

(No Model.)

W. A. CONNER.
ELECTRIC CABLE.

No. 448,604.

Patented Mar. 17, 1891.

Fig. 1.

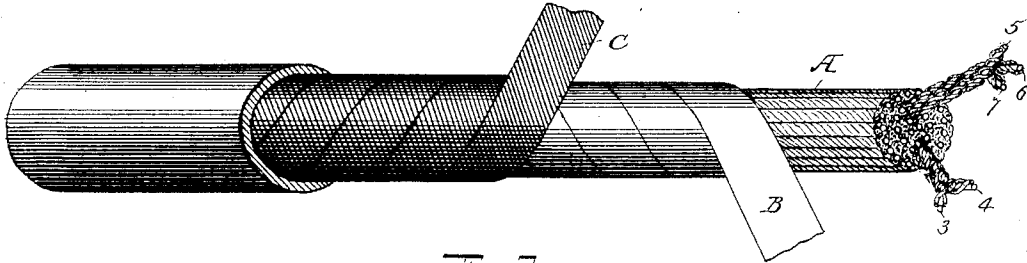


Fig. 2.

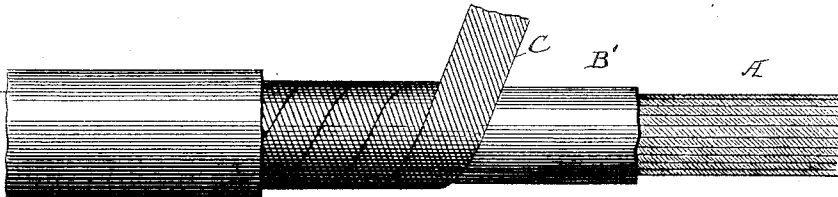


Fig. 3.

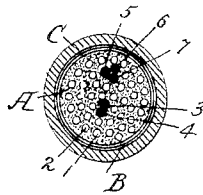


Fig. 4.



WITNESSES

J. G. Hinkel

W. S. McArthur

INVENTOR

W. A. Conner
by Foster Freeman
Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM A. CONNER, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO THE
STANDARD UNDERGROUND CABLE COMPANY, OF SAME PLACE.

ELECTRIC CABLE.

SPECIFICATION forming part of Letters Patent No. 448,604, dated March 17, 1891.

Application filed November 8, 1890. Serial No. 371,005. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. CONNER, a citizen of the United States, residing at Pittsburg, Allegheny county, Pennsylvania, have
5 invented certain new and useful Improvements in Electric Cables, of which the following is a specification.

My invention relates to electric cables, and more particularly to that class which are generally termed "lead-covered cables."
10

In cables of this class, especially when desired for telephone-service, it is extremely important to obtain the lowest possible specific inductive capacity, and several conductors composing an electric cable are generally separated from each other by dielectrics of various kinds, usually a composite of fiber or paper wrapped or braided thereon and saturated with some insulating compound, such as ozite, paraffine, resin-oil, &c. These covered conductors before saturation are bunched together in any desired number or arrangement, and bound closely together by a fibrous mesh or wrapping to form the
15 "cable core." The core thus constructed may or may not be placed in a hot-air chamber for the purpose of expelling any moisture that may be present, and it is then placed in a penetrating bath of hot insulating compounds, such as above named. This has the effect of sealing the fiber against the subsequent absorption of moisture. Finally, the cable-core thus prepared is usually given a protecting-coating which shall be impervious
20 to water.

It is well known that dry air is very much lower in specific inductive capacity than any of the known insulating compounds or fibers, and it is therefore preferable to omit the insulating compounds whenever possible. Several attempts to utilize this fact have heretofore been made. Electric cables have been constructed and used consisting of dry cotton insulated cores placed in a sheath of lead
35 pipe without any insulating compound whatever, and this results in considerably lowering the inductive capacity between the various conductors of the cable; but such cables have been found unserviceable and unreliable, generally from the fact that any defect
40 or opening in the protecting-sheath, even of

a very minute character, renders a considerable length of the core liable to the intrusion of moisture and the consequent loss of insulation. Cables have also been made
55 in which plugs or lengths of sealing material have been introduced at intervals in the lead pipe for the purpose of confining any damage from access of water or moisture within the limits of sections of the cable between two
60 adjacent plugs of sealing material.

The object of my present invention is to overcome the disadvantages above set forth and to produce a cable which shall have the lowest possible specific inductive capacity,
65 and at the same time be simple, cheap, and effective; and my invention consists in a cable constructed and arranged substantially as hereinafter pointed out.

In the accompanying drawings, Figure 1 is
70 a perspective view showing a cable embodying my invention, and Fig. 2 is a side view showing a modified construction. Fig. 3 is a longitudinal cross-section of Fig. 1; and Fig. 4 is an enlarged detail view showing a single
75 conductor covered with insulating material, forming interstices or open-work spaces for the air.

As before stated, the essential object of my invention is to provide a cable having all the
80 advantages of the dry-fiber core, and consequently low specific inductive capacity, and yet have the conductors of the core fully protected against access of moisture; and my invention may be stated, perhaps, more
85 concisely as consisting in a number of electric conductors covered with an insulating medium of any character—such as cotton, jute, paper, gutta-percha, &c.—preferably applied
90 so as to form an open mesh or structure, leaving numerous interstitial air-spaces around the conductors. The individual conductors so insulated may then be laid up into a core to form what is known as a "straight-away"
95 cable, or they may be twisted in pairs, threes, fours, or otherwise, and then these combinations laid up in a core, depending, of course, upon the particular purpose for which the cable is to be used. The core so prepared is preferably placed in a hot-air chamber for the
100 purpose of expelling all the moisture which may be present in the fibrous material. Over

the core as thus treated is then placed one or more windings of impermeable and thoroughly water-proof tape, preferably a strongly-adhesive rubber tape or other compound, or a rubber tube may be formed directly upon or drawn over the core, the prime and essential object being to provide a thoroughly water-proof covering for the core itself, which is entirely independent of the outer or lead covering thereafter applied. In order that this covering may not be injured by the heat of the lead in cases where the lead in a comparatively hot or molten condition is formed or compressed around the core, as is usual, I provide an additional covering to the water-proof covering, consisting of fibrous tape or braid which has preferably been previously saturated with some insulating substance, such as some form of hydrocarbon, for instance, which melts only at a high temperature, and which will thoroughly protect the water-proof covering of the core and prevent the latter from becoming burned, scorched, or injured in any way in the application of the lead covering.

Thus referring to the drawings, 1 2 3, &c., represent single conductors, each of which is covered with an insulating medium preferably in the form of fibrous material or equivalents, wrapped or covered so as to leave interstices or air-spaces through the covering and between it and the conductor.

3 4 represent two insulating - conductors twisted to form a pair, while 5, 6, and 7 represent three insulating conductors twisted together so as to leave interstices or open spaces on the covering surrounding the conductors. These covered conductors are then bunched in any desired form to form a core A, the conductors being loosely grouped together, so that there will be other interstices or air-spaces between the covered insulated wires or conductors. This core having been dried to expel the moisture is then wrapped or otherwise covered with a coating B of some thoroughly water-proof compound or material, and I have shown it as consisting of a tape spirally wound around the core, the tape preferably being saturated to render it water-proof, or a rubber tube B', Fig. 2, may be used in place of a coating B. The core as thus formed is rendered practically impervious to moisture, and the dry air in the interstices of the core acts to effectively reduce the electrostatic capacity, and it will be understood that the ends of the core may be sealed for trans-

portion or storage with the same winding material or with any sealing or insulating compound to prevent the entrance of moisture. This core as thus wrapped and protected is then covered with a sheathing C of some material capable of withstanding a comparatively high degree of heat, and I have shown it consisting of a fibrous tape spirally wound, preferably, in the opposite direction to the spirals of the tape B and covered or saturated with a hydrocarbon having a high melting-point. When this is done, the cable is in condition to receive its outer protective covering D, of lead or similar material, which is generally applied to the cable while in a hot or plastic condition; but the interposition of the sheathing C between the protective covering B and the core prevents any injury to the core which would admit or permit the entrance of moisture, and I am therefore enabled to produce a cable in which there is the lowest possible specific inductive capacity at a comparatively small cost, and one which has been found to be exceedingly durable and capable of withstanding the action of the elements without danger.

What I claim is—

1. An electric cable consisting of a number of conductors, each covered with a fibrous insulating material, the conductors being grouped together to form a core, the core being provided with water-proof covering and a sheathing of material capable of withstanding a comparatively high degree of heat, and an exterior protective coating of lead, substantially as described.

2. An electric cable consisting of a number of conductors covered with fibrous insulating material, the conductors being grouped together to form a core, and having interstices or air-spaces between the conductors, as set forth, a covering consisting of a tape or tube of water-proof material surrounding the conductors, a sheathing of fibrous material saturated with hydrocarbon having a comparatively high melting-point surrounding the water-proof covering, and a protective covering of lead, substantially as described.

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

WILLIAM A. CONNER.

Witnesses:

ARTHUR A. ANDERSON,
HORACE G. WORMSLEY.