July 29, 1941. C. L. STROUP 2,250,780

EARTH ANCHOR

Filed June 19, 1940 2 Sheets-Sheet 1

Fig. 1.

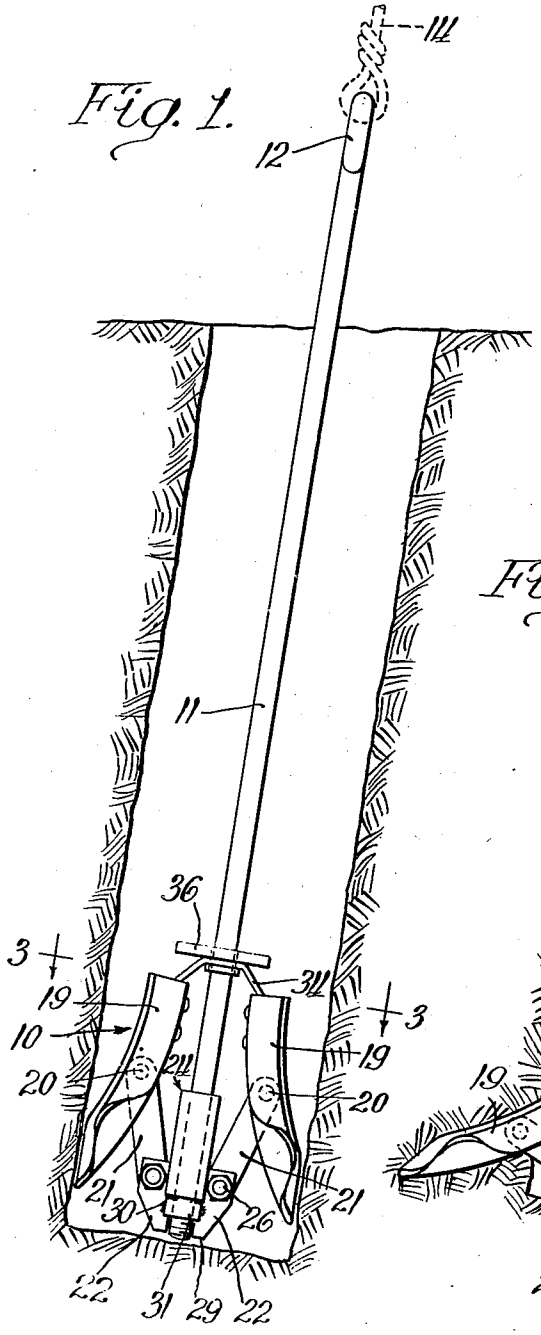



Fig. 5.

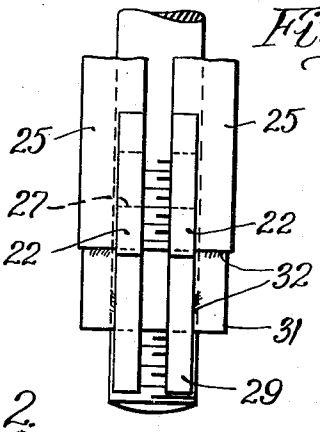
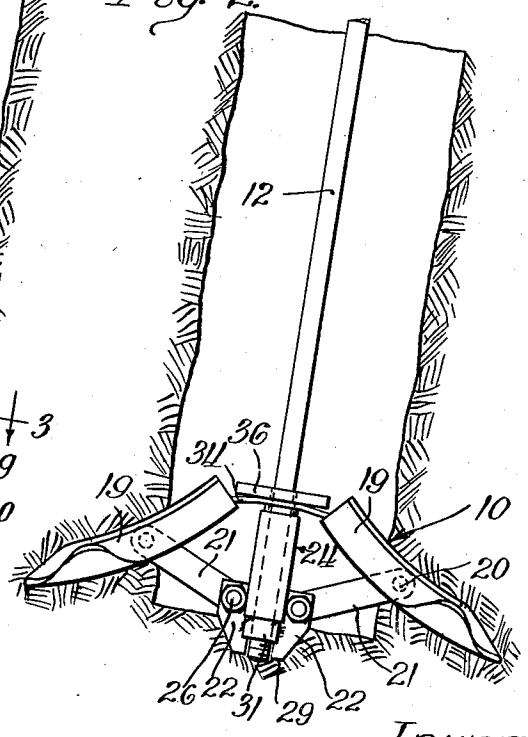



Fig. 2.




Inventor:
Charles L. Stroup
By Macfarlane Bottens & Brewer
Attys.

July 29, 1941. C. L. STROUP 2,250,780

EARTH ANCHOR

Filed June 19, 1940 2 Sheets-Sheet 2

Fig. 3.

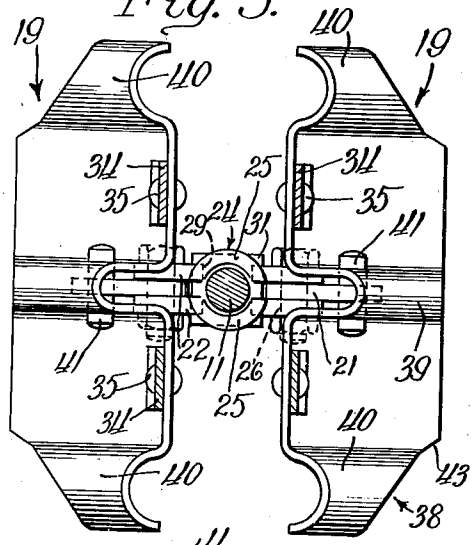



Fig. 4.

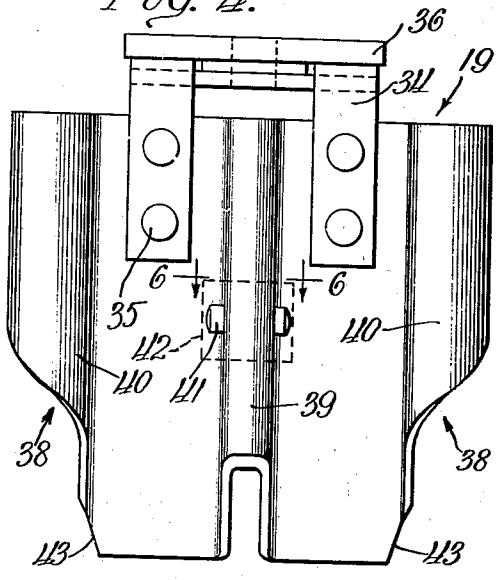



Fig. 8.

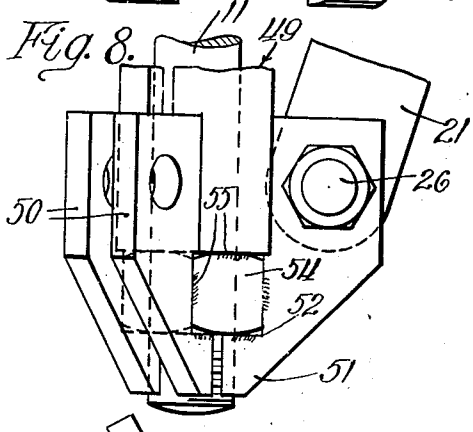



Fig. 7.

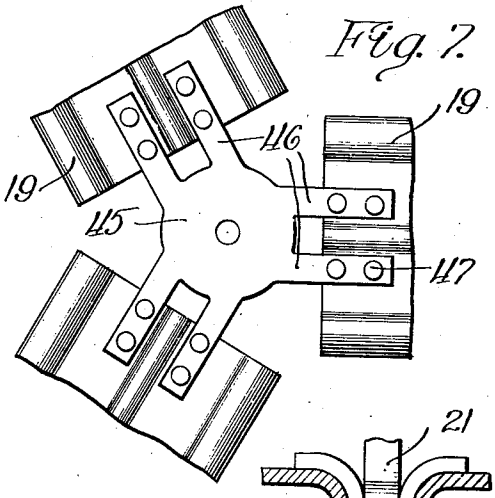



Fig. 9.

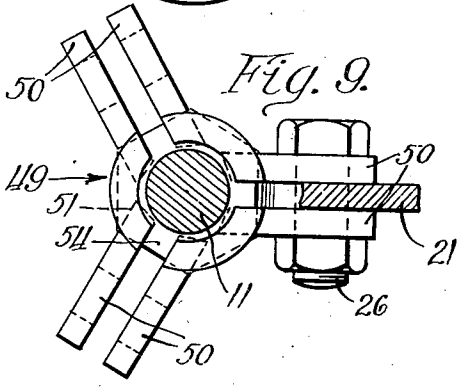
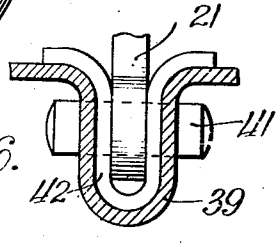



Fig. 6.




Inventor:
Charles L. Stroup
By Brownson Boettcher & Denner
Attys.

Patented July 29, 1941 2,250,780

# UNITED STATES PATENT OFFICE

2,250,780

## EARTH ANCHOR

Charles L. Stroup, Oak Park, Ill.

Application June 19, 1940, Serial No. 341,232

5 Claims. (Cl. 189—92)

This invention relates to earth anchors.

The device of my invention is of the class of anchors which are provided with engaging wings which are expansible, occupying in collapsed position a small projected area, enabling the anchor to be inserted into a hole of relatively small bore. In expanded position, the wings are supposed to penetrate the solid earth at the sides of the hole and then to occupy a greater projected area. Such anchors usually comprise a plurality of wings movable out in a direction generally radially from the anchor and intended to be extensible into the earth.

Such anchors are in extensive use. In observing their installation and operation, I have been struck by the fact that the outward movement of the blades, as these anchors are constructed, requires them to enter the earth forming the walls of the hole more or less flatwise instead of edgewise. No one would think of driving a spade into the ground more or less sidewise but that is what these anchors do. It not only makes the task of expanding the anchor far more difficult but it impairs their holding power by disturbing the earth against which they are supposed to hold.

I have conceived that if the blades, which may be made of relatively thin sheet-like stock, could be driven into the sides of the hole edgewise instead of flatwise, the work of installing would be easier and the anchor would hold better. Now there seemed to be a practical difficulty to this concept in that in order to get the blades down into the hole they ought to be disposed lengthwise of the hole so that they could be of a substantial length and could be moved into position by an endwise force, i. e., by a force applied longitudinally of the hole.

I conceived the possibility of making the blades arcuate since a circle changes by constant curvature from vertical to horizontal. That basic idea requires, of course, that provision be made for a linkage that would let or cause the blades to move on the arc of their own curvature.

This presented a difficult practical problem. To provide for movement of the blades into the earth, the blades must, of course, be supported to move relative to the guy rod. Supporting struts will accommodate this movement, but swinging motion of the free ends of the supporting struts gives the wrong curvature. To give the desired movement to the blades it is necessary to support each of the blades at more than one point. I have also found that both points of support must be free to move outwardly with respect to the guy rod, and the blades themselves change positions as they enter the earth, i. e., they not only move translationally outward from the guy rod, but their angular positions are altered. A compound or pivoted linkage will accommodate this movement, but since the arms of a pivoted linkage are not rigid, the anchor would be rather floppy and unstable. As an improvement upon a pivoted linkage between the upper ends of the blades I provide one or more integral metal straps which may be joined to the tops of the blades and to a center piece. These metal straps are strong enough to give the anchor rigidity, but they can be expanded or spread when force is applied to drive the anchor into the earth. Now by tamping down the center piece on the top edges of the blades I drive the blades or shovels outwardly and allow them after once entering the earth to follow the arc of their own curvature.

The blades or shovels may be provided with ridges or corrugations for strengthening them. They are preferably trimmed to an outline which will accommodate them to a minimum size hole.

The center of pressure of the bearing of the blades or shovels in the earth even when merely expanded into the sides of the hole without filling the hole is in such a direction that the anchor will not collapse short of failure of some member.

The details may be considerably varied without departing from the basic concept of the invention. Certain of the details are new of themselves as will be apparent from the following detail description of the preferred embodiment.

The anchor may be provided with any desired number of blades within the scope of the invention, a practical number being two or three.

Now in order to acquaint those skilled in the art with the manner of constructing and operating my invention, I shall describe, in conjunction with the accompanying drawings which form a part of this specification, a specific embodiment of the invention.

In the drawings:

Figure 1 shows the anchor of my invention in collapsed position inserted in a pit in the earth;

Figure 2 is a view similar to Figure 1 showing the anchor in expanded position;

Figure 3 is a sectional view taken on the line 3—3 of Figure 1;

Figure 4 is a side elevational view of the anchor;

Figure 5 is a side view of the sleeve by which the anchor is secured to the guy rod;

Figure 6 is a sectional view taken on the line 6—6 of Figure 4;

Figure 7 shows a connecting means for the blades of an anchor having three blades;

Figure 8 shows an elevational view of the sleeve by which a three-bladed anchor is secured to the guy rod; and

Figure 9 is a plan view of the sleeve shown in Figure 8.

Referring now in detail to the various figures of the drawings, the anchor as a whole is indicated by the numeral 10, shown secured to the lower end of a guy rod 11 and inserted in a hole in the earth. The upper end of the guy rod is provided with an eye 12 in which a guy wire 14 shown in dotted lines may be secured for anchoring a telegraph pole or the like.

The anchor proper includes two similar blades 19, 19 made of high carbon sheet metal or plate and are formed by stamping, or any other desired method. Hot stamping is preferred since this is the most convenient and economical method. The blades are preferably hardened. The blades 19 are pivoted at 20 to links 21 which in turn are pivoted in lugs 22 formed on the sleeve 24 secured on the lower end of the guy rod.

The sleeve 24, as best shown in Figure 5, is made up of two parts 25, 25, preferably stampings, and each is provided with oppositely extending lugs 22, 22 formed integral with the body part of the sleeve. Bolts 26, 26 extend through holes 27, 27 in the lugs 22, 22 and through the links 21, 21 for pivoting the links to the sleeve 24. Instead of bolts, riveted pins may be used. Each half 25 of the sleeve 24 is made up of a flat piece of metal with the central part rounded to semicylindrical shape and the lower end formed with the lugs 22, 22 which are turned outwardly to assume diametrically opposite positions with respect to the sleeve 24 as a whole. The lugs 22, 22 are shaped with downwardly extending projections 29, 29 with recesses 30 cut therein for the reception of a nut 31. The nut 31 is positioned in axial alignment with respect to the sleeve 24 and then preferably welded, as at 32, to the lugs 22 of the two counterparts of the sleeve 24. With this, the two counterparts of the sleeve are held rigidly in position. The tubular parts of the sleeve portion may be welded together. The guy rod 11 can be threaded into the nut 31 whenever the anchor is to be assembled. Thereby the sleeve 24 will be secured on the end of the rod. It will be understood that this form of sleeve is illustrative only and that different forms of sleeves or securing members may be employed without departing from the scope of my invention. For example, the sleeve may be formed of a single piece, with the lugs. Also the guy rod may be threaded directly into the sleeve, without departing from the scope of the invention.

At the upper ends of the blades 19 are connecting members 34 secured thereto as by rivets 35, each of which interconnects the two blades and is secured at its central point to a plate 36 which is slidable on the guy rod and positioned above the sleeve 24. The connecting members 34, in the preferred form, are U-shaped and made of strap metal, relatively soft tough iron, which will stand flexing and tension to which it is subjected in the operation of installing the anchor.

The blades 19, in side view, are of arcuate shape, and when driven into the earth follow the path of their own arcs, thus aiding easy penetration since the earth will not be displaced by any sidewise motion of the blades.

In the stamping operation by which the blades 19 are formed, corrugations 39 and 40 are produced. These corrugations extend longitudinally of the blades in the direction of their penetration into the earth. Alternatively, the corrugations may be produced by rolling. These corrugations add great strength to the blades, and with the arcuate shape of the blades, as viewed from the side, a simple, compact and strong anchor is attained. The side corrugations 40 are cut away near the lower end as indicated at 38 and the flat portions of the blades are tapered slightly as shown at 43 to produce a reduced entering face and to insure that the entering surface will start the blade on the proper arc upon beginning penetration into the earth. The cutting away of the corners reduces the size of the hole into which the anchor can be inserted.

The upper ends of the links 21 are pivoted in the central corrugations 39 by pins 41 which are welded in place in the corrugations. Referring to Figure 6, inserts or saddles 42 of strap metal are positioned in the central corrugations 39 at points whereby the pins 41 will pass therethrough. These saddles 42 act as reinforcements or pads and serve to strengthen the blades to compensate for the weakening thereof by the opening for the pins 41, they serve as bearing supports and guides for the links 21.

To set the anchor in anchored position, it is inserted into the hole in the earth, as shown in Figure 1, and then is expanded by impacting the top edges of the blades. Alternatively a hydraulic jack or expander may hook at its top into the eye 12 and press down upon the top edges of the blades to force the blades to expand outwardly into the position shown in Figure 2. It will be observed that the straps 34 act like a compound linkage allowing the adjacent ends of the blade both to turn and to separate. In the final position of Figure 2, the straps are in tension for a load applied to the tops of the blades. Expanding the blades by impacting or by operation of the jack will force the blades to swing about the links 21 and drive the blades into the earth at the sides of the hole, to the position shown in Figure 2. When the anchor is in anchored position, force on the guy rod tending to draw the anchor out will be exerted through the links to the blades tending to spread them farther, rather than tending to collapse the anchor.

It will be observed that when the anchor is spread and the blades driven into the earth the respective upper ends of the blades are displaced outwardly relative to one another. The flexible members 34 are adapted to accommodate this motion; the arms of the U are spread until the members are nearly flat, permitting the attached ends of the blades 19—19 to separate as they travel forward on their arcuate path.

It is contemplated that, instead of employing a jack to spread the anchor into the earth, it can also be done by tamping the plate 36 manually with a bar, the members 34 being flexible enough to permit this. The actual means used to spread the anchor to anchoring position is optional and does not form any part of the invention.

While I have shown the strap members 34 as attached at the very tops of the blades so that the plate 36 lies above the top edges of the blades 19, the straps may be attached at a lower point so that the plate 36 may lie either at or near the top edges of the blades and then the force of tamping or impacting does not have the same tendency to spread the tops of the blades at the

start. The anchor preferably rests upon the bottom of the hole for spreading the anchor by tamping but where it is spread by a hydraulic jack this is not necessary. In either case, as the anchor is being spread the lower end of the guy rod will be lowered, carrying with it the sleeve **24** and the pivot points **26** to allow the arcuate movement of the blades as they penetrate the earth. The earth is usually soft enough to permit this, but, of course, the anchor may be held slightly above the bottom of the hole when it is spread to avoid running the lower end of the guy rod into the earth. The anchor easily adapts itself to position and affords very great holding power.

Figures 7, 8, and 9 show appliances for a three-bladed anchor. Any number of blades may be used without departing from the scope of the invention. Replacing the flexible members **34** is a plate **45** with pairs of arms **46** extending radially outwardly. The arms **46** and plate **45** are of an integral piece of metal and formed by stamping. To each pair of arms **46** is secured a blade **19** as by rivets **47** in a manner similar to that of the previous embodiment. The arms **46** can be flexed similarly to members **34** to spread the anchor to anchoring position. Sleeve **49** is similar in construction to the sleeve **24** described in connection with the previous embodiment, but the present form of sleeve is made of three parts and is provided with three pairs of lugs **50** for supporting the links **21** to which the blades **19** are attached. Each of the parts of the sleeve **49** is stamped from a piece of flat metal with the central part curved to form part of a cylinder and the lugs turned outward to positions adjacent the lugs of the next adjacent parts of the sleeve. The lugs **50** are provided with downwardly extending projections **51** with recesses **52** cut therein in which a nut **54** is placed. The lugs are then welded as at **55** to the nut and the whole assembly made rigid for the insertion of the guy rod **11**.

In the forms shown the preferred method of expanding the anchor is to impact or press upon the plate **36** or **45**. The stiffness of the links **34** or **46** is great enough to cause the blades first to swing about the pivots **20** or **41** on the upper ends of the links **21** and the links to swing downwardly. Alternatively, as above indicated, the pressure may be applied to the tops of the blades. If desired, they may be shaped to facilitate impacting or pressing by providing reinforcing flanges at the upper edge.

Instead of the integral straps such as **34—46**, links may be used without departing from my invention but the integral straps are the preferred form of flexible connection.

The details herein shown and described are not intended to be limiting, but illustrative, and all arrangements of parts to meet particular adaptations are to be considered as within the spirit and scope of the appended claims.

I claim:

1. An earth anchor comprising a rod, a curved blade disposed generally longitudinally of the rod for insertion into a hole, a swinging link pivoted at its upper end to the central part of the blade and at its lower end to the rod, and a flexible link attached to the upper end of the blade and slidably mounted on and guided along the rod, pressure applied to the upper end of the blade causing it to penetrate the earth at the side of the hole by edgewise motion in an arcuate path forming an extension of its own curvature.

2. In a device for anchoring a guy rod in the earth, a connecting member secured to said guy rod, a plate slidably mounted on the guy rod above said connecting member, a plurality of arcuate blades, flexible members connecting said blades at the upper ends thereof together and to said plate, and link means connecting said blades at points below the upper ends thereof to said connecting member, said blades being forced outwardly into the earth in a path along the arcs of the blades when said plate is forced along said guy rod toward said connecting member.

3. In a device for anchoring a guy rod in the earth, a connecting member secured to said guy rod, a plurality of blades, link means pivotally connecting said blades to said connecting member, flexible members with their ends rigidly connected to said blades for connecting said blades together and adapted to be spread and follow the blades in their outward displacement as they penetrate the earth and maintain the blades in connected relation in all positions of the anchor, said blades when they have penetrated the earth being turned toward horizontal positions and adapted to receive the thrust from said guy rod in a direction forcing the broad sides of said blades against the earth.

4. In a device for anchoring a guy rod in the earth, a sleeve secured to the lower end of said guy rod, lugs formed on said sleeve, a plurality of blades, link means pivotally mounted in said lugs and on said blades for swingably supporting said blades on said sleeve, a plate slidably mounted on said guy rod above said sleeve, and flexible members connecting the upper ends of said blades together and to said plate, whereby movement of said plate toward said sleeve forces said blades outwardly into the earth, said sleeve acting as a stop limiting the movement of said plate.

5. A device for anchoring a guy rod in the earth comprising blades normally in vertically disposed, collapsed position and expandible into the earth, said blades each having a central corrugation disposed longitudinally in the direction of penetration of the blades into the earth, swinging links each pivoted at its upper end to a corresponding blade below the upper end of the blade and at its lower end to the guy rod, said central corrugation providing a downwardly facing groove, the upper end of the link extending into said groove, a pin extending through the side walls of the corrugation and through the upper end of the link for forming a hinge for connection of the respective blade to said swinging link, and a flexible connecting member having its ends rigidly connected to the upper ends of said blades, said flexible member being U-shaped when said blades are in collapsed position and being straightened out as said blades are projected outwardly.

CHARLES L. STROUP.