

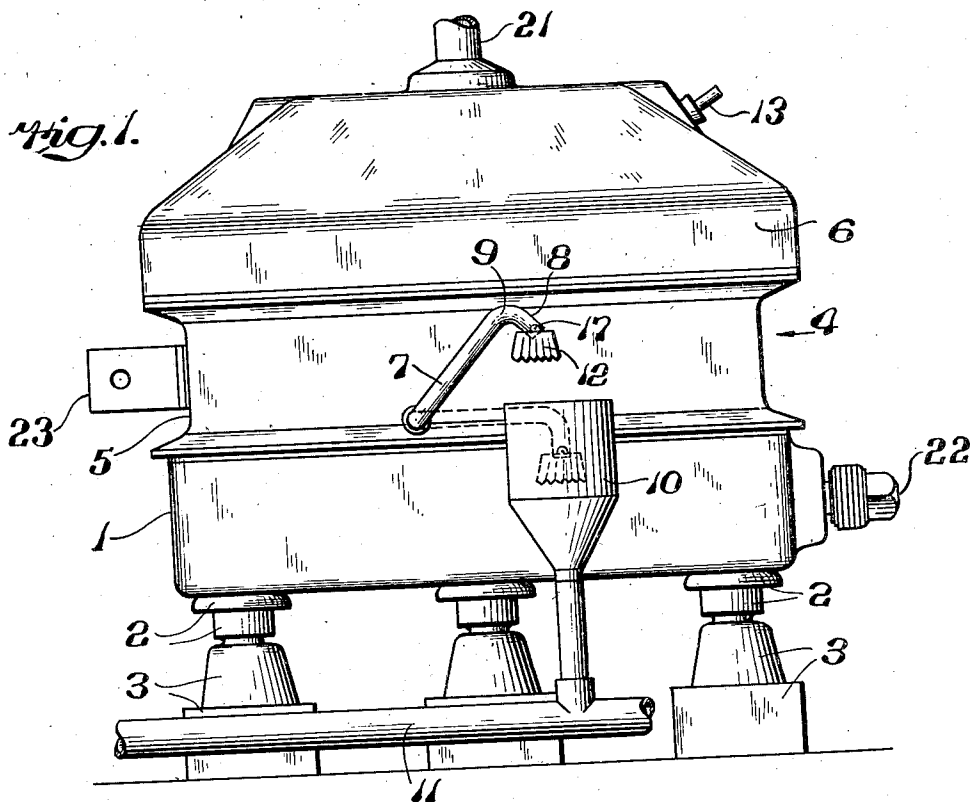
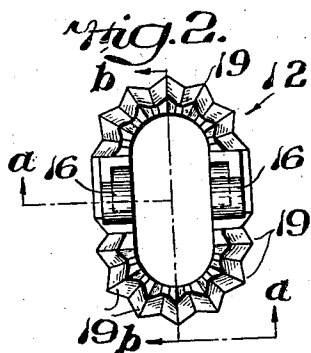
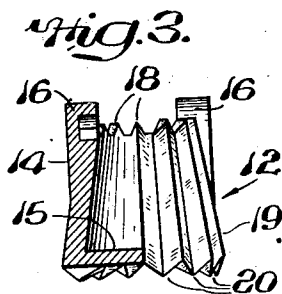
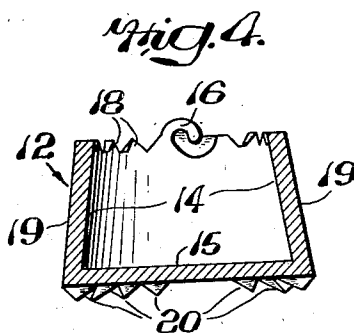
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2,414,741

MEANS FOR BREAKING UP LIQUID STREAMS

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MEANS FOR BREAKING UP LIQUID
STREAMS

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More particularly, my invention relates to means for breaking up into droplets streams of conductive liquids flowing into or out of vessels, such as electrolytic cells, carrying electric current, and hence at a different electrical potential from the ground or similar adjacent vessels. The object of my invention is to prevent grounding of such vessels through such liquid streams, and the consequent loss of electrical energy and injury to the vessel from electrolysis. One particular object of my invention is to prevent the grounding of electrolytic cells, such as caustic alkali-chlorine cells, through the continuous stream of effluent flowing from the steel cathodes of such cells into steel funnels or header pipes into which the effluent is received.

Electrolytic cells for production of caustic soda and chlorine by electrolysis of sodium chloride are now made in units designed to carry electric currents of 5,000 to 10,000 amperes. The effluent from a 10,000 ampere cell may amount to two liters of liquid per minute. These cells are connected in series in circuits which may consist of 200 cells. There may therefore be a difference of potential between the end cells of such circuits amounting to 700 volts, and if one end of the circuit should happen to be grounded, there may be a potential of 700 volts from the other end of the circuit to ground. In order to break up the effluent streams and prevent grounding of such cells, it has been customary to allow the stream to flow by gravity in free fall a distance of one to two feet from the effluent pipe through which the stream issues from the cell into the funnel in which the stream is caught. This is generally effective in breaking up the stream into droplets. However, instantaneous grounding of the cell may occur at infrequent intervals, and the funnel into which the stream is received is subject to slow disintegration from electrolysis. The funnels are sometimes made of non-conducting material. Said funnels are free from electrolysis, but the electrolysis is merely transferred through the stream flowing over the surfaces, to the steel header, where the destructive effect is even more serious. Moreover at certain times in the operation of such cells it becomes necessary to lower the effluent pipe and empty the cathode completely into the funnel. At such times the distance through which the stream falls is reduced to a few inches and the grounding much aggravated.

I have now succeeded in greatly reducing, if not entirely eliminating, the grounding of these

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cells, by means of a device which I shall describe by reference to the drawing, in which:

Fig. 1 is an elevational view of a caustic soda-chlorine cell of the type illustrated in U. S. Patent No. 1,866,065, showing the caustic soda effluent pipe, with my device affixed thereto.

Fig. 2 is a plan view of my device.

Fig. 3 is an elevational view of my device, half in section along line *a—a* of Fig. 2.

Fig. 4 is a sectional elevation along line *b—b* of Fig. 2.

Referring to Fig. 1: 1 is the base member of the cell, housing the anode assembly (not shown), and resting upon non-conducting members 2, which are supported from the floor by pedestals 3. Upon base member 1 is supported the cathode structure 4, preferably of steel, of which 5 is the outer enclosing wall. 6 is a cover, preferably of concrete, resting upon cathode 4 and adapted to receive chlorine generated in the cell and deliver it through pipe 21 to a chlorine resistant header (not shown). Cathode 4 is divided by an interior structure and diaphragm (not shown), into anode and cathode compartments. The anode compartment is filled with electrolyte and the cathode compartment with liquid product of electrolysis. The anodes and cathodes are connected through bus bars 22 and 23 to opposite conductors of a direct current generating system (not shown), and through the electrolyte and liquid product to each other. Means (not shown) are provided for supplying electrolyte to the cell through tube 13 to replace the electrolyte decomposed by electrolysis. From cathode 4 the liquid product of electrolysis, containing caustic soda and undecomposed sodium chloride, is discharged through effluent pipe 7. This pipe is screwed into an opening in the front of wall 5 and bent upward parallel with the face of wall 5 and has its outer end curved downward to form a spout 8. Pipe 7 swings upon the thread by which it is screwed into wall 5 and is of such length and adapted to be set at such an angle that the crest 9 of its curved outer end is normally just below the upper flange of cathode 4. The height of this crest 9 determines the level of the liquid product within cathode 4, which is therefore normally nearly filled with liquid. 10 is a funnel into which the effluent from pipe 7 is received after falling from the spout by gravity and 11 the header pipe by which it is carried away. As stated above, at certain times in the operation of such cells, it becomes necessary to empty the cathode completely, and this is done by swinging pipe 7 about its threaded end into the position

shown by the dotted lines in Fig. 1. In this position spout 8 is brought into much closer proximity to funnel 10. Moreover, during the emptying of the cathode, the flow of liquid from spout 8 is greatly increased, so that grounding of the cell is liable to occur. To prevent grounding of the cell during normal operation, as well as during the emptying of the cathode, I append to spout 8 a device illustrated at 12. This device is illustrated more fully in Figs. 2, 3 and 4.

Referring to these figures, it will be seen that this device consists in a bucket 12, having side walls 14 and bottom 15. Bucket 12 is suspended by hooks 16 from pins 17 which project from spout 8. Hooks 16 and pins 17 form a hinge, from which bucket 12 hangs. Bucket 12 therefore always hangs perpendicularly, regardless of the angle at which effluent pipe 7 may be set. The upper rim of bucket 12 is serrated as at 18, 18. The outer surfaces of walls 14 are ridged as at 19, 19 and the grooves between ridges 19 preferably terminate below in drip points 20, 20. Bucket 12, being of symmetrical form, always hangs so that its rim is horizontal. In operation, the stream of effluent fills bucket 12 and overflows over its rim. The overflowing liquid is divided by serrations 18, which act as weirs, into a plurality of small streams or trickles, (in practice 14), these follow the grooves between ridges 19 and run off from drip points 20. The main stream of effluent is thus positively divided into a plurality of smaller streams, and these latter are each so small that they break up into droplets within a relatively short distance.

In order to prevent the copious main stream of effluent being carried by its momentum over the rim of the bucket at the point opposite the direction of inflow, the walls of the bucket are preferably made upwardly convergent.

It will be noted that since the angle at which pipe 7 is set is variable, if bucket 12 were rigidly fixed to spout 8 it would be liable to be set at an angle with the horizontal, in which case its effectiveness would be much reduced. However, by suspending the bucket pivotally above its center of gravity, this possibility is prevented.

I claim as my invention:

1. In an electrolytic alkali-chlorine cell adapted to contain electrolyte and provided with electrodes adapted to be immersed therein; means for passing electric current through the electrolyte in the cell between the electrodes therein; means for continuously supplying electrolyte thereto; and means for continuously withdrawing liquid product therefrom, including a grounded

conductive header having an open mouth adapted to receive from the cell through a conductive delivery conduit in electrical contact with one electrode thereof, the product flowing by gravity in free fall for a part of its descent into said mouth: the combination therewith of means for preventing passage of electric current to ground through said header which comprises a bucket suspended in the path of the gravity flowing stream and adapted to receive the liquid and deliver it over its upper rim; said bucket having downwardly divergent side walls, a plurality of weirs spaced around the upper rim and a like number of serrations spaced around the lower edge of said side walls and projecting below the bottom of the bucket; and the outer surface of said side walls being provided with grooves extending from said weirs to the tips of said serrations, forming delivery spouts at said tips, adapted to divide the stream from each cell positively into a plurality of trickles breaking up into droplets within a relatively short distance.

2. In an electrolytic alkali-chlorine cell adapted to contain electrolyte and provided with electrodes adapted to be immersed therein; means for passing electric current through the electrolyte in the cell between the electrodes therein; means for continuously supplying electrolyte thereto; and means for continuously withdrawing liquid product therefrom, including a grounded conductive header having an open mouth adapted to receive from the cell through a conductive delivery conduit in electrical contact with one electrode thereof, the product flowing by gravity in free fall for a part of its descent into said mouth: the combination therewith of means for preventing passage of electric current to ground through said header which comprises a bucket suspended in the path of the gravity flowing stream, and adapted to receive the liquid and deliver it over its upper rim; said bucket having downwardly divergent side walls, a plurality of weirs of V-cross-section spaced around the upper rim and a like number of serrations of like cross-section spaced around the lower edge of said side walls and projecting below the bottom of the bucket; and the outer surface of said side walls being provided with grooves of V cross-section extending from said weirs to the tips of said serrations, forming delivery spouts at said tips, adapted to divide the stream from each cell positively into a plurality of trickles breaking up into droplets within a relatively short distance.

DEANE O. HUBBARD.