

UNITED STATES PATENT OFFICE.

VICTOR FRANCKEN, OF LIEGE, AND EDOUARD BENDER, OF BRUSSELS, BELGIUM, ASSIGNORS TO THE LECLANCHÉ BATTERY COMPANY, OF NEW YORK, N. Y.

GALVANIC BATTERY.

SPECIFICATION forming part of Letters Patent No. 364,639, dated June 14, 1887.

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To all whom it may concern:

Be it known that we, VICTOR FRANCKEN, of Liege, and EDOUARD BENDER, of Brussels, Belgium, have invented a new and useful Improvement in Galvanic Batteries, of which the following is a full, true, and complete description.

Our invention relates to a new and useful improvement in electro-negative or carbon electrodes of galvanic batteries.

We have discovered a process of forming these electrodes, which results in the production of a product more generally useful than the electrodes heretofore employed. These electrodes are especially applicable for use in the class of batteries commonly known as "Leclanché Batteries," in which a strongly electro-negative element is mingled with the carbon, making what is ordinarily called a "depolarizing conglomerate." We have discovered a method of making these electrodes whereby they are not so readily destroyed as the electrodes ordinarily used, and at the same time have great conductivity.

The compound which we prefer to use consists of the following elements: Peroxide of manganese, 40 per cent.; graphite 44 per cent.; tar, or equivalent material, 9 per cent.; sulphur, 0.6 per cent.; water 6.4 per cent. These substances are reduced to a fine powder and thoroughly mingled by hand or by mechanism, and during this mixture the water is gradually added. This damp mixture is then put into molds, preferably metallic, so constructed as to give the desired form, and, without heating, are thus molded. The press may be a single or a double one—that is, have one or two compressing-pistons, as desired. These bodies may likewise be formed by forcing them by pressure through an aperture and cutting them off in suitable lengths, as is done in the formation of electric-light carbons. The conglomerate bodies so prepared are sufficiently solid to be handled without difficulty. They are allowed to dry spontaneously, and are then put into a furnace or oven, where the temperature is gradually raised to about 350° centigrade. This temperature is insufficient to

decompose the depolarizing bodies, since peroxide of manganese only decomposes at a red heat, say from 600° to 700° centigrade; but this heat is sufficient to drive off the volatile parts of the mixture and to transform the remaining conglomerate into the new product thus produced. During this gradual heating, which generally occupies about two hours, what is left of the water evaporates. Then the most volatile of the oils contained in the tar, and, finally, the sulphur acting on what remains of the tar in the same way as it acts on other hydrocarbons, changes the tar by substitution partly into volatile products, which are driven off and are rendered manifest by the odor of sulphide of carbon and other sulphureted products which are driven off during the heating. The rest of the conglomerate is transformed by the action of the sulphur and the heat into a solid unattackable body. The action of the sulphur on the tar is very similar to its action in the vulcanization of india-rubber.

We do not limit ourselves to the proportions herein given, which may be somewhat varied. We may replace the tar by pitch, rosin, or other suitable cementing hydrocarbon. We may substitute for the peroxide of manganese bioxide of lead, oxide of copper, or other depolarizing bodies, or mixtures of two or more of such bodies.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The process herein described, which consists in mingling together peroxide of manganese, graphite, sulphur, and hydrocarbonaceous cement and water, and in subsequently heating the conglomerate at a temperature sufficient to drive off the volatile oils, but too low to decompose the peroxide of manganese, substantially as described.

2. The process herein described, which consists in mingling together peroxide of manganese, graphite, sulphur, and hydrocarbonaceous cement and water, in spontaneously drying the compound, and in subsequently heating the conglomerate at a temperature sufficient to drive off the volatile oils, but too

low to decompose the peroxide of manganese, substantially as described.

3. As a new product, an electro-negative electrode for batteries, which consists of a depolarizing agent, sulphur and carbon cemented together by a body containing carbon, substantially as described.

4. As a new product, an electro-negative electrode for batteries, which consists of peroxide of manganese, sulphur and carbon ce-

mented together by a body containing carbon, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

VICTOR FRANCKEN.
EDOUARD BENDER.

Witnesses:

P. C. BEHILTE,
J. W. BUESON.