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J. R. COOLIDGE

1,965,629

CROSS ARM

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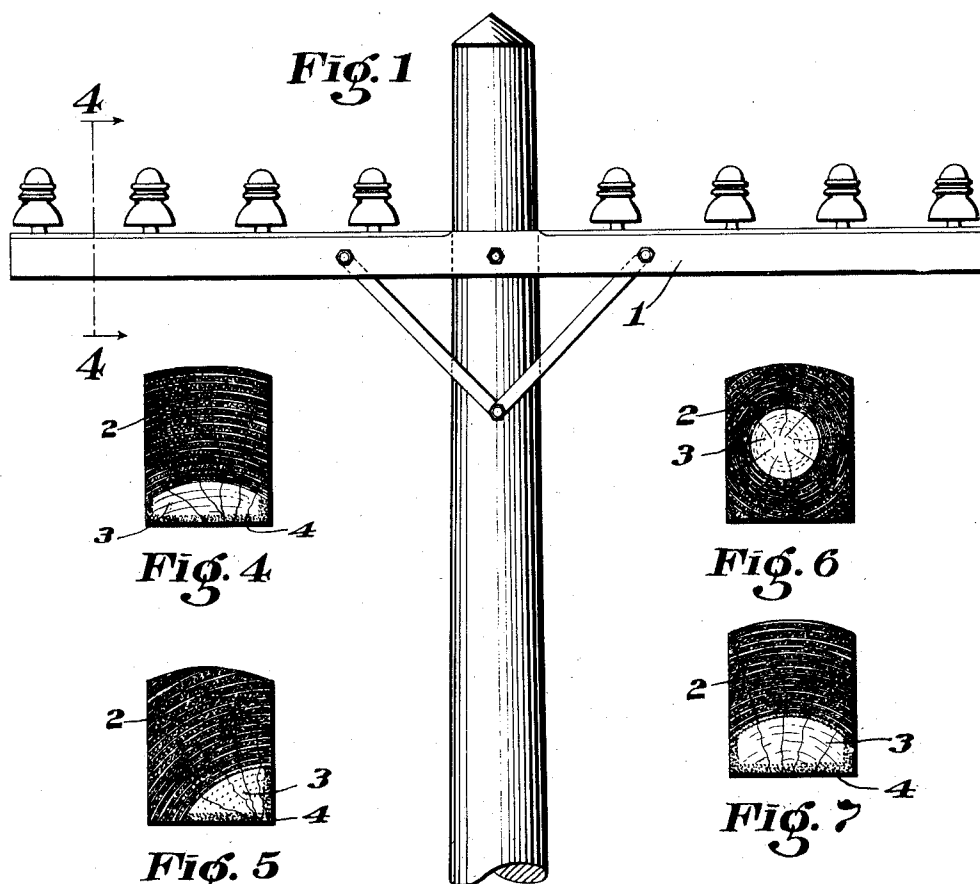
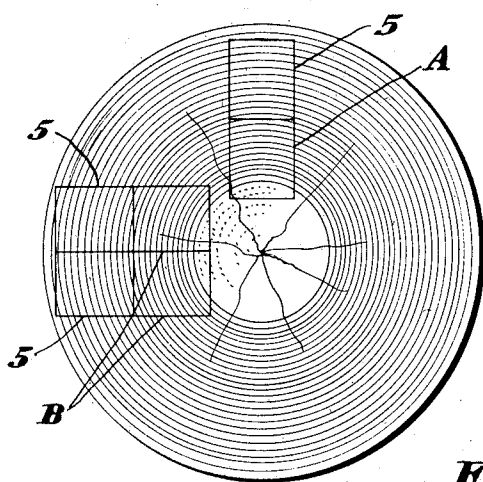
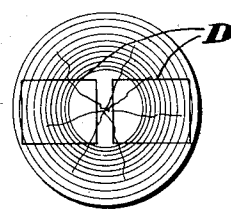
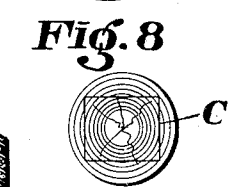
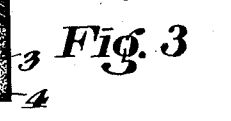


Fig. 2

Fig. 9.
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UNITED STATES PATENT OFFICE

1,965,629

CROSS ARM

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Application January 19, 1931, Serial No. 509,610

2 Claims. (Cl. 99—12)

This invention relates to cross arms for telegraph and telephone poles, electric light poles, and the like.

As is well understood by those skilled in this art, the cross arms support the pins which carry the insulators to which the telegraph, telephone, or power wires are fastened. They therefore carry a substantial mechanical load. In addition they often perform an important insulating function, particularly in the case of power transmission lines, where there may be a very high difference in voltage between adjacent wires carried by the same cross arm. For example, it happens occasionally that an insulator will become cracked or broken, thus allowing the wire which it formerly supported to drop on to the cross arm. If this occurs with two wires or cables on the same arm between which there is a high difference in potential, and the cross arm is wet, a short circuit occurs which is very likely to cause what is commonly known as a "pole fire". Such fires are even more likely to occur when metal insulator pins are used. There is also a substantial leakage along the cross arms between high potential conductors which becomes very pronounced in wet weather and which represents an appreciable loss of power. Circuit disturbances which create a rise in the potential difference between the conductors, and high potentials produced by lightning, may bring about conditions which will cause a "flash-over" between adjacent conductors, these usually occurring at the cross arms because the insulation between conductors is poorest at these points. It is obvious that as the cross arms decay and therefore hold water for longer periods of time, the electrical leakage increases and the conditions become more favorable to flash-overs.

Most cross arms contain both heart wood and sap wood. In untreated cross arms it is preferable to have as much heart wood as possible because the heart wood is more resistant to decay than the sap wood. The reverse is true, however, in cross arms which are impregnated with water resistant preservatives, such as creosote, since the sap wood absorbs the preservative far more readily than the heart wood, and when properly treated or impregnated is far more resistant to decay than the untreated heart wood. It is now the usual practice to treat or impregnate cross arms with preservatives of some character, creosote being the material most commonly used. Practically no attention, however, is paid to the relative distribution of the heart wood and sap wood in the cross arms except

insofar as the preponderance of one or the other affects the treatment to be given. That is, it is customary, at least in many concerns, to grade the cross arms according to the relative proportions of heart wood and sap wood, those having, say 80% or more of heart wood being graded as "heart arms" and those having a corresponding percentage of sap wood being classified as "sap arms", while the others are placed in a third grade often referred to as "mixed arms". This classification, however, is simply made for use in determining factors governing the treatment to be given.

While these impregnating treatments substantially increase the life of the wood, and also improve its insulating properties, much of their effectiveness is lost by the fact that the heart wood will not take the treatment to any substantial extent. The heart wood also is very likely to check, split or crack open, allowing water to enter the heart wood where it is retained, thus promoting decay and reducing very materially the insulating properties of the arm. The treated area of sap wood is very likely not only to assist in holding water in the heart wood, but to retard the drying out process.

The present invention deals particularly with these conditions. It aims to devise a treated or impregnated cross arm which will have an exceptionally long life, unusually high and stable insulating properties, and which can be manufactured economically.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawing and the novel features will be particularly pointed out in the appended claims.

In the drawing,

Fig. 1 is a side view of the upper part of an electric light, telephone or telegraph pole equipped with a cross arm embodying features of this invention;

Figs. 2 and 3 are diagrammatic views indicating sections of a log showing different methods of cutting cross arms from the log;

Figs. 4, 5, 6, 7 and 9 are sectional views of cross arms embodying this invention; and

Fig. 8 is a view similar to Figs. 2 and 3 illustrating still another method of cutting cross arms from a log.

A typical 8-pin cross arm such as that shown at 1 in Fig. 1 usually is approximately 10 feet in length, about 4¾ inches in height, and 3¾ inches in thickness. These dimensions obviously will vary with the requirements of the service in which the

arm is to be used and with the preferences of different companies. It is the usual practice to make the top or "roof" of the arm either rounded or V-shaped in contour to enable it better to shed water.

5 In these respects the arm illustrated is like those commonly used heretofore. Various kinds of wood may be used in making the arms, southern yellow pine being very commonly employed for this purpose.

10 An important feature of the present invention consists in so cutting the cross arms from the log that the heart wood exposed at the lateral surfaces of the arm is confined to the lower half, and more preferably to the lower third, of the height of the arm. Heart wood is, however, 15 permissible in the upper half of the arm provided it is protected both laterally and above by a wall of substantial thickness of sap wood. Preferably this thickness of sap wood is at least half an 20 inch.

All the arms are impregnated with some water resistant preservative, such as creosote oil. A very much better cross arm, however, is produced by impregnating the wood in accordance with my 25 prior Patent No. 1,556,570, granted October 6, 1925. This impregnation may be effected either with Montan wax alone or, as is the more common practice, with a mixture of 60% of Montan wax to 40% of creosote oil.

30 In Figs. 4, 5, 6, 7 and 9 of the drawing the dark areas 2 indicate the sap wood impregnated with a water resistant preservative, while the light areas 3 indicate the heart wood. That part of the heart wood closely adjacent to the outer surface 35 of the arm will be impregnated to a slight depth, say for example, one-eighth of an inch, or perhaps somewhat more, with the preservative. This area is indicated by the dark margin 4. By far the greater part of the heart wood, however, will 40 absorb little, if any, of the treating medium. The depth to which the heart wood is impregnated will vary greatly with the condition of the wood, the characteristics of the species, and the nature of the treatment, the penetration of this part of the 45 wood being very erratic.

As above stated, this invention requires the cutting of the cross arms from the logs in an unusual manner in order to confine the heart wood to the lower part of the arm unless it is to 50 be protected by sap wood in the manner above described. In Fig. 2 the log there indicated has an unusually thick sap wood in proportion to the amount of heart wood. It would be possible, therefore, to cut from this log cross arm blanks 55 5 composed entirely of sap wood and additional blanks A from which cross arms similar to those shown in Figs. 4 and 7 can be made. Other blanks B might also be cut from this log from which cross arms similar to those shown in Fig. 5 could 60 be produced. A cross arm like that shown in Fig. 6 might be cut from a log having the section shown in Fig. 3, the blank for this arm being indicated at C. Also, blanks D sawed from the log shown in Fig. 8 could be worked into cross 65 arms similar to that shown in Fig. 7. It is not contemplated that the remainder of the material in these logs would be wasted, but that it could be made into other arms suitable for other purposes or utilized in other ways. Fig. 9 shows an 70 arm similar to that illustrated in Fig. 7 but in which the proportion of heartwood is somewhat greater. Only a few of the arm blanks which can be cut from the log shown in Fig. 2 are there indicated, but the manner in which the others would 75 be sawed out is obvious from the illustration given.

These views are intended simply to indicate typical ways in which these cross arms can be produced.

The impregnation of the cross arms can be effected in accordance with common impregnating methods well understood by those skilled in the art of wood preserving, or more preferably, in accordance with my prior patent above designated. All the manufacturing operations should 80 be performed before treatment, including the boring of the holes for the pins, lag screws and bolts, shaping the "roof", planing the arm, etc. 85

This invention ensures the protection of the untreated heart wood by a solid covering of treated sap wood both above and at the sides of the heart wood. Since the sap wood takes the treatment very readily and is, therefore, effectively 90 protected, it also serves to protect the heart wood due to its relationship to the latter. When the cross arms have been installed on the poles, the heart wood is practically certain to check or 95 crack. This checking, however, always occurs radially of the heart wood, as indicated in Figs. 2 to 9. By locating the heart wood in the manner above described, any serious checking is confined almost exclusively to the heart wood, the 100 checks running into the treated sap wood to only a very slight extent. Any checking which occurs prior to impregnation is usually not particularly serious since the checks are filled during the treatment. The checking which causes 105 any substantial trouble is that which occurs after the treatment and usually after the cross arm has been put into service. In arms like that shown in Fig. 6 where the heart wood is entirely 110 surrounded by a substantial thickness of treated sap wood, no checking of a serious nature is likely to occur, and in arms such as those shown in Figs. 4, 5, 7 and 9 where the heart wood is 115 confined entirely to the lower half of the arm, any checking that occurs is directed downwardly so that there is no opportunity for water to run into the untreated heart wood by gravity. In other words, the checking is confined both as to 120 location and direction. 190

Moisture which is absorbed by the heart wood in damp weather is dissipated in dry weather since it is not imprisoned or sealed into the wood. The requirements for this kind of a cross arm 125 also insure the selection of better arms since the grain must be relatively straight in order to comply with the conditions above specified. If these arms are treated in the manner disclosed in my prior patent above referred to the checking difficulties are greatly reduced, particularly 130 since internal checking is not likely to break out through the treated sap wood. Furthermore, the insulating properties of the wood are thereby increased very substantially since the Montan wax and mixtures of Montan wax and creosote 135 specified in said patent are extremely waterproof. Also, the insulating properties of an arm so treated are much less affected by weather conditions than are the ordinary creosoted cross arms. These are important practical advantages, particularly 140 when the cross arms are used in power transmission lines since the electrical leakage between conductors is materially reduced, as compared with prior cross arms, and this reduction holds true in all kinds of weather and 145 throughout the entire life of the arm. 190

In the foregoing description no mention has been made of the impregnation at the ends of the arms. Both the sap wood and the heart wood absorb the treating medium more readily 150

by penetration endwise of the grain than in any other direction so that no particular attention need be given to these parts of the arms.

said arm being impregnated with a water resistant preservative.

While I have herein shown and described typical embodiments of my invention, it will be understood that the invention may be embodied in other forms without departing from the spirit or scope thereof.

2. A wooden cross arm impregnated with a water resistant preservative and including both heartwood and sapwood, the heartwood exposed at the lateral surfaces of the arm being confined to the lower half of the arm and the heartwood present in the upper half of the arm being protected both laterally and above by an outer wall of sapwood at least half an inch thick and impregnated with said preservative, the heartwood exposed at the outer surface of the arm being also impregnated to at least a slight depth with said preservative.

Having thus described my invention, what I desire to claim as new is:

1. A wooden cross arm including both heartwood and sapwood, the surfaces of the heartwood exposed at the sides of the arm being confined to the lower half of the arm, and approximately the entire body of the sapwood in

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