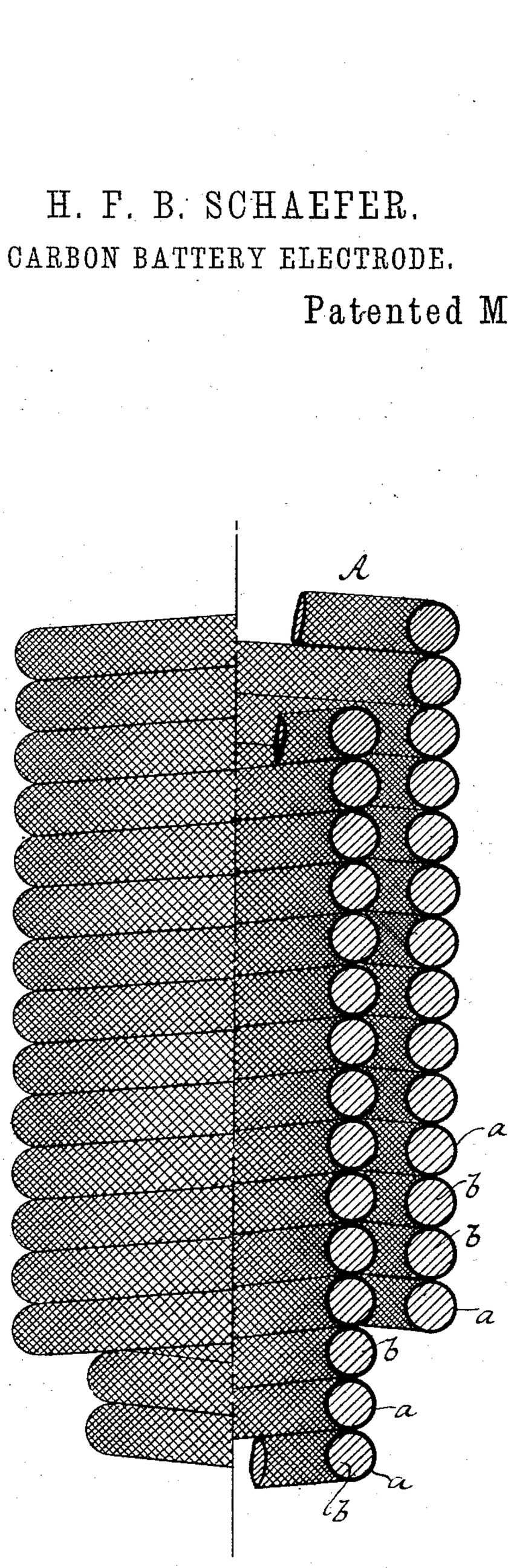
(No Model.)

H. F. B. SCHAEFER.

CARBON BATTERY ELECTRODE.

No. 318,300. Patented May 19, 1885.



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HERMANN FRIEDRICH BONTÉ SCHAEFER, OF BERLIN, GERMANY.

CARBON BATTERY-ELECTRODE.

SPECIFICATION forming part of Letters Patent No. 318,300, dated May 19, 1885.

Application filed November 13, 1884. (No model.)

To all whom it may concern:

Be it known that I, HERMANN FRIEDRICH BONTÉ SCHAEFER, a citizen of Prussia, residing at Berlin, Prussia, Germany, have invented new and useful Improvements in Carbon Battery-Electrodes, of which the following is a specification.

This invention relates to the production and application of carbon conductors for primary and secondary galvanic elements, and offers the advantage that the carbon conductors can be produced in any size.

Carbon conductors of any form, either natural or artificial, have hitherto been made only of a limited size, first, because natural coal, so-called "retort-coal," can be obtained from gas-retorts only of a limited size; and, secondly, artificial carbons can be produced only by hydraulic pressure, and are therefore limited in size by the dimensions of the press-plate of the hydraulic press. This impossibility of procuring large carbon conductors is completely overcome by my process, which enables me to produce carbon conductors of any desired size.

This invention is illustrated in the accompanying drawing, which represents a sectional side view.

In the drawing, the letter A designates my helical element, which is manufactured in the following manner: A tubular envelope, *a*, is woven or otherwise produced by means of well-known construction. This envelope is filled with carbon conductors *b* in a comminuted state, and, if desired, the filling process can go on while the envelope is being formed. As carbon conductors for filling the envelopes *a*, I use comminuted natural coals—such, for example, as hereinafter named—some of which I use by themselves, while I use others mixed in certain proportions with one another: first, pulverized retort-coal; second, pulverized coke; third, pulverized coal from sugar and molasses; fourth, pulverized charcoal; fifth, pulverized graphite; sixth, bone-coal; seventh, soot.

I. The process for producing tubular envelope elements, if the same are subsequently to be subjected to a red heat: In the production of carbon conductors which subsequently, after being formed, are to be subjected to a fire process, I form the tubular envelopes *a*—that is, the outer covering of my carbon conductors—of a refractory and acid-proof substance, preferably of asbestus. The tubular envelope is filled with comminuted carbon, which may consist of retort or sugar coal, or coke or graphite can be used, to which, however, a binding material—such as tar, asphaltum, molasses, or a similar substance—must be added. The tubular envelope, after having been woven to the desired length and diameter and filled, is wound helically around a core forming a coil, or else several lengths of filled tubular envelopes are wound in parallel spirals about the core, so that one, two, three, or more screw-thread-like coils or elements are formed. The form of the core, whether round, oval, &c., is not important. The cores on which the filled tubular envelopes have been wound can be either drawn directly out of the coil formed, or they can be made of a substance which is easily charcoaled, and which can be removed in said state after the fire process. The cores can also be made of glass, clay, or any suitable refractory material, and such cores may eventually remain in the finished helically-wound elements. It is evident that if a sufficiently-long envelope be used an element can be produced which could not be accommodated by the largest furnace in existence; or, in other words, coils can be made of any desired size, by which the internal resistance of the elements to be formed can be considerably diminished.

II. Process for the production of elements contained in tubular envelopes which do not require a subsequent heating: For this class of elements I construct the tubular envelopes not only of asbestus or glass, but also of the ordinary fibers used in the manufacture of textile fabrics, and fill the carbon into the same without previously mixing it with the binding materials mentioned under I, and besides the variety of coals mentioned I use also bone-coal and soot, as the finished element requires the same. The grains or the particles of the carbon conductor filled into the tubular envelopes lie close together, and the coils formed therefrom are porous, and they act similarly to the clay cells in use in batteries. The use of the tubular envelopes filled with carbon as galvanic elements offers no difficulties, as also in this case one or several lengths of the en-

velopes can be wound around a core, as indicated under I, for elements which were subsequently heated.

If the core is to remain in the coil formed around it, it is necessary to observe that the same is indifferent or not attacked by the fluid used in the galvanic battery, of which the coil forms an element; therefore glass, clay, rubber, or similar material must be used, or else the core may be made of a carbon conductor, and then it takes part in the action of the element.

III. Production of primary elements inclosed in tubular envelopes: In the production of these elements on a large scale the process is the same as that described under I and II, with the exception that forty to fifty per cent. of bituminous coal is added to the comminuted carbon before it is filled into the envelopes.

IV. Production of secondary elements inclosed in tubular envelopes: For this class of elements the comminuted carbon conductor is coated, either galvanically or chemically, with a metallic covering, and is then filled into the tubular envelopes, or else the carbon conductor is mixed with a metal salt or oxide and then filled into the envelopes, or both methods can be combined. In all cases when the element is to be used as a secondary element either a woven metal band, a metallic strip, a metallic chain, or one or several metallic wires is introduced with the prepared carbon conductors, or else the tubular envelope can be woven directly of metal wires or threads instead of textile fibers.

By the introduction of the metallic bands, &c., or else by weaving the envelope of wires, the efficiency of the elements is considerably increased, because the contact of metal and carbon conductor becomes a general one. When the element is made as above described, it can be placed opposite an element made of some other material, or two such elements can be placed together.

With reference to the use of my tubular elements, it is best to wind the same about a core of any suitable cross-section, no matter whether the core is passive or active in the liquid of the subsequent secondary pair. The best cross-section, however, is a narrow oval or a circle, but at the same time the cross-section of the core is dependent on circumstances, and can be chosen at pleasure.

Instead of winding the filled tubular envelopes helically about a core, they can also be wound helically in the interior of an outer jacket, and eventually fastened to the same. By this means it is possible to arrange two, four, and more of these tubular elements about a common center, and thus produce secondary elements which are but a few inches high, but are of a considerable diameter. When, however, the area for supporting the elements is small, a long coil is chosen for winding on the tubular element, and large heights with small diameters can be procured.

The low arrangement of coils will be preferably used for railroad-cars, because they can be placed under the floors of the cars, while the secondary elements, made in the form of high columns with small diameters, (up to five inches,) can be used in closed places of a limited area.

What I claim as new, and desire to secure by Letters Patent, is—

1. A galvanic element composed of a tubular envelope which is filled with comminuted carbon and wound in the form of a spiral.

2. A galvanic element composed of a tubular envelope of woven metallic threads or wire filled with comminuted carbon and spirally wound, substantially as described.

3. A galvanic element composed of a tubular envelope formed of the fibers of a refractory substance—such as asbestus—and of a filling of comminuted carbon.

4. A galvanic element composed of a spirally-wound tubular envelope filled with comminuted carbon, and a metallic core extending through the carbon filling, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HERMANN FRIEDRICH BONTÉ SCHAEFER.

Witnesses:

G. HARRISON SMITH,

M. W. MOORE.