June 14, 1932. A. O. AUSTIN 1,863,080

PROTECTION OF WOOD POLES BY AN INTERRUPTED OR SHUNT PATH

Filed July 2, 1926 2 Sheets-Sheet 1

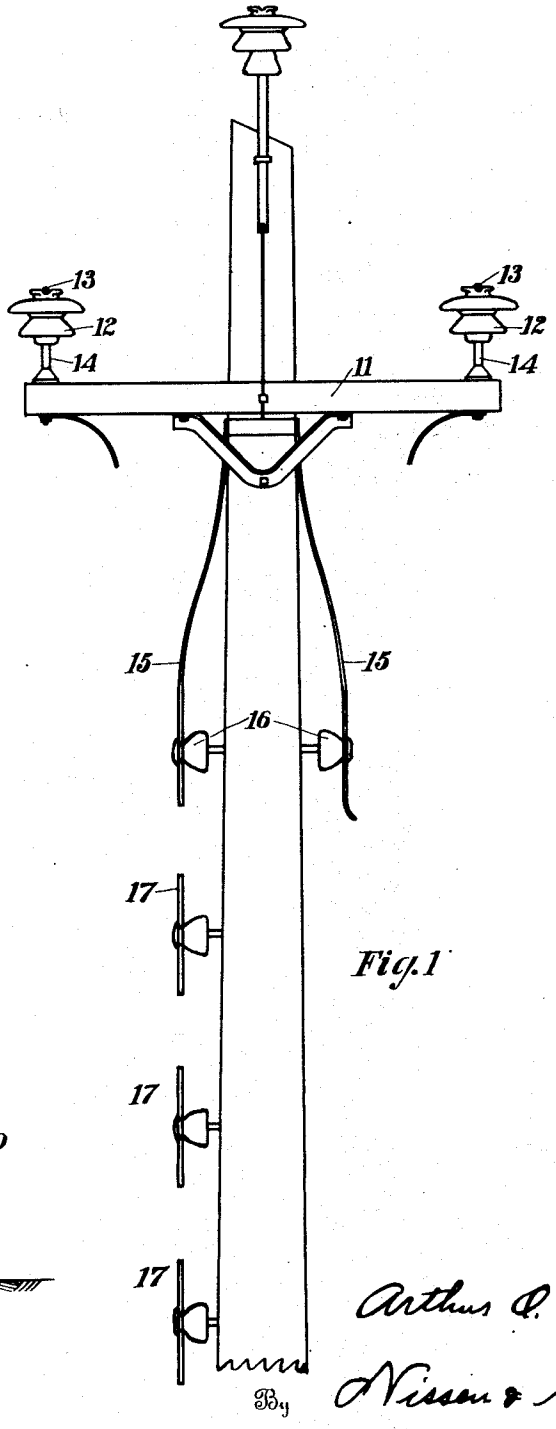


Fig. 1

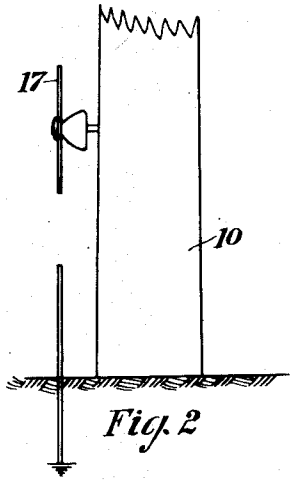


Fig. 2

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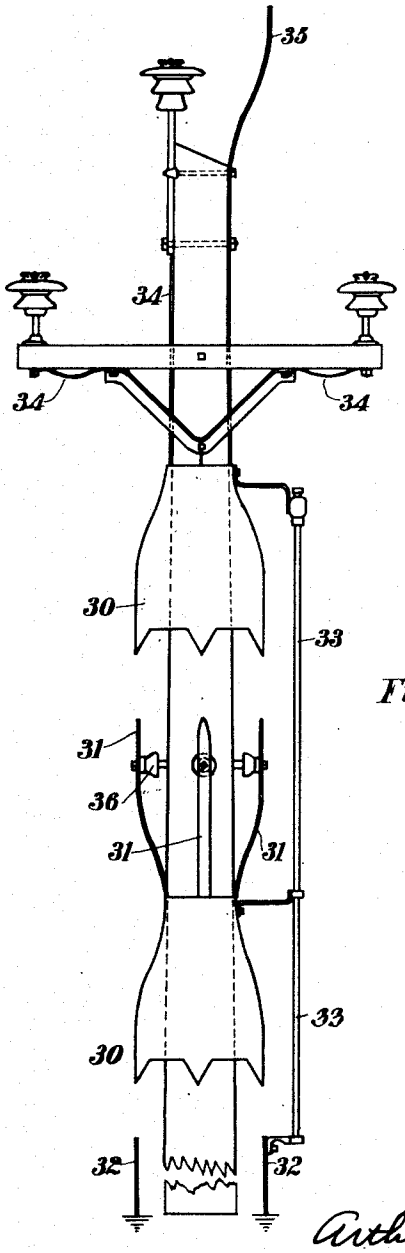


Fig. 3

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UNITED STATES PATENT OFFICE

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PROTECTION OF WOOD POLES BY AN INTERRUPTED OR SHUNT PATH

Application filed July 2, 1926. Serial No. 120,086.

This invention relates to supports for electrical transmission lines and has for its object the provision of means for overcoming objections heretofore encountered in the use of wood poles for supporting high potential transmission lines.

The invention is exemplified in the combination and arrangement of parts shown in the accompanying drawings and described in the following specification and it is more particularly pointed out in the appended claims.

In the drawings—

Fig. 1 is an elevation of the upper portion of a pole having one embodyment of the present invention applied thereto.

Fig. 2 shows the lower portion of the pole illustrated in Fig. 1.

Fig. 3 is an elevation of a modified form of the invention.

While it is generally recognized that the insulation in wood poles is very effective in supplementing that of the insulators carrying high tension conductors, this supplementary insulation in some cases amounts to far more than that furnished by the insulator and tends to eliminate interruptions due to power arcs to ground which may be caused by birds or squirrels shunting out part of all of the insulation furnished by the insulator or by lightning, producing stress which will cause a discharge over the insulator. In many cases the difficulty or limiting factor in making use of the wood insulation is the frequent shattering of the poles by strokes of lightning or discharges produced by same.

The present invention makes use of the insulation furnished by the pole and at the same time prevents shattering by severe electrical discharges.

Fig. 1 shows one form of the invention in which is shown a wood pole with bottom portion 10, cross-arm 11, insulators 12 and conductors 13. The insulators are mounted on pins 14 which may or may not be in electrical contact with each other. It is generally preferably to leave them disconnected and the insulators may be mounted on either wood or metal pins. In general, where leakage conditions are severe, tending to cause burning of the supporting wood structure, it is advisable to mount the insulators on metal pins and bond the several pins together, but not to ground. In most cases, the resultant voltage and current to ground is so small that no burning would result. Even where this is the cause, the screening or discharge members 15 will tend to eliminate the trouble by reducing the localization of the charging current. Where a path of low resistance is placed along side of a path of very high resistance, the electrical discharge will take the former so that the current flowing in the high resistance will be negligible for all practical purposes.

While running a metal lead down the side of the pole will shunt the discharge and prevent the destruction of the pole by lightning, it will also cut out the resistance or effective insulation of the pole which it is desired to maintain in order that flash-overs may be reduced to a minimum.

In many cases, if the arc or discharge is started some distance from the pole and does not have an opportunity again to enter the pole through a bolt or other fitting, the pole will not be shattered, although a potential sufficient to strike an arc to ground may be imposed on the structure. This desirable result may be accomplished by using a metallic conductor 15 to start the discharge to ground away from the pole and at the same time screen the pole so that discharge will not take place through it. In order to accomplish this, the discharge member 15 should be close to the pole or preferably in contact with it. As it extends downward, the space between the member and the pole is increased. This tends to increase the effective length of the unshunted portion of the pole so that the resistance of striking distance of the path along the pole will be greater than that between shunting member 15 and the next succeeding shunting member. A single shunting member 15 may be used or a number. The shunting member 15 may be in the form of a continuous weather shed if so desired, maintaining a high resistance for the section of the pole protected from the weather at all times. This protection is usually not necessary to prevent flash-over during lightning

storms, but may be desirable to prevent arcs to ground caused by birds or squirrels shunting the insulator. In most cases, a single shunting or discharge member is all that is necessary to protect the pole. Where considerable protection is necessary the shunting member can be continued for a considerable distance in the direction of the pole. Where a small member is used, it is frequently desirable to support the end of the member by an insulator 16 mounted on the side of the pole. In many cases an insulator is not necessary as a simple wooden arm or member can be used, particularly where this member has a high resistance, such as a piece of wood impregnated with linseed oil or paraffine.

Where several metal shunts 15 are used there is usually strong electrostatic repulsion at the high voltage which tends to start the arc or discharge outwardly from the pole where two or more conducting members are disposed around same. Where it is desired to maintain the full resistance of the pole to ground and reduce the resistance of the shunt path further than would be the case where the discharge point is well up the side of the pole, the additional discharge members 17 may be used to direct the arc. These members are preferably held with a wood member or mounted on an insulator, although in many cases they may be supported by a metal bracket. In general, where these members are supported with an insulator, there is less danger of an arc striking back into the pole and causing destruction than where a metal supporting bracket is used. The distance between the member 17 and the pole may be gradually increased or decreased as desired. It is evident that the shunting members 15 may be carried within a short distance of the ground if so desired. This, in general, is an objection, however, as any unbalanced leakage might tend to endanger the life should a person or animal come in contact with the member. Where the ends of the discharge member are located well up from the ground, there is little danger of this. Where it is desired to effect a rather short discharge gap or gaps in series it will not change the general characteristics of the pole so far as leakage is concerned and at the same time will effect a protection for very high voltages. Where there are a number of gaps in series or the amount of effective insulation of the pole cannot be shunted by any one climbing the pole, there is little danger of a shock due to unbalanced voltage to ground as it will be impossible for anyone to shunt out all of the pole resistance at one time. A rod or pole may be spaced from the lower end of the arc or discharge allowed to go to ground direct. Usually a rod driven in the ground at or near the pole is all that is required. If several rods are driven in the ground around the pole and bonded together, they will effect a screening for the lower end of the pole so that current will not enter same, although the resistance of the pole may be relatively low where it enters the ground. In general, poles of high resistance need less shunting than poles of low resistance. Complete impregnation of the pole tends to keep water out of the center of the pole and maintain the resistance of same. Starting the discharge well away from the pole lessens the danger of fire and rods driven into the ground in the vicinity of the pole with their ends projecting above the grass or other material will also tend to pick off the lower end of the arc and avoid setting fire to combustible material on the ground.

In the form of the invention shown in Fig. 3 a gap or series of gaps shunting the pole are formed by a metal hood 30 and horns or points 31, the last of the points 32 terminating in the ground. By using the metal hood 30 it is possible to maintain a portion of the pole dry or partly dry so that there will be less danger of an arc forming at normal frequency. The gaps may be shunted by a resistance 33 so that any combined leakage and charging current to ground will not burn the pole. With the dry zone there will be less danger of burning or a point of localized high resistance which occurs when there is a dry spot in the path along a wet pole.

When the metal insulator pins are connected by jumpers 34, the current will flow through these jumpers without burning the arms. Where a static or lightning rod 35 is used, it may be used to connect the pin of the upper insulator through the member 30 forming one side of the gap. While the portion of the gap projecting upward may be entirely enclosed, this is usually not advisable as it tends to induce birds to build nests in the opening and also to catch snow or water.

Where a considerable portion of the pole is to be shunted, the points 31 may be held or steadied by insulating members 36 which may be regular porcelain or glass insulators or be only wood pins or members in some cases. Where a lightning rod is used, it tends to charge up the metal structure to which the insulator is attached and thereby eliminates the tendency to discharge over the insulator. A series of gaps shunting the pole will protect the pole from shattering and at the same time maintain its full insulation to prevent bird trouble and may add greatly to the effective flash-over between conductor and ground, thus tending to eliminate flash-overs and interruptions, even under very severe conditions.

The shunting resistances 33 can be relatively high where it is possible to provide a dry zone or high resistance zone in the pole. For lightning, however, they are very effective though the resistance may be less than 100

ohms. In general, it is an advantage to have the shunting resistance 33 high as the danger of a power arc picking up due to a short produced by a bird is very much less.

The dry zone formed by the canopies 30 permits of increasing this resistance very materially over what would ordinarily be possible with the whole pole left unprotected. In many cases, the unbalanced leakage current to ground on a system is so slight that the resistances 33 may be very high so that even though a bird or squirrel causes a short over the insulator, the arc will clear owing to the fact that the current is limited to a very small value.

I claim—

1. The combination with a wood pole of a transmission line carried by said pole and insulated therefrom, a screening member of conducting material mounted on said pole near said transmission line but insulated therefrom, and an interrupted arcing path comprising a plurality of conducting members spaced outwardly from the said pole and outlining an arcing path from said screening member to ground.

2. The combination with a pole of dielectric or high resisting material, of a conductor supported on the upper portion of said pole and insulated therefrom, a member of conducting material secured to said pole adjacent said conductor but insulated from said conductor and flared outwardly and downwardly from said pole, and spaced conducting members disposed along said pole and forming with said first named conducting member, an interrupted arcing path from the upper portion of said pole to ground, said conducting members being spaced outwardly from said pole.

3. The combination with a wood pole of an insulator mounted on said pole, a transmission line conductor carried by said insulator, a screening member of conducting material secured to said pole adjacent said insulator and insulated from said transmission line, said screening member being directed downwardly and gradually flared outwardly from said pole, conducting members spaced along said pole and forming a series of arcing gaps from said screening member to ground and insulating supports for said spaced conducting members.

4. The combination with a wood pole of an insulator mounted on the upper portion of said pole, a transmission line carried by said insulator, a screening member of conducting material secured to the upper portion of said pole and insulated from said line and gradually flared outwardly and downwardly therefrom, spaced conducting members distributed along said pole and forming an interrupted arcing path paralleling said pole and spaced outwardly therefrom and a grounded member at the bottom of said arcing path and spaced outwardly from said pole.

5. The combination with a pole of high resistance material having a conductor supported thereon and insulated therefrom, of a discharge circuit insulated from said conductor and paralleling said pole and comprising conducting members spaced at intervals along said pole and having discharge gaps between said members spaced outwardly from said pole.

6. The combination with a pole of high resistance material having a conductor supported thereon and insulated therefrom, of a member of conducting material secured to said pole adjacent the top thereof and insulated from said conductor and a series of conducting members spaced from one another along said pole below said member of conducting material, said conducting members having arcing gaps therebetween spaced outwardly from said pole and a high resistance shunt paralleling said arcing gaps.

7. The combination with a pole of high resistance material, of a conducting member secured to said pole adjacent the top thereof and having a hood surrounding a portion of said pole and flared outwardly therefrom and a second conducting member having arcing points spaced from the lower edge of said hood.

8. The combination with a pole of high resistance material, of a plurality of conducting members spaced from one another along said pole, one of said conducting members having a protecting hood surrounding a portion of said pole to protect said pole from weather conditions.

9. The combination with a pole of high resistance material, of a plurality of conducting members distributed along said pole and spaced from one another to provide a discharge path parallel to said pole, one of said conducting members having a protecting hood flared outwardly and downwardly and having upwardly and outwardly flared arcing horns forming arcing gaps with the conducting member above said horns.

10. The combination with a pole of high resistance material having a conductor supported thereon and insulated therefrom, of conducting members distributed along said pole and spaced from one another to provide a discharge path paralleling said pole, one of said conducting members being attached to said pole intermediate the ends thereof and having upwardly directed discharge horns gradually flared outwardly from said pole to bring the points of said horns in spaced relation with said pole and having a downwardly directed hood encircling a portion of said pole, said hood being flared outwardly to bring the lower edge thereof in spaced relation from said pole.

11. The combination with a pole of high

resistance material having a conductor supported thereon and insulated therefrom, of spaced conducting members forming a discharge path paralleling said pole, one of said members comprising a downwardly and outwardly flared hood surrounding a portion of said pole while the next lower member is provided with upwardly and outwardly flared arcing horns forming arcing gaps with the lower edge of said hood and a high resistance shunt paralleling said arcing gaps.

12. In combination a wood pole, an insulator carried by said wood pole, a transmission line carried by said insulator, a charge-receiving body mounted on said wood pole in the vicinity of said transmission line but insulated from said transmission line, and a discharge path from said charge-receiving body to ground, said discharge path having an air gap therein normally breaking the continuity of said path but arranged to be bridged by an arc when the potential of said charge-receiving body exceeds a predetermined value.

13. In combination a wood pole, an insulator mounted on said pole, a transmission line carried by said insulator, a charge-receiving body carried by said wood pole in the vicinity of said transmission line but insulated from said transmission line, and a discharge path from said charge-receiving body to ground, said discharge path being spaced away from said wood pole and having a gap therein normally breaking the continuity of said discharge path but arranged to be spanned by an arc spaced away from said wood pole when the potential of said charge-receiving body exceeds a predetermined value.

14. In combination a wood support, an insulator carried by said support, a high potential transmission line mounted on said insulator, a screening member of conducting material mounted on said support adjacent said transmission line but insulated from said transmission line and from ground, a discharge path to ground from said screening member comprising an arcing gap spaced from said wood support, and a high resistance shunt bridging said arcing gap and also spaced away from said wood support.

15. The combination with a charge carrying conductor, of an insulator for supporting said conductor, a wood member holding said insulator in place and providing insulation between said conductor and ground in series with said insulator, and means forming a discharge path in parallel with said wood member and spaced therefrom to prevent injury to said wood member by abnormally high voltage discharges, said means comprising spaced discharge points forming an arcing gap in said path spaced away from said wood member.

16. The combination with a charge carrying conductor, of an insulator for supporting said conductor, a wood member holding said insulator in place and affording insulation between said conductor and ground in series with said insulator, and means for preventing injury to said wood member by leakage currents, said means comprising a high resistance leakage path apart from said wood member and in shunt therewith from said insulator to ground for conducting to ground currents which leak from said conductor over said insulator.

17. The combination with a charge carrying conductor, of an insulator supporting said conductor, a wood member holding said insulator in place and providing additional insulation between said conductor and ground in series with said insulator, a discharge path in shunt with said wood member between said insulator and ground including spaced arcing members forming a discharge gap in said path spaced away from said wood member, for protecting said wood member from injury by high potential discharges, and a high resistance leakage path between said insulator and ground and in shunt with said wood member and spaced away from said wood member to prevent leakage currents which flow over said insulator from injuring said wood member.

18. A transmission line support comprising a wooden structure, a transmission line carried by said structure, metallic parts positioned near the top of said structure and insulated from said transmission line and from ground, and a discharge member connecting with said metallic parts adjacent said wooden structure and having a free end spaced away from said wooden structure, and a grounded member forming an arcing gap from said free end to ground.

19. A support for a conductor comprising a wooden structure, insulating means supporting a conductor on said structure, metallic parts supported by said structure adjacent said conductor but insulated therefrom and also from ground, and a discharge member connecting with said metallic parts and having a free end directed downwardly and spaced away from the surface of said wooden structure, and a grounded member forming an arcing gap from said free end to ground.

20. In combination a wood pole having an insulator support thereon, a conductor carried by said insulator, a charge receiving member of conducting material carried by said pole adjacent said conductor but insulated from said conductor and from ground, and a discharge member connecting with said charge receiving member and gradually flared outwardly from said pole and having its free end spaced away from said pole, and a grounded member forming an arcing gap from said free end to ground.

21. A conductor support comprising a

wood structure, an insulator mounted on said structure, a transmission line carried by said insulator, a metal charge receiving member mounted on said structure adjacent said transmission line but insulated therefrom and from ground and a high resistance leakage conductor connecting said charge receiving member to ground, the resistance of said leakage member being sufficient to retain a charge on said charge receiving member for a period commensurate with the time that a like charge is retained on said transmission line.

22. A support for a conductor comprising a wood structure, an insulator mounted on said structure, a transmission line carried by said insulator, a charge receiving element supported on said structure adjacent said transmission line but insulated therefrom, a discharge horn connected with said charge receiving element and inclined outwardly and downwardly away from the surface of said structure, and a cooperating horn inclined upwardly and outwardly from said structure and having a free end spaced from said first named horn to provide an arcing path away from the surface of said structure.

23. A conductor support comprising a wood structure, a plurality of insulators mounted on said structure in spaced relation to each other, transmission lines carried by said insulators and charge receiving elements mounted on said pole and insulated from said transmission lines and from ground, said structure having an insulating section below said charge receiving member and means for directing discharge across said insulating section away from the surface thereof.

24. In combination a wood pole having an insulator near the top thereof, a transmission line carried by said insulator, a member of conducting material insulated from said transmission line and from ground and shunting a portion of said wood pole adjacent the top thereof, and arcing horns forming a discharge path to ground from said member of conducting material, said path being spaced away from said pole and spanning a portion of said pole below said member of conducting material.

25. The combination with a charge carrying conductor, of an insulator for supporting said conductor, a wood member holding said insulator in place and providing insulation between said conductor and ground in series with said insulator, and means forming a discharge path in parallel with said wood member and spaced therefrom to prevent injury to said wood member by abnormally high voltage discharges, said means comprising spaced discharge points forming an arcing gap in said path spaced away from said wood member.

26. The combination with a charge carrying conductor, of an insulator for supporting said conductor, a wood member holding said insulator in place and affording insulation between said conductor and ground in series with said insulator, and means for preventing injury to said wood member by leakage currents, said means comprising a high resistance leakage path apart from said wood member and in shunt therewith from said insulator to ground for conducting to ground currents which leak from said conductor over said insulator.

27. The combination with a charge carrying conductor, of an insulator supporting said conductor, a wood member holding said insulator in place and providing additional insulation between said conductor and ground in series with said insulator, a discharge path in shunt with said wood member between said insulator and ground including spaced arcing members forming a discharge gap in said path spaced away from said wood member, for protecting said wood member from injury by high potential discharges, and a high resistance leakage path between said insulator and ground and in shunt with said wood member and spaced away from said wood member to prevent leakage currents which flow over said insulator from injuring said wood member.

In testimony whereof I have signed my name to this specification on this 29th day of June A. D. 1926.

ARTHUR O. AUSTIN.