

(No Model.)

E. H. JOHNSON.
ELECTRICAL CONDUCTOR.

No. 359,726.

Patented Mar. 22, 1887.

Fig. 1.

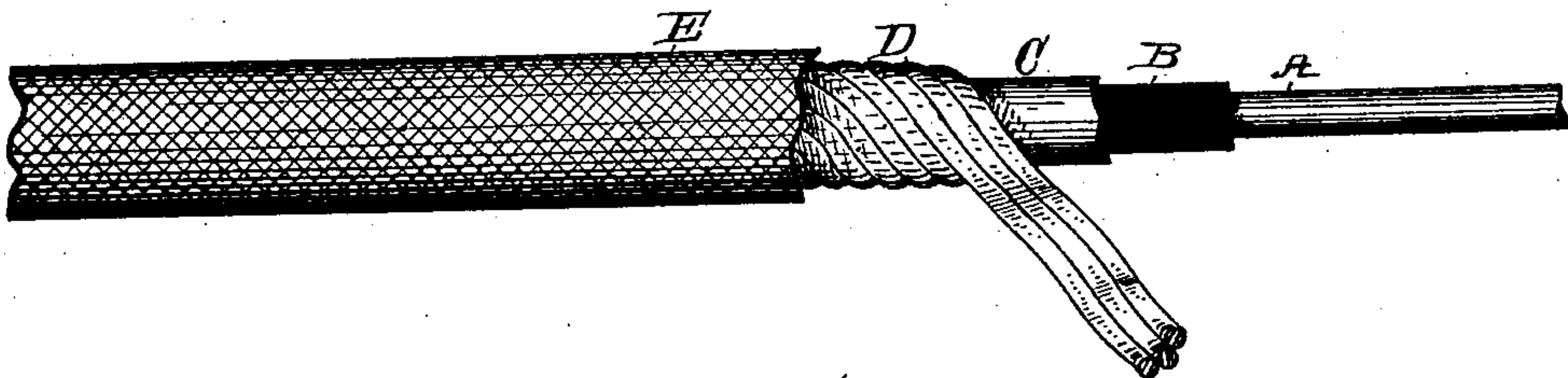


Fig. 2.

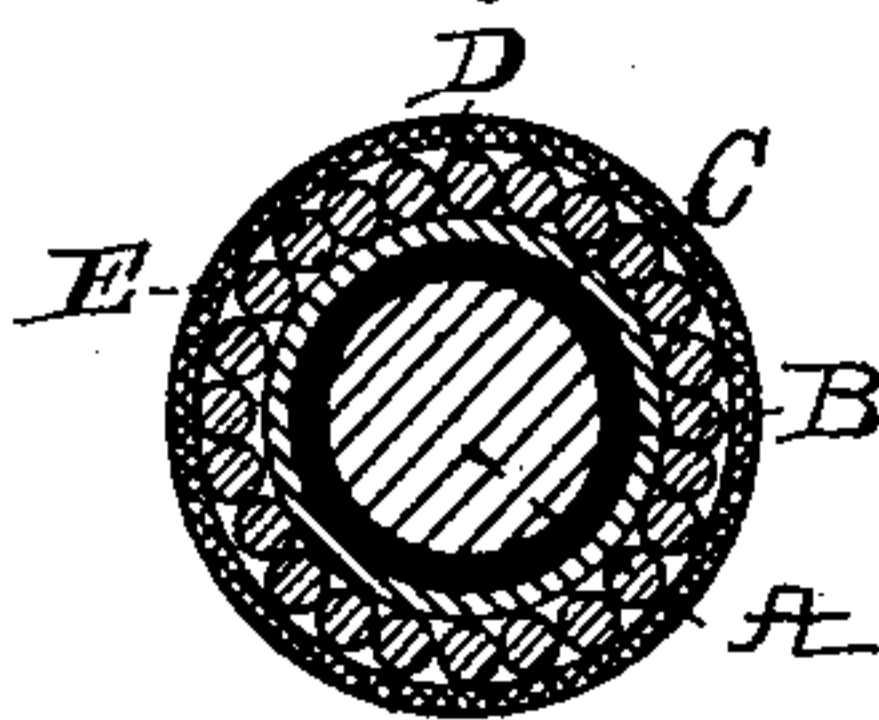
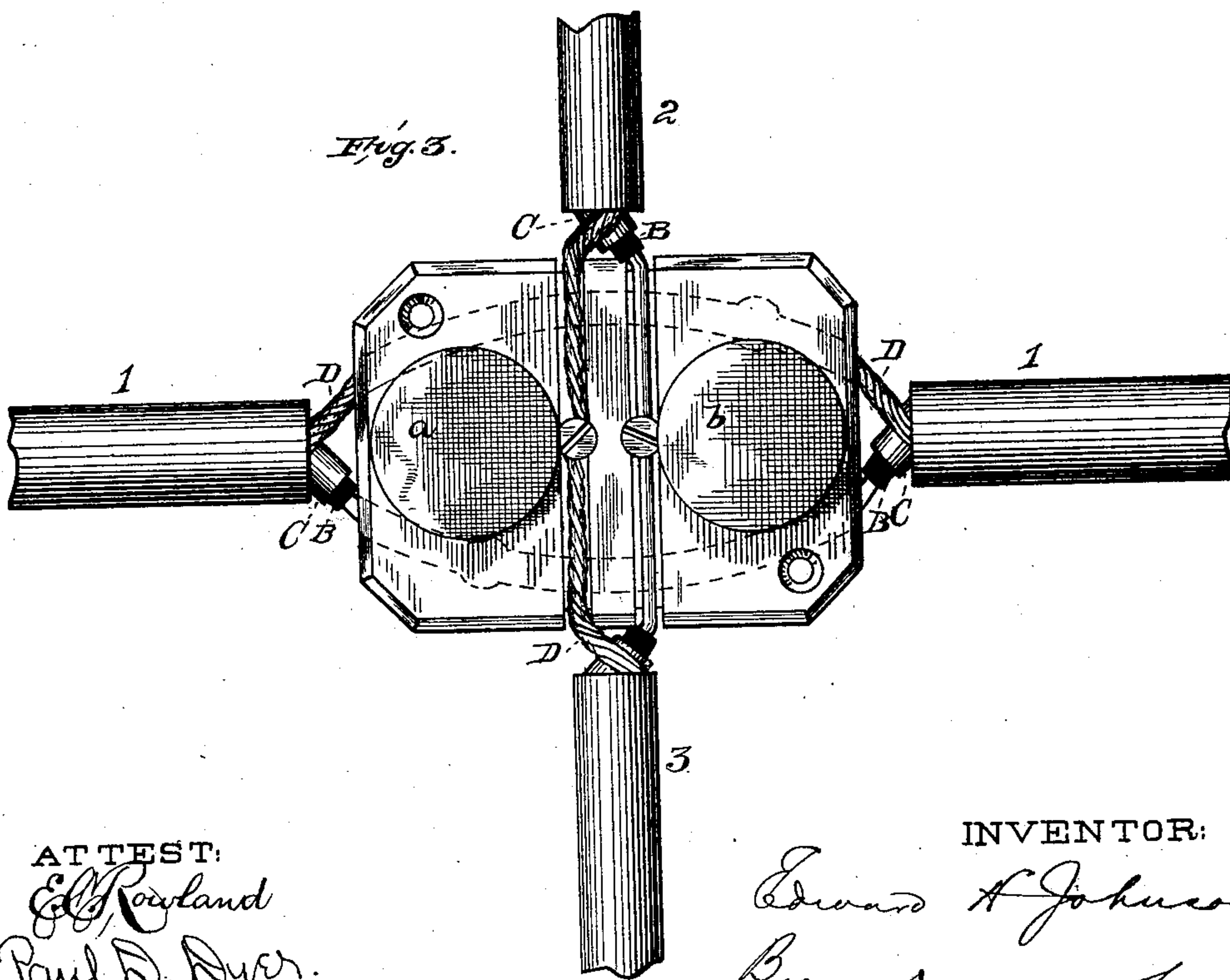


Fig. 3.



ATTEST:

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EDWARD H. JOHNSON, OF NEW YORK, N. Y.

ELECTRICAL CONDUCTOR.

SPECIFICATION forming part of Letters Patent No. 359,726, dated March 22, 1887.

Application filed August 13, 1884. Serial No. 140,470. (No model.)

To all whom it may concern:

Be it known that I, EDWARD H. JOHNSON, of New York city, in the county and State of New York, have invented a certain new and
5 useful Improvement in Electrical Conductors, of which the following is a specification.

The object I have in view is to produce a method of arranging and insulating electrical conductors, more especially adapted and de-
10 signed for wiring houses, ships, and other structures for the electric light and the wiring of fixtures for supporting incandescent elec-
tric lamps, which will make it possible, by the employment of fusible safety-catches, to pre-
15 vent absolutely the setting of fires by leakage of the current.

Heretofore it has been considered conducive to safety to separate the two conductors of an electric-light circuit a considerable distance;
20 but experience has shown that when this is done leaks between the conductors will occur through intervening material, which may be ignited by the formation of a high-resistance arc without fusing the safety-catches designed
25 to protect the circuit. I have discovered, however, that by bringing the conductors close together, and so arranging and constructing them that any imperfection of the insulation will immediately establish an arc between the
30 conductors themselves of such low resistance as to amount to a practical short circuit, the safety-catches will be invariably fused and the circuit broken before damage can occur.

The most perfect insulators of electricity
35 known to the art, and those that are proof against moisture, are oils or gums which are inflammable; but by the methods heretofore employed for insulating the separated conductors it has been found impracticable to use these
40 more perfect and water-proof insulations on account of their inflammability, and non-combustible insulating-coverings have been employed, which, by reason of being less perfect insulators, permit the formation of dangerous
45 leaks.

My method makes it possible to insulate the conductors from each other by the most perfect water-proof materials for the purpose, re-
50 gardless of their inflammable nature, and also to employ the non-inflammable insulations between the conductors and the structure upon which the conductors are supported, and where their inferior insulating properties are of less

importance. At the same time that I attain these desirable ends the flexibility of the con-
ductors is preserved, making them suitable for
55 the wiring of houses and other structures and fixtures, and the conductors are in such form that it is convenient to make the connections required in running circuits. 60

In carrying out my invention I produce a compound conductor having the two con-
ductors of a complete or round metallic cir-
cuit inclosed in a common insulating-covering,
which is a non-inflammable insulation of any
65 suitable character, such as a braided, woven, or knit cotton covering impregnated with white lead or other non-inflammable material. Within this covering the conductors are ar-
ranged so that one forms a complete metallic
70 shield for the other, and the two conductors are separated by the most perfect water-proof insulation, without regard to its inflammable nature, such as paraffine or rubber, or other
moisture-excluding material, such as bitumen
75 or a fabric impregnated with these or any other material of this nature.

The core of the compound conductor is a wire or a bundle of wires covered carefully
80 with the paraffine, rubber, or similar insula-
tion. The other conductor is composed of a number of bare wires of such a size that they can be placed over the inner conductor and its insulation, and will form a complete me-
tallic shield, and at the same time will have
85 the same or approximately the same current-conducting capacity as the inner conductor. These naked wires are preferably wound spi-
rally upon the inner insulated conductor in
90 one layer, the spiral winding being preferred
to prevent kinking in use, although the wires composing the outer conductor may be laid
parallel with the inner conductor.

Instead of using a number of wires for the
outer conductor, it may be composed of one
95 or more flat strips wound spirally upon the inner insulated conductor, and forming a complete metallic shield for the same. By reason of the arrangement of the outer conductor as
a shield for the inner conductor, said outer
100 conductor must necessarily have a less thick-
ness at any one point than the inner conductor, and it might be possible for the current in arc-
ing between the conductors to blow a hole
105 through the outer conductor without fusing the safety-catch, resulting in weakening the

outer conductor at that point and causing it to be heated by the current, which continues to flow. This objection to the arrangement of the conductors described I overcome by interposing between the outer and inner conductors, and in contact with the outer conductor, a thin body of metal the fusing-point of which is lower than that of copper. This thin body of metal may be a lead covering placed upon the insulation of the inner conductor in any of the known ways of covering insulated wire with lead. It is preferably quite thin, and should hug the insulation of the inner conductor closely, and this insulation of the inner conductor is also preferably as thin as it can be made practically. The body of easily-fusible metal, instead of being a solid tube of lead, as usual in covering wire with lead, might be made of lead or tin-foil wound upon the insulation of the inner conductor. The bare wires forming the outer conductor are laid directly upon this lead covering, which in the arcing of the conductors fuses before the copper, and forms an arc of the required low resistance to fuse the safety-catches. After the lead covering and the outer conductor are placed upon the inner insulated conductor, the whole is covered, as before explained, by a non-inflammable insulation, such as a cotton covering impregnated with white lead or other fire-proof material.

The compound conductor is used with fusible safety-catches placed in one or in each side of the circuit at the points of departure of smaller from larger conductors.

It will be seen that there can be no contact of the inner conductor with any external object except through the outer conductor. The breaking down of the insulation separating the conductors will with certainty produce an arc of such low resistance as to effect a short circuit between the conductors, instantly fusing the safety-catch or safety-catches protecting the particular conductors, and breaking the circuit, or the two conductors, being in such close proximity, will be soldered together by the fusion of the lead covering, which evidently will form a short circuit between them.

My compound conductor also possesses the advantage of cheapening to a large extent the cost of wiring houses and other structures for electric light, since provision only has to be made for one conductor, and the labor is equivalent to the running of one conductor only. For wiring fixtures, and especially combination gas and electric-light fixtures, the impossibility of forming an arc between the conductors and outside material—as the metal of the fixture—removes a constant danger, which has heretofore been an obstacle in the way of fixture-work.

In making connections with the compound conductor the outer conductor is unwound from the inner conductor to the desired extent and the inner conductor laid bare. The wires forming the outer conductor can be

twisted together by hand, and a good and secure electrical and mechanical connection can be made with them.

In the accompanying drawings, forming a part hereof, Figure 1 is an elevation of the compound conductor partially stripped to show its construction; Fig. 2, a cross-section, on a larger scale, of the compound conductor; and Fig. 3, a view showing the conductor in use.

A is the inner conductor. B is the high water-proof insulation of paraffine, rubber, or similar material, placed thereon. C is the lead covering of the inner conductor. D is the outer conductor arranged to shield mechanically the inner conductor, and E is the fire-proof insulation forming the outer covering for the compound conductor.

Referring to Fig. 3, the compound conductors 1, 2, and 3 are shown as joined in an electric-light circuit. 1 is larger than 2 and 3, which form branches of 1. At the point of departure of the smaller from the larger conductors the fusible safety-catches *a b* are introduced into the circuit. These are proportioned to protect 2 and 3. 1 is protected by fusible safety-catches where it branches from larger conductors or at the dynamo-machine, if it proceeds directly therefrom.

What I claim is—

1. A compound electrical conductor having, in combination, an inner conductor, an outer conductor surrounding the inner conductor and insulated therefrom, and a body of readily-fused metal interposed between the conductors, substantially as set forth.

2. A compound electrical conductor having, in combination, an inner conductor covered with insulation, a covering of an easily-fused metal upon such insulation, and an outer conductor in contact with said easily-fused metal covering, substantially as set forth.

3. The combination, in a flexible compound conductor, of an inner insulated conductor, a covering thereon of an easily-fused metal, and an outer conductor composed of a number of wires, substantially as set forth.

4. The combination, with two conductors, of a complete or round metallic circuit, one of which surrounds and forms a shield for the other, and the two conductors being situated in soldering proximity to each other, of a fusible safety-catch in the circuit, substantially as set forth.

5. The combination, in an electrical circuit, with an insulated inner conductor, an outer inclosing-conductor, and a body of easily-fused metal between the two conductors, of a fusible safety-catch, substantially as set forth.

This specification signed and witnessed this 8th day of August, 1884.

EDWARD H. JOHNSON.

Witnesses:

WM. H. MEADOWCROFT,
A. W. KIDDLE.