

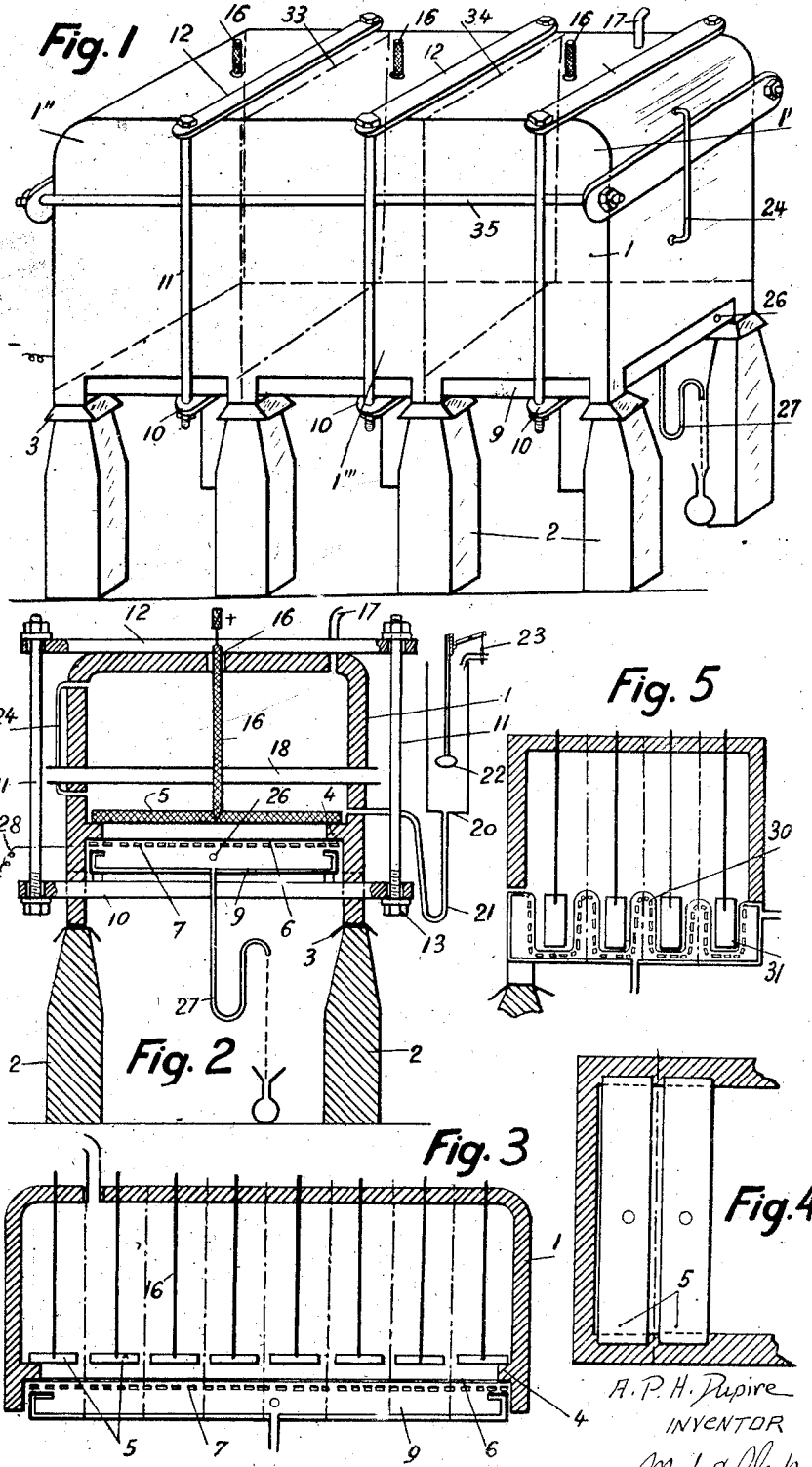
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APPARATUS FOR ELECTROLYZING CHIEFLY ALKALINE CHLORIDES

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APPARATUS FOR ELECTROLYZING CHIEFLY ALKALINE CHLORIDES

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My invention relates to electrolyzing apparatuses especially to those adapted to electrolyze alkaline chlorides and generally speaking all substances producing liquid or gaseous substances.

The electrolyzing apparatuses used nowadays in the manufacture of soda and chlorine are of two classes.

1. Horizontal diaphragm apparatuses such as the Biltzer apparatus. They comprise a bell of concrete or heavy stonework containing the anodes, the inlets for the electrolyte and for the heating fluid and the chlorine outlet. The bell rests on the diaphragm supported by the cathode, the whole being disposed in the cathodic vat. The result is that each time the diaphragm is to be changed (i. e. about every three months), the heavy and cumbersome bell must be raised and removed by means of an overhead traveller and the apparatus taken to pieces.

2. Vertical diaphragm apparatuses. Such apparatuses are fragile and cannot be used with more than 1000 or 1500 amperes. The soda produced is diluted as the flow is very irregular. The water pressure on the diaphragm is very irregular and much greater on its lower part. Besides these apparatuses require considerable supervising because if the level of the electrolyte falls below the top of the diaphragm the chlorine and hydrogen produced will mix the consequences of which are, as is well known, disastrous.

The apparatus according to my invention is of the horizontal diaphragm type but is devoid of the drawbacks of this type inasmuch as the anodic bell is stationary and does not require removal when the diaphragm or anodes are to be changed.

The cathodic compartment supporting the diaphragm can be considered as hung inside the bell through a rod arrangement whereby it can be lowered or raised and consequently the diaphragm can be changed without moving the bell.

Preferably a peripheral flange is disposed inside the bell. The anodes constituted by graphite bars rest on this flange and are fed with current through graphite rods passing through the bell. For removing the anodes,

these rods are first removed from outside after disconnecting them from the graphite bars. They are then removed from inside by moving them obliquely.

On the lower side of the bell flange are disposed the diaphragm and cathode which are pressed against the said flange by the edges of a cathodic vat supported by rods adapted to be raised and lowered with reference to the bell.

In a modified form of construction the anodic and cathodic compartments instead of being separated by a flat diaphragm may be separated by a corrugated diaphragm, the edges of the bell and cathodic vat being correspondingly shaped. The anodic bars which may be disposed inside the corrugations have thereby an increased active surface.

In view of making the transportation of the electrolyzer easier and of building it of any desired size, I may build it out of a certain number of parts the two extreme parts closing the bell. These parts are cemented together through a resisting cement and connected through suitable securing means. Molten basalt may be used to advantage for making up these parts as it is a very good insulating material which resists most chemicals, whereby iron-free clear solutions may be produced in the apparatus.

I have described hereinbelow with reference to appended drawings several forms of execution of my improved electrolyzing apparatus.

Fig. 1 is a perspective view of a first form of execution.

Figs. 2 and 3 are a cross-section and a longitudinal section thereof.

Fig. 4 is a detail plan view.

Fig. 5 is a longitudinal section of a modified form of my apparatus.

The electrolyzer on Fig. 1 comprises a parallel-epipedic bell 1 of concrete or other resisting material; it extends downwards in as many points as may be necessary whereby it is supported by the posts 2 with the interposition of an insulating part 3. Inside and at the lower part of the bell is a flange 4 running longitudinally along the long sides. On

this flange 4 rest the anodes constituted by flat graphite bars 5 disposed parallel to each other. Under the flange 4 is the porous diaphragm 6 and then the cathode 7 appearing as a perforated plate or gauze. The whole rests on the edges of a shallow parallelepipedic vat 9 supported by the rods 10 held by the threaded rods 11 supported by the rods 12 borne by the top of the bell 1. The nuts 13 hold the rods 10, on the rods 11.

The bell 1, which is the anodic compartment is provided with the following apertures: the aperture 15 through which pass the graphite rods 16 screwed or secured to the bars 5 to which they lead the current, and a chlorine outlet 17. The bell is also traversed by the silicon tube 18 adapted to be heated by a fluid circulation for instance, of hot water or steam.

The electrolyte is provided in a small reservoir 20 communicating with the bell 1 through a pipe 21. A float 22 provided with a rack is disposed in the reservoir and controls the cock 23. The float being adjusted through the rack, the level in the bell 1 can be varied, the tube 24 allowing inspection of this level.

The cathodic compartment 9 comprises an outlet 26 for the hydrogen; the soda passes out through the siphon 27 and the negative terminal of the wire 28 is connected with the cathode.

The apparatus is very easily taken to pieces. By unscrewing the nuts 13 the cathodic vat can be lowered when desired together with the diaphragm which can be changed at will.

On the other hand when the cathodic part 6—7—9 and 10 is lowered, the anodes can be reached. If the rods 16 have been previously removed from outside through the apertures 15, the bars 5 can be removed from below by inclining them a little obliquely.

With such an apparatus it is easy to obtain with NaCl for instance, a soda lye containing 180 gr. of NaOH per litre with an efficiency as to current of 96 to 98% and as to energy of 60 to 85%.

If the electrolyte were to fail or its level to go down below the anode the chlorine and hydrogen could not mix as they would be separated by a thin liquid film. Moreover the intensity of the current falling to zero, the gas production would be reduced and even stop. It is therefore possible to completely drain an electrolyzing apparatus and to prevent the mixing of the cathodic and anodic solutions.

An apparatus as described can be built for large outputs without its taking to pieces becoming a hindrance as two men are sufficient for any size of apparatus.

In the modified form shown on Fig. 4 the two long sides of the anodic bell instead of showing a flat horizontal lower edge end with

an undulating line 30 to which corresponds the top undulating edge of the cathodic vat. The projections and hollows of the two lines fit into each other. The cathode and the diaphragm are corrugated in a manner such as will make their vertical cross-section correspond to the line 30. The anodic bars 31 are comparatively thick and are disposed inside the corrugations. Evidently such an arrangement allows a shorter electrolyzer to be built for the same out-put because the bars 31 instead of only having their lower side active as is the case of the bars 5 have also their side faces active. This allows also an economy of graphite.

However such an apparatus shows some of the abovementioned drawbacks of the vertical diaphragm apparatuses. But these drawbacks are minimized by the fact that the height of the bars 32 is always small. On the other hand this apparatus is stronger, less cumbersome and more easily taken to pieces than any other.

Instead of building the apparatus with one large bell 1 it may comprise a number of elements cemented together in order to allow it to be more easily transported, handled and adapted to different purposes.

The bell (Fig 2) would in this case comprise two end parts 1' taking up the width of the bell and a number of intermediary standard parts 1''.

The connection between these parts is made along the dot-and-dash lines 33, 34, the parts being connected through a chemical resisting cement. They are moreover held together by an arrangement of plates and rods, threaded or not, as shown in 35 which prevents the parts from separating.

The elements 1', 1'', 1''', can be made of moulded molten basalt which shows the considerable advantage of resisting chemical products such as moist chlorine and salt water whereby very pure products are obtained.

The number of intermediary parts 1''' can be increased in view of providing an apparatus having a predetermined length. If desired, the cathodic compartment can be formed with a number of parts equal or not to that of the anodic parts.

What I claim is:

1. An electrolyzing apparatus comprising a stationary anodic bell, posts on which the said bell is fixed and forming a lower extension of the bell, anodes inside the bell, a cathodic vat, means for removably securing said vat inside and at the lower part of said bell under the anodes, a cathode over said vat, a diaphragm over the cathode and under the anodes, an electric supply and means for connecting said supply respectively with the anodes and with the cathode.

2. An electrolyzing apparatus comprising an anodic bell, posts on which the said bell is fixed, an internal peripheral flange at the

lower edge of the bell, anodes resting on said flange, a cathodic vat the top edges of which are disposed under said flange, a cathode disposed over the vat under said flange, a diaphragm between the cathode and the said
5 flange, a series of horizontal vertically movable rods disposed under the cathodic vat, vertical rods removably supporting the horizontal rods and secured to the bell, an electric supply and means for connecting said supply
10 respectively with the anodes and with the cathode.

3. An electrolyzing apparatus comprising an anodic bell, of molten basalt constituted
15 by a series of elements cemented and secured together, posts on which the said bell is fixed, anodes inside the bell, a cathodic vat removably disposed inside and at the lower part of said bell under the anodes, a cathode over
20 said vat, a diaphragm over the cathode and under the anodes, an electric supply and means for connecting said supply respectively with the anodes and with the cathode.

4. An electrolyzing apparatus comprising
25 a stationary anodic bell, posts on which the said bell is fixed and forming a lower extension of the bell, a cathodic vat having undulating transversal edges, means for removably securing said vat inside and at the lower
30 part of said bell under the anodes, a cathode fitting over said vat, a diaphragm fitted over the cathode and in the undulations in which the anodes are disposed, an electric supply and means for connecting said supply respectively with the anodes and with the
35 cathode.

In testimony whereof I have affixed my signature.

ANDRÉ PAUL HENRI DUPIRE.