

UNITED STATES PATENT OFFICE.

FRIEDRICH MARX, OF BERLIN, GERMANY.

PROCESS OF MANUFACTURING METALLIC ELECTRODES FOR BATTERIES.

SPECIFICATION forming part of Letters Patent No. 425,335, dated April 8, 1890.

Application filed December 30, 1889. Serial No. 335,422. (No model.)

To all whom it may concern:

Be it known that I, FRIEDRICH MARX, a subject of the King of Prussia, German Emperor, and a resident of Berlin, No. 91 Grossbeeren Strasse, in the Kingdom of Prussia, German Empire, have invented a certain new and useful Process of Manufacturing Metallic Electrodes, of which the following is an exact description, and for which I have applied for Letters Patent in Germany on the 21st of November, 1889.

The method of manufacturing metallic electrodes in use up till now consisted in working into the required form the metal obtained by a smelting process and then placing the same into the battery.

I have observed that the working effect of metallic electrodes may be considerably increased by avoiding the smelting process in their manufacture, and, instead, depositing the metal by electrolysis or precipitation by other metals in a loose state. I base my process on the fact that the metals gained in the smelting process, on account of their mechanical compactness and dense molecular combination, are capable of resisting chemical actions to a considerable extent, and consequently the electrolyte can only operate slowly on the same. If, on the other hand, the metal for the electrode be obtained by precipitation with other metals or electrolysis, a loose mass, almost of a spongy nature, is gained, which is easily attacked by chemical reagents. If, now, the metal gained by electrolysis or precipitation with other metals be used as electrodes for galvanic batteries, the current generated by the battery will be much stronger than those batteries in which the metal employed has been obtained by the smelting process, for the reason that the electrolyte can combine more thoroughly with the electrodes, and thus the chemical reaction will take place more vigorously.

Of course the decomposition of a certain amount of metal will only produce the corresponding amount of electricity, so that the sum of the amount of electricity generated remains the same in both cases, whether the electrodes are made of metal obtained by the smelting or electrolytical process or that of precipitation by other metals. The advantage of the present invention, however, is that

electrodes of metal gained by the latter process, on account of the increased energy of the chemical reaction, will be used up or decomposed in much shorter time, so that the batteries need not to be so large as was formerly necessary, while the strength of the current does not get less.

It need hardly be mentioned that the electrodes must be renewed more often.

For the practical application of my invention I proceed in the following manner: The porous loose mass of metal gained by the electrolytic process or by precipitation with other metals is first carefully washed to clean it of any salts which it may contain and to prevent later oxidation. The metal is then either rolled or hammered to a concrete mass, which may then be coated with plumbago or metallic oxides in order to exclude the oxygen of the air. It is often advantageous to roll into the mass a woven-wire fabric or rough metal plate, which, if necessary, may be used to carry the connection binder.

A further modification which may be advantageously employed in the practice consists in depositing the metal which is to form the electrode directly on a conductor, (metal plate,) to which it is fixed by rolling after having been washed as above described. The mechanical treatment is of importance in so far as by this means the electrode becomes capable of resistance to a certain extent, and then again the oxidizing effect of the air is diminished, because the surface of the metal will be made denser by the mechanical pressure.

In the case of zinc it is advantageous to add quicksilver, which is accomplished by adding a soluble quicksilver salt to the electric bath in the one case or by adding metallic quicksilver to the precipitated metal.

As an example, showing how much stronger electrodes manufactured on this principle work, it may be mentioned that an ordinary battery of iron and carbon in a solution of common salt gave the following result: 0.1 ampère and 0.35 volt, (the iron having been gained by the smelting process,) while a battery of the same size in which the iron was gained by electrolytic process and then worked mechanically gave the result: 0.9 ampère and 0.85 volt.

I am aware that metals gained by the electrolytic process have been worked up for electrodes; but this was always achieved by first melting, then casting and rolling the same into the required form. The gist of the present invention consists in avoiding the smelting process entirely and to use the loose chemically-active metal after having been worked directly as an electrode.

The process above described may be employed for every sort of metal which has up till now been used for electrodes; but practice has proved that the manufacture of zinc, iron, and copper electrodes may be conducted on my principle with particular advantage.

Having thus fully described and ascertained the nature of my said invention, what I desire to secure by Letters Patent of the United States is—

1. The process of manufacturing metallic electrodes for galvanic batteries by purifying from the presence of salts the metallic deposit obtained by the electrolytic process or by pre-

cipitation with other metals and then working mechanically the mass so purified into the required form, substantially as specified.

2. The process of manufacturing metallic electrodes for galvanic batteries by purifying from the presence of salts the metallic deposit obtained by the electrolytic process or by precipitation with other metals and then rolling into the mass so purified a wire woven fabric or metal plate; in the manner substantially as described.

3. The process of manufacturing metallic electrodes for galvanic batteries by electrolytically precipitating or with other metals precipitating the metal on a conducting-plate, then washing the same and fixing it on the plate by rolling, in the manner described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

FRIEDRICH MARX.

Witnesses:

EUSTACE HOPKINS,
PAUL AULICH.