

Nov. 30, 1926.

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A. W. MALONE

GROUND ANCHORAGE FOR UPRIGHT STRUCTURES

Filed Oct. 3, 1923

3 Sheets-Sheet 1

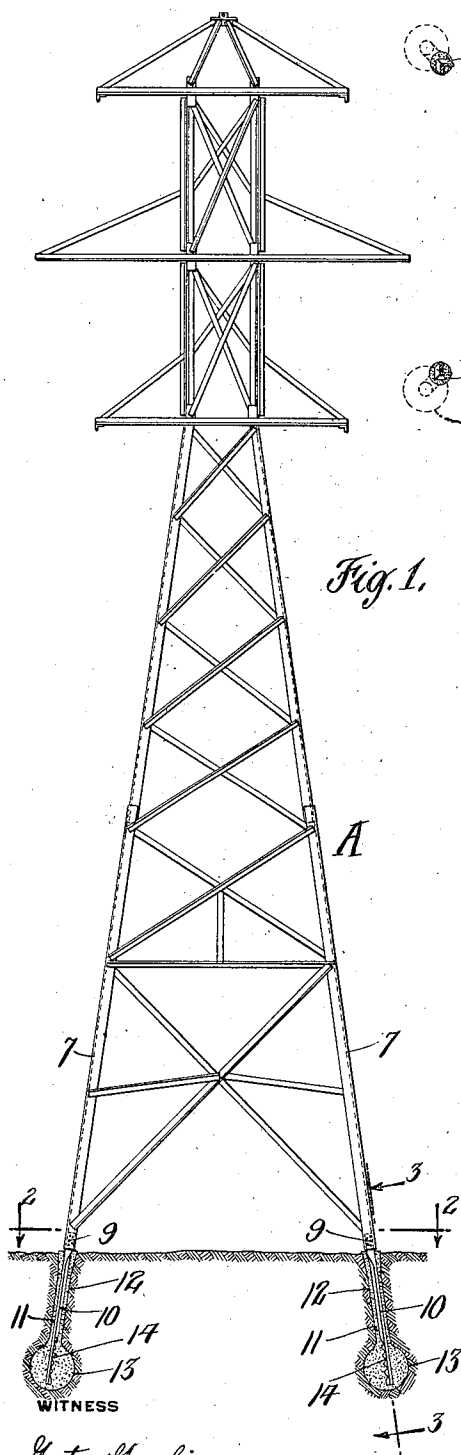


Fig. 1.



Fig. 2.

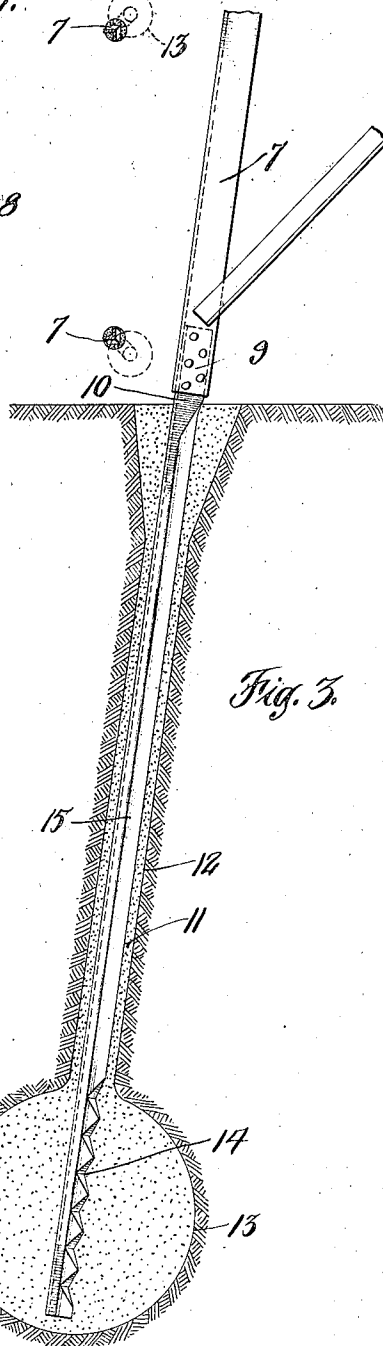
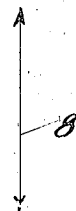


Fig. 3.

Gustav Henglinger

INVENTOR.

Adolph W. Malone

BY HIS ATTORNEYS

Symmes & Lechner

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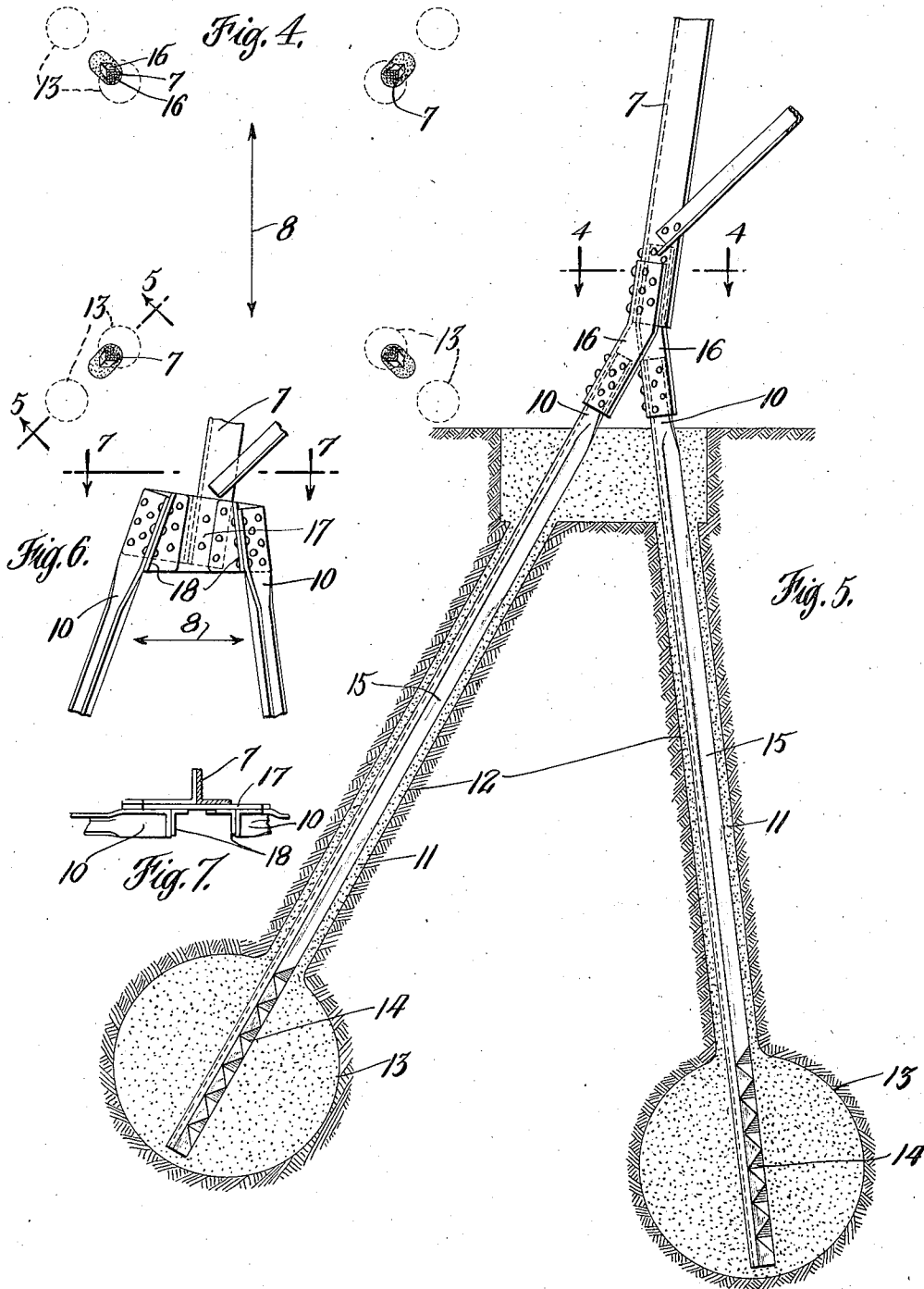
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A. W. MALONE

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3 Sheets-Sheet 2



WITNESS

Justus Genslinger.

INVENTOR.

Adolph W. Malone
BY HIS ATTORNEYS
Symmetvedt & Lechner

Nov. 30, 1926.

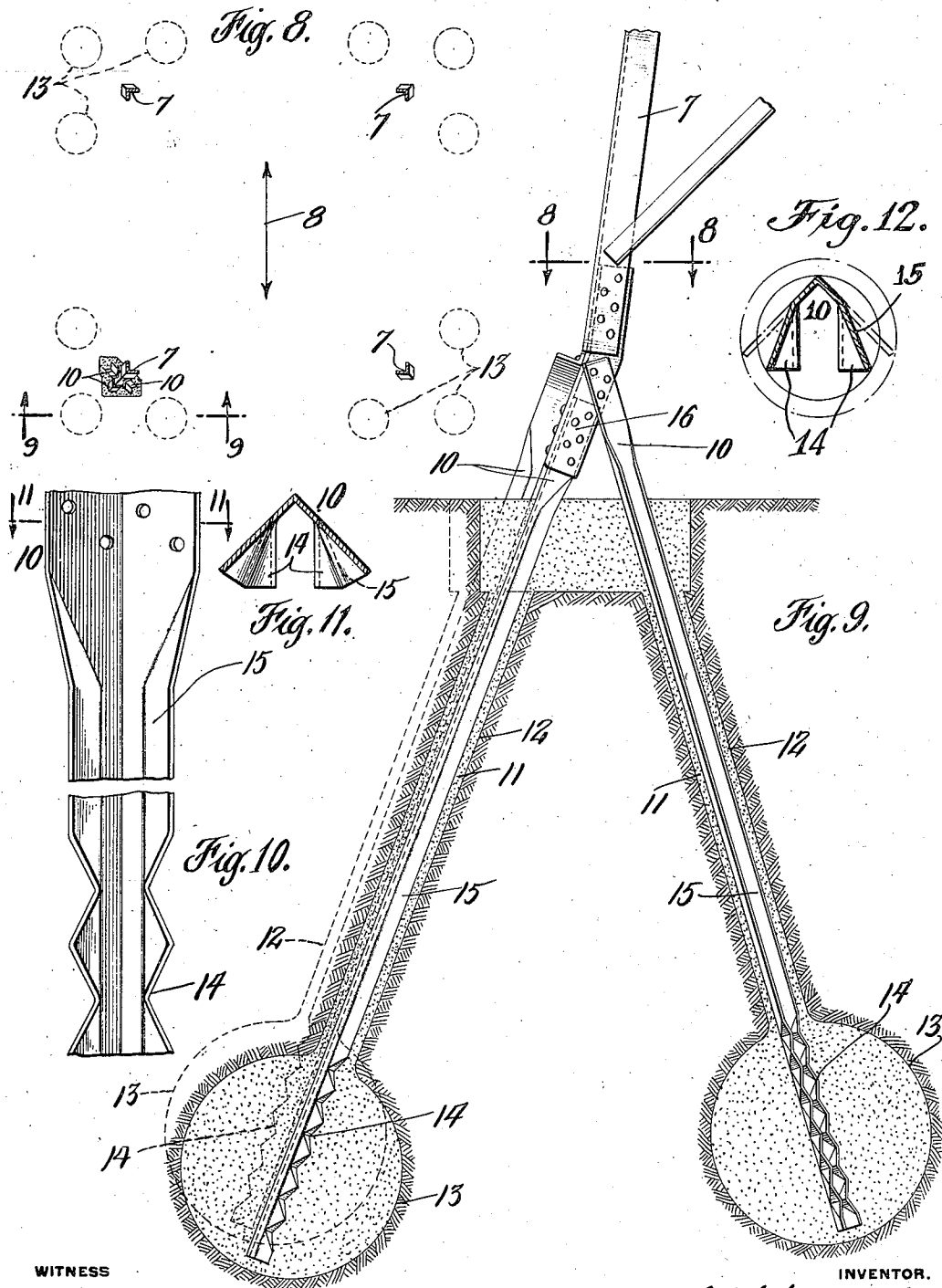
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A. W. MALONE

GROUND ANCHORAGE FOR UPRIGHT STRUCTURES

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3 Sheets-Sheet 3



WITNESS

Guustav Genslinger.

INVENTOR.

Adolph W. Malone

BY HIS ATTORNEYS

Symmes & Lechner

Patented Nov. 30, 1926.

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UNITED STATES PATENT OFFICE.

ADOLPH W. MALONE, OF SPRINGDALE, PENNSYLVANIA, ASSIGNOR TO BLAW-KNOX COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF NEW JERSEY.

GROUND ANCHORAGE FOR UPRIGHT STRUCTURES.

Application filed October 3, 1923. Serial No. 636,232.

My invention relates to ground anchorages for transmission towers such as used on electric power lines, and other upright structures in which there are high compressive loads as well as tension strains. The invention will be described with particular reference to transmission towers for power lines made up of angle iron construction.

One of the objects of my invention is to provide an anchorage which may be secured directly to the tower legs so that the tower proper is anchored without the use of a sub-base or grillage such as is used with many anchorage schemes now in use.

Another object is to provide an anchorage which may be secured to the tower legs in such a manner as to take the compressive and tension stresses as though constituting an extension to the leg.

Still another object is to provide an anchor member which has the requisite strength yet permits the employment of a relatively small hole and allows ready introduction of a cooperating cementitious anchoring means.

Still another object is to provide a simple, inexpensive, but effective, anchorage member for use in ground anchorages.

In general, my invention affords the further advantage that commercial cross-sections, including those of angular character (angle, channel, etc.), can be used in the anchorages, as well as for the tower legs themselves above ground. Hollow shapes of this character afford free passage for concrete.

How these and other advantages can be realized in a novel manner through my present invention will appear from my description hereinafter of the best embodiment of the invention known to me.

In the drawings Fig. 1 is an elevation of a typical power transmission tower with the anchorage shown in cross section.

Fig. 2 is a plan section taken on the line 2-2 of Fig. 1.

Fig. 3 is an enlarged section taken on the line 3-3 of Fig. 1 showing my improved anchorage as applied to a tower leg.

Fig. 4 is a diagrammatic plan section taken on the line 4-4 of Fig. 5, showing a construction in which two anchorages are used for each leg of the tower.

Fig. 5 is an enlarged section taken on the line 5-5 of Fig. 4.

Fig. 6 is a fragmentary view showing a modified form of connection between the anchorage and tower leg.

Fig. 7 is a section taken on the line 7-7 of Fig. 6.

Fig. 8 is a diagrammatic plan section taken on the line 8-8 of Fig. 9 showing a construction in which three anchorages are used for each leg of the tower.

Fig. 9 is an enlarged section taken on the line 9-9 of Fig. 8.

Fig. 10 is a detailed view of one of the anchorage members and Fig. 11 is a section taken on the line 11-11 of Fig. 10.

Fig. 12 is a diagrammatic view illustrative of how the bending and crimping of the anchor member 10 makes possible the use of a small drilled hole.

Referring to the drawings A is a power transmission tower, the direction of the power line being as indicated by the arrow 8, in Fig. 2. The tower as here shown is provided with four legs 7, each of which has bolted or otherwise secured thereto at the point 9, an anchorage member 10, which is embedded in a concrete filling 11, in the hole 12. It is to be observed that the particular construction of the anchorage member 10 makes possible the drilling of a hole relatively small in diameter as compared with the size of holes employed for anchorages now in general use. In fact the holes are of such small size that drills may be employed which run as small as four inches in diameter. The holes after being drilled are expanded at their lower ends either by the use of an explosive or in any other suitable manner to provide an enlarged portion 13 in the virgin earth well below the surface, which, when filled with concrete or other cementitious material will afford a solid anchor insuring against overturning of the tower due to the compression or tension strains which exist in this class of service.

Referring particularly to Figs. 10, 11 and 12 it will be seen that the anchorage member 10 is of angular cross section having its lower portion 14 crimped or deformed, its upper portion provided with holes for securing it to the tower and its intermediate portion formed or bent into a substantially V-shaped cross section 15. By thus slightly closing in the sides of the angle member it is possible to employ a smaller hole than otherwise, for an anchor member of a given cross-sectional

area. (See Fig. 12.) An anchorage member so constructed is capable of being attached to the tower leg, in line therewith for taking either compressive or tension stresses exactly as though the leg were extended and directly imbedded in the concrete fill. It should be noted that the crimping produces both inwardly-offset V-portions as well as serrated edges on the channel, providing the most tenacious grip in the concrete without the loss of strength which would occur by cutting the serrations in the member. The open side of the member 10 allows free flow of the concrete to the ball and insures proper encasement thereof in the concrete while the crimped portion insures a firm hold. In some cases it may be desirable to use anchorage members of plain angle construction or angles having projecting lugs fastened thereto for gripping in the concrete.

The usual procedure for anchoring a tower as shown in Fig. 1 is to drill the holes (one for each leg) in the ground in proper relation to the dimensions of the tower and then to centralize the anchorage member 10 in the concrete fill. After the concrete has set, the tower proper may be secured directly to the members 10 without the use of an auxiliary structure such as a foundation or grillage.

To meet the requirements in some installations where large towers are used it may be desirable to provide more than one anchorage member for each leg of the tower in order to get sufficient footing. Figs. 4 to 9 inclusive show several methods of providing the necessary extra footing. In Figs. 4 and 5 two anchorage members 10 are shown which may be riveted or otherwise secured to each leg by means of splice pieces 16 and are disposed at an angle to the direction of the power line when viewed from the top. The splice pieces 16 are shaped to position the members 10 with respect to the legs 7 so that the line of the leg falls within the members whereby the strains are distributed equally to said members. This is also true in cases where three or more anchorage members 10 are employed as shown in Figs. 8 and 9. It is to be observed that in such cases not one of the members is likely to fall in direct line with the line of the leg which falls within the group of members so that the group as a whole provides support in much the same way as a single anchorage of larger size.

Figs. 6 and 7 show the manner of splicing the anchorage members 10 to the legs of the tower when they are positioned in a line parallel to the direction of the power line. The splice consists of a plate 17 fastened to the leg to which the members 10 are secured as well as to the angles 18 carried by the plate 17.

While I have described and illustrated my invention with particular reference to pow-

er transmission towers it is to be understood that it is equally applicable to various other structures in which ground anchorages having the advantages pointed out are desirable.

What I claim is:

1. A ground anchorage comprising in combination a cementitious filling in a hole of narrow throat and bulged bottom, and an anchor member of substantially V cross section embedded therein and having its lower portion crimped to form inwardly-extending V-shaped angles and resultant serrated edges for gripping engagement with the filling.

2. In a ground anchorage, an anchor member of angular cross section having a portion of each leg of the angle bent inwards so that the member may be inserted in a relatively small hole and having the lower part of such bent portions crimped inwardly so as to form serrated edges and V-shaped indentations, and a bulbous hole of greatly restricted cross section for a large part of its depth and substantially bulged at the bottom filled with a cementitious material, said member being embedded in said material with the crimped portion in the bulged portion of the hole.

3. In ground anchorages for upright structures, an anchor member having a portion at the upper end thereof adapted to engage the structure to be anchored, and a portion at the lower end thereof of substantially V cross section with its edges crimped inwardly, and the intermediate portion thereof of substantially V angle construction.

4. A ground anchorage comprising a bulging cementitious filling in a hole of small diameter relative to its depth and having a bulged bottom portion, and an anchor member of angular cross section embedded in said filling, said member having its lower end extending substantially to the bottom of the bulged portion of the hole and having its edges crimped inwardly, in that part of its length located in the bulge, for anchoring engagement with said filling.

5. In combination with a tower having metallic legs, anchorage means including a number of metallic members each imbedded in a cementitious mass anchored in the earth, and means for connecting said members to the tower legs and to each other so that the apex of their axes falls on the axis of the leg substantially at the point of connection.

6. An anchor member for a metallic tower leg, comprising, in combination a bulbous concrete footing cast in place in a cavity several feet below the surface of the ground, a metallic angle member, with one end embedded in said bulbous footing and the other provided with connections for securing it to a tower leg so as to form an extension of said leg, said member having the flanges of the angle crimped inwardly only in that portion of its length embedded in the foot-

ing, and a concrete protective covering for the uncrimped portion of the angle member extending from the bulbous footing to a point above the surface of the ground, said
5 footing and covering being integral.

7. As an article of manufacture, an anchoring extension to a structural steel tower leg, comprising a structural angle iron of sufficient length to extend from the base of
10 the tower leg into a concrete footing several feet below the ground level, and comprising in combination an upper portion fabricated for direct connection to the tower leg in predetermined alignment therewith, a lower
15 portion having the flanges of the angle crimped for engagement with a bulbous concrete anchorage footing, and a straight intermediate shank portion.

8. A ground anchorage comprising in
20 combination a cementitious filling in a hole

of narrow throat and bulged bottom, and an anchor member of substantially uniform cross section embedded therein and provided with projections, the diameter of the circumscribing circle of the latter not exceeding substantially that of the remainder of the embedded portion.

9. A ground anchorage comprising in combination a cementitious filling in a hole of narrow throat and bulged bottom, and an
30 anchor member of substantially angular cross section embedded therein and provided with projections, the diameter of the circumscribing circle of the latter not exceeding substantially that of the remainder of
35 the embedded portion.

. In testimony whereof, I have hereunto signed my name.

ADOLPH W. MALONE.