PORTABLE EQUIPMENT FOR MEASURING TWIST IN DOORS

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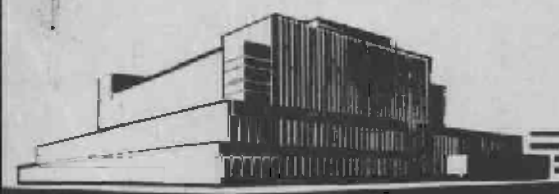

FOREST PRODUCTS LABORATORY
MADISON 5, WISCONSIN

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
In Cooperation with the University of Wisconsin

PORTABLE EQUIPMENT FOR MEASURING TWIST IN DOORS

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The principle that three points or two intersecting straight lines establish a plane has been used in a low-cost, easily constructed device for accurately measuring twist in wood doors without removing them from their hinges. This device was recently developed and used at the U. S. Forest Products Laboratory. It should be valuable for sash and door companies, building contractors, and architects for use in large buildings with many doors, or even large wood panels.

All of these flat surfaces sometimes warp when exposed to fluctuating humidity conditions. This is particularly important in doors because, after they are hung, it may be difficult to determine whether the amount of warp is within acceptable limits. Some types of warp, such as cup and bow, can be measured with a straightedge. A third type, twist, is harder to measure.

This device measures twist by using two wires that cross to establish the plane surface equidistant from the door at three corners. If the wire at the fourth corner measures the same distance from the door as the wires at the other three corners, there is no twist. However, if the wire at the fourth corner is not equidistant, the door is twisted.

Basically, the unit consists of four special C-clamps, a flashlight, two small springs, some insulated wire, and several feet of fine (number 30) bare copper wire (fig. 1). Accuracies to ±0.01 inch can be achieved through the use of tightly strung fine wire. The flashlight is modified so that the circuit is completed within it, and the bulb lights only when the fine wires make contact with each other at the center of the door.

Bolt shanks on three C-clamps are notched to receive the copper wire at equal distances from the surface of the door. The fourth C-clamp, on which the flashlight is mounted, differs from the other clamps in that it has no notch in the bolt shank. Instead, it has a sliding collar which is notched to hold the wire. These C-clamp bolts should not be excessively tightened to the door. If they are too tight, the bolts may dig into the wood and thereby produce inaccurate measurements, as well as marking the door.

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[1] Maintained at Madison, Wis., in cooperation with the University of Wisconsin.

To set up the measuring equipment one C-clamp is fastened on each corner of the door. Two separate strands of thin, bare copper wire are attached diagonally in the notches of the bolt shanks and the notch of the sliding collar. Each copper strand contains a tensioning spring to keep the wire taut. Figure 2 shows how the entire circuit is hooked up.

To operate the device, the operator moves the sliding collar until the two wires barely touch where they cross at the center of the door, and the light just flickers. The operator then carefully measures the offset, from the door, of the wire on the sliding collar (fig. 3) and compares it with the offset of the wires at the other three clamps.

For example, if the three clamp bolts have been notched exactly 3 inches from the ends, and the wires touch slightly (causing the light to flicker) when the notch on the sliding collar is 3-1/4 inches from the door, there is a 1/4-inch twist in the door. However, if the light flickers when the notch on the sliding collar is 3 inches from the door (the same distance as the wire in the other notches), there is no twist in the door.

This device is normally used to measure twist only, and not cup or bow. A door or panel could be bowed or cupped without being twisted and might conveniently be measured with a straightedge. However, if no straightedge is available, the wires of this device can be used by stringing them parallel to the edges of the door. All doors and panels should be in an upright position when they are measured, to prevent inaccuracies caused by sagging wires or distortion of the door from its own weight.

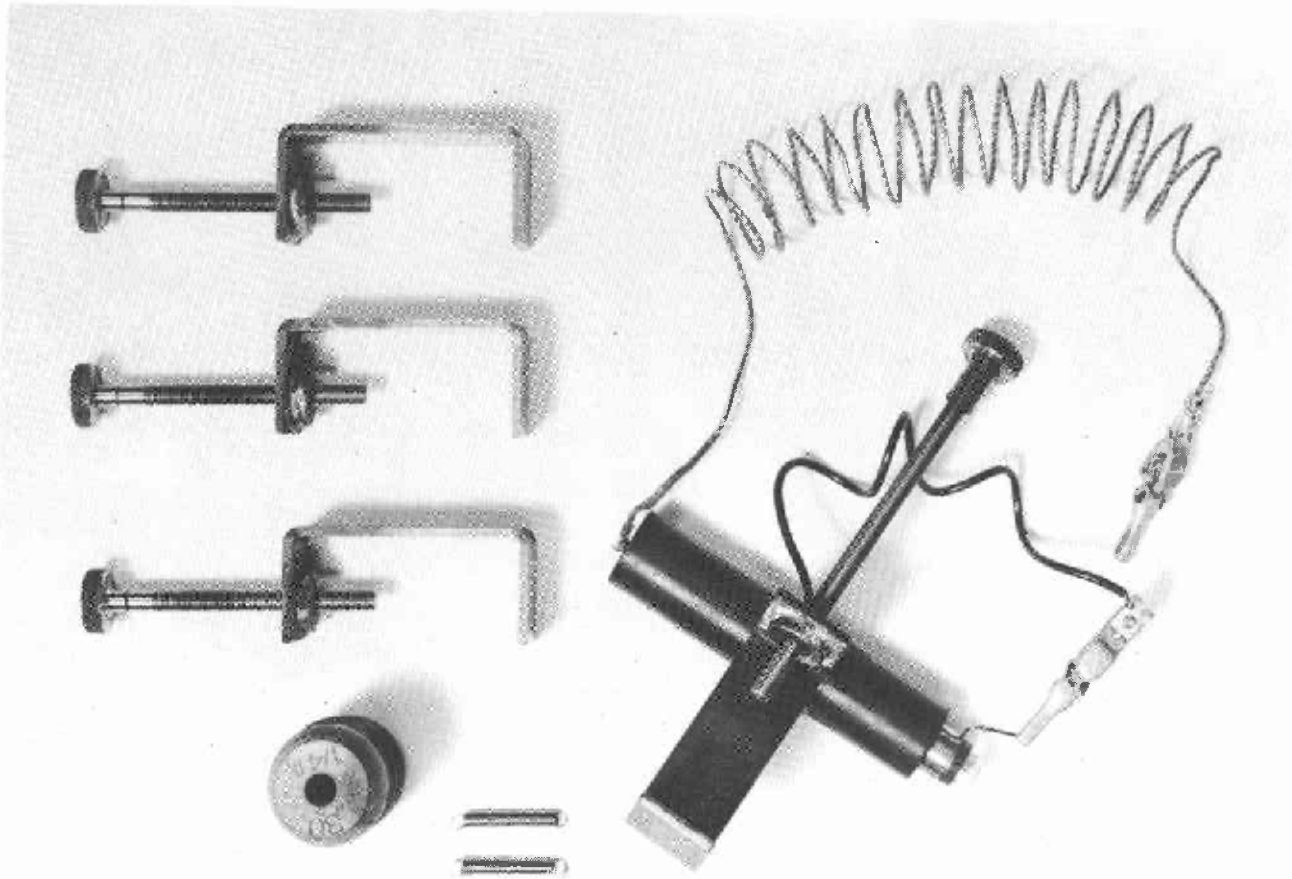

Figure 1.--Basic parts of the portable device for measuring twist in wood doors.

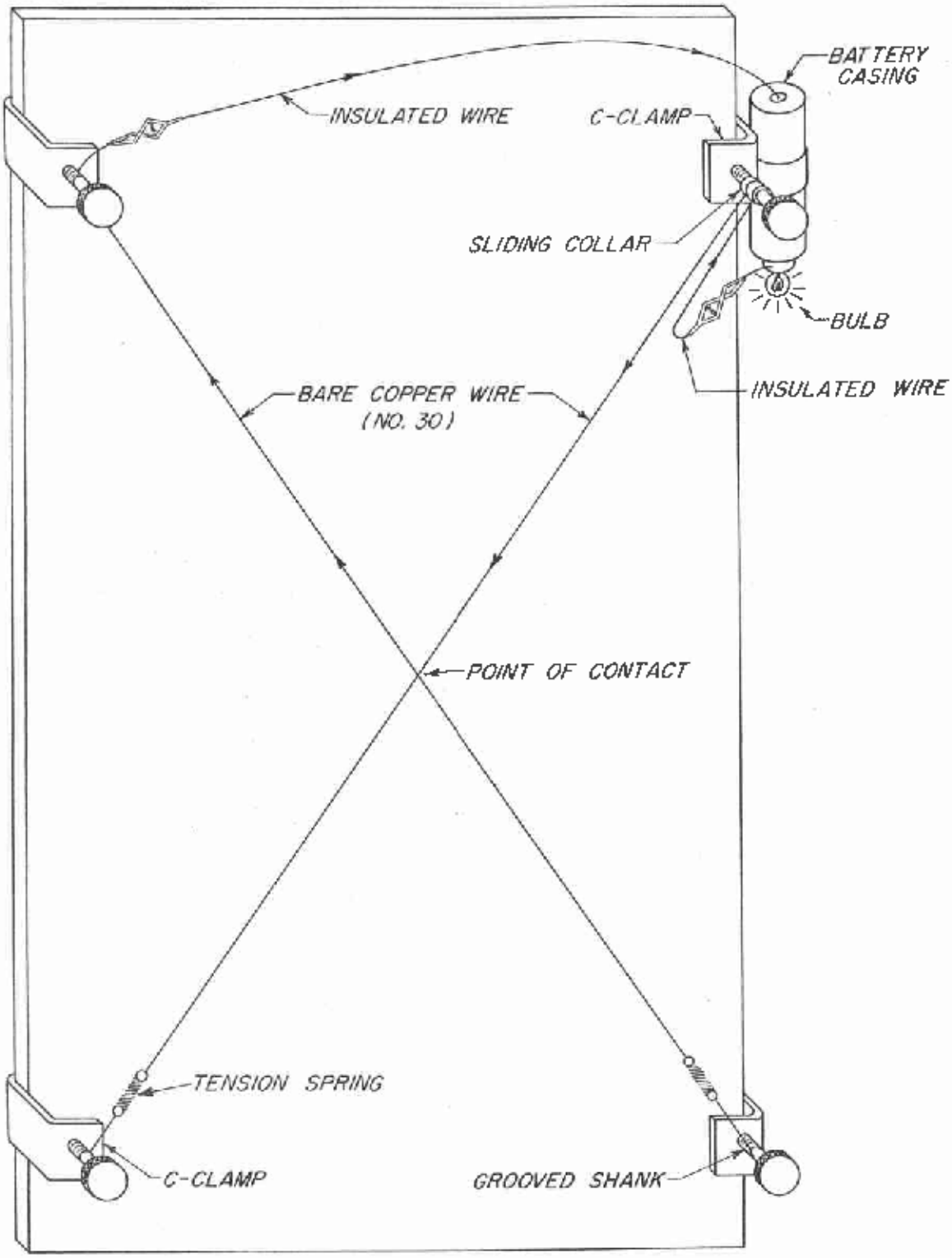

Figure 2.--Sketch of the device for measuring twist, as it appears when mounted on a door

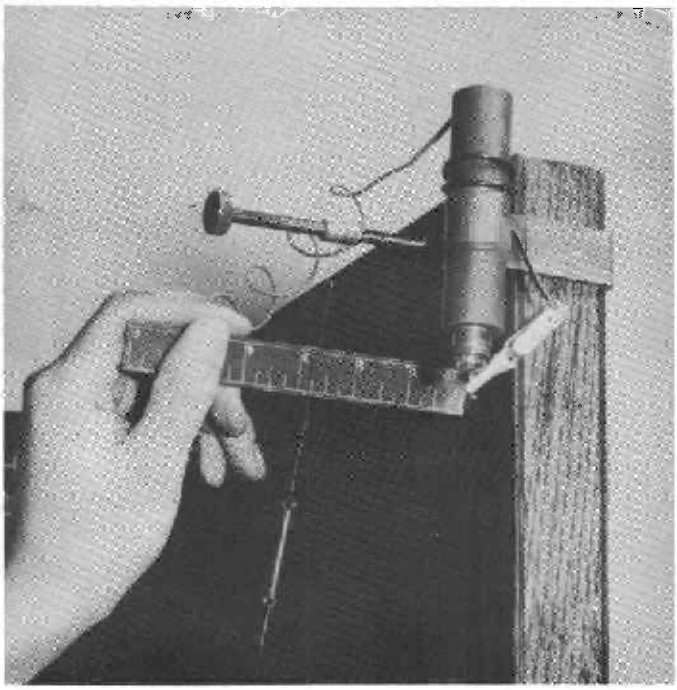

Figure 3.--Measurement of the offset of the wire from the door after the device has been adjusted. For more precise measurements, a ruler with smaller scale might be used.

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