

PULL-N-JENNY, a soil probe puller: its fabrication and use

Llewellyn L. Manske, Jeffrey J. Kubik, and John A. Urban
North Dakota State University
Dickinson Research Extension Center

The Probe Pull-N-Jenny is not a jack; it is a simple elevated-fulcrum-and-lever puller that can be used to easily extract soil probes during the collection of soil water samples.

Soil water content can be accurately measured by the gravimetric method using a Viehmeyer soil tube. The technique collects samples of soil at selected increments with a 5-foot probe that is driven into the soil with a specially designed 15-pound hammer. Pounding the probe into the soil requires some physical effort. Extraction of the probe, however, is more strenuous because of the need to pound upward, with the blows of the hammer striking the underside of the lugs located on each side of the probe head. The task of soil probe extraction can be comparatively effortless with the use of the Pull-N-Jenny to pull the probe from the soil.

The Pull-N-Jenny has three main components: the adjustable mono-leg, the handle-lever with a grab hook (figure 1), and the lug cradle apparatus with sling chain (figures 2 and 3). The two-part tube steel leg is supported on a steel plate shoe, and one section of the leg can move up and down within the larger lower tube to permit adjustments in the height of the fulcrum pivot point

located at the top of the leg (figure 4). The handle-lever rotates on the pivot and has a grab hook attached at the shorter end (figure 5). With the attachment of different links of the sling chain into the grab hook, the distance between the handle-lever and the lug cradle can be changed. The lug cradle apparatus fits specifically around the soil probe head and makes contact with the underside of the lugs located on each side of the soil probe head (figure 3). The points of lift on the soil probe are the lugs.

Extraction of a soil probe from the soil requires moving the Pull-N-Jenny near the soil probe and placing the lug cradle under the lugs on the probe head (figure 6). Pushing down on the longer side of the handle-lever transfers a lifting force onto the lugs, and pulls the soil probe up (figure 7).

Acknowledgment

The authors are grateful to Miller Machine and Welding for fabrication of the steel main components. The authors are grateful to Amy M. Kraus for assistance in preparation of this manuscript and to Sheri Schneider for assistance in production of this manuscript.

Table 1. Materials for the Pull-N-Jenny.

Quantity	Description and Use
1	Steel square tube for leg that has two ½ inch holes used for adjustments in height drilled at 18 and 30 inches from bottom. A shoe is welded to the bottom of the leg. 36 inches long, 2 X 2 inch tube, 3/16 inch thick.
1	Steel plate for leg shoe with the longer dimension perpendicular to handle-lever. The ends of the shoe are turned up. 6 inches long, 4 inches wide, 3/8 inch thick.
1	Steel square tube for leg extension that has two ½ inch holes used for adjustments in height drilled at 6 and 18 inches from bottom. The pivot is welded to the top of the leg extension. 42 inches long, 1.5 X 1.5 inch tube, 3/16 inch thick.
1	Steel bolt and nut used as leg extension height adjustment pin that is placed into selected holes of leg and leg extension. 3 inches long, ½ inch diameter.
1	Seamless (DOM) round tube steel used as pivot that is welded to the top of leg extension. 1.5 inches long, 1.25 inch outside diameter, 5/8 inch inside diameter.
1	Steel bolt and nut used as pivot pin and to connect pivot to handle-lever pivot arms. 3 inches long, 5/8 inch diameter.
1	Steel square tube for handle-lever with welded pivot arms centered 8 inches from shorter end. A 1 X 3 inch cutout is made on both the top and bottom sides at the shorter end. A ½ inch hole drilled on ¾ inch center from shorter end is used to hang threaded chain link and grab hook. 48 inches long, 1.5 X 1.5 inch tube, 3/16 inch thick.
2	Steel plate for pivot arms that are welded one on each side of handle-lever and centered 8 inches from shorter end. A 5/8 inch hole drilled on ¾ inch center from end of both pivot arms is used for pivot bolt to connect handle-lever to pivot located on top of leg extension. A ¾ inch lug welded on side of one pivot arm to prevent the hex end of pivot bolt from turning in relation to the pivot arm makes the fulcrum at the contact surface between the pivot bolt and the inside of the seamless (DOM) tube. 4 inches long, 1.5 inches wide, 3/16 inch thick.
1	Steel bolt and nut placed through holes at end of the handle-lever and used for hanging threaded chain link and grab hook. 2 inches long, ½ inch diameter.
1	Threaded steel chain link used as connection between handle-lever and grab hook. ½ inch diameter link.
1	Steel grab hook connected to threaded chain link at end of handle-lever. 3/8 inch.
1	Steel square tube used as extension of handle-level. 48 inches long, 1 X 1 inch tube.
1	Steel plate for lug cradle-lift, which is the receptacle designed to make contact with the lugs located on each side of the soil probe head. The steel plate is bent into a stirrup shape with a 1.5 X 1.5 inch cutout located in the middle to fit around the soil probe head. Weld beads are placed on each side of the cutout near the front edge and used to prevent lugs from slipping forward during probe extraction. Half-inch holes drilled through the two upright wings, with center 5/8 inch from front edge and ½ inch from top edge, are used for bolt that connects the lug cradle to the sling chain and places greater lift force toward a forward position. 11.5 inches long, 2.5 inches wide, ½ inch thick.
1	Steel bolt and nut placed through holes of upright wings and used to connect lug cradle to sling chain. 3 inches long, ½ inch diameter.
1	Steel link chain for sling used to attach lug cradle to grab hook at end of the handle-lever. 36 inches long, 3/8 inch diameter links.

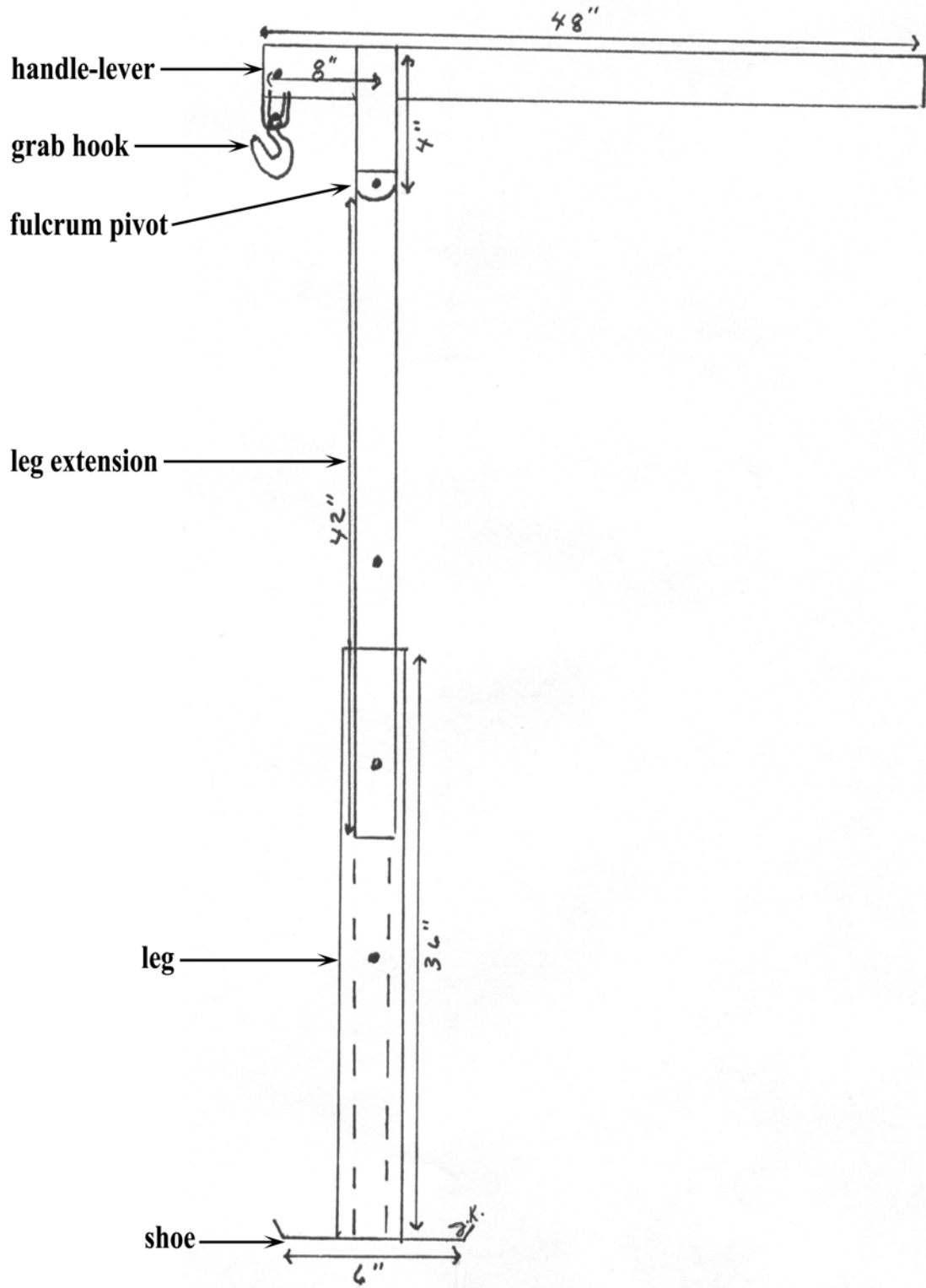


Fig.1. Diagram of Pull-N-Jenny.

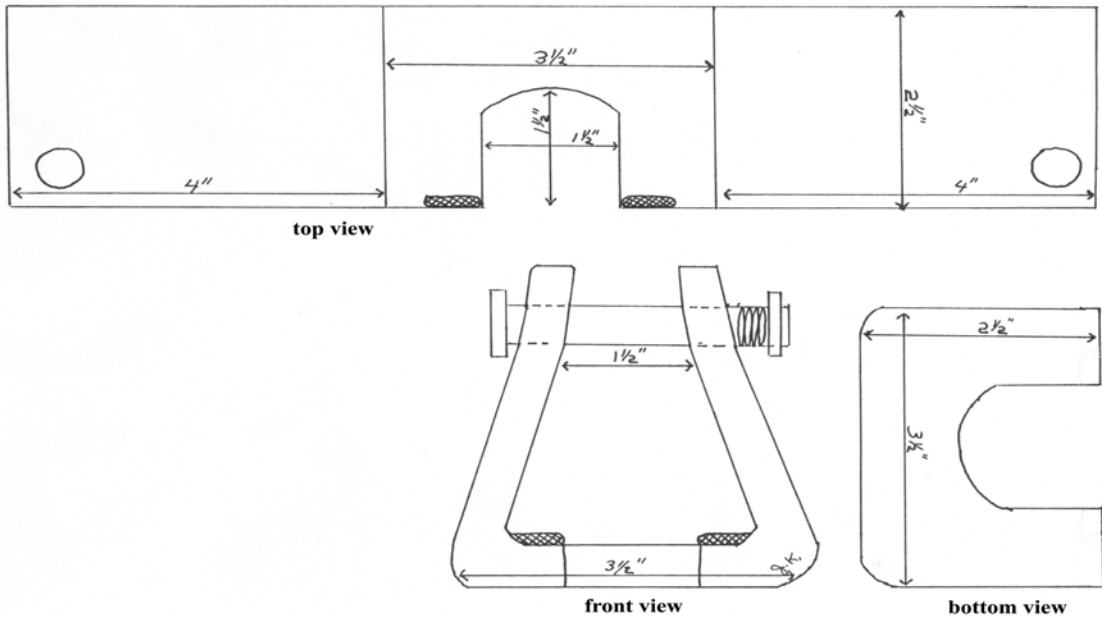


Fig. 2. Diagram of Lug Cradle-Lift.



Fig. 3. Pull-N-Jenny lug cradle apparatus.





Fig. 6. Pull-N-Jenny pulling probe from soil.

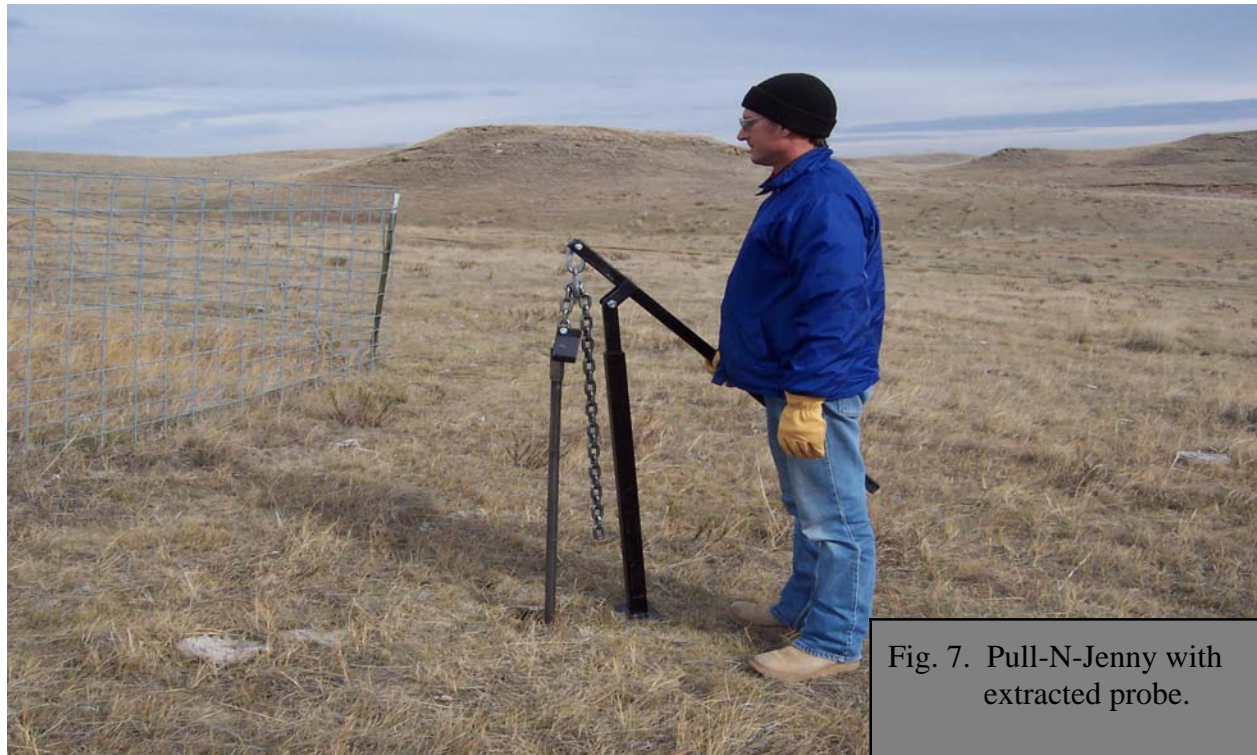


Fig. 7. Pull-N-Jenny with extracted probe.