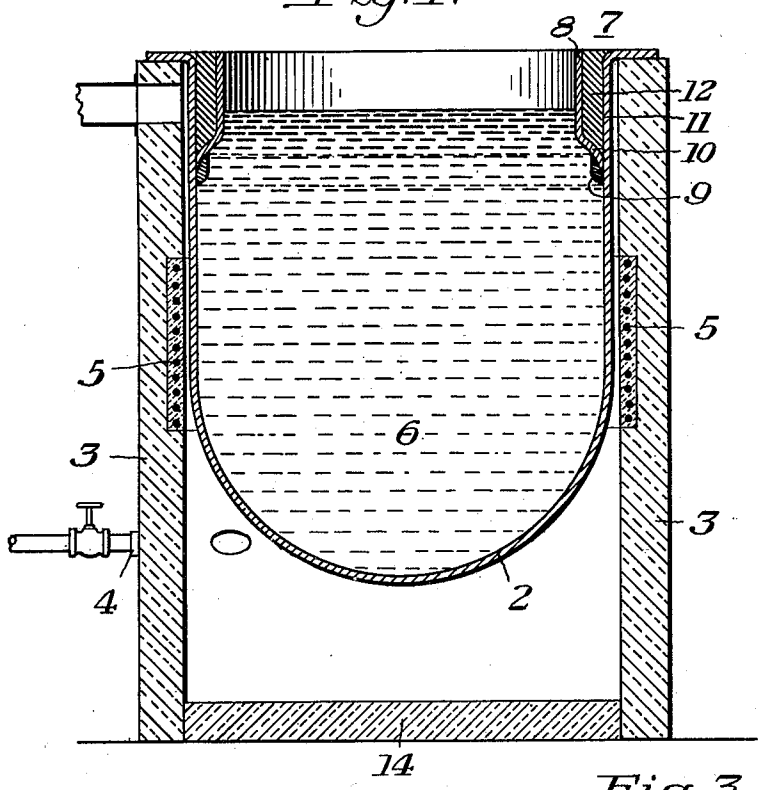


Fig. 2.

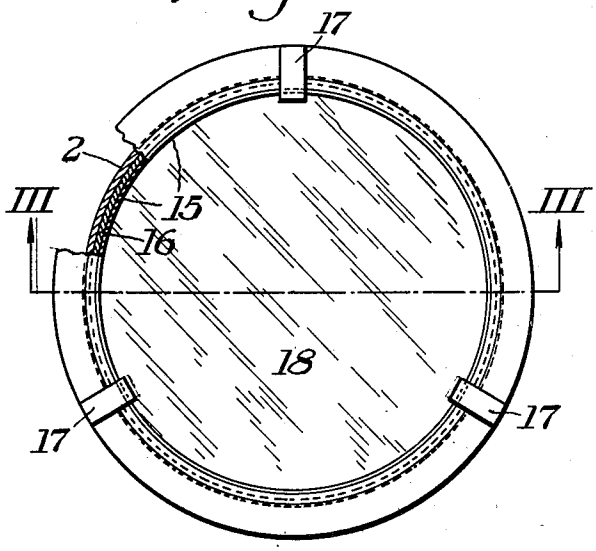
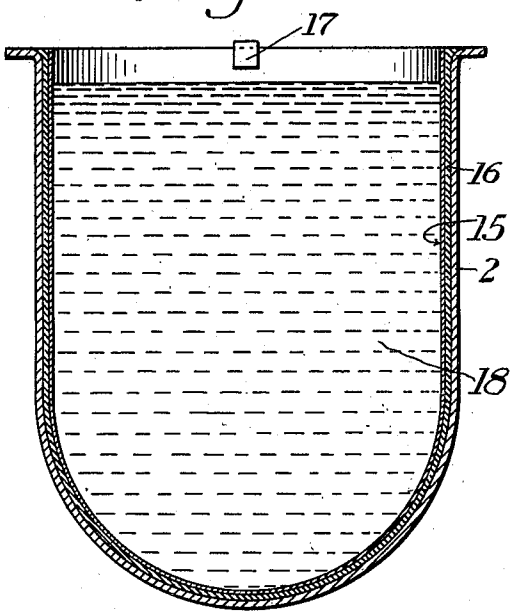


Fig. 3.



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Patented July 23, 1929. 1,721,994

UNITED STATES PATENT OFFICE.

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POT.

Application filed March 14, 1928. Serial No. 261,523.

Our invention relates to pots, and more particularly to pots for heat treating or carburizing metallic objects, although it is to be understood that the pot may be used for other purposes.

The heat treating or carburizing of metallic objects is usually conducted at high temperatures in pots of a heat resisting alloy. Alloys frequently used for such purpose contain chromium, iron and nickle. Such pots are capable of withstanding very high temperatures over long periods of time, provided that no chemical is used in the pot which introduces a corrosive or dissolving action on its walls. Where a lead bath fills the pot, the pot has lasted several years.

In certain heat treating operations it is desirable to fill the pot with chemically active baths. For heat treating ferrous objects a salt bath is often used, and for certain carburization processes it is desirable to fill the pot with a cyanide bath. When this is done it is frequently found that the heated or molten chemical baths in the pot, together with the air which comes in contact with the bath at its upper surface, have a corrosive action upon the wall of the pot at or near the surface of the bath. This action causes a pitting of the metal, which gradually ruins the pot by making it spongy or porous. Eventually, the pits extend completely through the walls of the pot and allow the bath, if in a fluid condition, to leak out. The corrosive action varies with the temperature of the bath and with the amount of air mixed therewith. We have found that the corroding action of the bath may take place over the entire inner surface of the pot at higher temperatures. The action is intensified by the presence of air admixed therewith. At slightly lower temperatures, the presence of air near the surface of the bath in the form of froth causes pitting of the pot for several inches below the surface of the bath.

Substantially pure iron, such as wrought or ingot iron, or steel of extremely low carbon content is resistant to the action of alkalies. Consequently, a pot of very pure iron has been used for containing cyanide and other baths of an alkaline nature. However, at the high temperatures at which such baths are maintained, the outside of the pot which comes in contact with the air gradually burns or rusts away until the walls become so thin as to render the pots unserviceable. The deterioration of such iron pots from outside oxidation is relatively rapid, and they last only a comparatively short time.

We provide a pot in which the outer surface is composed of a heat and air resisting alloy such as chrome iron or chrome nickel alloys. The interior of the pot is lined either wholly or partially with a liner of metal resistant to the action of the baths in the pot. Where the nature of the bath and/or the temperature at which it is maintained are such as to cause the bath to attack the entire surface, we use a complete inner lining of an alkaline resistant material. In cases where pitting is caused primarily by the admixture of air to the upper portion of the bath, we provide a liner of an alkaline resistant material that extends a sufficient distance below the level of the bath to protect the outer wall.

For protecting the outer surface of the inner lining from oxidation and for giving an indication of the development of pits in the inner lining, we fill the space between the inner and outer parts of the pot with a protecting material. The protecting material is preferably a non-conductor of air, fluid at high temperatures and a good conductor of heat. The presence of the material prevents the access of air to the outer surface of the inner lining and therefore prevents oxidation. The formation of pits in the inner lining is indicated by the leakage of the material to the inside of the pot, if it is in a fluid condition at the temperature of the bath. In case the inner lining of the pot becomes pitted, it is replaced by a new lining without scrapping the outer shell, which in most cases is of a more expensive material than the inner lining. The accompanying drawings illustrate the present preferred embodiments of our invention, in which;

Figure 1 is a sectional view of a heat treating pot embodying our invention,

Figure 2 is a plan view of a modified form of the invention, and

Figure 3 is a sectional view taken along the section line III—III of Figure 2.

Referring to Figure 1, a heat treating pot 2 is supported by a masonry wall 3 and is heated by a burner 4 and electrical heaters 5. The pot 2 is filled with a bath 6 of molten material for heat treating or carburizing metal objects. The chemicals commonly utilized

in high temperature pots are lead and zinc for coating objects, a lead bath or a salt bath for heating treating objects, and a cyanide bath for carburizing such objects. The material of the pot 2 is a heat resisting alloy which is only slightly attacked by most of the chemicals utilized in such baths. A chrome nickel or chrome iron alloy is very serviceable for such pots where high temperatures are utilized. When lead or other inert baths are utilized a chrome nickel or a chrome iron alloy lasts for a long time. However, when salt or cyanide baths are utilized at higher temperatures, there is a tendency for the chemicals of the bath to attack and corrode the alloy. When air becomes mixed with the bath in the form of froth, the corroding action is more pronounced and takes place near the surface of the bath at lower temperatures. The depth of the penetration of the air depends upon the frothiness of the bath and often is several inches.

The corrosion of the material of the pot renders it pitty and spongy, and if continued, the pot is eventually perforated, permitting the bath to leak out of the pot. Such corrosion is relatively rapid.

Substantially pure ferrous metals, such as wrought or ingot iron or steel of extremely low carbon content are more resistant to the attacks of baths having alkaline characteristics, such for example as cyanide baths, than are nickel chrome and nickel iron alloys. Accordingly, such pure ferrous pots may be used for such baths with considerably less danger of their being pitted due to the action of the chemicals of the bath. However, iron is readily oxidized by the air at the temperature at which such baths are maintained, which is usually above the melting point of the bath. However, it is to be understood that the use of our pot is not limited to molten materials, or to any specific bath. The air attacks the outer exposed surfaces of the pot and corrodes or rusts them away. The action of the air is so rapid that a ferrous pot lasts but a relatively short time.

To protect the surface of the heat resistant alloy of the pot 2 at the level of the bath, we provide a protecting portion 7 constituted by a metallic band 8 extending above and below the level of the bath 6. The height of the metallic band 8 is made such that it extends below the zone of air impregnation in the bath 6. The band 8 is secured by a weld 9 of soft iron or other suitable metal to the body portion 2. Wrought or ingot iron and steel of extremely low carbon content are suitable materials for the band 8, although it is to be understood that other metals and alloys may be substituted for the ferrous metals if desired.

For protecting the outer surface of the band 8 it is provided with an offset portion 10, forming a pocket 11 between the pot 2 and the outer surface of the band, which pocket is filled with a material 12. The material 12 preferably is a nonconductor of air, in a fluid condition at high temperatures and is a good conductor of heat. The material 12 prevents the access of air to and the oxidation of the outer surface of the band 8. Lead is suitable for such purposes. The presence of the material 12 also affords an indication of pitting of the band 8, as the material 12, if fusible, leaks out of the pocket 11 as soon as any openings occur in the band. The band 8 may then be replaced by a new band without scrapping the more expensive pot 2.

The presence of the material in the pocket 11 does not materially interfere with the temperature at the upper portion of the bath. In such pots most of the heat is absorbed by the lower portion, and hence the increased thickness of the upper wall of the pot does not appreciably change the temperature of the bath 6. Where the pot 2 is heated by the burner 4, the upper part opposite the band 8 does not absorb a large proportion of the heat. When the pot is heated by the electrical heaters 5, the greater proportion of the heat is absorbed in the mid-portions of the pot and the heat reaching the bottom of the pot is radiated from the floor 14 of the masonry structure 3. For this reason, when the pot is heated by the electrical heaters 5 only, the bottom of the pot is at a somewhat lower temperature than the mid-portion and there is less tendency for the pitting thereof than occurs along the mid sections of the pot. The burner 4 and electrical heaters 5 may be used simultaneously if desired.

Referring to Figures 2 and 3, where the nature of the bath is such as to attack the heat resistant alloy of the pot 2, even when air is excluded from the bath, we provide a pot in which a complete inner lining or shell 15 of alkali resistance material is inserted within the heat resistant material of the pot 2. The space between the inner and outer shells of the pot is filled with a material 16 of good heat conducting characteristics. Examples of such materials are lead and aluminum. The lining 15 is connected to the outer shell of the pot by strips 17 which are welded or otherwise secured to both shells. Where the material 16 fuses at a temperature within the range of the temperatures to which the pot is subjected, the inner casing is apt to be lifted up by the buoyant effect of the molten metal unless it is secured in place by the strips 17. The lifting tendency of the molten material 16 is in part overcome by the weight of the bath 18 contained within the lining 15.

While we have illustrated and described the present preferred embodiments of our invention, it will be understood that the invention is not limited thereto, but that it may be otherwise embodied and various changes made therein without departing from the spirit of

the invention or the scope of the appended claim.

We claim:

A pot comprising a body portion of an alloy resistant to oxidation at high temperatures, a protecting portion permanently secured within the body portion and formed of a metal resistant to the combined actions of air and the material of a bath contained in the pot, and a body of metal having good heat conducting characteristics disposed between said body and protecting portions for protecting the outer surface of said protecting portion against oxidation.

In testimony whereof we have hereunto set our hands.

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