

July 19, 1938.

S. J. RALPH

2,124,261

MANUFACTURE OF ELECTRODES

Filed Feb. 6, 1936

Fig. 1.

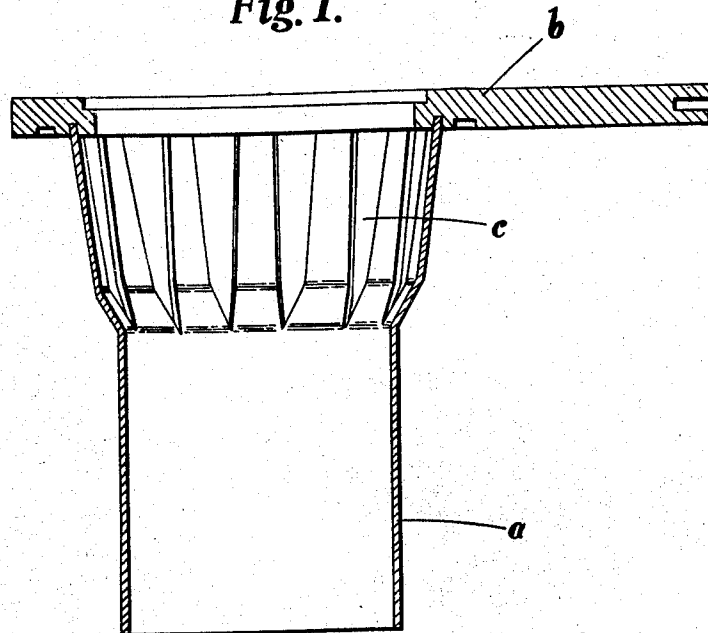
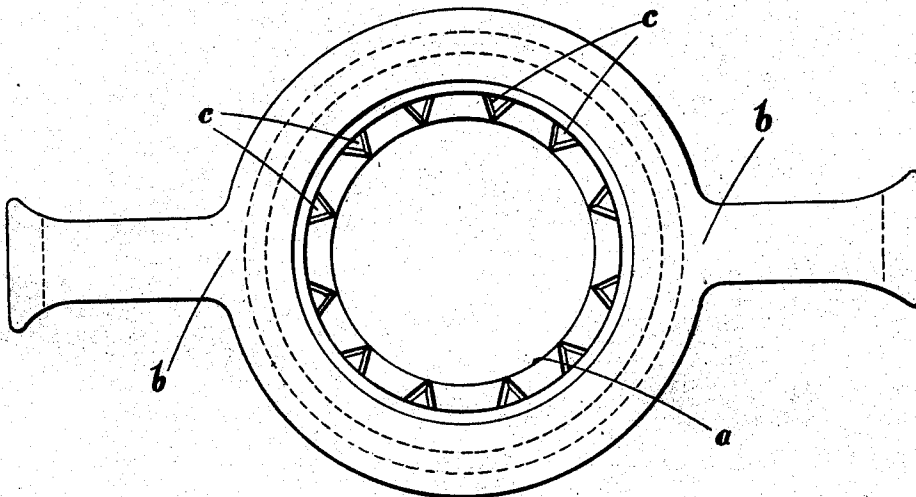


Fig. 2.



INVENTOR
Sydney Jamieson Ralph

BY
Emil Bönnelycke
ATTORNEY

UNITED STATES PATENT OFFICE

2,124,261

MANUFACTURE OF ELECTRODES

Sydney Jamieson Ralph, Point Pleasant, Wandsworth, London, England, assignor to The Aluminum Plant and Vessel Company Limited, Point Pleasant, Wandsworth, London, England

Application February 6, 1936, Serial No. 62,711
In Great Britain February 6, 1935

1 Claim. (Cl. 204—5)

This invention relates to the manufacture of electrodes and has particular reference to the manufacture of electrodes which are composed of relatively expensive or valuable metals, for instance, nickel, and which are required to carry heavy electric currents.

Such electrodes are used in connection with the electrolysis of liquids, as, for example, in the production of metallic sodium from caustic soda and they are usually formed by casting. Such castings are relatively expensive to machine all over, the machining not only adding to the costs but being generally necessary for the purpose of obtaining an even thickness and for ensuring that the surface of the electrode shall be parallel with its neighbouring electrode. Furthermore, it has been found difficult to ensure that such castings are free from blow holes, porous places and oxide inclusions and experience has shown that such castings often break down prematurely in use owing to such defects. In this connection it must be borne in mind that such porous places or blow holes left in the machined casting give rise to process troubles due to the reduced effective current-carrying capacity of the particular part of the section at which they occur and thus the effective current density from one electrode to another is less than in such places where the metal is free from such defects.

The chief object of the present invention is to provide an improved and simplified method of forming such electrodes and an improved form of electrode which is less expensive and which at the same time possesses the conductivity and other attributes necessary for enabling the same to be used for electrolysis and similar purposes.

According to the invention the improved form of electrode is composed of two parts, to wit, a hollow cylindrical body portion composed of a relatively expensive metal, such as, nickel, and a surmounting ring-like element united as, for example, by fusion, welding or the like with the upper end of the body portion and composed of a less expensive good electrically conducting metal, such as copper, the cylindrical body portion being preferably formed of sheet metal having suitable liquid circulating openings formed therein.

In carrying the invention into effect according to one convenient mode, the hollow cylinder of sheet metal is formed at its upper end with a series of circumferentially spaced slits, slots or openings and the slitted, slotted or apertured end is flared outwardly in such a manner that the effective current-carrying cross-sectional area of the electrode is substantially constant through-

out its length, thereby ensuring that the current density shall remain substantially constant notwithstanding the fact that liquid circulating openings are thus provided. In order to provide a good electrical connection between the two elements of the electrode, the ring-like element or elements of copper or other relatively inexpensive metal is preferably cast, welded or silver-soldered in position on the upper end of the flared part of the body portion of the electrode. In this connection it has been found that owing to the searching or penetrating nature of certain electrolytes, e. g. hot caustic soda, and distortions arising in the use of the electrode, mechanical means, such as riveting or bolting, of the two parts of the electrode are unsuitable as it has been found that the electrical contact becomes progressively worse under operating conditions owing to the gradual seepage of the electrolyte between such mechanically united surfaces, particularly in instances where spray is carried above the surface of the electrolyte.

In order that the said invention may be clearly understood and readily carried into effect, the same will now be more fully described with reference to the accompanying drawing, in which:—

Figs. 1 and 2 show respectively in vertical sectional elevation and in plan an electrode produced in accordance with the present invention.

The electrode shown in the accompanying drawing is made up of a hollow cylindrical body portion *a* composed of the relatively expensive metal such as nickel and a surmounting ring-like element *b* composed of the less expensive electrically conducting metal such as copper. At its upper end the body portion is provided with a series of circumferentially spaced slits, slots or openings *c* to permit the liquid under treatment to pass therethrough and is flared outwardly in the manner shown, the effective current carrying cross sectional area of the electrode remaining substantially constant throughout its length. The hollow cylindrical body portion may be cut from a metal tube but, for economical reasons, it is preferably formed from a flat sheet of metal which is rolled or curved so that its opposite edges are brought together and suitably joined as, for example, by welding, the welding extending only to the lower end of that portion of the body which is subsequently flared. By providing the upper part of the cylinder or flat sheet with a series of slits or slots, the subsequent flaring of the upper end of the cylinder results in the formation of the desired liquid cir-

culating openings, without loss of cross sectional conducting area.

5 The surmounting ring-like element of copper or the like is cast, welded or silver-soldered in position on the upper end of the flared part of the body portion of the electrode or on the
10 tongues between which the aforesaid openings are formed. If desired, the area of contact and the anchorage between the two elements may be increased or improved by providing the tongues
15 with a series of pins or other protuberances which are embedded in the ring-like element or elements.

From the foregoing it will be appreciated that
15 the two-part, two-metal electrode produced in accordance with the present invention possesses many advantages over the one-piece cast nickel electrodes used hitherto. In the first place, it is
20 free from the drawbacks inherent with any form of casting when used for electrolytic and like purposes and, secondly, the costs can be materially reduced since not only does the invention enable
25 sheet metal to be utilized for the formation of the electrode, thus saving machining and scrap, but, owing to the use of a copper or like surmounting ring, the mass of the more expensive material, for instance, nickel, used is considerably

less. Moreover, from the point of view of mounting or assembly, difficulties involved in connecting up the electrodes with a source of electric supply are largely overcome as it is a relatively
5 simple matter to form a good electrical connection with the copper ring as compared with that of obtaining a good electrical connection with the upper part of a nickel electrode. Other advantages will be apparent to those skilled in the art.

Having thus described this invention what I
10 claim as new therein and desire to secure by Letters Patent is:—

A bi-metallic electrode for use in the electrolysis of caustic alkalis, consisting of a liquid immersion part in the form of a hollow cylindrical
15 body portion composed of nickel and a surmounting ring-like part composed of copper, the upper end of the nickel body portion being flared outwardly and of constant cross-sectional area and current carrying capacity, said upper end being
20 formed with a series of liquid circulation openings constituted by circumferentially spaced slits which, by the flaring, have the form of slots, and the ring-like part of copper being united by fusion
25 with the upper end of the outwardly flared part of nickel.

SYDNEY JAMIESON RALPH.