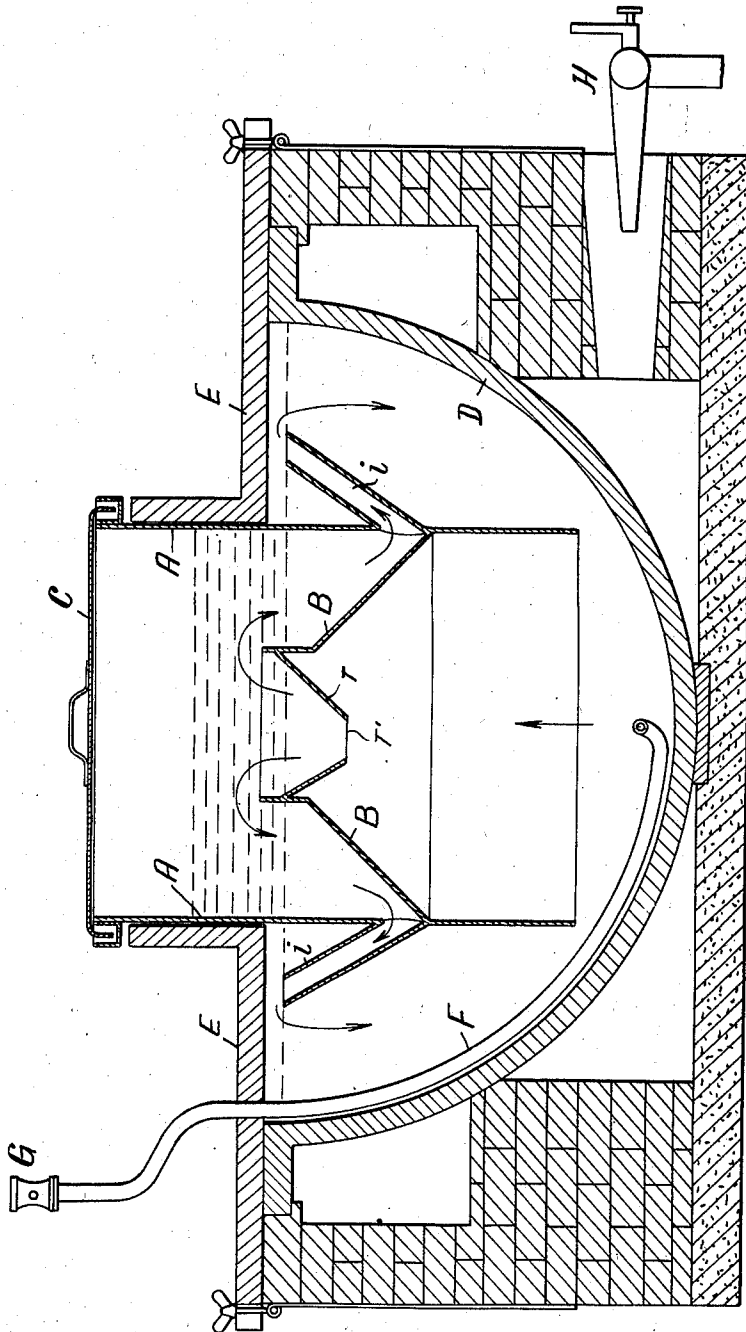


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APPARATUS FOR REFINING LEAD AND MORE PARTICULARLY  
FOR REMOVING ARSENIC, ANTIMONY, TIN AND ZINC  
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## UNITED STATES PATENT OFFICE

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APPARATUS FOR REFINING LEAD AND  
MORE PARTICULARLY FOR REMOV-  
ING ARSENIC, ANTIMONY, TIN, AND  
ZINC

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4 Claims. (Cl. 266—34)

The invention relates to an apparatus for refining lead and more particularly for removing arsenic, antimony, tin and zinc.

It is known to refine lead beneath a surface layer of salts exercising a purifying action, by agitating by steam. The refining is however incomplete as in this known proposal the lead is circulated only at the centre of the refining pan at the bottom where the steam is introduced whereas the motion very rapidly decreases from the centre towards the edges of the pan. Also, with simple agitation by means of steam a not inconsiderable part of the lead is oxidized.

The object of the present invention is to overcome these difficulties. This is effected in that the agitation and resultant upward motion of the lead is effected within a container extending into the lead bath and open top and bottom, a truncated conical insertion having a cylindrical extension open at the top being secured to the inner wall of the container in such manner that the upper end of the cylindrical extension terminates in the surface layer on the lead bath; somewhat above the junction of the insertion with the container the wall of the latter is provided with outlet apertures to permit the passage of the lead which is thrown into motion by the steam pipe terminating below the container.

Tubes terminating in the surface of the lead bath are attached at the outlet apertures in the container

In this way a rapid and intensive circulation of the entire lead bath is effected with rapidly changing contact surfaces between the lead and the refining salts without the use of any mechanical pumps or other appliances.

The apparatus and its mode of utilization will now be described with reference to the accompanying drawing which shows diagrammatically one constructional form of the invention.

D is the refining pan which is filled with lead and is heated by the oil burner H. Steam is introduced through a tube F by way of a regulating valve G. The actual refining apparatus is the cylinder A of sheet iron held by two supports E welded on laterally and resting on the edge of the pan D. At their ends, the supports E are anchored to the foundation by means of wing nuts. The cylinder A is arranged centrally in the pan and its lower part which is entirely open extends down to near the bottom of the pan. Sufficient space is left between the pan D and the lower edge of the cylinder A to permit the convenient passage of the tube F.

The outlet of the steam tube F is disposed at the centre of the bottom of the pan and thus is central with respect to the cylinder A which is located above it. The upper part of the cylinder A projecting above the surface of the lead is provided with a loosely fitting cover C to prevent lead and caustic soda from splashing out. Internally, the cylinder A is divided into two compartments by an insertion B. Insertion B comprises both a truncated conical portion, the lower side of which is secured to the walls of cylinder A and a vertically disposed cylindrical extension at the top of the conical portion. If desired, a downwardly projecting truncated conical extension T may be secured to the cylindrical extension at insertion B slightly below the top thereof as shown in the drawing. When the insertion T is employed, the compartments defined by insertion B connect by a central opening T' through which the lead, which the steam has caused to boil, passes from the lower compartment to the upper compartment containing the salt mixture floating on the surface of the lead. In operation, the lead boiling up from the lower compartment, passes through the opening T' when the extension T is used and flows over the top of the cylindrical portion of insertion B through the tubes *i* welded to the lowermost part of the upper compartment to the surface of the lead outside the cylinder. The tubes *i* terminate at the surface of the lead outside the refining apparatus at the points where a much smaller motion occurs in the ordinary agitation of the lead than at the centre of the pan where the steam rises vertically upwardly and occasions violent boiling. The mode of operation of the above-described agitating and refining apparatus is as follows:

After the lead to be refined has been heated to above 400° C., the cylinder A is charged with the requisite quantity of caustic soda salt mixture, which immediately fuses on the surface of the lead within the cylinder.

Thereupon, by means of the valve G which can be adjusted to fine limits, sufficient steam is admitted to enable a violent boiling to be observed in the interior of the cylinder after removing the cover C. The lead at once commences to move in the direction of the arrows. The refining of the lead also starts with this motion. Due to the boiling and the flow of the lead through the interior of the cylinder, the molten metal has large contact surfaces and high speeds, so that large quantities of lead are rapidly moved past the surface of contact with

the refining salts where the impurities are intensively and rapidly oxidized. The lead in the pan around the cylinder A moves downwardly with the same speed as the molten metal moves upwardly within the cylinder towards the surface of contact with the salt mixture. The downwardly moving lead re-enters the refining apparatus at the bottom of the cylinder A. The separation of the part of the lead which is boiling from the remaining part which is less disturbed, makes it possible to obtain a rapid and systematic circulation of the entire lead contained in the pan because the boiling motion occurs in a container open top and bottom and closed laterally and provided with an internal conical insertion open centrally, the upper open end of which projects above the surface of the lead and terminates in the salt mixture. The lead boiling up over the upper open end of the insertion creates a pressure in the upper compartment and is constantly directed through tubes attached at apertures above the junction of the insertion with the container and terminating in the surface of the lead outside the container. The downward motion commences immediately the lead leaves these tubes.

I claim:—

1. Apparatus for refining lead beneath a surface layer of refining salts by means of steam comprising a refining pan, means for heating said pan, means for introducing steam into said pan centrally adjacent the bottom thereof, a container open top and bottom disposed above said steam outlet and adapted to be partially immersed in the metal in said pan, an upwardly extending conical insertion open at the top, located within and secured to the wall of said container the compartment above said insertion

receiving the refining salts and communicating with the metal outside said container.

2. Apparatus as claimed in claim 1, comprising externally disposed tubes leading upwardly from the upper compartment of the container to constitute the communication with the metal outside said container.

3. Apparatus for refining lead comprising a refining pan containing the lead to be refined, a foundation supporting said pan, means for heating said pan, means for introducing regulable quantities of steam into the heated lead at the bottom centre of the pan, a cylindrical container partly immersed in the heated lead with its axis in vertical alignment with the centre of the pan, a loosely fitting cover on the top of said container, a substantially conical insertion open at the top extending upwardly within the cylinder from within the heated lead to above the surface thereof, tubes extending outwardly and upwardly from apertures in the wall of said cylinder above the bottom of the conical insertion to the surface of the heated lead surrounding the cylinder, supporting members attached to the cylinder and means for releasably anchoring said supporting members to the foundation supporting the refining pan.

4. For use in refining lead beneath a surface layer of refining salts by means of steam, an apparatus for partial immersion in the heated metal in a refining pan and comprising a container open top and bottom, an upwardly directed open ended tapering insertion secured to the wall of the container and means constituting a connection between the interior of said container above said insertion and the exterior of said container.

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