(No Model.)

H. C. SPALDING.

ELECTRICAL CABLE.

No. 327,491. Patented Sept. 29, 1885.

Fig 1

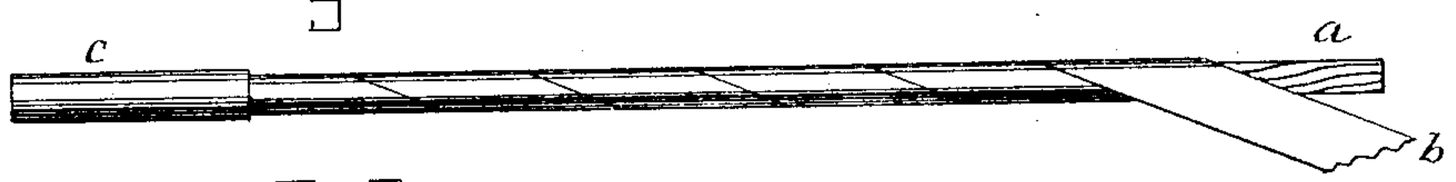


Fig 2

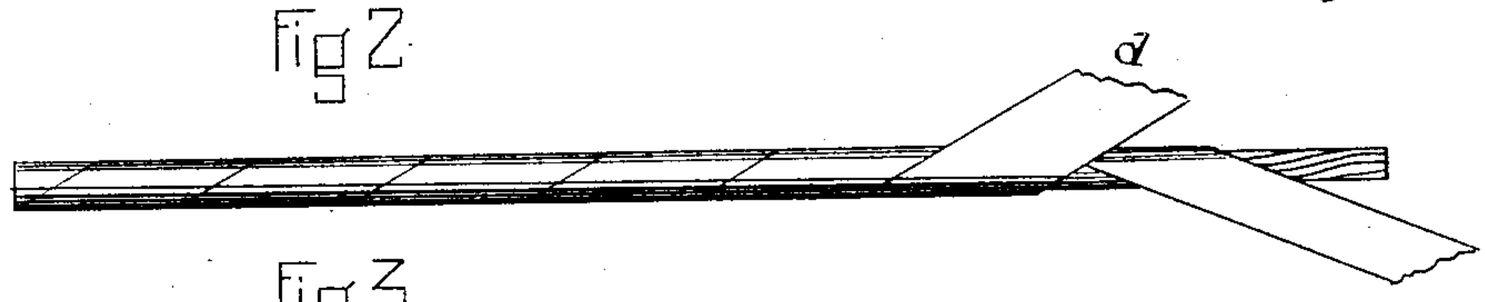


Fig 3

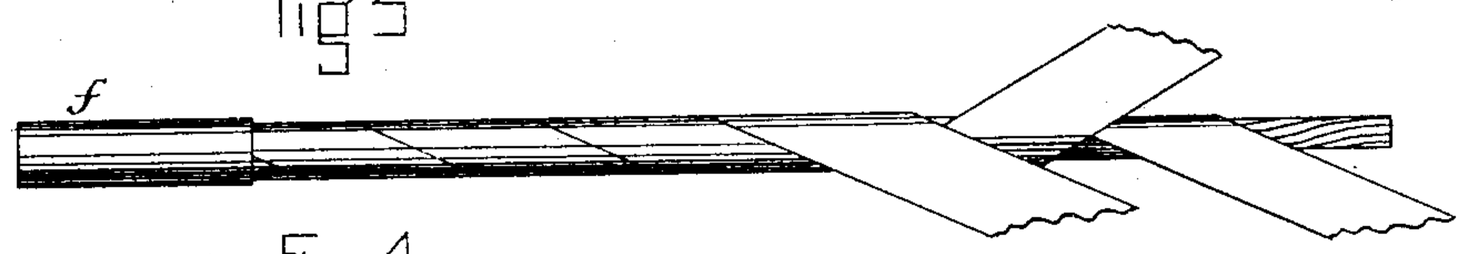


Fig 4

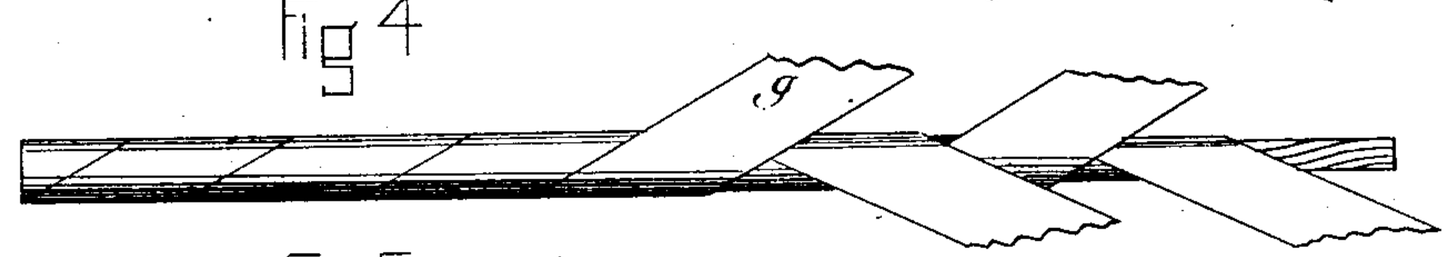


Fig 5

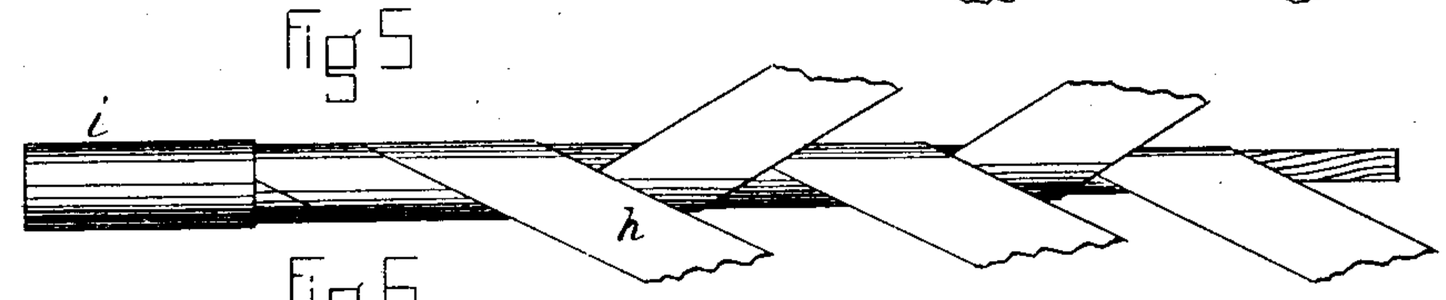


Fig 6

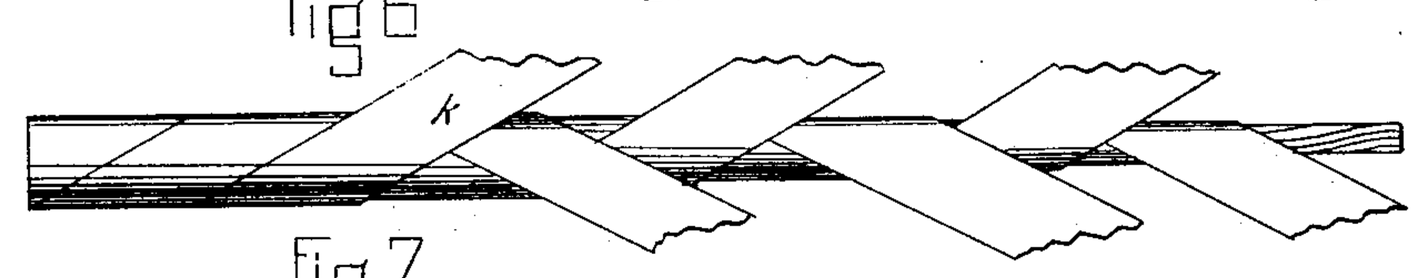


Fig 7.

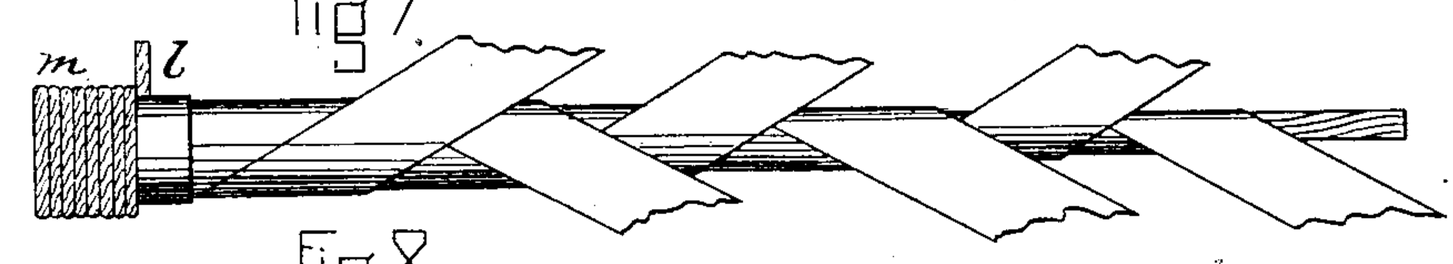
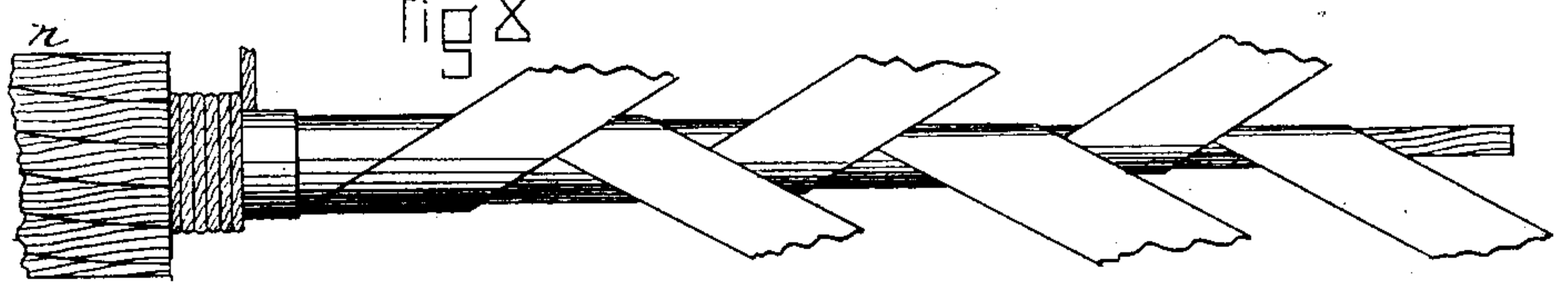


Fig 8



WITNESSES

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ELECTRICAL CABLE.

SPECIFICATION forming part of Letters Patent No. 327,491, dated September 29, 1885.

Application filed November 30, 1883. Renewed February 28, 1885. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. SPALDING, a citizen of the United States, and a resident of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Electric Cables, of which the following is a specification, reference being had to the drawings accompanying and forming a part of the same.

This invention relates to the construction of electric cables more particularly designed for submarine use, the main objects of the invention being to secure a higher specific insulation and to lessen the retardation to which the electric impulses, by reason of electrostatic induction, are liable when transmitted through submarine or subterranean conductors. These objects I attain by the application of insulating materials under certain novel conditions and by the employment of metallic screens and strengthening jackets or servings, combined in such manner as to produce a durable, highly-flexible, and very cheap cable.

In the drawings hereto annexed I have illustrated in its successive stages of manufucture a practicable and efficient form of cable constructed in accordance with my invention.

In Figure 1, *a* designates the central conductor, composed, as is usually the case, of a number of comparatively fine strands or wires of copper twisted together. Upon the conductor *a* is wound spirally a strip of paper, *b*, which has been previously saturated with paraffine. Over the paper is then applied in any well-known way a coating, *c*, of resinous varnish. Over the coating *c*, while still soft, is wound, spirally, a second strip of paraffined paper *d*, Fig. 2. Upon this is wound a strip of tin-foil, *e*, Fig. 3, which is then covered with a coating, *f*, of the resinous varnish. Next is wound upon the coating *f* a third strip of paper, *g*, Fig. 4, which in turn is covered by a spirally-wound strip of tin-foil, *h*, Fig. 5. This is coated with the resinous varnish, as shown at *i*, and upon the varnish is wound another strip of paper, *k*, Fig. 6. Over the paper *k* is applied a coating of a bituminous compound, *l*, Fig. 7, rendered permanently viscous by the addition of some proper substance, and into this coating is wound and embedded a layer of twine, *m*. For the protection and strengthening of the cable is then applied the armor *n*, Fig. 8.

A cable is thus produced composed of layers of plastic, insulating, and fibrous materials and metal, the order of the layers and their specific character being as follows: Paraffined paper surrounding the central conductor, a resinous coating, a layer of paraffined paper, a layer of tin-foil, a coating of resinous varnish, a layer of paraffined paper, a layer of tin-foil, a coating of resinous varnish, a layer of paraffined paper, a bituminous coating, a serving of twine, and the armor or exterior jacket of wires.

This cable presents certain important advantages due to the materials entering into its composition and the relations in which they are used.

Fibrous materials have heretofore been saturated with paraffine or with resinous compounds and used in the construction of cables. I have found, however, that a fibrous material saturated with paraffine and coated with a resinous varnish produces a combination which possesses a much higher specific insulation than any of its components. For bringing these materials into the most efficient relations I use for the fibrous material a strong Manila paper .004 inch in thickness. This is saturated with paraffine in the usual way. The varnish or plastic compound that is used in conjunction with this paper is composed wholly or in part of any resinous substance, though I have obtained the best results from the use of a varnish composed of ninety parts of shellac and ten parts of linseed-oil brought to a suitable consistency by the addition of alcohol. This discovery I take advantage of by applying the coating of resinous varnish to paraffined paper wherever an insulating layer is needed in the cable. The resinous varnish may be applied to both sides of the paper with the result of securing a still higher insulation, and in cases where a paper strip is to be applied over a coating of varnish it is desirable that this be done before the varnish has become hard or dry, as by this means a perfect adherence of the two is effected, the paper being practically embedded in the coating of varnish.

In forming the several layers on the cable I prefer to wind narrow strips of paper and of

tin-foil spirally around the central core. The successive layers also should be oppositely wound in order to give greater strength and flexibility to the cable.

The metal used for the layers may be of various kinds. For the inner layer ordinary tin-foil will answer. For the layer next to this, or that designated by the letter *h*, however, it is desirable to use pure tin, since it affords better protection against borers and water, and is not easily corroded by the mineral substances commonly found in solution in water.

For the bituminous coating which is applied over the fourth layer of paper I use refined Trinidad asphalt, rendered permanently viscous by the addition of some substance which maintains it in a slightly plastic condition—such as linseed-oil or the residuum of the petroleum-still, the latter being preferable. It results from this that when the serving of twine is applied it is embedded in the bituminous coating, which, when warm, permeates the twine, binding it firmly together and causing it to adhere closely to the cable.

The insulated metallic sheathings prevent retardation due to the electrical charges of the earth or the currents set up by induction from the central conductor.

In certain respects the construction of the cable may be somewhat varied—as, for example, in the number or arrangement of the layers; or, as indicated above, important changes may be made in the character of the fibrous material or metals used. I have, however, described my invention in the most practicable and useful form of which I am at present aware.

What I therefore claim is—

1. An electrical cable having a central conductor insulated by layers of fibrous material saturated with paraffine and coated with resinous varnish.

2. An electrical cable having a central conductor insulated by one or more layers of paper saturated with paraffine and coated with a resinous substance.

3. An electrical cable having a central conductor insulated by one or more layers composed of a spirally-wound strip of paper saturated with paraffine and coated with a resinous substance, as set forth.

4. In an electrical cable, the combination, with an insulating material composed of layers of fibrous material saturated with paraffine and coated with a resinous substance, of a serving of twine wound in a viscous bituminous coating, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

H. C. SPALDING.

Witnesses:
E. B. WELCH,
ALEX. L. HAYES.