Dec. 15, 1931. M. O. SEM 1,836,880

ELECTRODE

Filed Jan. 16, 1928

Fig. 1.

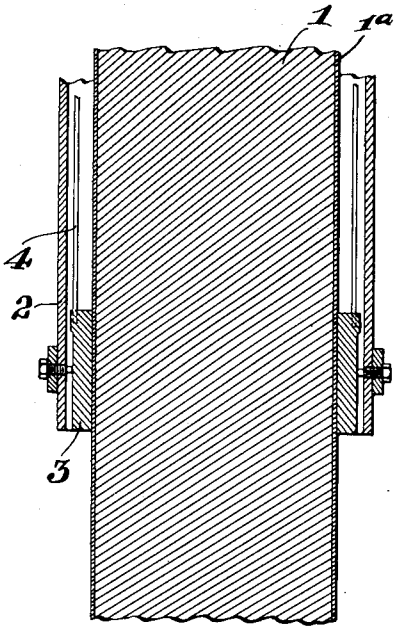
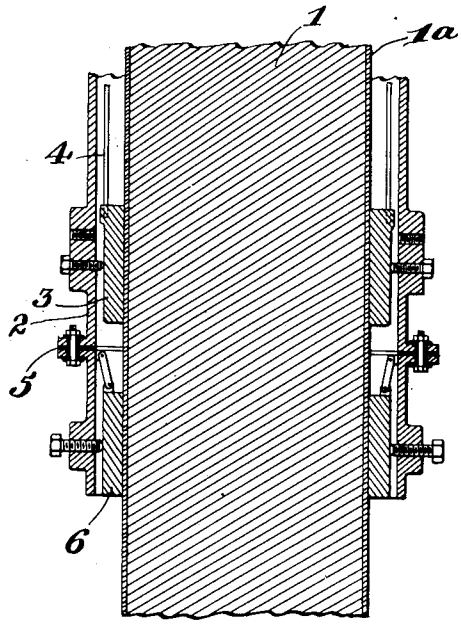


Fig. 2.



Inventor

Mathias Orram Sem

By *Hosey & Cole*

Attorney

Patented Dec. 15, 1931

1,836,880

UNITED STATES PATENT OFFICE

MATHIAS OVROM SEM, OF BUFFALO, NEW YORK, ASSIGNOR TO DET NORSKE AKTIESELSKAB FOR ELEKTROKEMISK INDUSTRI OF NORWAY, OF OSLO, NORWAY

ELECTRODE

Application filed January 16, 1928, Serial No. 247,241, and in Norway January 15, 1927.

This invention relates to electrodes which are baked while in use in the electric furnace. Such electrodes are generally provided with a metallic casing, which acts as a mould for the electrode and at the same time transmits the current to the baked part of the electrode. In certain cases such a metallic casing has various drawbacks which require special precautions. The object of the present invention is a casing which eliminates such drawbacks. In the standard electrodes the mantle will melt together with the electrode and will enter the furnace product whereby this is contaminated. Generally the contamination is so small that it need not be considered at all. In some cases, however, for instance in the electrolytic production of aluminum special precautions must be taken to prevent contamination of the product. This may be avoided by employing a mantle consisting of aluminum. If the contacts are clamped to the external sides of the electrode as is common practice with self-baking electrodes I have however found that such a mantle cannot be employed as there will be a voltage drop of 0.3–0.5 volt between contact and aluminum mantle. As the total furnace voltage is only 6 volts the said voltage drop is a serious drawback which must be eliminated if first class results are wanted from the electrode. Also in the use of mantles of other material there will be a certain voltage drop and I have therefore found that in such cases it is often advantageous to do entirely without the metallic mantle. U.S.A. Patent No. 1,442,031 describes a modification of self-baking electrodes in which the metallic mantle may be avoided. When employing the procedure described in this patent certain difficulties are found which are more or less prevalent in the different types of electrode mass used and according to the various other conditions under which the electrode works. As shown in the patent it is necessary to give the electrode an armature which moulds the electrode and keeps it together until it is sufficiently baked to do without support. This armature often has the shape of a casing into the upper end of which the electrode mass is filled and whose lower end is connected with a combined electrode holder and contact arrangement. The baking must then be effected in such a manner that the holder will be situated on a baked part of the electrode.

When using electrodes of the type above described it is found that the paste has a tendency to stick to the surrounding casing and to the contact. This is especially noticeable if the electric current after the lowering of the electrode in the holder must pass through a layer of electrode paste which is not baked. This layer will then very rapidly become baked while its organic binders (generally tar and pitch) are coked and the paste will thus stick so tightly to the contacts that the electrode can only with difficulty be lowered when this again becomes necessary to compensate for the electrode consumption in the furnace. Also in the upper part of the guiding casing it is found that the paste easily sticks and its upper part will more or less remain in the guiding casing without following the electrode down into the furnace. This latter phenomenon may however be avoided by placing metallic rods, wire or netting of suitable composition in the electrode paste whereby the upper part of the paste is better connected with the lower part. The method of working will however not be quite satisfactory unless the present invention is used and the electrode mass is surrounded by a coating—preferably a non-metallic coating—which may suitably consist of organic substances or the like which prevent the sticking. This coating may be employed in the form of a casing consisting for instance of wood, veneer, cellulose card board or the like which envelopes the electrode. The said materials may be employed alone or impregnated with substances which prevent saturation with tar as for instance water glass or glue. The non-metallic casing must be of such strength that the paste is held together without the use of a special external guiding mantle. In many cases it is however advantageous to employ a guiding mantle which may be metallic or non-metallic. A composition of graphite and oil or cardboard impregnated with said mixture may then also

be employed. This composition may also be applied on the guiding mantle before the electrode mass is filled in. The composition will then form a layer of graphite around the electrode whereby the lowering of the electrode is greatly facilitated.

A non-metallic casing may at the same time act as a heat insulator for the electrode and must then of course be made with due regard to this fact.

If in the manufacture of such a non-metallic casing inorganic compounds are employed which increase the resistance between the electrode contact and the baked electrode it may be advantageous to make the electrode holder in such a way that it will automatically remove the non-metallic coating surrounding the electrode when the electrode is lowered through the holder. This may be done for instance as taught in Patent 1,657,948 to Westly.

I have made thorough investigations with this method and have found that the sticking as already mentioned above is especially prevalent if the current is supplied to the electrode in such a manner that the current will pass through a paste not yet quite baked.

It is therefore of great importance to take care that the baking of the electrode proceeds sufficiently high up in the electrode. This may be effected by employing artifical baking of the electrode above the holder. It is however not necessary to resort to this complication if electrode holder and contact are made in such a way that the cooling of the electrode becomes negligible. It is then suitable to employ a contact which is allowed to run hot, allowing the electrode mass to become baked all the way out towards the contact. It is preferable to let the contact become red-hot and it should therefore be made of a temperature-resistant metal, for instance nickel-chromium or the like.

An electrode as mentioned above has the drawback that it will become red-hot under the holder and the action of the air will then easily cause consumption of the electrode. Such consumption may however be avoided in the modification shown in Fig. 1, where the electrode is surrounded by a mantle entirely enveloping the electrode and only being open downwardly. In this way oxidizing air may be prevented from reaching the electrode between the clamps. 1 is a selfbaking electrode having a casing 1*a* of organic substance, 2 is the enveloping mantle, 3 is a contact clamp, 4 is current supply.

This modification also has an advantage in that the electrode will only draw very small amounts of heat away from the electric furnace for which reason the effectivity of the electrode in the smelting furnace is very good.

An electrode made in this way may only be lowered comparatively short distances at a time as otherwise unbaked mass will enter the contact thus causing the above mentioned drawbacks and also increasing the chances of breakage of the electrode.

Fig. 2 shows a modification where operation of the electrode will not be limited in this way and where it will be possible to regulate the baking of the electrode above the holder. 1 is a selfbaking electrode which is illustrated as having a casing 1*a* of organic material, 2 is the mantle, 3 is a contact clamp, 4 is current supply, 5 is insulation, 6 is a holder clamp. As will appear from the drawings contacts are used which are placed above the electrode holder and which if desired may be so made that they can be moved independently of the said holder. The electrode baking may then be regulated by regulating the distance between contact and holder and difficulties due to adhesion between unbaked mass and contacts need not be feared, especially if the contacts are so made that they may be moved independently of the holder.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. Electrode which is baked while in use in the electric furnace comprising raw electrode mass, a non-metallic casing for said mass and a mantle surrounding said casing, said mantle having contact members and gripping members, the contact members being placed above the gripping members and electrically insulated therefrom.

2. An electrode which is baked while in use in an electric furnace comprising raw electrode mass, a mantle surrounding the electrode, contact members for the electrode, and gripping members therefor, the gripping members being electrically insulated from the contact members.

3. An electrode which is baked during its use in the electric furnace, comprising raw electrode mass, and a casing of organic substance enveloping said electrode mass adapted to hold the material of the mass together and prevent sticking of the electrode to a holder in connection with which it may be used.

4. An electrode which is baked in a furnace in which it is used, comprising raw electrode mass, a casingfi of organic substance in which said mass is contained, and an outer metallic casing surrounding the first said casing and separated by the latter from the electrode mass.

5. An electrode which is baked while in use in the electric furnace comprising raw electrode mass, a casing made up of organic material in which said mass is supported and contained, an outer metallic casing surrounding the first said casing, and a clamping arrangement carried by the said outer metallic casing.

6. An electrode which is baked while in use

in an electric furnace comprising a casing of organic material having electrode mass contained therein, said casing being impregnated with a substance for preventing saturation of the casing by the binder of the electrode mass, and a metallic casing surrounding the first said casing.

MATHIAS OVROM SEM.