

[54] **A TEMPLET AND METHOD FOR ASSEMBLING CATHODE CAPS ON ELECTROLYZERS FOR MOLTEN SALTS**

[72] Inventors: **Evgeny Ivanovich Adaev**, 2 Schukinsky proezd, 10 korpus 1, kv. 56; **Alexander Vasilievich Blinov**, ulitsa Gorkogo, 41, kv. 48; **Georgy Mikirtychevich Kamarian**, Vorontsovskaya ulitsa, 30 "b," kv. 18; **Viktor Alexandrovich Novoselov**, ulitsa Vavilovas 10, korpus 20, kv. 28; **Leonid Markovich Yakimenko**, Abelmanovskaya ulitsa, 7, kv. 17, all of Moscow, U.S.S.R.

[22] Filed: **April 5, 1971**

[21] Appl. No.: **131,534**

Related U.S. Application Data

[63] Continuation of Ser. No. 854,571, Sept. 2, 1969, abandoned.

[52] U.S. Cl. **29/203 J**

[51] Int. Cl. **C22d 1/02**

[58] Field of Search **29/203 R, 203 J, 203 P**

[56] **References Cited**

UNITED STATES PATENTS

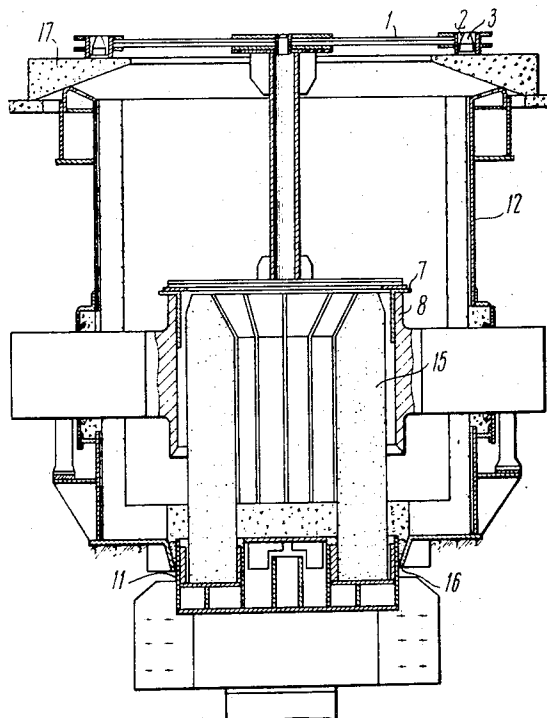
2,855,239	10/1958	Nokleby et al.	29/203 J X
2,977,780	8/1961	Carlisle et al.	29/203
3,009,239	11/1961	Carlisle et al.	29/203

Primary Examiner—Granville Y. Custer, Jr.
Attorney—Holman & Stern

[57] **ABSTRACT**

A templet or assembly jig for use in the maintenance and assembly of an electrolyzer for molten salts when separating chlorine and sodium, for example, in which the templet or assembly jig orients reference pins at an upper exposed portion of an electrolyzer tank in relation to the cathode which will normally be immersed beneath a bath of molten salts, and the same templet is used during the assembly of a replaceable cathode cap and diaphragm so that orientation and assembly of the cap is effected with respect to the previously located reference pins whereby during operation of the electrolyzer replacement of the cathode cap and diaphragms is accomplished while the electrolyzer bath or tank is immersed beneath the salts so that installation of the cathode cap is accomplished with minimum shut-down time and optimum designed efficiency of the electrolyzer is retained.

13 Claims, 7 Drawing Figures



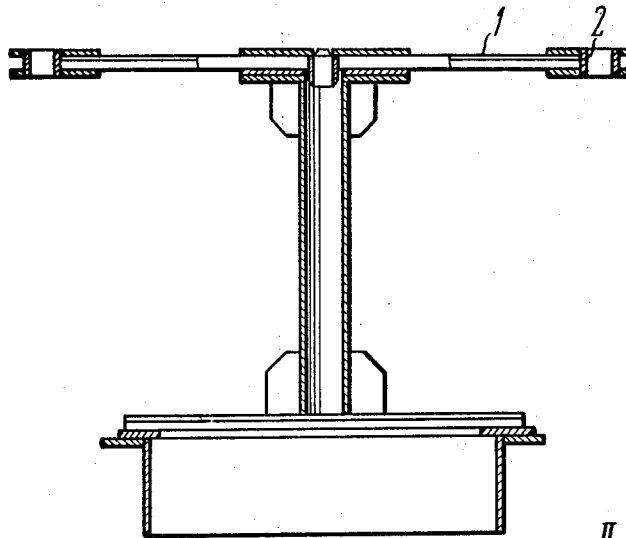


FIG. 2

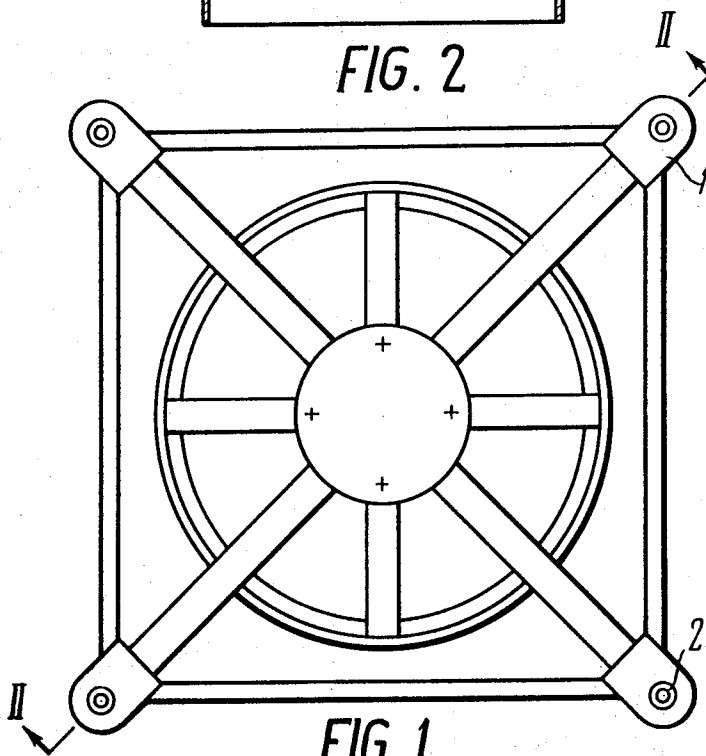


FIG. 1

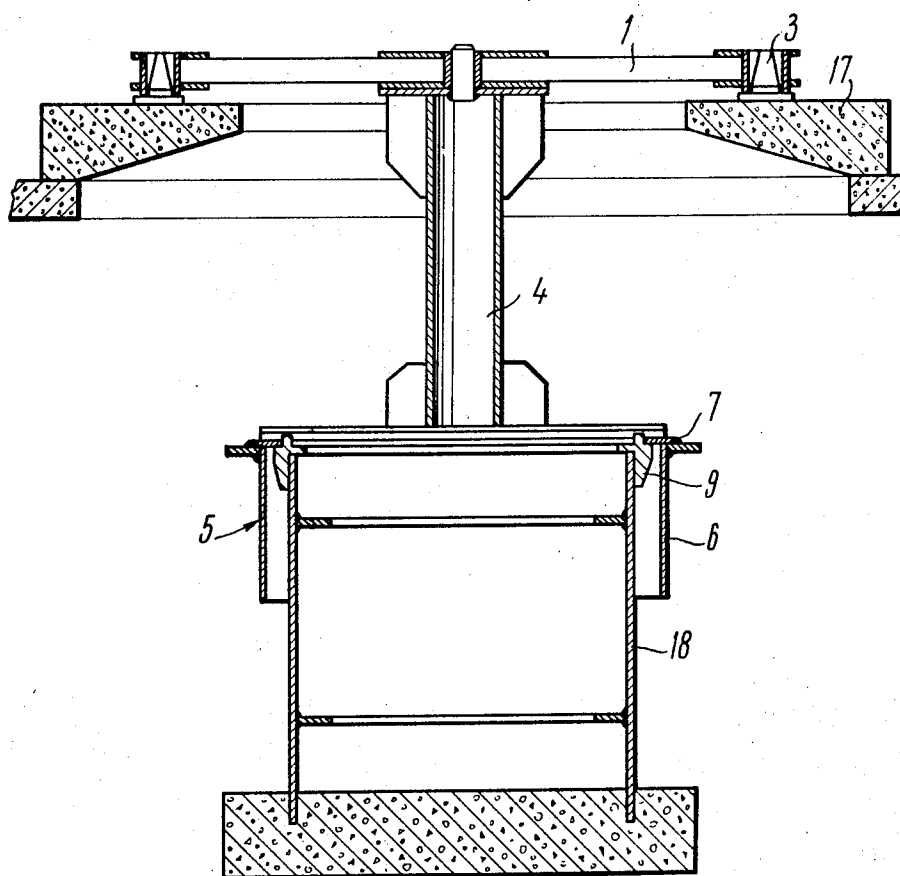
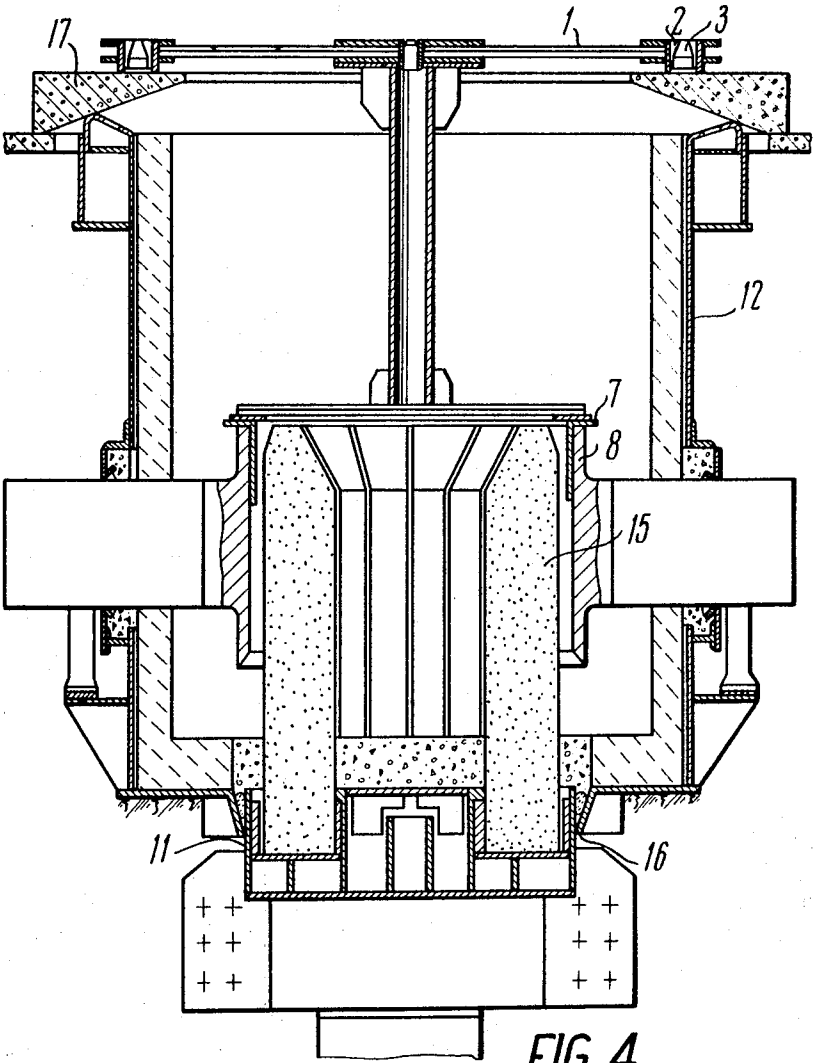
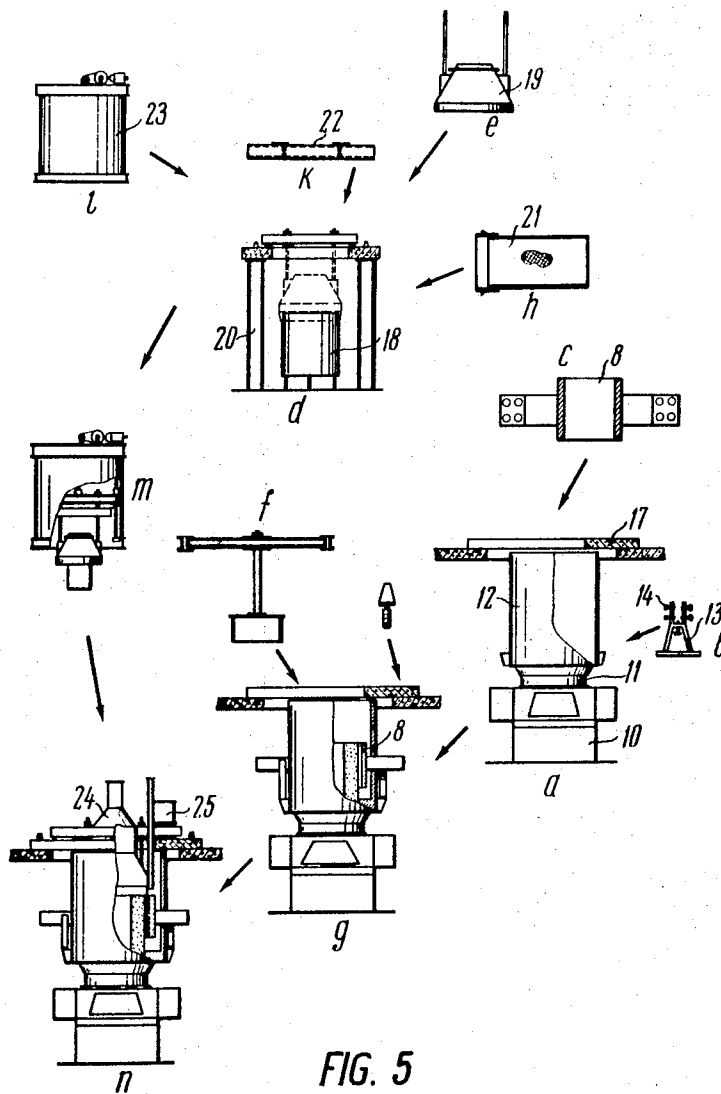
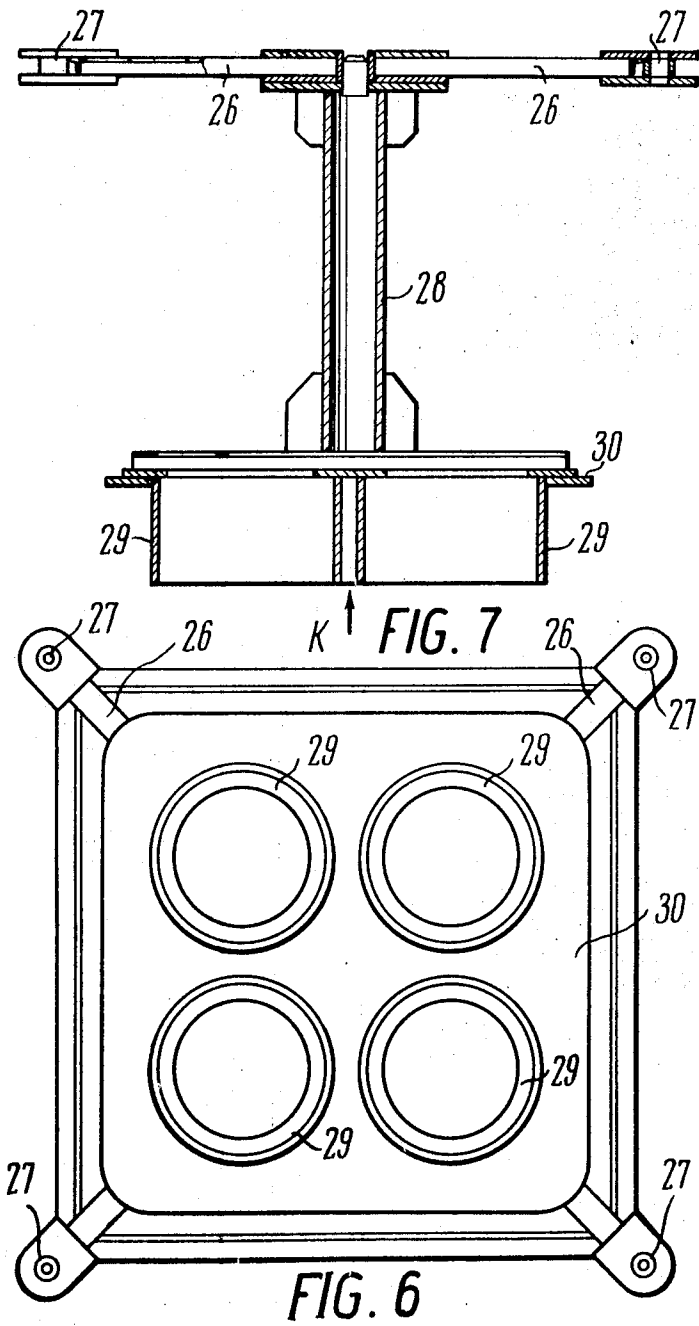


FIG. 3







TEMPLET AND METHOD FOR ASSEMBLING CATHODE CAPS ON ELECTROLYZERS FOR MOLTEN SALTS

This application is a continuation of application Ser. No. 854,571 filed Sept. 2, 1969, now abandoned.

The present invention relates to devices used during assembly of electrolyzers for molten salts, and, more particularly, for mutually aligning electrolyzers having replaceable cathode caps and diaphragms, used with a removable attachment for lowering the cathode cap onto an electrolyzer; a common stand or templet being used for pre-assembling the parts of the cathode cap with diaphragms in relation to fixed references on an electrolyzer bath with which it cooperates.

During the course of use, a plurality of industrial electrolyzers used in concert require a periodic change of their cathode caps with diaphragms. There arises the problem of precision orientation of the cathode cap onto the complete base assembly at the electrolyzer, and installing the diaphragms connected with the cathode cap between the electrode under the conditions when the complete base assembly is immersed beneath a bath of molten electrolyte. At the same time, it is necessary to provide a precise mounting of any assembled cathode cap on any electrolyzer of the series.

Known in the art are methods of assembling electrolyzers and sets of the cathode caps with the aid of templets. Most of these methods require employment of several bulky precise templets that are complex in manufacture, whereas maintenance of their original precision during the course of their prolonged use presents quite a problem. When using this method of assembly, due to the "accuracy" of the templets, the parts of electrolyzers must be either manufactured in a very precise manner, or have elements disposed thereon which compensate for the inaccuracy of manufacture during the course of assembly. These requirements make the manufacture of separate, or replacement, parts of electrolyzers more complicated and expensive. Further, the conventional methods do not ensure mutual alignment (orientation) of the templet used for the assembly of sets of the cathode caps with a prepared electrolyzer base. This may nullify the advantages of the measures taken in order to provide a precise assembly of the electrolyzer proper, and the replacement cathode cap in case their original alignment is distorted during the course of use of said templets.

The misalignment of the electrolyzer and setting the cathode cap taking place due to the above-said disadvantages of the conventional prior art systems of assembly when setting the cathode cap into the electrolyzer may result in a screen being crushed, and the diaphragms are not positioned concentrically in the interelectrode spaces of the electrolyzer, which decreases the current output power, brings about short-circuiting and burning-through of the diaphragms and, consequently, necessitates their frequent replacement and reduces production.

An object of the present invention is to eliminate the above-mentioned disadvantages of the prior art. Other objects and advantages of the present invention will become evident from the foregoing disclosure.

The present invention has as its purpose the provision of a templet or assembly with elements and parts, that ensure a precise and quick mutual alignment

(orientation) of the assembled electrolyzer base or tank and the stand for the assembly with the setting of the cathode cap.

This object is accomplished by providing, in accordance with the present invention, a templet for mutual alignment (orientation) of the electrolyzer and the stand for the assembly of the set of the cathode cap by way of mounting with its aid an electrolyzer on the upper plate and centering pins (dowels) on the plate of the stand; said pins being intended for use with removable attachment used for lowering the set of the cathode cap with diaphragms into the electrolyzer and ensuring similar repositioning of the movable attachment (in the course of a subsequent installation thereof) relative to the axis of the complete base assembly and relative to dummy electrodes to be found on the stand for the assembly of the cathode cap.

In accordance with the present invention said templet is fashioned as a part having holes for installing the centering pins on the plates of the electrolyzer, and pins on a stand for the assembly of the cathode cap with a diaphragm that is rigidly connected to an element having centering surfaces that are congruent in shape to the electrode of the electrolyzer and the dummy electrode disposed on the stand for the assembly of the set of the cathode cap. The dimensions of the surfaces ensuring adhesion of the working surfaces of the element to the centering surfaces of the electrolyzer electrode and the dummy electrode on the stand during its successive connection therewith.

It is expedient that the templet element be made in the form of a piece of pipe with a flange secured to an upright, the latter being connected to a member in the form of crossed beams with holes for the pins.

This piece of the pipe may have an outside diameter 0.1 to 5 mm smaller than the inside diameter of the cathode and the inside diameter of the flange may be 0.1 - 5 mm larger than the outside diameter of the dummy electrode on the stand.

The templet may have an element consisting of several pipe pieces fastened to a common flange, the number of pipe pieces being selected to suit the number of the like electrodes of the electrolyzer.

Now the invention will be described in detail by way of example with reference to the accompanying drawings, in which:

FIG. 1 is a top plan view of an electrolyzer;

FIG. 2 is a vertical sectional view taken along line II-II in FIG. 1;

FIG. 3 is a vertical sectional view through a templet on a stand;

FIG. 4 is a vertical sectional view through a templet on an electrolyzer;

FIG. 5 is a schematic flow diagram showing a method of electrolyzer assembly with use of the templet according to the invention;

FIG. 6 is a templet with element of four pipe pieces, bottom view;

FIG. 7 is a longitudinal section of the templet of FIG. 6.

EXAMPLE 1

The electrolyzer assembly templet comprises a part 1 (FIGS. 1 and 2) made in the form of crossed beams, connected by side members for better stiffness, and

having holes 2 for the centering pins 3 (FIG. 3). The part 1 is welded to the upper end of an upright member 4 which, in turn, is connected rigidly at its lower end to the element 5 made in the form of a piece of pipe 6 with a flange 7 at its upper end. The outside diameter of the piece of pipe is preferably 0.1 to 5 mm smaller than the inside diameter of the cathode 8 (FIG. 4) while the inside diameter of the flange 7 is preferably 0.1 to 5 mm larger than the outside diameter of the dummy electrode shoes 9 of the stand (FIG. 3).

The electrolyzer is assembled in the following order. Without reference to the external parts, two main dimensions must be accurately ensured; the interpolar distance and the distance from the upper edge of the cathode to the screw supports on which the cathode cap frame rests. The contact anode unit 11 is installed on the foundation 10 (FIG. 5a), then the electrolyzer casing 12 is lowered from above and the supports 13 (FIG. 5b) are fastened to the casing; then the cathode 8 (FIG. 5c) is lowered on the supports and the screws 14 (FIG. 5b) are rotated for installing the cathode 8 to such a position as to direct its working surface vertically. Then the anode 15 (FIG. 4) is installed with reference to the cathode 8 and poured with lead 16 in the contact unit 11.

Then the electrolyzer casing is lined with refractory bricks and the input terminals are grouted with heat resistant concrete. Next, the electrolyzer is covered with a plate 17.

Having assembled the electrolyzer tank, the electrolyzer is next joined with the stand for the assembly of the cap, which is performed as follows.

The element 5 (FIG. 3) is lowered on the shoes 9 (FIG. 3) of the cylinder 18 (FIG. 5d) of the stand for the assembly of the cap 19 (FIG. 5e) with the screen, in such a manner that the element 5 is held by the flange 7 on the shoes, contacting them with its inner surface.

The part 1 will rest on the reinforced-concrete plate 17 located on supports 20 (FIG. 5d).

Then centering pins 3 are placed into the templet holes 2 (FIG. 4) and welded to the metal strips of the plate 17 after which the templet is withdrawn from the stand.

In this manner the pins are installed on the stand during its assembly, after which they must be periodically checked in operation to see that their position has not changed.

Using the same templet, the centering pins are installed on each electrolyzer. For this purpose, the templet is lowered (FIG. 5f) into the electrolyzer with the cylindrical part of the templet entering into the cathode 8 (FIGS. 4 and 5g) and the flange resting on the upper edge (face) of the cathode 8. The part 1 will rest on the plate 17. Then the centering pins 3 are placed into the holes 2 and welded to the metal strips of the plate 17. Then the templet is withdrawn from the electrolyzer.

In this manner the centering pins in each electrolyzer are set identically with respect to the vertical axis of the cathode cylinder and in the same way as the stand pins are set with relation to the axis of the stand cylinder, which means that the electrolyzers, after the installation of the pins, are identical with each other and with the stand.

The cathode cap is assembled with the diaphragm on the stand in the following order. The diaphragm 21 is placed (FIG. 5h) on the cylinder 18 (FIG. 5d) so that its upper face is located below the upper edge (face) of the cylinder, and the shoes 9 are then installed (FIG. 3). The cathode cap 19 with rods is then lowered (FIG. 5e) to the shoes 9 of the cylinder 18. Frame 22 is placed (FIG. 5k) on the plate 17, and the rods of the cathode cap 19 are connected to the frame to which rods the diaphragm 21 are then fastened. (FIG. 5h).

The lifting and lowering device 23 (FIG. 5l) is lowered so as to direct the centering pins 3 of the stand (FIG. 5d) into the holes of the centering lugs of the device.

Then the frame of the lifting and lowering device is connected to the frame 22 (FIG. 5k) and the entire unit is transferred onto the electrolyzer.

The lifting and lowering device 23 (FIG. 5l) is installed on the electrolyzer so as to insert the centering pins 3 into the holes in its centering lugs, and the cap with the diaphragm is lowered into the electrolyzer. Then the lifting and lowering device is disconnected from the cap and removed from the electrolyzer. The receivers 24 and 25 (FIG. 5n) for chlorine and sodium are then installed.

This completes the operations related to the assembly of the electrolyzer.

EXAMPLE 2

The electrolyzer assembly templet is provided with a frame part 26 (FIGS. 6 and 7) made in the form of crossed beams, connected by side members for better stiffness, and having holes 27 for the centering pins mentioned in example 1. The frame 26 is welded to the upright 28 which, in turn, is connected rigidly to an element in the form of four pipe pieces 29 secured to a common peripheral flange 30. The number of pipe pieces preferably corresponds to the number of cathodes in the electrolyzer. The outside diameter of each pipe piece is 0.1 to 5 mm smaller than the inside diameter of each electrolyzer cathode while the inside diameter of the flange 30 is 0.1 to 5 mm larger than the outside diameter of the dummy electrode of the stand shoes 9 (FIG. 3).

Assembly of the electrolyzer by means of the templet described in the second example is analogous to that described in the first example with the sole difference that the pipe pieces are installed, correspondingly, on the cathodes and there is a stand with dummies of these four cathodes (not shown in the drawing).

Owing to the use of one and the same templet for the assembly of all the electrolyzers of a given series, the pins are installed identically which makes it possible to use the same lifting and lowering devices for installing the cap and diaphragm exactly into the interelectrode space, coaxially with the anode and cathode surfaces.

The centering operation described above is performed with relation to one or more cathodes of the electrolyzer, though centering with relation to one or more anodes may be performed with equal success.

Though the present invention has been described with reference to the preferable embodiment of the invention, it will be understood that various modifications and changes within the spirit and the scope of the invention may occur to those skilled in the art.

We claim:

1. An electrolyzer assembly templet comprising: a part having a plurality of holes for the installation of centering pins on the plates of the electrolyzer and stand for the assembly of the cathode cap with the diaphragm; and an element rigidly fastened to said part, said element being congruent in shape with the electrolyzer electrode used in centering the pins and with the dummy electrode on the stand, and having a size ensuring good contact between the working surface of the element and the centering surface of the electrode and dummy electrode when they are consecutively joined.

2. An electrolyzer assembly templet according to claim 1 wherein the outside diameter of said section of pipe is 0.1 – 5 mm smaller than the inside diameter of the cathode and the inside diameter of said flange member is 0.1 – 5 mm larger than the outside diameter of the dummy electrode.

3. An electrolyzer assembly templet according to claim 1 wherein said element comprises a plurality of pipe pieces secured to a common peripheral flange, the number of said pipe pieces corresponding to the number of the like electrodes of the electrolyzer.

4. An electrolyzer assembly templet according to claim 1 wherein said element has a configuration corresponding to a section of pipe and includes a flange member, and further comprising an upright secured at its lower end to said flange member, said part comprising a pair of crossed beams and being secured to the upper end of said upright.

5. An electrolyzer assembly templet according to claim 1 wherein said element has a configuration corresponding to a section of pipe and includes a flange member, and further comprising an upright secured at its lower end to said flange member, said part comprising a pair of crossed beams and being secured to the upper end of said upright.

6. An assembling and orientation templet for an electrolyzer for molten salts in which the electrolyzer includes a bath having an electrode normally immersed beneath a bath of molten salts or the like, a replaceable cathode cap and diaphragm, and an assembling stand for the cathode and diaphragm, said templet including a part having means for installing indexing means, and an element fixed relative to said part for engagement with the bath electrode, said stand including a dummy electrode corresponding to that of said bath for permitting said part means to locate second indexing

means corresponding to those first mentioned whereby the cap and diaphragm are assembled with respect to indexing means of the cooperating bath, cap and diaphragm of said electrolyzer.

7. A templet used to assemble an electrolyzer for molten salts including an electrolyzer bath having an electrode, said electrolyzer bath having a top plate portion, said template having a portion engageable with said electrode for orienting a part with reference holes on said top plate portion for locating indexing pins on said electrolyzer bath, said template portion similarly engageable with an assembly stand for a cathode and diaphragm for locating similar indexing pins relative to a dummy electrode corresponding to that of the electrolyzer bath whereby preassembled cathode cap and diaphragm assemblies can be readily oriented onto said electrolyzer bath in relation to the electrode thereof.

8. A templet as set forth in claim 7 in which said element comprises a tubular element having a peripheral orientation flange, said tubular element being receivable in a tubular cathode for orientation, and said flange including an inner portion for engagement and orientation of said template relative to dummy electrodes.

9. A templet as set forth in claim 7 in which said element comprises a tubular element having a peripheral orientation flange, said tubular element being receivable in a tubular cathode for orientation, and said flange including an inner portion for engagement and orientation of said template relative to dummy electrodes.

10. A templet as set forth in claim 8 in which said tubular element is constructed to be about 0.1 to 5 mm less than the inner cross section of the cathode in which it is removably received, and said flange has an inner diameter about 0.1 to 5 mm greater than the outer cross section of a dummy electrode.

11. A templet as set forth in claim 9 in which said tubular element is constructed to be about 0.1 to 5 mm less than the inner cross section of the cathode in which it is removably received, and said flange has an inner diameter about 0.1 to 5 mm greater than the outer cross section of a dummy electrode.

12. A templet as set forth in claim 8 in which said tubular element comprises a plurality of pipes depending from a common flange.

13. A templet as set forth in claim 9 in which said tubular element comprises a plurality of pipes depending from a common flange.

* * * * *

50

55

60

65