A Tractor-powered Method for Installing Earth Anchors during Fence Construction

DENNIS M. MUELLER

Abstract

A tractor-powered post-hole digger was adapted to screw earth anchors into the soil to reinforce fence corners. Constructing single-brace corners with earth anchors saved approximately 2-1/2 hours over conventional double-braced corners guyed to a buried object for reinforcement.

Fencing is an important tool for managing rangelands. However, the cost of conventional fencing is often prohibitive for anything other than boundary or important cross fences (Moore et al. 1968). Suspension fences cost about half as much as conventional fences, and, under many conditions, will turn cattle equally well, last as long, and require less upkeep (McNamee and Kinne 1965). A suspension fence requires strong corner assemblies. A typical corner is double braced with the first brace post guyed to a "deadman" (a large object such as a rock or section of post) buried 60 cm deep midway between the corner and first brace post. Installing a deadman is hard, time-consuming work. Under most soil conditions it takes one man approximately 45 minutes per deadman if a power auger is used to dig the hole.

This paper describes the adaptation of a tractor-powered post hole digger to screw earth anchors into the soil for use as a deadman, thus reducing the installation time per deadman from 45 to 10 minutes. It also reports on the suitability of earth anchors for holding fence-corner assemblies. The use of a tractor to install screw-in earth anchors requires an adapter to transmit the turning force of the auger power head to the earth anchor. The adapter (Fig. 1) fits on the power head in place of the auger and holds the eye of the earth anchor so that the power head can screw the anchor into the soil. The materials needed to construct the adapter are readily available in most communities from some of the larger hardware stores (Fig. 1).

The earth anchor used with the adapter shown in Figure 1 had an 11/16-inch (18 mm) rod, a 6-inch (15 cm) helix, and an overall length of 48 inches (122 cm). If an anchor with a different sized eye or rod were used, the dimensions of the adapter would need to be adjusted accordingly. Also, if the shaft of the power-head were different in size than the one used, a different sized adapter sleeve would be needed (Fig. 1).

Earth anchors should be lined up and installed before the posts are set; this allows room to operate the tractor. The anchor is started perpendicularly to the ground and turned until the helix is covered by the soil surface. The anchor shaft is then angled towards

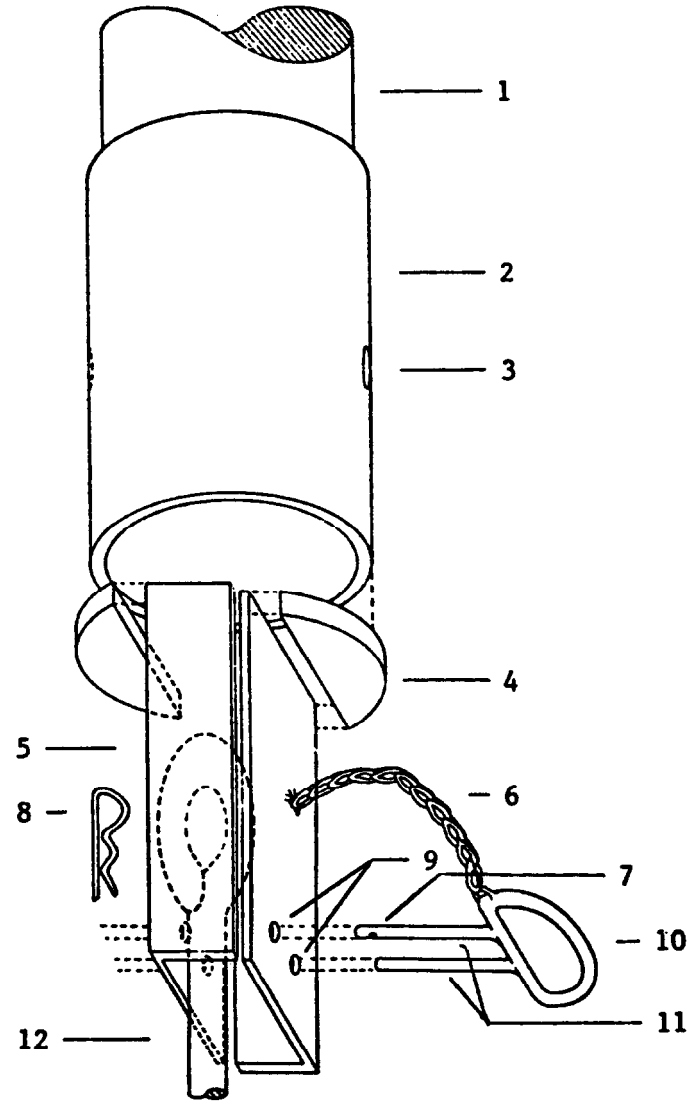

Fig. 1. *Adapter, exploded view. The numbers refer to the following: (1) auger shaft; (2) 2-5/8 inch (7 cm) I.D. well casing, length 4 inch (10 cm); (3) 3/8-inch (10 mm) hole; (4) 1/4-inch (6 mm) plate; (5) 1/4 inch (6 mm) by 1-7/8 inch (5 cm) angle iron, length 5 inch (13 cm); (6) 5-1/2 inch (14 cm) small chain; (7) 1/4-inch (6 mm) hole; (8) 1/8-inch (3 mm) by 1-1/4 inch (3 cm) spring locking pin; (9) 3/8 inch (10 mm) hole; (10) 1/4 inch (6 mm) by 8-inch (20 cm) cold-rolled steel; (11) 3/8 inch (10 mm) by 2-1/2 inch (6 cm) bolts; (12) earth anchor.*

Author is range scientist, USDA, ARS, Crops Research Laboratory, Colorado State University, Fort Collins 80523.

This report involved cooperative investigations of USDA, ARS, Fort Collins, Colo., and the Colorado Agricultural Experiment Station, Fort Collins. Published with approval of the Director of the Colorado Agricultural Experiment Station as Scientific Series No. 2687.

Manuscript received October 4, 1981.

Fig. 2. *Post-hole digger being used to screw in earth anchor.*

the top of the brace post by backing the tractor. Once the anchor is aligned with the brace post so that the achor shaft and the guy wire form a straight line, the anchor can be screwed the rest of the way into the ground (Fig. 2). Two loops of No. 9 galvanized wire or one loop of 1/4 inch (6 mm) galvanized aircraft cable is passed through the eye of the anchor and around the top of the brace post (Fig. 3ab). If aircraft cable is used, it is tightened with a wire stretcher and clamped with 1/4 inch (6 mm) galvanized cable clamps.

The fence corners installed at the Central Plains Experimental Range (CPER) northeast of Nunn, Colorado were single braced and held by two 6 inch (15 cm) helix earth anchors (Fig. 3a). No noticeable sagging of the wire or loosening of the fence corners has occurred in four years. Most deadmen fail when the wire attaching it to the post breaks, either because of damage to the wire during installation or rust. If a buried object, such as a rock or post, were being used as a deadman, it would have to be removed before the wire could be replaced. An earth anchor does not have to be removed to replace a wire.

The 6-inch (15 cm) helix earth anchors used at CPER have a holding power of 2722 kg in a medium textured soil. This exceeds expected fence loads of 907 to 1361 kg (Pochop and McNamee 1971). Therefore, single-brace instead of double-brace corners were constructed. Constructing single-brace corners with earth anchors saved approximately 2-1/2 hours over conventional corner construction in addition to the saving in materials that would have been required for two extra braces. An even greater savings could have been achieved by using the less expensive 4-inch (19 cm) helix anchors with a holding power of 2041 kilograms or one 6-inch (15 cm) helix anchor placed next to and directly behind the corner post (Fig. 3b). Corners for small enclosures can also be constructed without brace posts by fastening a cable from a single 6-inch (15 cm) helix earth anchor directly to the top of the corner post. These non-braced corners work satisfactorily, but leave the cable exposed to livestock (Fig. 3c).

Soil conditions dictate the type of earth anchors needed. Anchors with 8-inch (20 cm) helixes are best for sandy soils and double helix anchors are best for rocky soils. Some earth anchors have a nut welded near the top of the shank. These anchors are designed to be put in with portable hand held augers. The adapter (Fig. 1) could be easily modified to fit such an anchor by replacing the box that holds the anchor eye with a deep socket.

Anchors can be purchased where mobile-home supplies are sold and at some of the larger hardware stores. In 1981 a 4-inch (10 cm) helix anchor cost about $3.90 and a 6 inch (15 cm) helix anchor cost about $5.80.

Earth anchors should work satisfactorily for almost any fencing operation that requires a deadman. Powered post-hole diggers are available on most farms and ranches. The adapter described in this paper provides the farmer or rancher with a quick and economical means of installing earth anchors by eliminating the need to purchase commercial anchor installing devices.

Literature Cited

Moore, R.A., H.G. Young, M.E. Larson, and G.B. Haiwick. 1968. Long span fences. South Dakota State Univ. Agr. Exp. Sta. Bull. 546.

McNamee, M.A., and E.A. Kinne. 1965. Pasture and range fences. Rocky Mountain Reg. Pub. No. 2 Univ. Wyoming.

Pochop, L., and M. McNamee. 1971. Steel fene corner assembly tests. Univ. Wyoming Agr. Exp. Sta. Res. J. 42.

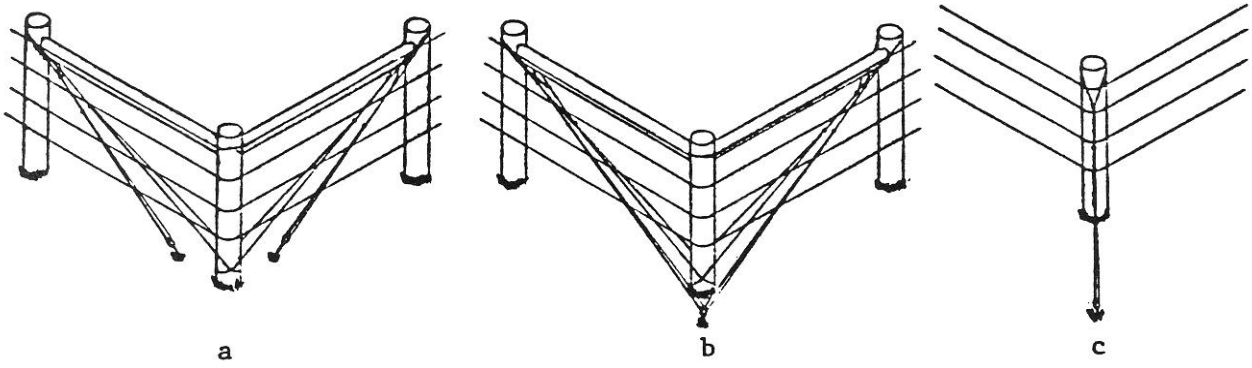

Fig. 3. *Fence corner assemblies. (a) corner with two anchors and single-brace assembly; (b) corner with one anchor and single-brace assembly; (c) corner with one anchor and no brace assembly.*