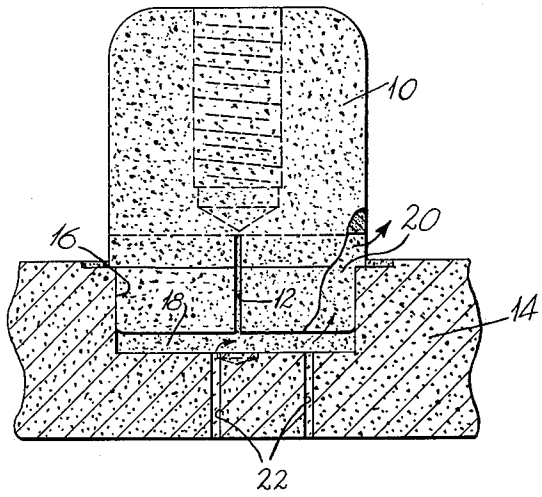
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ROD AND PLATE ELECTRODE ASSEMBLY

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Fig. 1.



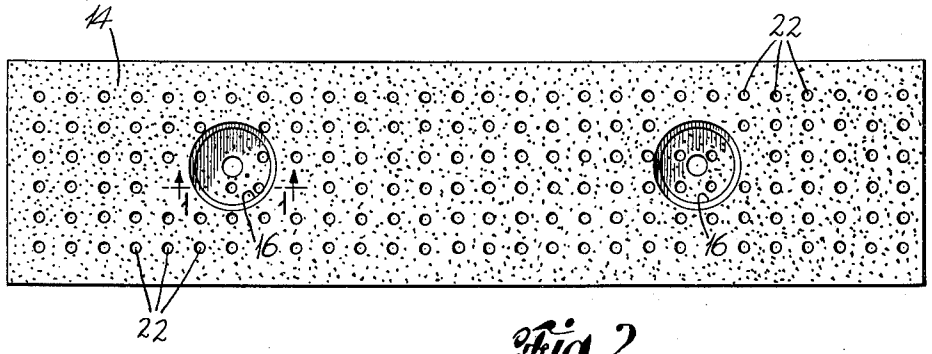


Fig. 2.

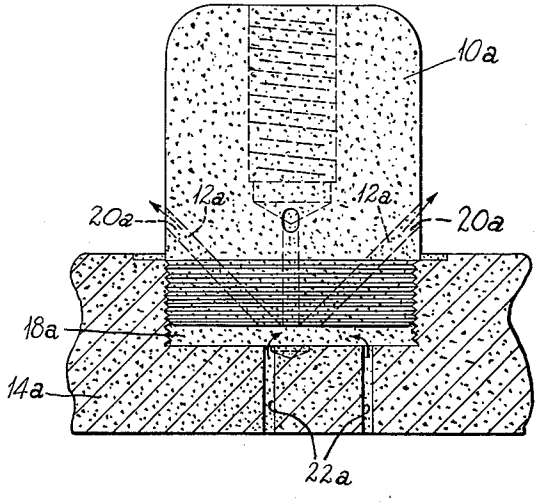


Fig. 3.

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Fig. 4.

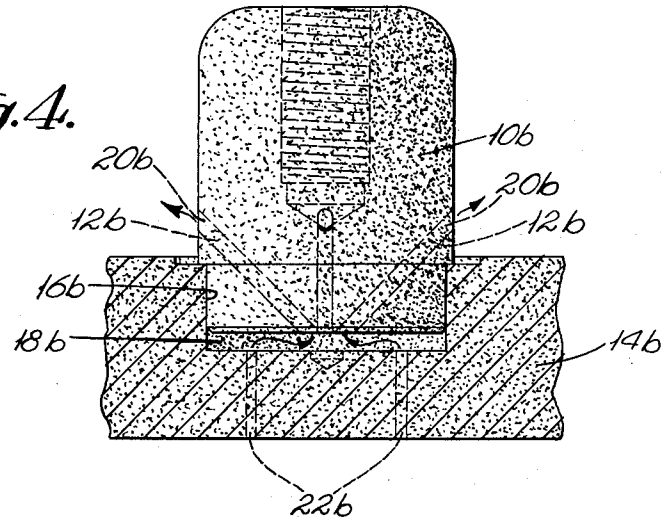
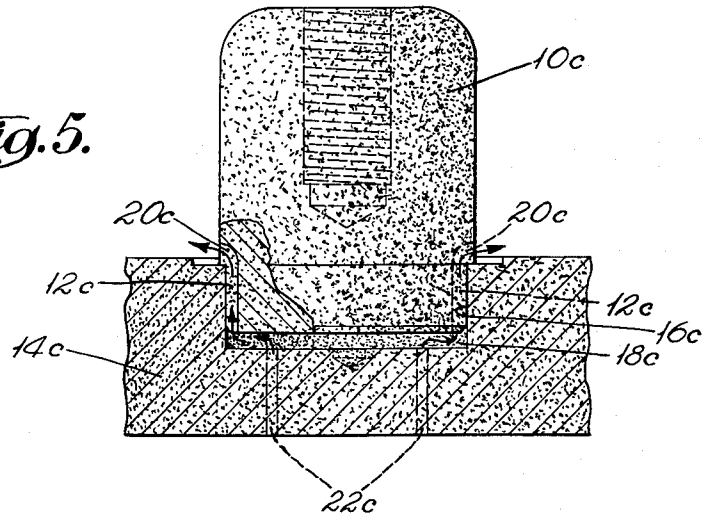


Fig. 5.



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ROD AND PLATE ELECTRODE ASSEMBLY

John P. Oliver, Berea, Ohio, assignor to Union Carbide Corporation, a corporation of New York

Filed Apr. 9, 1958, Ser. No. 727,355

2 Claims. (Cl. 204—288)

This invention relates to electrodes for a flowing-mercury cathode type electrolytic cell such as the De Nora or Mathieson cell, and, more particularly, relates to a riser rod and plate anode assembly for use in such type cells.

In an electrolytic cell of the type using a flowing-mercury cathode such as the De Nora or Mathieson cell, an amorphous carbon or graphite anode plate is positioned horizontally over a flowing-mercury cathode, and electric current is carried to the anode plate through a carbon or graphite riser rod which also holds the plate in place within the cell. Usually more than one anode plate is positioned within the cell, but, in any event, the anode plate or plates extend over nearly the entire area of the cell above the flowing-mercury cathode. Because of this construction, it was found difficult to provide a means for the escape of gases generated within the cell and below the anode plates.

Escape of these gases, usually chlorine and hydrogen gases, rapidly from the anode plate area of the cell is important not only for recovering the gases, but also, because gas accumulation at the anode surfaces reduces the efficiency of the cell. The gases form bubbles in the electrolyte which collect at the bottom of the anode plates, adhere to their surfaces and reduce the surface area of the anode plates accessible to the reaction within the cell.

One means known for providing escape for gases within a cell has been to drill a plurality of vents or holes through the anode plates so that the gases may pass through the plates instead of following the longer path about the edges of the plates. A difficulty with this type of construction has been that anode plate wear during operation in a cell was not uniform. The anode plates wore rapidly about that area of the plates where the holes or vents were placed, but beneath the riser rods where the rods entered the anode plates, no vents were provided and plate wear proceeded much slower. Consequently, the anode plates wore unevenly and "humps" appeared beneath the riser rods. These "humps" were found to be disadvantageous in the operation of a cell since they prevented the lowering of the anode plates to a fixed and uniform distance from the mercury cathode. It was found necessary to grind the anode plates so that a practicable useful life could be obtained. Thus, means for distributing gas venting evenly over the area of an anode plate is extremely desirable.

The principal object of the invention is to provide means for rapid and even distribution of venting gases through rod and plate anode assemblies.

A further object of the invention is to prevent the uneven wear of the anode plates by preventing the formation of "humps" under the anode riser rods.

According to the invention, means are provided by which gas venting through an anode plate at the assembly of the riser rods is accomplished, thereby providing an even distribution of gas egress through an anode plate so

that plate wear will be substantially uniform. Although such means may be accomplished in a number of ways, the most expedient will be found in the following embodiments.

In the drawings:

Fig. 1 is a vertical cross-section of a slotted interference-fit anode rod and plate assembly showing the preferred embodiment of the invention.

Fig. 2 is a plan view of an anode plate used in the practice of the invention.

Fig. 3 is a vertical cross-section of a threaded anode rod and plate assembly showing another embodiment of the invention.

Fig. 4 is a vertical cross-section of a press-fit anode rod and plate assembly showing another embodiment of the invention, and

Fig. 5 is a vertical cross-section of a press-fit anode rod and plate assembly showing still another embodiment of the invention.

In the preferred embodiment shown in Fig. 1, a slotted interference-fit anode rod and plate anode assembly is utilized such as is described and shown in U.S. application, Serial No. 588,510, filed May 31, 1956, by C. E. Ford, now abandoned. In this assembly kerfs are sawed into the bottom of the riser rods forming slots of suitable depth to provide a tight but easily fitted interference joint. Referring now to Fig. 1, the riser rod **10** is provided with slots **12**, generally parallel to its longitudinal axis; preferably two slots dividing the end of the riser rod into quadrants. The riser rod **10** is then inserted into the anode plate **14** within the blind hole **16** in interference fit relation. For best results, it has been found that the riser rod **10** should be fitted into the blind hole **16** only partially, providing a space **18** below the riser rod **10**. The slots **12** are cut suitably in the riser rod **10** to a depth sufficient to extend the slots above the anode plate **14** when assembled providing openings **20** at the side of the riser rod through which gases may escape. Vents or holes **22** deliver the gases from the bottom of the anode plate to the space **18** below the riser rod where the gases escape through the slots **12** and the slot openings **20**.

In the anode plate of the invention as shown in Fig. 2, vents **22** for the escape of gases are distributed uniformly over the whole area of the anode plate **14** including the area below the holes **16** into which the riser rods are fitted.

In another embodiment of the invention shown in Fig. 3, the riser rod **10***a* is threaded into the blind hole in the anode plate **14***a* and passages **12***a* are provided in the riser rod **10***a* for the escape of gases through the assembly. The passages **12***a* are dispersed angularly through the riser rod **10***a* and extended therein from their openings **20***a* above the plate **14***a* downwardly to the space **18***a* below the riser rod. Vents or holes **22***a* are provided in the anode plate **14***a* for delivering the gases through the assembly.

In the embodiment of the invention shown in Fig. 4, the riser rod **10***b* is press-fitted into the blind hole **16***b* in the anode plate **14***b* and passages **12***b* are provided in the riser rod **10***b* for the escape of gases through the assembly. The passages **12***b* are disposed angularly through the rised rod **10***b* and extend therein from their openings **20***b* above the plate **14***b* downwardly to the space **18***b* left beneath the lower end of the riser rod **10***b* when it is press-fitted into the blind hole **16***b*. Vents or holes **22***b* are provided in the anode plate **14***b* for delivering the gases through the assembly.

In the embodiment of the invention shown in Fig. 5, the riser rod **10***c* is press-fitted into the blind hole **16***c* in the anode plate **14***c*, and small grooves **12***c* are pro-

vided in the riser rod 10c for the escape of gases through the assembly. The small grooves 12c are provided in the periphery of the riser rod 10c and extend therein from their openings 20c above the anode plate 14c downwardly into the space 18c left beneath the lower end of the riser rod 10c when it is press-fitted into the blind hole 16c. Vents or holes 22c are provided in the anode plate 14c for delivering the gases through the assembly.

From the foregoing description it is apparent that the gases which form under the anode rod and plate assembly of the invention will be able to rapidly escape from the anode plate area of the cell by passing through the vents or holes which are provided uniformly over the whole area of the anode plate, including the area below the riser rods, and thereby insuring substantially uniform wear over the entire area of the anode plate.

What is claimed is:

1. For use in an electrolytic cell, as assembly which comprises an anode plate and at least one riser rod, said assembly being adapted to be positioned horizontally with respect to a fluid cathode of said electrolytic cell; said anode plate and said riser rods being made of a material chosen from the group consisting of amorphous carbon and graphite; said anode plate having blind holes therein, and said anode riser rods having ends in the unstressed condition of a greater transverse dimension than said holes, said anode riser rods having kerfs provided

in the lower ends thereof and being interference fitted into said blind holes in said anode plate thereby forming a low resistance current-carrying joint; said anode plate being provided with a plurality of evenly distributed venting apertures over its entire area which extend completely through said anode plate and some of which extend into said blind holes beneath said riser rods and thereby permit the escape of gases from beneath said anode plate and from the electrolyte area of said cell; said kerfs in said riser rods forming passages which extend from the lower ends of said riser rods to exit points in said riser rods above said anode plate and thereby permit the escape of gases from beneath said riser rods.

2. The plate and rod assembly as claimed in claim 1, in which said anode riser rods are interference fitted in said blind holes in said anode plate to such a depth as to leave a space between the lower ends of said riser rods and said anode plate.

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