

stranded cables and other similar forms. Long continuous lengths, ample cross section combined with flexibility, and the ease of its installation over crooked courses render stranded cables, in general, better than any other form of conductor available. Substantial iron points in five-sixteenths diameter, for small form buildings, or one-half inch in diameter, for large industrial structures, form one of the best possible systems of conductors for lightning rod construction. There is no good reason for purchasing other fanciful forms of cable at materially greater expense per pound than are asked for standard sizes of cable of approximately the same weight.

(1) Do lightning rods really protect buildings? Answer: Yes; but the rods must be of proper character, properly installed, and properly grounded in relatively moist earth. Periodical inspection and maintenance in good condition are indispensable to efficient protection.

With Insulators or Without

(4) Are gilded or otherwise expensive points of platinum or special metal or of fanciful construction necessary? Answer: No; not in the least. Sharp, needlelike points are effective in dispersing small sustainable electric discharges. No harmful manifestations are perfectly harmless. The imagined superiority of such fanciful points is utterly valueless when the rod is struck by a real lightning flash. The useful qualitative lightning rod must possess the following attributes: strength and security of installation, and permanence and durability under prolonged exposure to the weather. Stout bluntly pointed iron rods three-eighths or one-half inch in diameter rigidly and securely fastened so as to prevent vibration are the best structures to which they are attached satisfy all the requirements.

This question can not be answered fairly in a single statement. Because of its availability and cheapness, as well as its electrical properties, iron is one of the best materials for rods. Iron, however, rusts and deteriorates rapidly when exposed to the weather. This can only partly be overcome by galvanizing; hence, galvanized rods and lightning rods should be of ample size (not less than one-quarter inch in diameter) carefully installed and subjected to systematic inspection and repair. Two-strand cable galvanized in the same style as barbed wire, but without the barbs, is perhaps a very good material for cheap iron lightning rods. The presence of the barbs constitutes a rather serious in-

(6) Solid lightning conductors be made in the form of solid rods, thin bars or bands, stranded twisted cables, woven strands, ribbons, or hollow twisted cables. Answer: Any of the forms may properly be employed, or two or more forms may be employed in combination. Conductors should be put up in long continuous pieces as far as possible. Solid round wires one-quarter to one-half inch in diameter are best for this purpose. Conductors of a size larger than one-fourth inch, however, present difficulties in handling and installation if the rods are solid. It then becomes better to use

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Connections at the Base

(7) **M** Lightning rods should be connected to the earth? Answer: Yes; by all means, and most effectively. Just a few pointers in the lightning-rod profession have been able to impose upon the uninformed a system of installation of lightning rods. Such rods are a menace instead of a protection. It is impracticable to fully discuss these methods, but a main connection to the earth. In general terms, the conductor should be carried down the side of the earth and away from the building in a trench, or by other excavation, so as to reach and embed the electrode itself in plates attached thereto in permanently moist earth. Connections of water pipes or other metal work to itself, and to the earth constitute good grounds.

(8) Are government buildings provided with lightning rods? Answer: Yes; many of them.

(9) Does the government use the

material for the rods or the system of any particular agency? Answer: No; there is nothing mysterious or exceptional about lightning rods, the material of which they are composed, or their construction and installation. Suspicion may well be aroused as to the reliability of those making extravagant claims of superiority for their particular wares to the exclusion of others.

(10) What is the best arrangement of rods on a building? Answer: A building completely screened and surrounded by and enclosed beneath by a network of substantial metal rods, all properly interconnected and joined, will be most effectively protected from lightning discharges. For ordinary purposes a far simpler system is adequate. For example, good protection is afforded by a conductor running along the ridge of the roof, extending to the earth, either at the middle of the sides or, preferably, at each of the four corners. Points should rise above any prominent features, such as chimneys or, in the absence of such features, from the ridge of the roof at intervals of 25 feet or thereabouts.

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