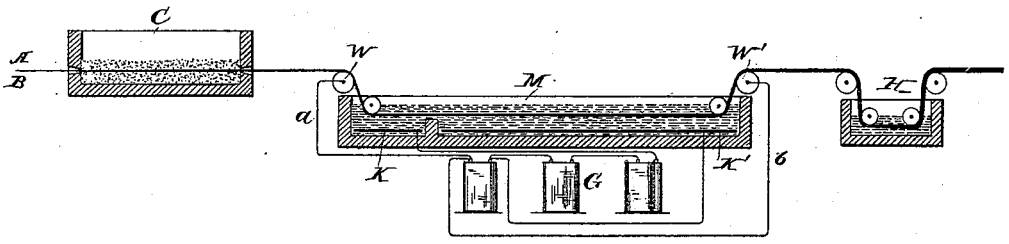
(No Model.)

E. G. ACHESON.

PROCESS OF MANUFACTURING ELECTRIC CONDUCTORS.

No. 343,099. Patented June 1, 1886.



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UNITED STATES PATENT OFFICE.

EDWARD G. ACHESON, OF NEW YORK, N. Y.

PROCESS OF MANUFACTURING ELECTRIC CONDUCTORS.

SPECIFICATION forming part of Letters Patent No. 343,099, dated June 1, 1886.

Application filed January 26, 1886. Serial No. 189,839. (No model.)

To all whom it may concern:

Be it known that I, EDWARD G. ACHESON, a citizen of the United States, and a resident of the city, county, and State of New York, have invented a new and useful Improvement in Processes of Manufacturing Electric Conductors, of which the following is a specification.

My invention relates to the manufacture of electrical conductors; and it has for its object to improve the mode of manufacture in such a way as to produce a cheap and effective conductor, that is flexible and durable, and at the same time will avoid the disturbances due to induction from neighboring wires.

To these ends my invention consists in the method substantially as hereinafter pointed out for manufacturing conductors, and in more particularly describing my invention reference is made to the accompanying drawing, in which is indicated one form of apparatus by which my improvements may be carried out.

The line-wire or conductor A is covered with some insulating material, B, preferably consisting of a fibrous covering saturated with some hydrocarbon having a comparatively high melting-point, as asphaltum. This may be applied in any usual and well-known manner, not necessary to illustrate in the drawing. Over this insulating material I form a metallic covering or shield, preferably of copper deposited by electrolytic action, and in order to do this cheaply and effectively I pass the insulated conductor A B through a box or receptacle, C, containing powdered graphite. This graphite will adhere to the insulating covering; but to insure its uniform distribution rubbers or brushes may be used, as is usual in such instances, to produce a thin uniform coating of the plumbago or lead. The conductor is now in condition to receive the coating of copper, and in doing this I prefer to cover it, first, with a thin metal surface and subsequently build up upon this coating to the desired thickness. The deposition of the first coat requires a current of comparatively high electro-motive force to overcome the resistance due to the graphite; but I have found that the shield is more flexible, durable, and suitable for the purpose designed when the greater part of the deposition of the metal is more slowly performed and by a current of lower electro-motive force and of greater quantity. Various arrangements may be adapted for carrying out this part of the invention, and I have shown one that I have found convenient. The insulated conductor, with its covering of graphite, is passed over a metal wheel, W, into the bath M of electrolytic fluid, and one end, *a*, of the circuit of the electric generator G is connected to the wheel and the other end, *b*, to a plate, K—of copper, for instance—immersed in the bath. This bath may be comparatively short, and I have indicated a current of comparatively high electro-motive force as passing through it by including the three cells of battery in the circuit. From this bath the conductor passes to another similar though larger bath, which in practice may be a practical continuation of the first, and thence through the bath and out over another roller, W', which is connected to one branch of the circuit from the generator, the other being connected to the large plate K'. I have shown three cells of battery connected in series in the circuit of the first bath and a single cell in the circuit of the second bath. The electro motive force of the currents used will depend upon the thickness of the two coats of metal desired, as well as the conditions of the electrolytic fluid and other conditions well known to those skilled in the art.

It will thus be seen that while the operation is practically continuous there are, in fact, two kinds of deposits made upon the conductor, which combined give it great strength and flexibility, and the shield is formed over the insulating material of a uniform thickness.

I have found that by making the baths of proper proportion and using proper strengths of current the conductor may be fed along continuously, and the operation be expeditiously and effectively performed. While any suitable electric generator may be used, I have derived very satisfactory results from an improved dynamo-electric machine having a uniform field of force, which gives an unusually steady current of great quantity and low electro-motive force. I have also found it advantageous to coat the electro-deposited shield with a metallic alloy having a low melting-point, and to do this I simply pass the con-

ductor through a vessel containing the alloy in a fused state, and allow it to adhere to the copper shield, and I have shown such an arrangement at H, and as the conductor is rapidly passed through the alloy it does not receive a heat sufficient to injure the insulating material.

The conductor may be further covered with insulating or protective coverings in any of the well-known ways and to suit the purpose for which it is to be used.

One arrangement I have found useful is as follows: Two separate generators of constant electro-motive force are used, having a relative power of five to one, the former being used to apply the first or interior layer of copper. The bath consists of a saturated solution of sulphate of copper, and the wire is passed through the baths at the rate of about twenty-five feet per hour. The anode and cathode have substantially the same superficies and are about two inches apart, and the temperature of the bath varies from 33° to 70°.

Of course I do not limit my invention to any of the above-specified details, as they may be any or all varied, as will be evident to those skilled in the art.

Various modifications of my invention will suggest themselves to those skilled in the art, which do not depart from the spirit of the invention, and which are not necessary to be specified here.

I am aware that it is not new to use a current of higher electro-motive force at the commencement of the deposition, and then to continue the deposit by a current of lower electro-motive force. My invention differs therefrom in that I continue the use of the current of high electro-motive force to produce a substantial layer of comparatively hard, brittle, and crystalline deposit, and then by reducing the electro-motive force I produce upon said first layer a substantial layer of softer and more flexible deposit, thereby producing a conductor having the necessary flexibility and tenacity, as well as cheapness.

What I claim is—

1. The method of forming electric conductors, which consists in covering insulating conductors with an electrolytically-deposited shield by first depositing a comparatively hard crystalline layer, and then depositing upon the same a comparatively soft and flexible layer, substantially as described.

2. The method of forming electric conductors which consists in covering them with an electrolytically-deposited shield of different layers in one continuous operation by passing the conductors through baths of different size and supplied with currents of different electro-motive forces, substantially as described.

3. The method of forming electric conductors which consists in covering the insulated conductor with a metal shield, electrolytically deposited in layers of different degrees of hardness, and covering the same with a metal alloy by passing the conductor through a molten mass of the alloy, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWARD G. ACHESON.

Witnesses:
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