UNITED STATES PATENT OFFICE.

WILLIAM MILLS, OF ELIZABETH, NEW JERSEY.

BATTERY ELEMENT.

SPECIFICATION forming part of Letters Patent No. 508,897, dated November 14, 1893.

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To all whom it may concern:

Be it known that I, WILLIAM MILLS, a citizen of the United States of America, residing at Elizabeth, county of Union, State of New Jersey, have invented certain new and useful Improvements in Battery Elements, of which the following is a specification.

My invention relates to compositions for use in battery elements as well as to the process of manufacturing them, and the special object of my invention is to provide an element which will take the place of the usual carbon cylinder employed in primary batteries, although the composition of matter, which I employ in their construction, permits of the use of the same in any desired form.

An element made in accordance with my invention is cheaper, easier to compound, stronger, and as porous with as little resistance as a carbon cylinder.

One of the objects of this invention is to use as a body or filler a non-combustible, non-conductive and non-shrinkable substance to take the place of a greater portion of the carbon used to form the ordinary element, which material should preferably be free from iron, (which is present in gas-retort and other carbons as a deleterious element) so as to use as little carbon in the composition of the element as possible, and at the same time to get from the element, or have present therein, an amount of conductivity and porosity, with as little resistance, as is necessary for the purposes of its use.

My invention, therefore, consists in a method and in a product; and by the practice of my invention I obtain an element wherein each small particle of the body or filler is surrounded by a coating of conductive material having strong conductive characteristics equal to that of an element composed entirely of carbon.

I proceed in the practice of my invention as follows: For the body or filler I take stone, rock, or any stone like body capable of resisting high heat, such as the ordinary field-stone or bowlder, preferably free from iron, (or iron bearing stone can be treated in any of the methods known to the art for the purpose of extracting the iron) and this I grind in a mill in any suitable way. If the element is to be coarse in its composition, the stone should be reduced to a granular condition, and for a denser element the stone should be reduced to a pulverulent condition. This granulated or pulverized non-conductive, non-combustible, non-shrinkable mass is next treated so as to bind the granules or powder together by the use of a binding material, which binding material by reason of its subsequent treatment, as hereinafter set forth, is reduced to a carbon and forms the conductive ingredient in the element.

For the purpose of producing the binder I take the ordinary coal pitch of commerce, and melt or heat it until it flows, or until it is in a fluid condition. The granular or pulverulent stone is then mixed with the fluid pitch in a suitable receptacle, such as a pitch pot; and during this step of my process I have found that it is preferable, although not absolutely necessary, to keep the mass of pitch heated and in a fluid condition during the mixing process, as such heating insures a more equal distribution of the pitch over the particles of stone. If the pitch is not in a fluid state during the mixing process, the top of the mass of stone and pitch will become bound by hardening of the pitch before the lower strata has been thoroughly mixed and the particles of stone sufficiently coated.

The mixing of the stone and pitch, and the distribution of the pitch about the stone particles can be had in any desired way, as by a mechanical mixer or by a shovel; and the proper time for this mixing may be determined in the following way: Separate vessels can be used, one for holding the fluid pitch, and the other a steam kettle in which the mixing process is to be conducted as before stated, and the granulated or pulverulent stone can then be placed in the steam kettle and the fluid pitch caused to run from the pitch receptacle into the steam kettle, slowly, the mixing being commenced at once and continued until the pitch has been run out of the pitch receptacle, by which time a thorough mixing and coating of the stone particles will be had. Although I consider this last a very good way to carry out my process I do not limit myself to the same.

The proportion of stone to pitch is regulated by the density it is desired to give the element. For ordinary purposes I prefer to

use about one hundred pounds of stone, or equivalent body to about thirty pounds of pitch in the fluid condition. One property of the stone is that it can be reduced to a finer or more pulverulent condition than the carbon which is ordinarily used for the purpose of making battery elements, and for this reason a smaller amount of pitch can be used with the stone than can be used with the same quantity of carbon either in bulk or in weight to obtain a like degree of density. By reason of the capability of superior reduction of the stone to a pulverulent condition, a greater amount of stone in bulk can be compressed into shape for the element with the same amount of binder than can be had with carbon.

The mixing process causes each particle or granule, or group of particles or granules, to be coated with a covering of pitch, and after this mixing the mass is permitted to cool and harden when it will be found to consist of an aggregation resembling marbles or pebbles, which comprise one or more granules or particles of stone of various sizes coated with pitch. When the mass is hardened, as by cooling in the atmosphere (which is the preferable mode), it is then placed in a grinding mill where the pebbles of coated granules or particles are separated. This re-grinding is not had for the purpose of reducing the stone to a finer condition than it was in before being mixed with the pitch, but is done for the purpose of disintegrating the pebbles, so as to bring the mass back as near as possible to the condition that the stone was in prior to being mixed with the pitch. When re-ground or disintegrated the mass is placed in molds of any desired shape or configuration, which molds are preferably kept hot, as by a steam jacket, which causes the binder to become plastic, but not fluid and when of a sufficient degree of plasticity, pressure is put on the material in the mold which compresses it to the requisite condition of density, during which compression the mass gets a "set," and is then a homogeneous mass of the requisite size and shape. The rest of the process is the old and usual one of baking in an oven or retort, during which the pitch or binder is carbonized.

By the three steps of, first, coating the particles of stone with fluid pitch, next, cooling and separating the individual particles, each of said particles having a conducting carbonaceous coating and then rendering plastic said conducting coating of the particles while conglomerated in a mass, I succeed in producing a new article of manufacture, an element composed of stone granules and carbon, which is equally as porous as a pure carbon element.

I am aware that it is not new broadly to bind together particles of sand with pitch, tar, or other carbonaceous material, but, in the art as hitherto practiced, so far as I am aware, no provision has been made for preserving the porosity found in a pure carbon element, but the particles of stone and the viscid carbonaceous material are commingled in the ordinary manner, the result of which evidently is that the latter fills up the interstices between the former, so that the porosity of a carbon element is lacking in the product so obtained.

The essence of my invention lies in substituting for the particles or granules of carbon in a carbon element, particles of stone with a carbon coating, which particles are so combined in the compound element, that it has the same porous and granular structure as in the pure carbon element. These particles of coated stone may, of course, be put upon the market in their granular condition for use by makers of battery elements.

Moreover this process results in an element in which the particles or granules of stone form a body of non-conductive, non-combustible material, which is also non-shrinkable, which can be successfully used as an adulterant, without being affected by heat or compression, which will not shrink during manipulation, and which is much cheaper than carbon, each particle or granule, or groups of the same, being bound or held together to form a coherent mass by a binder of conductive material, which conductive material covers each particle or granule, or groups of the same, the element then being formed or consisting of an aggregation of particles or granules of non-conductive, non-combustible, non-shrinkable material, held or bound together by a binder of conductive material which coats each particle or group and separates them from each other.

Although the element produced in accordance with my invention may be heavier than the carbon element of the same bulk, yet it possesses greater strength by reason of the possibilities of greater density. It has the appearance of an element made entirely of carbon, and is equal in its conductivity to a carbon element.

I do not limit myself to the use of coal pitch as a binder, as any other material, having the capacity of binding the mass together, and capable of being reduced during the process of manufacture to a conductive condition, will answer the purposes of my invention.

Having described my invention, I claim—

1. The process of making a battery element, which consists in combining granules of stone and a carbonaceous material into a non-porous mass, granulating said mass, and re-conforming the granules into a porous mass, substantially as described.

2. The process of making a battery element, which consists in providing separate individual non-combustible granules or particles with a coating of plastic carbonizable material, assembling said individual granules into a porous body, and expelling the gaseous elements of said carbonizable material, substantially as described.

3. The process of making a battery ele-

ment, which consists in mixing granules of stone or like material with carbonizable material in a heated fluid state, cooling the mixture, granulating it, re-conforming the granules into a porous body in a mold, and expelling the gaseous elements of said carbonizable material, substantially as described.

4. The process of making a battery element, which consists in coating non-combustible granules or particles with a heated plastic carbonaceous material, cooling the mass, granulating it, re-conforming said particles into a porous body, and applying thereto heat sufficient to render said coating plastic and binding, substantially as described.

5. As a new article of manufacture, a battery elment composed of particles of a non-combustible material coated with carbon, the interstices between the particles being free from carbon except such as serves to coat said particles, substantially as described.

6. As a new article of manufacture, a battery element composed of particles of a non-conducting material coated with carbon, the interstices between the particles being free from carbon except such as serves to coat said particles, substantially as described.

Signed at the city of Newark, county of Essex, and State of New Jersey, this 5th day of November, 1892.

WILLIAM MILLS.

Witnesses:
GEO. W. MILLS,
JAMES B. BOYLAN.