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ELECTROLYTIC CELL FOR THE PRODUCTION OF ALUMINUM

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Fig. 1.

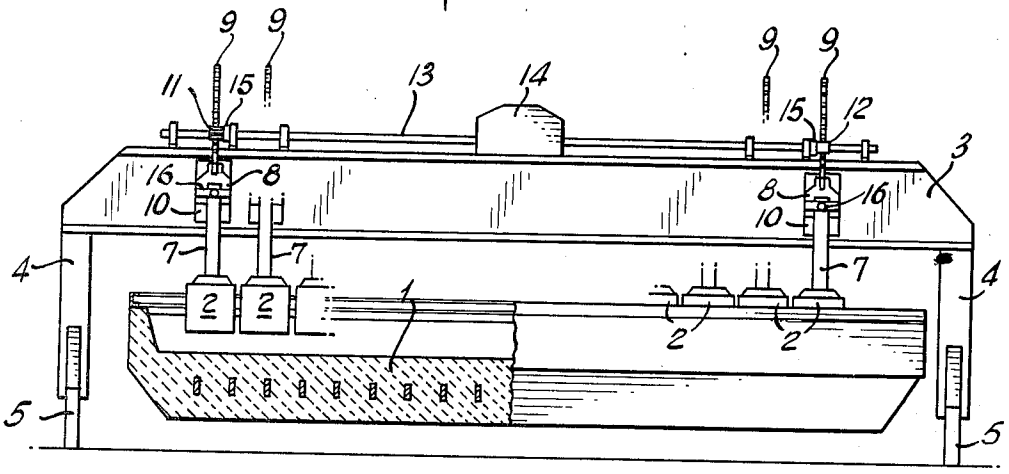
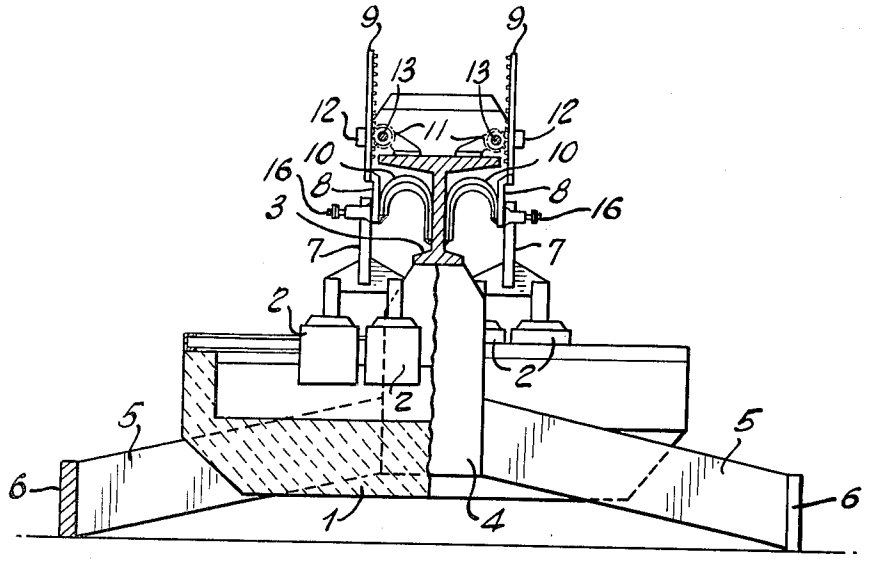


Fig. 2.



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ELECTROLYTIC CELL FOR THE PRODUCTION OF ALUMINUM

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5 Claims. (Cl. 204—225)

The present application is a continuation-in-part of application Serial No. 159,226 filed December 4, 1961.

The present invention relates to an electrolytic cell for producing aluminum.

Electrolytic cells for the production of aluminum in fused baths usually comprise a cathodic pot in which a fused fluoride bath is maintained and one or more carbon anodes carried by vertical rods arranged in rows from one end of the pot to the other. Whether the anodes are prebaked or selfbaking, they are consumed as the production of aluminum proceeds, and they are therefore lowered corresponding to their consumption. For that purpose, the anode carrying rods are vertically movable endwise and usually are affixed to a horizontal current conductor which is carried by lifting mechanisms mounted on separate supporting frames spanning the pot transversely. The current is fed to the ends of the horizontal current conductor from outside the cell by means of rising conductors which include flexible means permitting raising and lowering of the horizontal current conductors with the anode or anodes.

As a feature of the present invention, there is provided an electrolytic cell with a rigid frame which serves not only as the supporting structure for the anodes but also as a current conductor for the anodes. This frame spans the cathodic pot from one end to the other and comprises vertical conductors at opposite ends of the cell and a horizontal conductor frame beam extending between them, the vertical conductors constituting the legs of the frame. In such a cell, servicing operations such as breaking the crust on the bath, introducing alumina into the bath and tapping off metal are facilitated, as there is no special frame for carrying the anode impeding access to the pot and rendering it difficult to mechanize the various operations.

In order that in the cell described, the anode may be vertically adjusted, each anode is connected by means of a flexible conductor with the horizontal beam of the current-conducting frame and is electrically connected with the frame beam by means of a flexible conductor.

As an additional feature of the present invention, the basic construction described is designed for simplification. According to this design, the anodes are suspended from the rigid current-conducting frame by means of toothed racks, each engaging a pinion arranged on a shaft carried on the horizontal beam of the frame and releasably connected with the shaft through a coupling. By driving the shaft, the pinions and the tooth racks may be operated in unison, causing thereby all of the anodes to be lowered as a whole to progressively compensate for their consumption. It is also possible to move vertically each anode individually up or down after releasing the coupling connecting the pinion to the shaft, for example, to replace a used anode.

Various other objects, features and advantages of the present invention are apparent from the following description and from the accompanying drawings, in which

FIG. 1 shows the cell embodying the present invention, somewhat diagrammatic, partly in side elevation and partly in central vertical section;

FIG. 2 is an end elevation of the cell, somewhat diagrammatic, partly in section.

Referring to the drawings, the electrolytic cell in accordance with the present invention comprises a cathodic pot 1 and a plurality of anodes 2 arranged in two parallel rows of paired anodes, adapted to dip into the electrolytic bath in the pot during operations. For supporting the anodes 2 and for supplying current thereto, there is provided a horizontal beam 3 spanning the cell from one end to the other. The beam 3 forms with rising conductors 4 at both ends of the cell a rigid current-conducting and anode-supporting frame and is preferably of structural cross-section such as of T cross-section as shown, or of I cross-section. The rising conductors 4 as well as the beam 3 are desirably made by continuous casting from pure aluminum or from a suitable aluminum alloy, such as, for example, an aluminum alloy containing 1.8 to 2% iron. This alloy has high structural strength and high current conductivity.

The rising conductors 4 are supported by cross beams 5 on brackets constituting part of the frame structure of the plant building. The cross beams 5 are connected to bus bars 6.

The anodes 2 consist of prebaked carbon blocks attached in pairs to anode rods 7, the pairs of anodes being arranged in a row on each side of the beam 3. Each anode rod 7 is detachably connected to a plate 8 by means of a clamping device 16 carried by the plate. Current is supplied to the anodes 2 from the current conducting frame beam 3 by means of flexible conductor strips 10 made of aluminum, each of these strips having one end welded to the beam, the other end being welded to the corresponding connecting plate 8. To facilitate welding of the conductor strip 10 to the connecting plate 8, the connecting plate is desirably also made of an aluminum alloy.

To the upper end of each connecting plate 8 is affixed an upright toothed rack 9 meshing with a corresponding pinion 11 and guided for vertical movement in a bracket 12 secured to the frame beam 3. Two parallel shafts 13, extending along opposite sides of the beam 3 parallel thereto and supported on said beam, carry the pinions 11. These shafts 13 are driven by means of a motor and reduction gear unit 14 supported on top of the beam 3 midway thereof. Each pinion 11 can be selectively secured to its shaft 13 for rotation therewith or can be released therefrom by means of a suitable releasable coupling 15 permitting the shaft to rotate while the pinion is held against rotation. By means of this arrangement, the anodes 2 may be raised or lowered simultaneously through the operation of the motor gear unit 14, when the pinions 11 are all coupled to the shafts 13, or each anode may be individually raised or lowered independently of the other anodes by uncoupling the corresponding pinion 11 from the corresponding shaft 13. Such individual movement of any anode 2 may be necessary, for example, to replace a consumed anode, while the corresponding toothed rack 9, connecting plate 8 and clamping device 16 remain on the cell.

In the electrolytic cell of the present invention, the anodes 2 are directly suspended from the current-conducting frame 3, 4 and 5. It is not necessary with this construction to provide an auxiliary beam or conductor bar which must be moved with the anodes. Auxiliary means for moving such unit are, therefore, dispensed with. Also, the construction of the present invention affords favorable conditions for conducting current to the anode rods 7. The contact surface of the connecting plate 8 is easily worked and the anode 2 easily replaced.

While the invention has been described with particular reference to a specific embodiment, it is to be understood that it is not to be limited thereto but is to be construed broadly and restricted solely by the scope of the appended claims.

What is claimed is:

1. An electrolytic cell for the production of aluminum in a fused bath containing in a cathodic pot comprising a rigid current-conducting frame beam spanning the pot from one end to the other, anodes adapted to extend into said bath and arranged in a row on one side of said frame beam, vertical rods connected to said anodes respectively, vertical toothed racks connected to said anode rods respectively, a shaft extending along said beam and supported thereon, means for driving said shaft, a series of pinions carried by said shaft in spaced relationship therealong and meshing with said racks respectively, whereby said anodes are supported indirectly from said frame beam, coupling means for coupling said pinions individually to said shaft for rotation therewith and for release therefrom, and flexible metal strips between said beam and said anode rods.

2. An electrolytic cell according to claim 1, wherein the toothed racks are detachably connected to the anode rods.

3. An electrolytic cell according to claim 1, wherein each vertical toothed rack is connected to the corresponding anode rod by means comprising a connecting plate affixed to the rack, and a means detachably connecting the rod to said connecting plate.

4. An electrolytic cell according to claim 1, wherein said connecting plate is made of a material of the class consisting of aluminum and an aluminum alloy, and the corresponding flexible metal strip connecting the frame beam with the anode rod is made of said material and is welded to the corresponding connecting plate.

5. An electrolytic cell according to claim 1, wherein said anodes are arranged as two parallel rows on opposite sides of the frame beam.

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