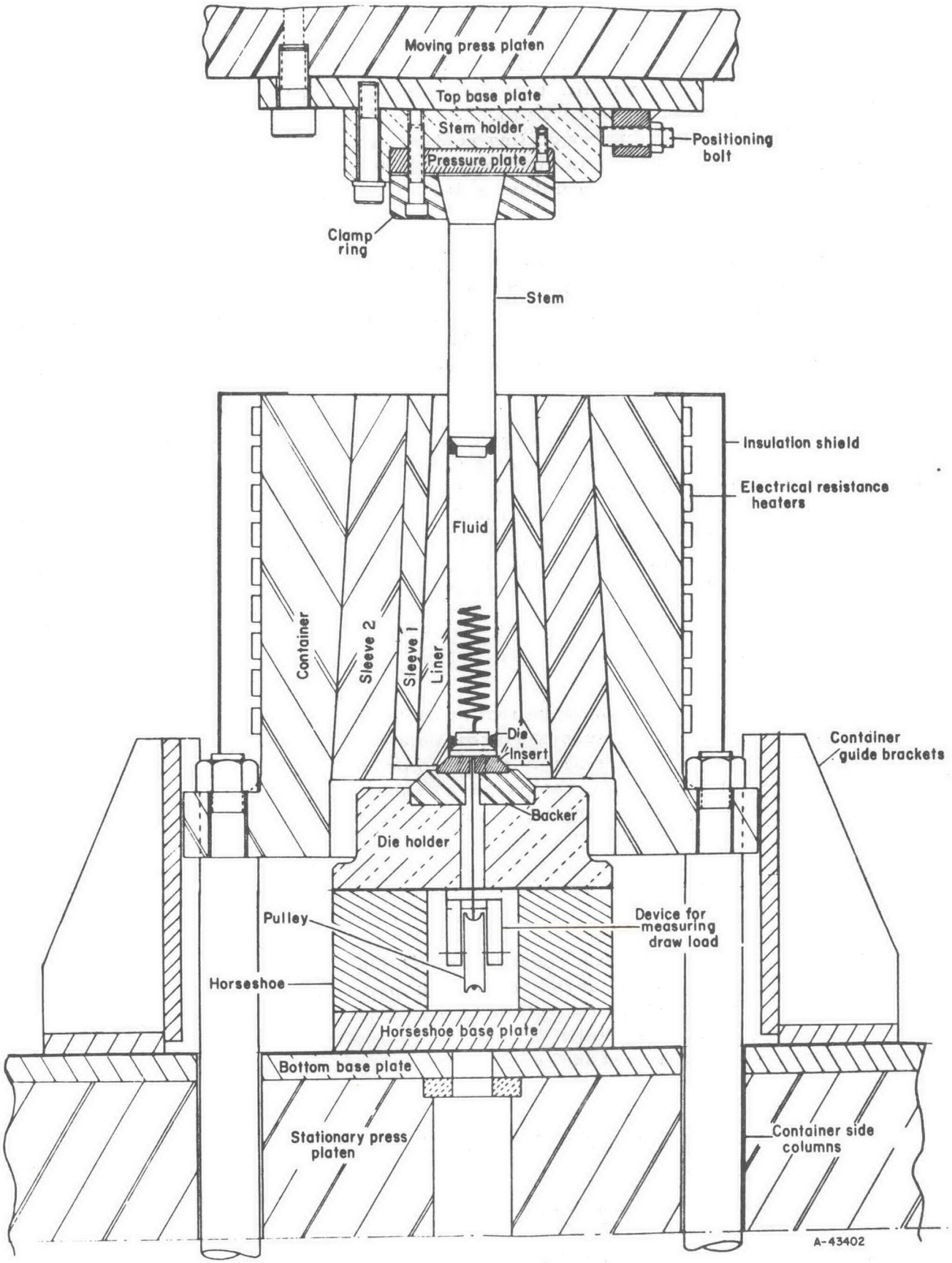

FIGURE 35. TOOLING SET-UP FOR HYDRAW OF WIRE

The drawing speed and drawing load were controlled by a unit which was capable of varying torque and speed independently. In the low draw load range for fine wire, a variable-speed motor (Zeromax Type E1-S6M2) drove through one of two interchangeable electromagnetic variable-torque limiters (Vickers Magnaclutch, Model Nos. 1 MC 90B and 10 MC 90B) permitting a control of torque from 2 to 14 inch-pounds and 10 to 140 inch-pounds. A 2.8-inch-diameter coiling reel was mounted on the output shaft of the unit. The speed range of the output shaft was 0 to 50 rpm giving a draw speed range of 0 to 32 fpm. With the two torque limiters a draw-load range of 1.5 to 100 pounds was possible.

A draw-load measuring device was located in the gap of the horseshoe. The device consisted of a steel yoke which supported a pulley mounted in ball races. The purpose of the pulley was to allow the wire to exit normal to the die axis. Strain gages were mounted on the arms of the yoke to detect strains due to the application of a draw load applied to the wire or ribbon. Draw loads could be measured to within an accuracy of ±1 percent of the maximum drawing load capacity.

In the HYDRAW of shapes, the product exited axially and therefore provision was made for the draw load to be applied beneath the 700-ton press. This was achieved by attaching a steel cable to the reduced end of the shape, passing it round a pulley about 16 feet below the tooling and then around a pulley driven by the draw control unit. Here, draw control was accomplished by a unit whose output shaft speed could be varied between 0 and 120 rpm and draw load varied between 10 and 1000 lb. (Dynamatic Ajusto-Gear, Model No. AC MG-904F.) Draw load and speed were monitored on a control console.

Wire Coil Configurations

Two methods of uncoiling the wire from within the container were used. These are shown in Figure 36. The freely suspended coil on a vertical axis was used for most of the trials. The wire guide was necessary to assist in preventing tangling at the die entry. This technique was satisfactory for the purpose of these experiments, but in the handling of fine wire, such as beryllium, tangling occasionally occurred and therefore it was necessary to investigate the horizontal-axis reel. Neither technique provides for the accommodation of large quantities of wire. However, for the purposes of these experiments, the HYDRAW parameters were readily determined with relatively short lengths of wire.

Further refinements in accommodating and paying out large quantities of wire in small-bore containers were considered but their implementation were not possible within the scope of the program. These considerations will not be necessary when containers capable of handling production quantities of wire are available. The feasibility of such large bore containers is indicated in the container design study at the end of this report.

Experimental HYDRAW Procedure

Preparation of the Point on Wire and Shape

As with conventional wire and shape drawing, it is necessary to point the wire or shape in the HYDRAW process so that it may pass through the die in order to permit gripping and applying a drawing load. For wire, the point or lead was prepared by