

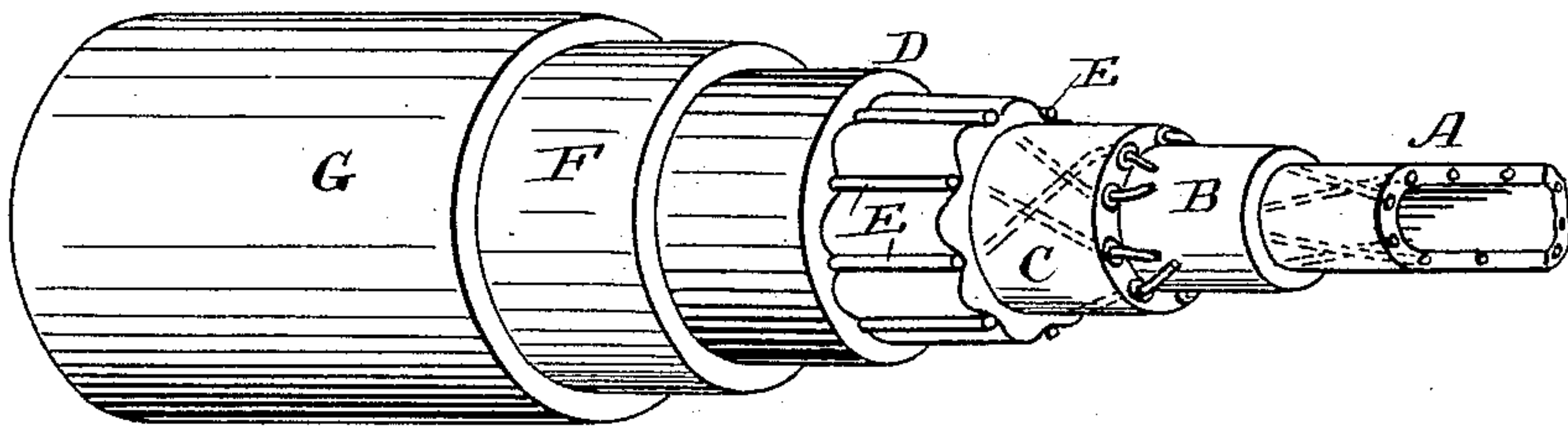
(No Model.)

H. D. ROGERS.  
ELECTRIC CONDUCTOR.

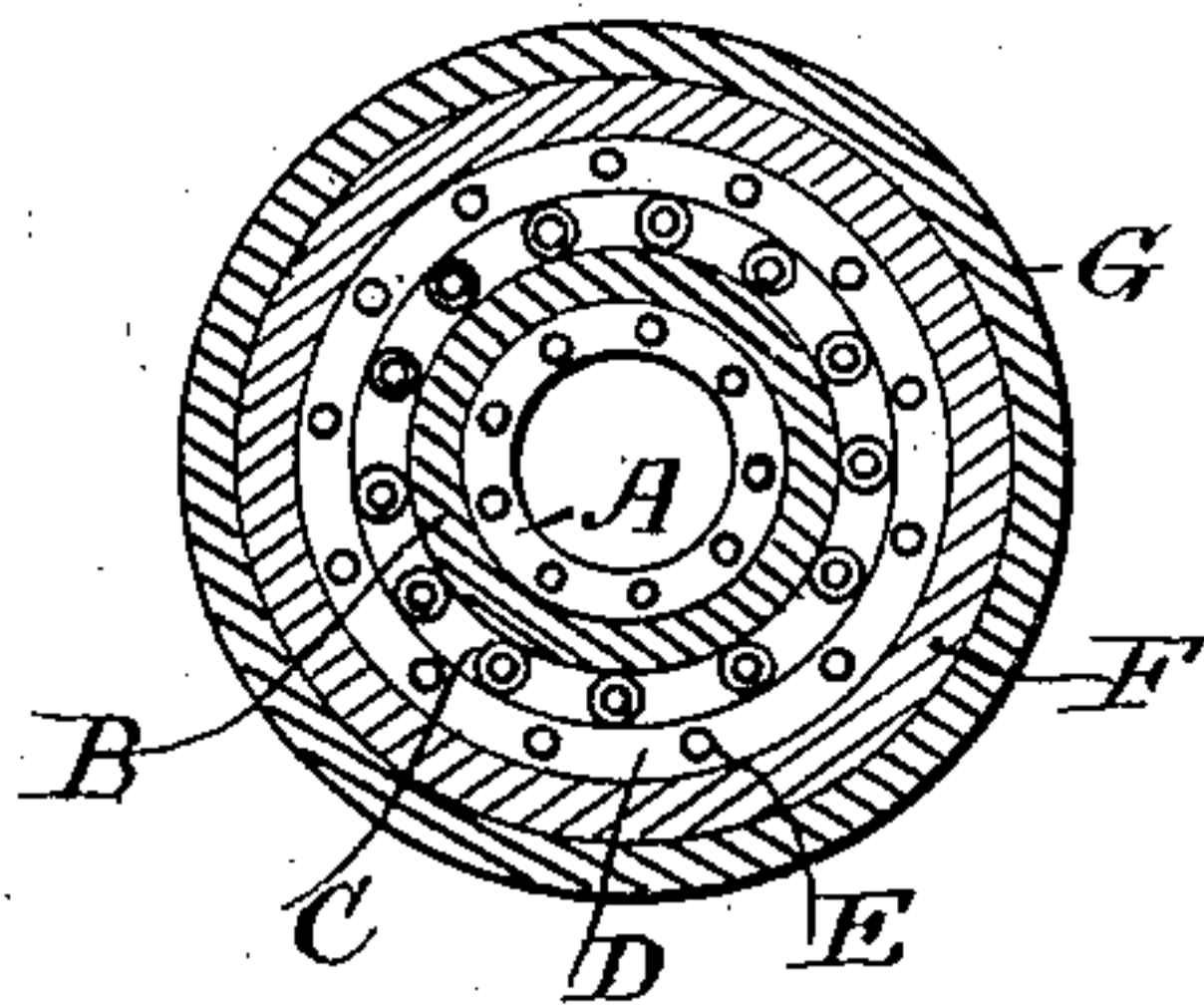
No. 281,223.

Patented July 10, 1883.

*Fig. 1.*



*Fig. 2.*



Witnesses:

E. E. Masson  
Philip H. Bland

Inventor:

Hiram D. Rogers  
by A. Pollok  
his attorney.

# UNITED STATES PATENT OFFICE.

HIRAM D. ROGERS, OF NEW YORK, N. Y.

## ELECTRIC CONDUCTOR.

SPECIFICATION forming part of Letters Patent No. 281,223, dated July 10, 1883.

Application filed June 14, 1882. (No model.)

*To all whom it may concern:*

Be it known that I, HIRAM D. ROGERS, of New York city, in the county and State of New York, have invented a new and useful Improvement in the Manufacture of Electrical Conductors, which improvement is fully set forth in the following specification.

This invention has reference, first, to the formation of a tubular conductor or pipe by braiding or otherwise arranging wires, ribbons, or the like upon a core or mandrel, and then uniting the several strands by electro-deposit; second, to the simultaneous formation by electro-deposition of a number of wires in and upon an insulating envelope or support; third, to the protection of insulated conductors to be sheathed or incased in lead pipe by plating or connecting the insulating material with metal before running them through the lead-pipe press; fourth, to the new products or articles produced by the above improvements; and, lastly, to special combinations of conductors in a cable designed to secure strength with economy of material and space.

In the accompanying drawings is represented a conducting-cable made in accordance with the invention, Figure 1 being a side view with different layers exposed, and Fig. 2 a cross-section.

A is the central hollow conductor or tube; B, a coating of insulating material thereon; C, a second tubular conductor enveloping the insulating-coating B; D, insulating material; E, a series of conductors embedded in said insulating material D; F, a protecting shell or plating of metal, and G an exterior sheath or pipe of lead.

The conductor A is formed by braiding, weaving, twisting, plaiting, winding, or otherwise arranging a series of metal wires, strips, ribbons, or the like on a suitable core or mandrel, and then, having immersed the whole in an electrolytic solution or electroplating-bath, depositing by electricity from the solution upon the conducting-base of braided or twisted wires or the like a coherent mass of metal, which attaches the several wires together and unites them into a single tube. The electro-deposit and the base may both be of copper; or, if desired, they may be of other suitable metal or metals. When the base of braided

wires or the like is able to sustain itself, it is or may be removed from the core or mandrel before placing it in the electroplating-bath. The deposit or electroplating is made of any desired thickness, so that the conductor will be either flexible or rigid, as may be required. The conductor thus formed is coated with insulating material, B, in any ordinary or suitable way. The material used may be cotton or silk soaked in paraffine, rubber, gutta-percha, or other known or suitable insulating material.

The conductor C is formed by braiding, plaiting, weaving, winding, or otherwise suitably arranging insulated wires, strips, or ribbons of copper or other metal around the insulating material B, and then depositing by electrolysis copper or other suitable metal thereon. It is preferred to black-lead the insulating material which serves as a core, or to coat it with metallic paint, so as to favor the deposit of metal in the interstices of the braided wire. The removable core or mandrel for forming the conductor A may in like manner be black-leaded or painted.

The insulating material B may be applied and the wires of the conductor b braided over the applied material in the same machine, simultaneously or successively.

The conductor C is coated with insulating material, in which are left or formed a series of open channels extending in straight lines lengthwise of the cable or spirally around the same or in other suitable direction. These channels are formed by strips, or they are made by a suitable tool in a body of plastic insulating material or in other suitable way. The walls of the channels are black-leaded or coated with metallic paint or otherwise rendered conducting, and, the cable being placed in an electroplating-bath, copper or other metal is deposited in said channels until a series of conductors of the required thickness are obtained. If desired, wires or conducting-strips may be laid in the channels as foundations for the deposit. After the conductors E are formed they are covered with the insulating material D. The said material is then black-leaded or otherwise rendered conducting at the surface, and is covered with a plate or protecting-shell, F, after which the cable is



passed through the hollow core and die of a pipe-press, and the leaden sheath or tube G is pressed thereon, as well understood for enveloping conductors in leaden pipes. The object of the sheath or plating F is to protect the insulating material beneath during the application of the leaden sheath. Heretofore great difficulty has been experienced in coating insulated conductors with lead pipe by means of a pipe-press, because of the melting or shifting of the gutta-percha or other insulating material when subjected to the high temperature (about 400° Fahrenheit) at the die of the press. By the application of the protective shell or plating F, which is made of metal not fusible at that temperature, the insulation is preserved from injury. The central conductor, A, being hollow, may receive one or more small insulated conductors, or may be used for conveying liquids or gases.

Modifications may be made in the details of construction without departing from the spirit of the invention, and portions of the invention may be used separately. For example, the central conductor may be a solid wire, to answer the purpose of a conductor or for strength, if used for aerial lines, or it can be a tube made by drawing or other suitable way. Outside the wires E a series of similar wires may be placed, with or without the interposition of a tubular conductor, such as C. Instead of braiding bare wires to form conductor A and electroplating them, it may be formed, like conductor C, of insulated wires braided, woven, or otherwise suitably arranged and united by electroplating. The braided conductor may be tubes, if desired. The shell or plating F, to protect the insulation in applying the leaden sheath, may be used for single wires as well as for cables. An improved cable may be formed of a number of ordinary conductors, or wires may be embedded in insulating material between concentric conductors of ordinary construction, or of the improved construction of braided wires united by electroplating. The plating F and leaden sheath G may be utilized as a conductor, if desired. In some cases the electro-deposit on the braided wires may be omitted—as, for example, when the wires are tightly braided or woven—the ends in such case being secured by plating, solder, or otherwise.

Having now fully described my said inven-

tion and the manner of carrying the same into effect, what I claim is—

1. The method of forming a tubular conductor or pipe by arranging wires, strips, or the like around a core or center, and then depositing metal thereon by electrolysis, to unite the strands, substantially as described.

2. A tubular conductor or pipe having a base of wires, strips, or the like united by an electro deposit or plating, substantially as described.

3. The method of forming electrical conductors for cables by providing grooves or channels in insulating material, adapting the surface of said grooves or channels to receive an electro-deposit, and depositing metal in said grooves or channels simultaneously, substantially as described.

4. In the manufacture of lead-incased conductors by a pipe-press, the method of protecting the insulating material by enveloping the same in a metallic shell or plating before passing through the pipe-press, substantially as described.

5. An electrical conductor having a metal shell or plating outside the insulating material, and a leaden sheath applied to said shell or plating, substantially as described.

6. An electrical conductor having a hollow tubular conductor at the center, and a series of conductors arranged about said hollow conductor at a suitable distance and insulated, substantially as described.

7. An electric cable or compound conductor comprising a central conductor, a tubular conductor surrounding the same, a series of conductors around said tubular conductor, a leaden sheath, and a protective metallic shell or plating inside said sheath, said conductors being separated from each other and from said shell or plate by insulating material, substantially as described.

8. A tubular conductor formed of insulated wires woven, braided, twisted, or similarly arranged, and united by electroplating, substantially as described.

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

H. D. ROGERS.

Witnesses:

JOHN MCCLURE,  
GEO. E. MACOY.