

WIRE INSULATION.

BY H. W. NELSON.

THE insulation of wire for electrical purposes has grown into a large and important industry in this country during the past ten years. For the lack of the right kind of commercial and scientific attention it has grown up very badly in certain lines, viz., those relative to lighting and transmission of power, which are the lines covering by far the larger part of the business.

On the other hand, the manufacture of telegraph and telephone wires, notably the telegraph, has been brought up to a splendid state of efficiency, both commercially and scientifically. The reason is not far to seek, when we consider that such men as Lord Kelvin, Edison, etc., have not thought the minutiae of this branch too small to engross their colossal minds, and that the manufacturers have co-operated with them to turn out a good commercial article. In lighting and power transmission work, attention to the fine details of wire insulating has been positively shirked by the technical men, they having left their part to crude, untrained minds. A glance at the patents list, with its hundreds of ridiculous, foolish specifications for insulating wire, presents evidence of uneducated dabbling.

In conjunction with this neglect of the engineer there has been an almost entire absence of co-operation of the business man with the technical.

As a consequence of the striving of the one for cheap wire and the other for high quality, and no attention to the intervening details, the market has run into two channels: On the one hand a cheap and very poor insulation, and on the other, a high quality and very high price. There are a few grades between, of insignificant amounts, which do not affect the argument.

A friendly association on the part of these men, with a little more regard to the importance of the details involved, would in all probability have made a market for a fair-priced medium wire. For an instance, a wire is needed for interior and hidden work, to go on a 52-volt circuit alternating current from a 1,000-volt main line, or on a 125-volt circuit direct, constant current. For this a wire is demanded having an insulation resistance of from 800 to 1200 megohms per mile, and unless the engineer and underwriters are hoodwinked, a high-priced rubber-covered wire is put in which is capable of withstanding without rupture the shock of from 5,000 to 10,000 volts alternating. This appears an excessively large factor for safety, but with their present knowledge those on whom the responsibility lies cannot accept anything less costly, and take the risk of perhaps an early breakdown of their insulation. They have a general knowledge that an insulation compound made up with a large percentage of pure rubber will resist water and not be short-lived, and that a more attenuated compound, or another compound, may be good or rubbish. They cannot tell without the test of time, and not being familiar with its manufacture, they will not accept risks on another's ipse dixit. They therefore must stick to an extra superfine where an ordinary wire would do.

This ordinary wire, by which is meant a fair insulation resistance sufficiently long-lived, at a medium price, would undoubtedly be forthcoming if the market demanded it. In this regard, however, when the engineer does not demand anything more than an insulated wire, the purchasing agent has an opportunity to get something cheap, and the lowest tender gets the contract. This is the place where very poor stuff masquerades as

electrically-insulated wire. One very prominent kind, which is literally a whited sepulchre, is a wire covered with a braid or wrap of cotton, or other fibrous material, very hygroscopic, which is saturated with pitch, or some much vaunted insulating paint, to render it non-hygroscopic, which it does not; the whole then receives a plaster of whiting and fish-glue, or similar compound, to render it fire-proof, which it does not.

Then again, where the high cost wire is put in, the ends on the cut-outs, rosettes, etc., are often left bare or worse by being insulated with sticking tape, made of cotton (hygroscopic) and poor rubber compound which quickly oxidises, and against such weak spots a wire having an insulating resistance of 200 megohms per mile should be more than ample. In addition to this the flexible drop cords to the lamps have simply been called for in specifications as rubber-covered lamp cord, and the purchasing agent buys the cheapest article which can legally be labelled "rubber-covered." If a drop of salt water be dropped on this cord when the circuit is closed its quality will probably show up in a very bright way.

The insulation called "weatherproof," which is not weatherproof, however, serves the purpose for which it is generally used very well. It is generally used as a line wire on currents at a low voltage, and providing that the pole insulators are good, it simply serves as a separator, preventing a dead short circuit if stray wires of low voltage touch it. In choosing this wire, if the choice were made more with regard to its usefulness and life, and not so much to the highly polished surface, a saving in renewals might be effected without an extra first outlay, in that the money saved by foregoing the extra work in fancy finishing could be put into the material, by having a heavier, stronger covering.

It must be remembered that this covering only acts as a separator, that it soaks up water almost as a sponge, and that the end to be gained is that the covering required be strong enough to resist the rough usage it gets from the kerb-stones, posts, trees, road-gravel, etc., when the linemen are stringing it, and from the sun and rain afterwards. To this end it is necessary to put on two or more strong jute or cotton braids, and to saturate them with a compound which will stick the braids to the wire and preserve them from rotting. There can be very little of the polish left when the wire is stretched on the poles after this handling.

The above somewhat short and imperfect remarks, if they succeed in calling attention to a very backward branch of electrical work, may suggest many ideas for improvement.

(1). It may be suggested that some of our prominent consulting engineers (men above financial interest in any particular manufacture) make a special study of this subject, in order to have more than a mere general knowledge of it.

(2). That the leading fire insurance companies together engage a man thoroughly experienced in wire insulating as a permanent inspector of insulations. (N. B. They already do something abortive in this direction.) That they fit him up with a laboratory, and have a sample of all wires tested and put on record before they are allowed to be strung, or

(3). That the government appoint this official and

(4). That a law be passed making it a misdemeanor for anyone to string wires a sample of which has not been officially accepted by the inspector.