

(No Model.)

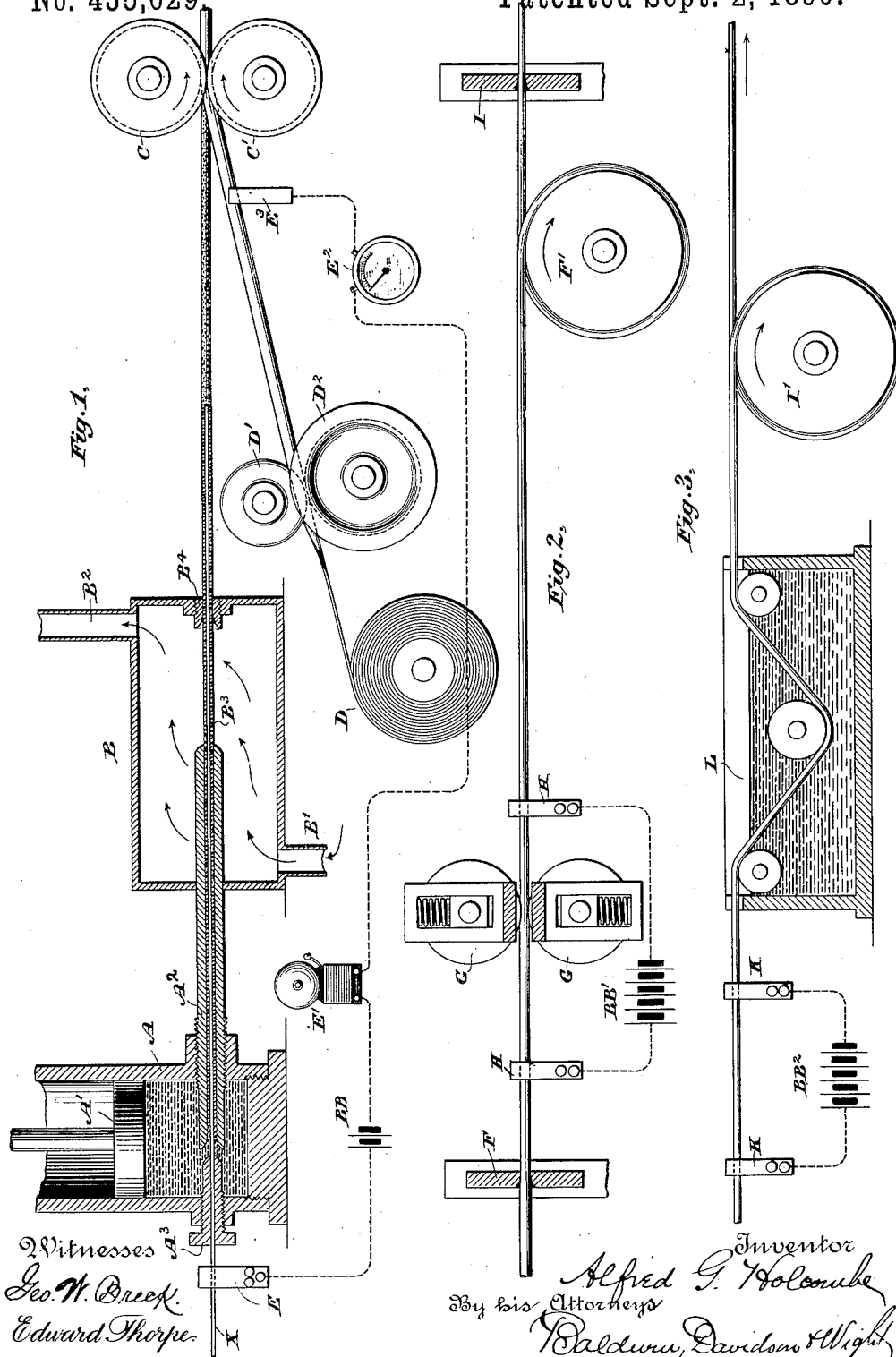
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A. G. HOLCOMBE.

APPARATUS FOR COVERING ELECTRIC WIRES.

No. 435,629

Patented Sept. 2, 1890.



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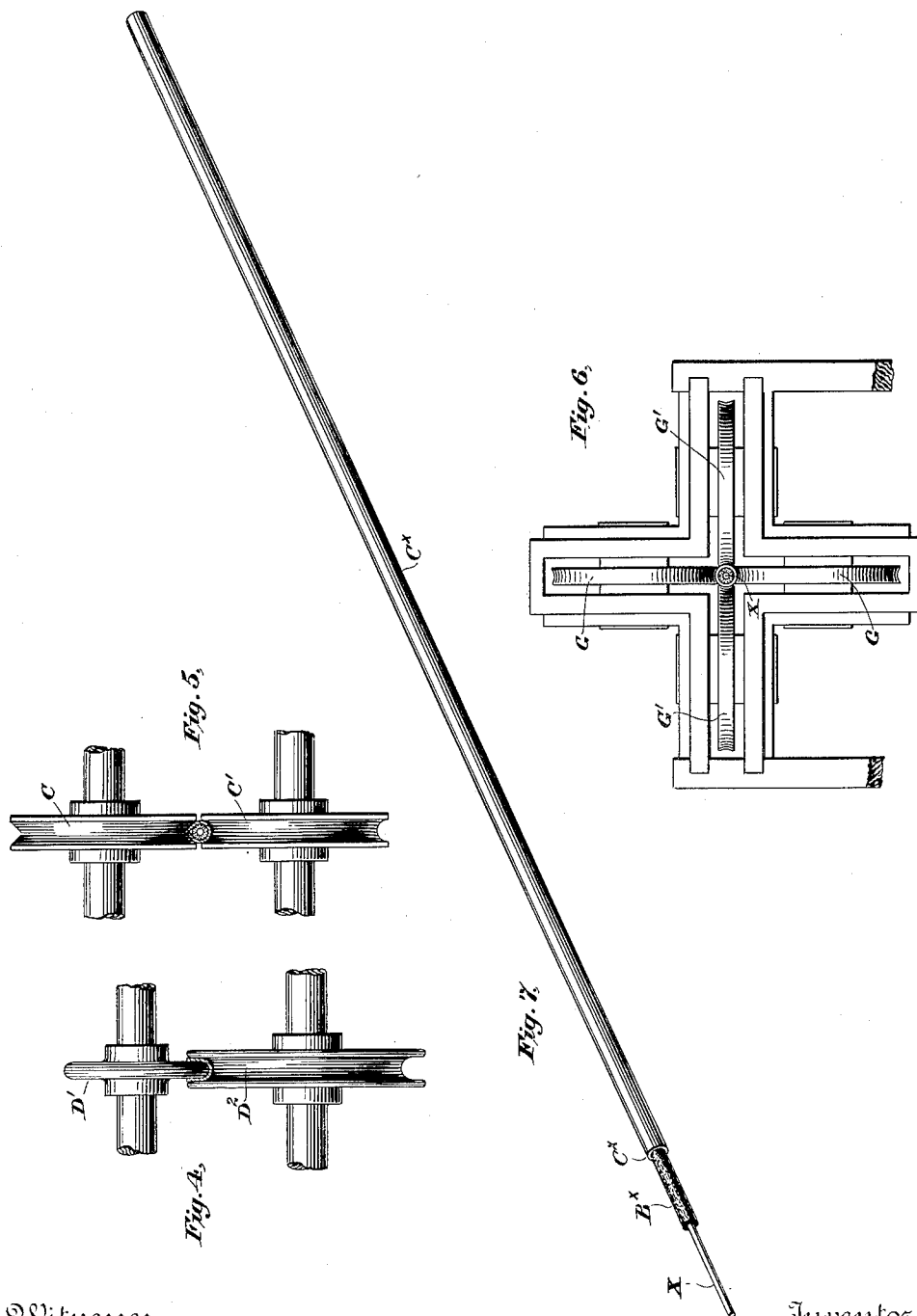
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Witnesses
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UNITED STATES PATENT OFFICE.

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APPARATUS FOR COVERING ELECTRIC WIRES.

SPECIFICATION forming part of Letters Patent No. 435,629, dated September 2, 1890.

Application filed March 17, 1890. Serial No. 344,145. (No model.)

To all whom it may concern:

Be it known that I, ALFRED G. HOLCOMBE, a citizen of the United States, residing at Long Island City, in the county of Queens and State of New York, have invented certain new and useful Improvements in Electrical Conductors and in the Method of Manufacturing the same, of which the following is a specification.

The object of my invention is to produce an electrical conductor having a covering of non-carbonizable, indestructible insulating material, and an exterior hermetically-closed tubular sheath of metal.

Of course I am aware that heretofore in a number of instances it has been proposed to insulate a wire and then envelop it in a sheath of metal the edges of which have been sealed or soldered. I do not, therefore, claim as my invention such broad ground; but what I do claim appears from the following specification and claims.

In the accompanying drawings, Figure 1 is a diagrammatic view with part of the apparatus in section, indicating the manner of manufacturing my improved conductor; Fig. 2, a similar view, being a continuation of the right-hand end of Fig. 1, and Fig. 3 a similar view, being a continuation of the right hand end of Fig. 2; Fig. 4, a detailed view of the forming-wheels, between which the metal ribbon passes as it approaches the insulated conductor; Fig. 5, a similar view of the grooved rolls which fold the ribbon around the insulated conductor as they come together; Fig. 6, a detailed view, being a transverse section of the conductor, showing the wheels for compacting the sheath upon the insulated conductor and by means of which its welding may be effected; and Fig. 7 is a perspective view illustrating the completed conductor.

The insulating material which I prefer to use is composed of asbestos and fire-clay, both of which are subjected, either together or separately, to a heat of a temperature sufficient to reduce to ash any combustible or carbonaceous material that may be contained therein, and when so reduced by heat they are mixed with silicate of soda or other suitable flux. This compound is of a vitreous character and is capable of sustaining the highest temperatures without being destroyed and

having its insulated properties impaired. It is the mixture which I prefer to use, but it is specified, not as the only mixture, but as illustrative of a class of compounds, vitreous in character and of high insulating property, that may be employed. This compound I mix with water and form it into a pasty mass of a proper character to be molded around the electrical conductor, and the operation of applying it may be practiced in any of the ordinary ways by which such plastic insulating compounds are applied around conductors, for instance.

In the drawings, Fig. 1, A is the cylinder of a press, and A' the plunger. A hollow core-bar A² projects into the rear of the press, and a hollow die A³ projects into its front. The wire passes through them both, and the plastic material is formed around the conductor as it is drawn forward in the same manner that lead pipe and similar tubular bodies are made. The hollow die A³ is preferably prolonged and enters for any suitable distance into a heating and drying box B, through which hot air or products of combustion enter at B' and pass off at B², thoroughly drying the insulation upon the conductor both as it passes through the prolongation of the die A² and as it passes uncovered through the heating-box at B³. The insulated conductor leaves the heating-box through a suitable guide B⁴ and passes between grooved rolls C C'. (Shown in detail in Fig. 5.)

The ribbon of metal, which is preferably a relatively-thin ribbon of some ductile metal—such as copper or tin or alloys of aluminium—is wound upon a reel D and passes between the rollers D' D², (shown in detail in Fig. 4,) which rollers have their peripheries shaped to bend the metal into a trough-like form—that is, into U shape—in cross-section. From these rolls the metal ribbon thus shaped passes to the insulated conductor, which lies in the bottom of the trough-shaped ribbon, the sides of which are by the wheels C C' (shown in detail in Fig. 5) turned over and pressed down upon the insulation with their edges overlapping or abutting.

As the conductor X enters the core-bar A², it passes into contact with a rubber E, from which a wire leads to one pole of a source of electrical energy B B. The wire from the

other pole includes the coil of an electric bell or other suitable sounding or alarm device E' , and from thence passes through a galvanometer or current-indicator E^2 to another rubber E^3 , with which the metal ribbon is in contact. The circuit from the source of energy $B B$ is therefore completed through the conductor X and through the insulating compound thereupon in contact with the ribbon, through the ribbon and rubber E^3 to the opposite pole of the source of energy. The function of this organization is threefold. First. Should any moisture remain in the insulation, the current that would pass by reason of the presence of such moisture would tend to dissipate it. Any vapor resulting from such an operation would have full opportunity to escape, since the metal ribbon is not at once closed tightly. Secondly. The galvanometer or current-indicator serves to indicate when a current sufficient to move the needle passes in the circuit. Thirdly. The alarm device E' audibly calls the attention of the attendant in the event of a defect in the insulation of a sufficiently grave character to permit the passage of current enough to sound the alarm. Such a defect would be the presence of some foreign conducting body in the insulation, or the scaling off of the insulation.

As the insulating conductor having the ribbon folded thereupon leaves the rolls $C C'$, it passes through a draw-plate F , by which the insulation and the enveloped sheath are drawn down or reduced in diameter and the insulation more thoroughly compacted. The power for the draft of the conductor through the draw-plate is furnished by a driven pulley F' . After leaving the draw-plate F the conductor passes between two pairs of wheels $G G$ and $G' G'$ having grooved peripheries. The peripheries of these wheels closely envelop and press upon the metal cover, the wheels being mounted in sliding blocks pressed inwardly by coil-springs g . On each side of the wheels a rubber H bears upon the metal sheath, and the rubbers are connected with opposite poles of the source of electrical energy $B B'$. The function of this arrangement may be two-fold—first, the current passing through the metal sheath is of such quantity as to heat and anneal the sheath which may have been more or less hardened or crystallized by its passage through the draw-plate; second, the quantity of current may be sufficient to heat the sheath to such a point as to insure a perfect welding of the seam or joint therein; but in operating according to my invention I may pass the sheathed conductor through several draw-plates, the operation of which alone will weld the edges of the sheath and convert it into a solid tube. After leaving the pulley F' the conductor passes through a second draw-plate I , by which the sheath is drawn down and the insulation further compacted. The power for drawing the conductor through this plate is derived from a driven pulley I' . After leav-

ing the draw-plate I the sheath is further annealed by passing in contact with two rubbers $K K$, connected with opposite poles of the source of electrical energy $B B'$. Now if it be desired to coat the sheath either with a metal—such as tin, or zinc, or with asphaltum varnish or other compound—it is passed through a bath of the desired material contained in a tank L , from whence it passes around the driven pulley I' to a storage-reel (not shown) and is ready for use.

In Fig. 7, X represents the interior conductor, B^x the insulating compound, and C^x the enveloping tube or sheath. Among the advantages attending the use of this conductor I may mention the following: It can be heated up to the melting-point of copper without impairing the insulation. It is not affected by moisture. Hence it can be placed under ground, on the ground, or under water, and can be attached to trees or poles without insulators. Connecting the metal jacket with the ground is a thorough protection from the effects of lightning. It forms a complete metallic circuit by using the jacket as a return-conductor. The metallic jacket protects the insulation from abrasion. The central conductor is protected from the inductive effect of currents on other wires. By its use self-induction becomes an advantage instead of a detriment, the philosophy of which is, when the current starts the inductive action produces a current in the jacket in an opposite direction, and as the jacket is a part of the circuit the mutual action produces acceleration instead of retardation. When the current stops, the induced current being in the same direction as the primary current, the "tailing out" or prolongation of the primary current is prevented. Therefore, for rapid signaling, as in automatic telegraphy, telephoning, or for alternating-current lighting it has great advantages, and the cost will compare favorably with any system where metallic circuits are used. Thus it will be seen that the conductor may be used for any class of electrical work, and as the exterior metal sheath may be used as the return-conductor and may be left uninsulated and in contact or connection with earth, so as to be at the same potential with earth, high-tension currents may be employed without danger.

I claim as my invention—

1. The herein-described improvement in the art of manufacturing electrical conductors having a central conducting-core, an insulating-compound, and an enveloping metallic sheath, which improvement consists in forming the insulation around the central conductor, drying the same, enveloping the insulated conductor in a metal ribbon applied longitudinally, then passing the conductor thus formed through a draw-plate, and then annealing the sheath as it leaves the draw-plate, substantially as set forth.

2. The herein-described improvement in the

method of manufacturing the conductor herein described, which improvement consists in forming the insulating material around the central core, drying the insulating material, applying the metal ribbon longitudinally around the insulation, passing the conductor thus formed through a draw-plate, and then electrically welding its edges as it leaves the draw-plate, substantially as set forth.

3. The improvement in the method of manufacturing the conductor herein described, which consists in forming the insulating material around a central core, drying the same, applying the metal ribbon longitudinally around the insulation, passing the conductor thus formed through a draw-plate, electrically annealing the sheath as it leaves the draw-plate, then passing it through another draw-plate and electrically annealing it as it leaves the second draw-plate, substantially as set forth.

4. The combination, substantially as set forth, of a mechanism for forming the insulation around the central core or conductor, the metal-ribbon roll, the rolls D' D², the former having a convex and the latter a concave periphery to give the ribbon a trough-like form, and the rolls C C', both having concave peripheries for folding the trough-shaped ribbon around the insulation.

5. The combination, substantially as set

forth, of means for forming the insulation around the central conductor, the metal ribbon, means for applying it around the insulation, and the electric circuit containing a galvanometer and including the ribbon, the insulation, and the central conductor.

6. The combination, substantially as set forth, of means for forming the insulation around the central conductor, the metal ribbon, means for applying it around the insulation, and the electric circuit containing an alarm device and including the ribbon, the insulation, and the central conductor.

7. The herein-described method of making an insulated conductor, which consists in subjecting non-carbonizable insulating material exposed to the air to a high temperature to eliminate or reduce to ash any carbonizable foreign matter that may be contained therein, then mixing the insulating material into a plastic mass by admixture with a suitable liquid, molding such plastic material around the wire, drying it as the wire is drawn forward, and applying a metal sheath as the insulated wire leaves the drier.

In testimony whereof I have hereunto subscribed my name.

ALFRED G. HOLCOMBE.

Witnesses:

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