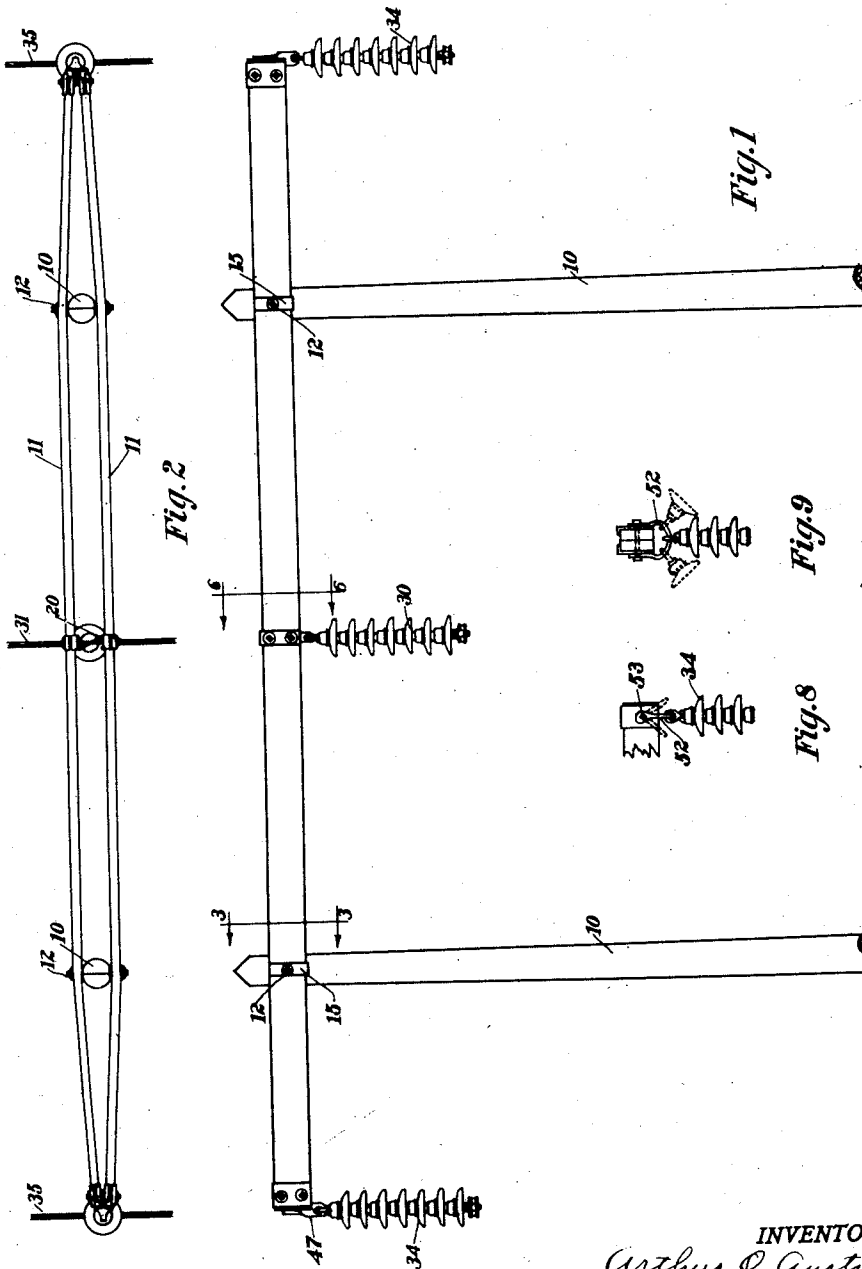


Sept. 13, 1932.

A. O. AUSTIN
CONDUCTOR SUPPORT
Filed June 27, 1928

1,876,580

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

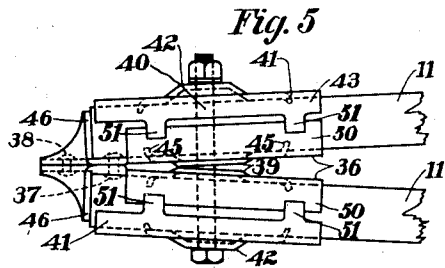


Fig. 5

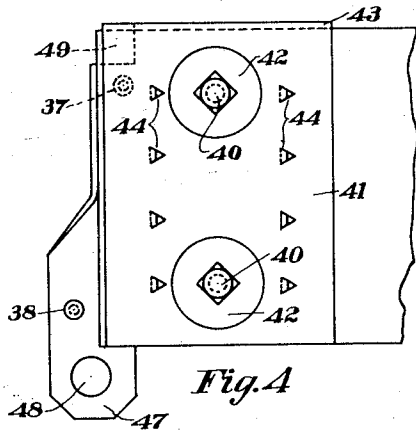


Fig. 4

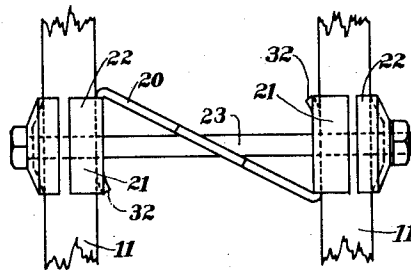


Fig. 7

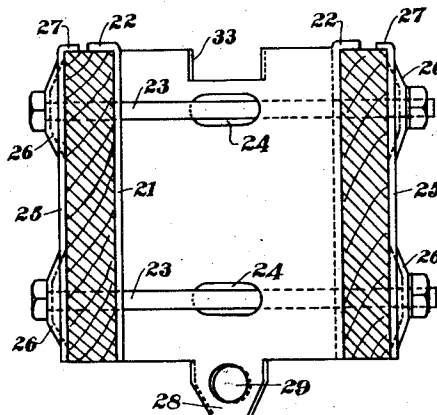


Fig. 6

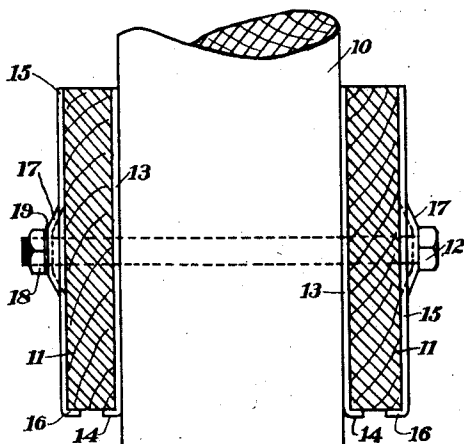


Fig. 3

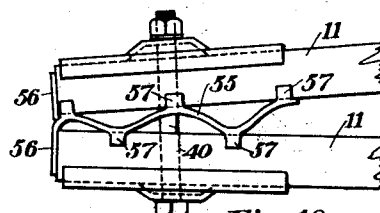


Fig. 10

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CONDUCTOR SUPPORT

Application filed June 27, 1928. Serial No. 288,728.

This invention relates to supports for electrical conductors and especially to wood structures for supporting high voltage transmission lines, and has for one of its objects the provision of a support for electrical conductors which shall be of improved construction and operation.

A further object is to provide a conductor support in which the natural insulating properties of the wood structure will be utilized and which shall also be mechanically efficient and economical to construct and install. Other objects and advantages will appear from the following description.

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 a transmission line support showing one embodiment of the present invention.

Fig. 2 is a top plan view of the support shown in Fig. 1.

Fig. 3 is a vertical section on line 3—3 of Fig. 1.

Fig. 4 is a side elevation of one end of the cross arm structure of Fig. 1 but on a larger scale than that of Fig. 1.

Fig. 5 is a top plan view of the parts shown in Fig. 4.

Fig. 6 is a vertical section on line 6—6 of Fig. 1.

Fig. 7 is a top plan view of the parts shown in Fig. 6.

Fig. 8 is a fragmentary side elevation of a modified construction.

Fig. 9 is a view at right angles to Fig. 8.

Fig. 10 is a view similar to Fig. 5 but showing a modified form of construction.

Many transmission lines are built with wood supporting structures and the present invention deals with improved construction for these transmission lines and while the construction may be used for practically any voltage, it particularly applies to high voltage lines.

In the improved construction it is possible

to utilize the insulating value of the wood for resisting very high potentials set up by lightning. The construction is such that the troubles due to shattering of the poles from severe electrical surges is materially reduced and, at the same time, an improved mechanical construction results.

The invention may take several different forms, the single horizontal construction being shown in Figs. 1 and 2. This construction consists of two poles 10 and a cross arm made of two members 11. The cross arms are attached to the poles by through-bolts 12 and metal supporting members 13 and 15. In making up the cross arm with two relatively thin deep sections, maximum rigidity and strength is obtained in a vertical direction and owing to the rather thin members, it is possible to impregnate the members with a creosote oil or other preservative in a much more thorough manner than where a single large member is used.

Since the effective specific inductive capacity of the wood members is usually several times that of air, a distinct advantage is gained by providing the necessary mechanical strength without providing a large cross section of wood. Owing to the higher flux carrying capacity of the wood over that of air, there is a tendency for the discharge to follow the path of the wood. Where a single large member is used, it frequently has a wet core or center so that under heavy electrical discharge the path of the discharge is likely to be through this core which shatters or destroys the arm, in many cases allowing the conductor to fall. When the arm is made up in two pieces, even though one part is damaged by shattering or burning, the other part is almost certain to withstand the load.

By making up a cross arm with comparatively thin deep members, construction is facilitated owing to the lighter parts and the necessary mechanical strength can be obtained without braces, struts or trusses. Where a wood arm has to be braced or trussed with metal, the effective flashover of insulator and pole is greatly reduced so that the danger of a phase-to-phase short or a discharge to ground is greatly increased. In some cases,

this reduction in effective flashover voltage may easily amount to 40% over that where a carefully designed unbraced and untrussed wood arm is used.

The improvement consists essentially of a cross arm made up of two parts with metal fittings for attaching the insulators to the supporting members which develops a high degree of mechanical reliability and strength, and at the same time, makes use of the effective insulation of the wood members.

Particular attention is given to a construction which facilitates erection and at the same time, accomplishes the desired results.

The wood members can be entirely fabricated before impregnation or before sending into the field. By spreading the two members 11, placing one on each side of the pole, and then bringing the two members together at the end, produces a truss which provides considerable bending moment in the direction of the conductors, even though the moment of inertia of the single members is rather small.

An especially designed saddle or bracket is provided for attaching the wood beams 11 to the poles 10, as shown more clearly in Fig. 3. The plate 13 fits against the inner face of each beam 11 between the beam and the pole 10 and the lower edge of the plate is provided with a flange 14 upon which the bottom edge of the beam 11 rests. A second plate 15 engages an outer face of each beam 11 and is provided with a flange 16 also engaging the lower edge of the beam 11. A bolt 12 passes through both plates 13 and 15 and through the beams 11 and pole 10, thus holding the parts together in the position shown in Fig. 3. The plates 15 are slightly bulged outwardly, as shown at 17, so that when the nut 18 is screwed tightly on the bolt 12, a certain amount of resilient stress will be present in the bulged portion 17 of the plates 15. A lock washer 19 may be interposed between the nut 18 and the plates 15. The bulge 17, on the plates 15, has an action somewhat similar to that of a dome and will, consequently, withstand strong pressure without collapsing and the resiliency of the bulged portion 17 will automatically take up any looseness which may result from the shrinkage of the wood parts, thus retaining the parts tight at all times.

By the use of the complementary saddle plates, supporting niches are provided for the beams 11 which afford supporting shelves for the lower edges of the beams without the necessity of notching or gaining the wood pole. This eliminates a great deal of the labor usually required for attaching cross beams to wood poles and also retains the full strength of the pole and prevents one of the common causes of decay in wood structures. It is well known that decay in wood structures usually starts where the fibers have been injured or where the material has been

cut away and by providing a support which removes the necessity for gaining the pole, one source of decay is avoided.

The plates 13 and 15 also brace the sides of the beams 11 so that the beams are held from twisting or canting. The opening for the bolt 12 in the beams 11 may be slightly larger than the bolt to insure the support of the beams on the flanges 14 and 16 rather than directly by the bolt. The bolt 12, however, will fit closely in the openings in the plates 13 and 15 so that the weight of the beams is transferred to the bolt 12 through the plates 13 and 15.

The pressed metal fitting placed between the members of the cross arm and the supporting pole forms a shelf for taking the downward load of the cross arm. A member of this kind eliminates any necessity of gaining the pole and makes it possible to use but a single bolt. This construction tends to spread the arms further apart, increasing the truss action, and exposes a much greater portion of the surface of the pole so that it will dry out readily. In addition, the pole is not weakened at this point so that maximum strength and life are insured.

While more than one bolt may be used, the single bolt construction makes it possible for some lateral movement without tending to spread the pole or arm. The single bolt also facilitates installation, for with this arrangement, no drilling is necessary in the field. The spring in the arms and in the fittings tends to insure pressure in the bolt heads and nuts at all times so that the danger of nuts coming off is reduced to a minimum.

Midway between the poles 10, the beams 11 are provided with a fitting for bracing the beams and holding them in spaced relation and for supporting a central insulator string. The central bracing means is shown best in Figs. 6 and 7 and comprises a Z plate having a web portion 20 interposed between the beams and engaging their adjacent faces. The Z plate, as shown in Figs. 6 and 7, comprises a transverse web member having angle plates 21 at its opposite upright edges for engaging the faces of the beams 11. The top edges of the angle plates 21 are turned outwardly to form flanges 22 which overlie the top edges of the beams 11. The free edges of the angle plates 21 are biased outwardly so that they are placed under resilient stress when clamped between the beams 11.

Bolts 23 extend through openings 24 in the web 20 and also through openings in the angle plates 21 and beams 11. Plates 25 are fitted on the outer faces of the beams 11 and are provided with openings through which the bolts 23 extend. The portions of the plates 25 surrounding the bolts 24 are bulged

outwardly to form resilient bosses 26, similar to the bosses 17 on the plates 15.

The plates 25 are provided with flanges 27 at their upper edges which rest on the upper edges of the beams 11. An ear having an opening 29 therein is formed on the lower edge of the web 20 for supporting a central insulator string 30. The insulator string 30 carries a conductor 31 and the weight of the string and conductor is supported by the web 20 and is transferred by the flanges 22 to the upper edges of the beams 11. The bolts 24 preferably fit closely in the openings through the plates 21 and 25 but may be provided with clearance in the beams 11 so as to insure the support of the insulator string by the flanges 22 and 27 on the upper edges of the beams. The free edges of the angle plates 21 may be curved inwardly as shown at 32 to prevent the edges from cutting the fibers of the beams 11 where they are pressed against the beams when the bolts are tightened to spring the angle plates inwardly against their initial set. The resiliency of the angle plates 21 and the bosses 26 insures a tight joint between the beams 11 and their fittings at all times, even though the wood may shrink after it has been installed. This member may or may not be provided with teeth which grip the wood members. Clamping straps 25, which are preferably cupped so as to stiffen them and also provide necessary resiliency so that they will be tight at all times even though the wood members shrink, further insure mechanical strength.

While the spacer piece 20 may be bolted to either arm independently of the other, it is usually preferable to use a through-bolt, passing through the fittings and the two arms at the same time.

The Z brace is preferably stamped from a flat plate and the flanges 22 and angle plates 21 bent into position after the blank has been stamped from the stock. A series of blanks may be stamped from a single strip, the ear 28 of each blank being notched from the adjacent edge of the next blank, leaving an opening shown at 33 in the top edge of each web member 20 where the corresponding ear 28 of the next web was removed.

The projecting ends of the beams 11 are sprung inwardly and secured together by end fittings which support end insulator strings 34, from which conductors 35 are suspended. The end fittings are shown best in Figs. 4 and 5. Each end fitting comprises a pair of plates 36 riveted together at 37 and 38 adjacent their outer edges and having contacting bosses 39 which cause the plates to diverge from each other at their inner edges upon an angle corresponding to the angle between the ends of the beams 11 when the ends of the beams are sprung inwardly. The ends of the beams 11 are held against the outer faces of the plates 36 by bolts 40 and plates 41. The

plates 41 are provided with resilient bosses 42 and flanges 43 which rest on the top edges of the beams 11.

Triangular teeth 44 are struck from the plates 41 and bent inwardly to penetrate a short distance into the outer faces of the beams 11 so as to hold the plates 41 firmly from sliding upon the surfaces of the beams 11. Similar teeth 45 are formed on the outer faces of the plates 36 to engage the inner faces of the beams 11. The plates 36 project beyond the ends of the beams 11 and the upper parts of the projecting portions are turned laterally to provide flanges 46 which engage the ends of the beams 11 respectively. Ears 47 are formed at the lower outer corners of the plates 36 and are provided with openings 48 for supporting the insulator strings 34. The plates 36, like the Z brackets 20, are formed from a continuous strip of metal plate, the ears 47 of each plate being struck from the corner of the next adjacent plate leaving a notch 49. A portion of the upper edge of each of the plates 36 is bent over to form flanges 50 at the upper edges of the plates 36, which flanges rest on the upper edges of the beams 11 and support the plates 36, together with the ears 47 and insulator strings 34. The openings for the bolts 40 may be provided with sufficient clearance to insure that the weight sustained by the plates 36 is carried from the top edges of the beams 11, rather than from the bolts themselves. The flanges 43 and 50 may be provided with interlocking tongues 51 and notches for receiving the tongues to hold the plates 36 and 41 from relative movement in the direction of the length of the beams 11.

In assembling the parts, the plates 36 are formed up as shown in the drawings and riveted together before they are placed on the wood beams. After the beams have been secured to the poles and the central fitting has been secured in place, the plates 36 and one of the plates 41 are fitted to the end of one of the beams 11, and the two beams are then sprung together by any suitable clamp or jacking device. The bolts 40 may then be inserted and the other plate 41 placed in position and the nuts tightened upon the bolts, thus firmly clamping the ends of the beams 11 together and securing them against relative movement. The teeth 44 and 45 will be pressed into the fiber of the beams by the pressure of the bolts 40. The entrance of the teeth, if necessary, may be facilitated by tapping the plates with a hammer or other instrument.

For tensions in the direction of the conductor, it is evident that one member will tend to slide by the other. In order to prevent this and develop a high mechanical strength, the new type of fitting for the end of the wood beams, has been devised. This fitting includes a central member which may

be made up of either one or two parts, as desired.

While the bolts 40 will tend to transfer a shearing stress from the outer clamping plates, these plates are subject to some bending moment so that they will not become very effective until some slipping has taken place.

In order to develop the longitudinal grip of the clamping plates to a maximum, they are provided with a projection 51 which meshes with notches in the inner plate. It is evident that there are other means of attaching this plate to the central member which will develop the shearing strength. The bearing plates 41 are preferably made out of steel which may be cut or ribbed so that a good bearing stress is provided, particularly toward the outside of the plate. Making the plates in this manner makes it possible to use thinner material. In addition, the plates spring or deflect when tightened up, the spring in the plates tending to insure tightness at all times. This latter is important as loose metal parts frequently cause much radio disturbance. The springing action permits air space which readily allows the drying out beneath the plates so as to prevent decay.

When the projections or teeth gripping the wood are formed by punching the plates forming the bearing surfaces, further ventilation is provided. The comparatively large area tends to spread the ends of the members so that the danger of electrical discharge starting inside the wood is reduced.

When the parts are assembled the tongues 51 will fit into their complementary notches to hold the plates 36 and 41 against relative movement. It will be seen that the teeth 44 and 45 and the interfitting tongues 51 and complementary notches hold the ends of the beams 11 against any endwise displacement. The flanges 46 which engage the ends of the beams, also assist in holding the beams against relative movement. This firmly braces the projecting ends of the beams and holds them against lateral bending in the direction of the length of the transmission lines.

When the parts are assembled, a rigid mechanical structure is provided in which the parts are firmly braced together and in which full advantage is taken of the mechanical strength of the various parts. The wood parts are not injured or weakened by unnecessary mortising and the suspension lines are carried by a cross arm having a cantilever action for supporting the weight of the lines.

The construction shown is especially adapted for a three-phase transmission line but it will be readily understood that it may be modified for a different number of conductors and that other modifications may be readily made by those skilled in the art

without departing from the spirit and scope of the invention, as pointed out in the appended claims.

In place of the ear 47 for supporting the insulator strings at the ends of the cross arms, a clevis 52 may be supported at each end of the cross arm by means of a clevis pin 53 extending through the end fittings. It will be apparent from Fig. 9 that the insulator string will be free to swing laterally upon the clevis 52, as indicated in broken lines. This may be of considerable advantage in relieving the stress on the cross arm in case the line breaks at one side or the other of the support. The clevis will also pivot upon its pin to permit angular movement of the insulator string transversely of the transmission line.

In the modification shown in Fig. 10, the central plates 36 of Fig. 5 are replaced by a single plate 55 which is undulated to fill the angular space between the beams 11. The projecting edge of the plate has tongues 50 bent in opposite directions and bearing against the ends of the beams. The top edge of the undulated plate 55 is provided with ears 57 resting on the top edges of the beams 11. The plate 55 may be provided with a supporting ear for the insulator string similar to that of Fig. 5 or a clevis similar to that of Figs. 8 and 9 may be employed.

It will be seen that the undulated plate 55 forms a resilient spacer for the ends of the beams that will assist in keeping the joint tight at all times.

I claim:

1. A support for electrical conductors, comprising a pair of spaced wood poles, wood beams disposed at opposite sides of said poles in registration with each other, brackets mounted on said poles and having supporting shelves engaging the lower edges of said wood beams for supporting said beams, a fitting for holding said beams in fixed spaced relation to each other between said wood poles, said fitting having flanges engaging the top edges of said wood beams to support said fitting from said top edges, an insulator string suspended from said fitting, said beams having the ends thereof projecting beyond said poles and sprung inwardly toward each other, clamps for holding said inwardly sprung ends together, said clamps having flanges for engaging the upper edges of said beams to support said clamps from said edges, and suspension insulators suspended from said clamps.

2. A support for an electrical conductor, comprising a pair of connected parts, a threaded member for holding said parts together and a plate engaging said threaded member and having a resilient boss thereon for maintaining tight connection between said parts.

3. A support for an electrical conductor, comprising a pair of members, one of said members being formed of wood, a bolt for securing said members together, a metal
5 plate engaging said wood member and having an opening through which said bolt extends, said plate being bulged to form a boss thereon surrounding said bolt and arranged to exert resilient tension on said bolt to maintain tight connection between said members.

4. A support for an electrical conductor, comprising horizontally disposed beams having registering ends, and means for clamping said ends together, said clamping means having teeth thereon for penetrating said beams to prevent relative movement of said beams when clamped together and having flanges engaging the upper edges of said beams.

5. A cross arm, comprising a pair of wood
20 beams having projecting ends disposed in registration with each other, means for clamping said ends together, comprising plates engaging opposite faces of each of said beams adjacent the ends thereof, a resilient spacer interposed between the connected ends of said beams and a bolt extending through said plates for holding said beams together.

6. A support for an electrical conductor, comprising an upright member, a pair of wood beams mounted on said member in spaced substantially parallel relation with each other, said beams having projecting ends arranged in registration with each other, metal
25 plates engaging the inner faces of said beams adjacent their projecting ends, said plates being secured together and having flanges engaging the ends of said beams, means on said plates for supporting an insulator, flanges on the upper edges of said plates for engaging the upper edges of said beams respectively, complementary plates engaging the outer faces of said beams respectively and a bolt extending through said
45 beams and plates for clamping the ends of said beams together.

7. A support for an electrical conductor, comprising a pair of wood beams having spaced registering projecting ends, metal
50 plates secured to the opposite sides of each of said projecting ends respectively, said plates having teeth thereon arranged to penetrate the fiber of said beams, flanges on the upper edges of said plates arranged to rest upon the upper edges of said beams, the flanges for each beam having interfitting means for holding the plates on each beam against relative movement, means for securing the inner
60 plates together, a bolt extending through said plates and means for holding the ends of said beams together, and means for supporting an insulator on the ends of said beams.

8. A support for an electrical conductor,

comprising a pair of converging beams having registering ends, plates engaging the inner faces of said beams respectively, said plates being secured together adjacent the ends of said beams and having resilient bosses
70 thereon for holding said plates in angular relation to each other corresponding to the angular relation of said beams, complementary plates engaging the outer faces of said beams, respectively, said plates having teeth
75 thereon for preventing relative movement between said plates and beams, and a bolt extending through said plates and beams for holding the ends of said beams together.

9. A conductor support comprising a pair
80 of wood beams, means for clamping said beams together, and a hanger interposed between said beams and having flanges engaging the upper edges of said beams.

10. An insulator support comprising a
85 pair of wood beams and means for clamping said beams together, said clamping means comprising plates engaging the outer faces of said beams respectively, a hanger interposed between said beams and flanges on said
90 hanger and said plates respectively engaging the upper edges of said beams, the flanges on said plates being interlocked with the flanges on said hanger.

11. An insulator support comprising a
95 pair of wood beams, means for clamping said beams together, and a hanger interposed between said beams, said hanger having flanges engaging the upper edges of said beams and also having flanges engaging the ends of said beams.

12. An insulator support comprising a pair of wood beams, plates engaging the outer faces of said beams adjacent their ends, said plates having teeth penetrating said
105 faces and having flanges overhanging the upper edges of said beams, and a hanger interposed between said beams, said hanger having flanges interlocked with the flanges of said plates.

13. An insulator support comprising a pair of wood beams, plates engaging the outer faces of said beams adjacent their ends and having resilient bosses thereon, a bolt
115 extending through said beams and plates and having the ends thereof held by said bosses, plates engaging the inner faces of said beams and secured together to form a hanger, said hanger having flanges engaging the upper
120 edges of said beams and interlocked with said first-named plates.

In testimony whereof I have signed my name to this specification this 23rd day of June A. D. 1928.

ARTHUR O. AUSTIN.