



# AGRICULTURAL ENGINEERING NEWS LETTER

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## LIGHTNING RODS

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### Efficiency of Lightning Rods

A question that every farm owner must answer sooner or later is "shall I install lightning rods on my buildings?" There was, at one time, considerable doubt as to the amount of protection afforded by lightning rods, but we now know that such equipment actually does protect and that it is a relatively cheap form of insurance. The state fire marshal of Iowa found that during the years 1919 to 1924, 60 per cent of the unrodded barns struck by lightning were a total loss while, during the same period, only 4.8 per cent of the rodded barns were destroyed. From statistics gathered in several of the states and in the province of Ontario in Canada the efficiency of lightning rods is found to be well over 90 per cent. In Iowa from 1905 to 1912 an efficiency of 98 per cent was maintained. It is possible that the rodded buildings that were destroyed were destroyed because the rods were either inadequate or defective or both. Most fire insurance companies quote lower rates on rodded than on unrodded buildings.

### What Lightning Is

Lightning is the spark or flash caused by the equalization of the potential or electric pressure between the clouds or between a cloud and the earth. The same principle, only on a very minor scale, may be observed when one's finger comes close to a spark plug on a running gas engine.

Why and how the clouds become charged will not be discussed here, but we do know that the difference in electrical pressure between the clouds and the earth is tremendous, millions of volts at times. We also know that the charge on the cloud, positive perhaps, attracts to it, on the ground below, an opposite or negative charge. If these two opposite charges approach each other closely enough they will come together by means of what we call a lightning flash. If trees, buildings, chimneys or any other objects are higher than the surrounding ground it is only natural that the lightning will strike them because they are closer to the clouds. Lightning always takes the shortest or easiest path from one place to another.

### What Can Be Done About It

Unfortunately there is nothing that we can do that will prevent the accumulation of these opposite charges on the clouds

and the ground below. But we can, to a certain extent at least, help reduce the difference in electrical pressure between cloud and ground so that if the stroke must come we can direct it so that it will do a minimum of damage.

Since a lightning stroke is the result of oppositely charged bodies coming close together, it follows that the higher ground or high objects on the ground are most apt to be struck. It is for this reason that the most dangerous place to be during an electrical storm is on a hill or in a high structure on a flat plain. Chimneys and towers of various kinds are struck most frequently because the tops of them are nearer the clouds. The reason that these chimneys and towers are not destroyed is that they are protected by lightning rods. Tall radio towers, because of their usually isolated location, are practically sure to be struck during any electrical storm. The static that one hears on the radio during a thunder storm may be caused by this interchange of electricity between cloud and tower top. Such towers, usually of steel, are not destroyed because they are nearly perfect lightning conductors. Another reason that these towers are not destroyed is that they permit the difference in potential between cloud and earth to be equalized gradually.

### Points, Rods and Grounds

The protection offered by lightning rods depends primarily on three factors: good grounds, good rods and sharp points. The purpose of the ground is to receive and dissipate any electrical charge brought to it by the conductor. A good ground must be ample in size and thoroughly and permanently bedded in damp soil. The ground must be mechanically strong and of such material that it will not be destroyed by corrosion.

The rod or conductor may be of any metal, since metals are all good conductors, but usually it is of iron or copper. Iron rods are cheaper and are most frequently used. They may be and usually are protected by a copper or zinc coating. Copper conductors may be hollow, solid, star shaped, twisted cable or flat braided tape. The rods may be fastened directly to the building or held away by insulators. The insulators are of no particular value except, perhaps, to relieve the owner's mind. A continuous rod of any

kind is always better than a jointed one because the joints may become loose and make poor electrical connections. The average barn or similar building should have at least two rods and grounds, usually at opposite corners. Lightning rods must be protected against mechanical damage, such for instance as being struck by a passing wagon hub.

Points should be sharp and of such material that they will stay sharp. Whenever the electrical potential between the earth and clouds becomes great enough there is a mutual attraction and since the earth can not move, the cloud tends to lower. When the cloud gets low enough there is some leakage from sharp points on the earth to the clouds or perhaps from clouds to earth. The leakage, while of no great moment, does have some effect in reducing the strength of the flash when it comes. The more points the more leakage. This action is somewhat similar to that of a safety valve on a boiler. Safety valves do not prevent boiler explosions but they do help.

Good practice requires points on all chimneys, cupolas, ventilators, etc., and about twenty feet apart on all ridges.

### Losses from Lightning

The annual property loss in the United States from lightning is estimated to be about \$10,000,000. During the same period between 400 and 500 people will be killed by the same means. There probably is no way by which this terrific loss can be entirely eliminated but it can be reduced very materially by exercising a few precautions. All buildings, particularly those in exposed locations, should be rodded. The more valuable the building or its contents the more protection it needs. Lightning arresters on radio antennae, telephone and power lines undoubtedly help. All wire fences should be grounded; steel fence posts make excellent grounds. Permanent metal work, such as hay tracks, should be thoroughly bonded to the lightning rod. The safest place during a thunder storm is in a steel building or a building protected by lightning rods. If compelled to be outside avoid hills or knolls and by all means avoid taking shelter under an isolated tree.

A very good bulletin "Nature's Artillery," may be had, free of cost, from the National Board of Fire Underwriters at 222 West Adams Street, Chicago, Illinois.