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ELECTRODEPOSITION OF METAL

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This invention relates to the electrodeposition of zinc upon cathodes or starting sheets and has for an object the provision of certain improvements in methods for such electrolytic deposition. More particularly, the invention contemplates the provision of a method for producing uniform deposits of electrolytic zinc upon zinc starting sheets or zinc cathodes.

Heretofore, in processes for the production of electrolytic zinc, aluminum cathodes have usually been employed. The use of aluminum cathodes or starting sheets involves considerable expense and causes operating difficulties under certain conditions. Aluminum cathodes have a high first cost due to the fact that specially refined metal must be employed in their manufacture. Ordinary commercial aluminum is not satisfactory for cathode use due to its higher tendency to corrosion in the presence of electrolytes, and even high grade aluminum is corroded by the electrolytes commonly employed, especially above the solution line. Hence aluminum cathodes have comparatively short lives. Still greater difficulties in the use of aluminum cathodes result from the fact that the deposited zinc must be stripped from the cathodes at frequent intervals, entailing a high expenditure for labor, and requiring frequent polishing of the cathodes in order to prevent the formation of a bond between zinc and aluminum which is difficult to break.

In the electrolytic recovery of metals from solution, the more economical system is to employ a cathode of the same metal that is being deposited. Such practice has been followed for many years in the electrolytic deposition of copper, where thin starting sheets are first formed on greased copper blanks. After stripping, the starting sheets are hung in the so-called commercial sections of the tank-house and additional copper is deposited upon them until a relatively thick sheet is formed. As compared to processes where the entire metal production must be stripped from blanks or cathodes, this system results in savings in materials and labor.

Recently, efforts have been made to apply this practice to the electrolytic recovery of zinc. Thin zinc starting sheets are formed upon aluminum blanks of the old type. The starting sheets are stripped, and hung in other electrolytic cells where they accumulate heavy deposits of zinc. They are then withdrawn and sent to the melting furnaces. In this way it is sought to achieve the benefit which accrues to the use of the same practice in copper metallurgy, namely, lower stripping costs per unit of metal produced, at the same time, lower costs for aluminum cathodes. In practice, an additional benefit accrues in that the current efficiency when using zinc starting sheets is considerably higher than when aluminum cathodes are employed The superiority of this process in the metallurgy of zinc is great enough to enable it to supersede the older practice of total deposition upon aluminum cathodes, provided that certain problems arising out of the character of zinc starting sheets are solved. It is to the solution of these problems that the present invention is directed.

The problems referred to, while also arising to some extent in the use of other cathodes to receive deposits of electrolytic zinc, are greatly augmented when zinc starting sheets are used and particularly when zinc starting sheets formed on aluminum blanks are used. In the formation of such sheets by electrolytic deposition upon aluminum blanks, some contamination of the sheets with aluminum and impurities contained in the blanks almost invariably occurs. The contamination is greater on the face of the starting sheet in contact with the aluminum, but, since the sheet is relatively thin, such contamination usually pervades the whole sheet to some degree. A second source of contamination of the starting sheets is the stripping operation. A certain amount of handling is unavoidable, and, as a result, the sheets become contaminated through contact with gloves, tools and surfaces upon which they are laid. Furthermore, in the stripping operation, the starting sheets are inevitably flexed. Flexure induces strains in certain portions of the sheets and not in others with the result that local differences in potential between strained and unstrained portions may arise when the starting sheet is subjected to the flow of electric current in the second stage of zinc deposition. Lastly, the thin character of the starting sheet, together with the inevitable sharp edges which are formed when the sheet is stripped from the aluminum blank gives rise to a variation in current density, especially at the edges of the sheet.

When the starting sheets are placed in the electrolytic cell to form cathodes for receiving additional deposits of zinc the above-described factors combine to produce exceedingly irregular deposition of zinc upon the surfaces of the cathodes. Re-solution of zinc proceeds at some places while in other zones an excessive development of excrescences or trees may occur. If deposition is allowed to proceed under these conditions, the re-solution of metal, especially at the solution line, may cause the sheets to rupture and fall to