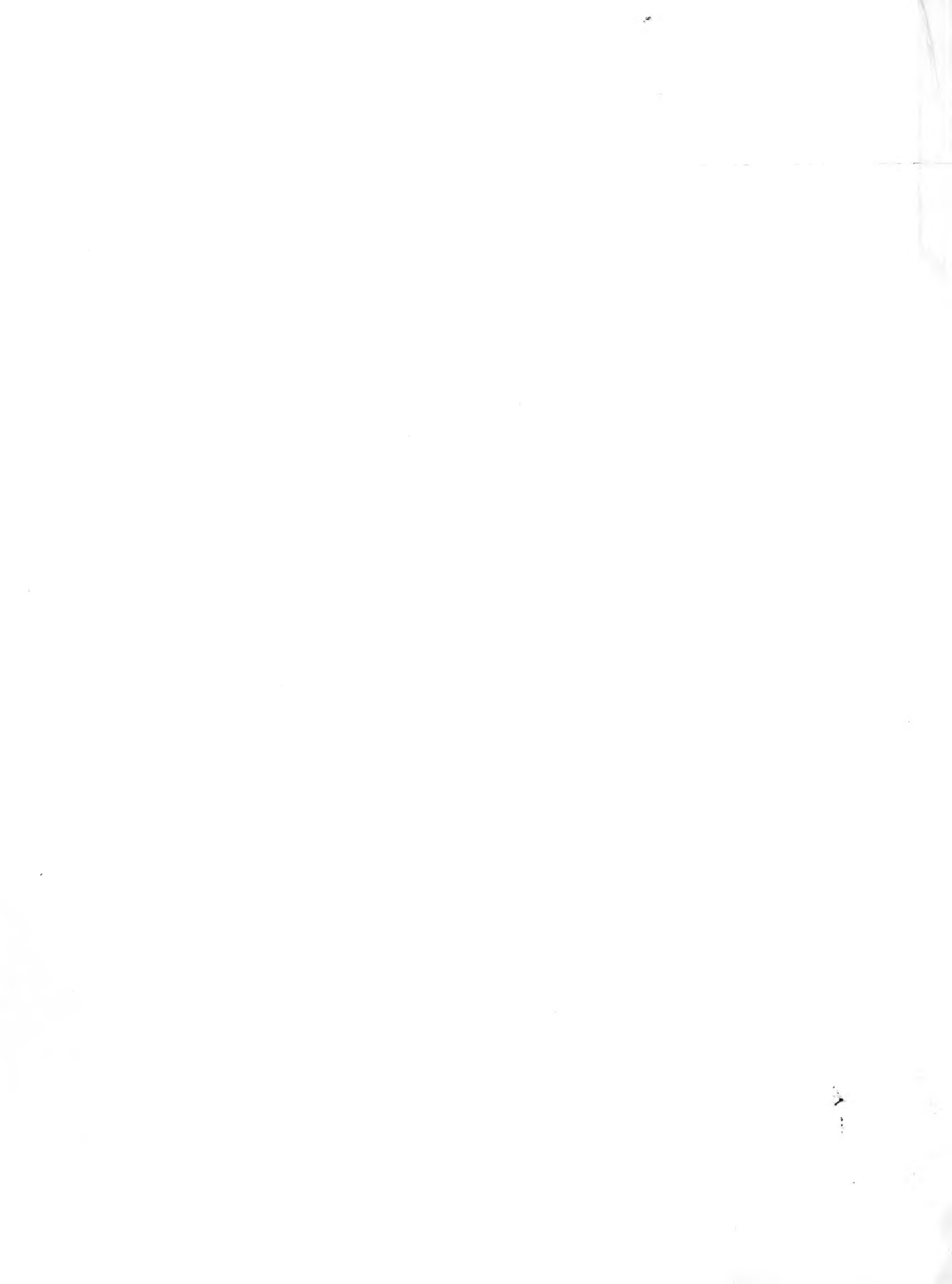


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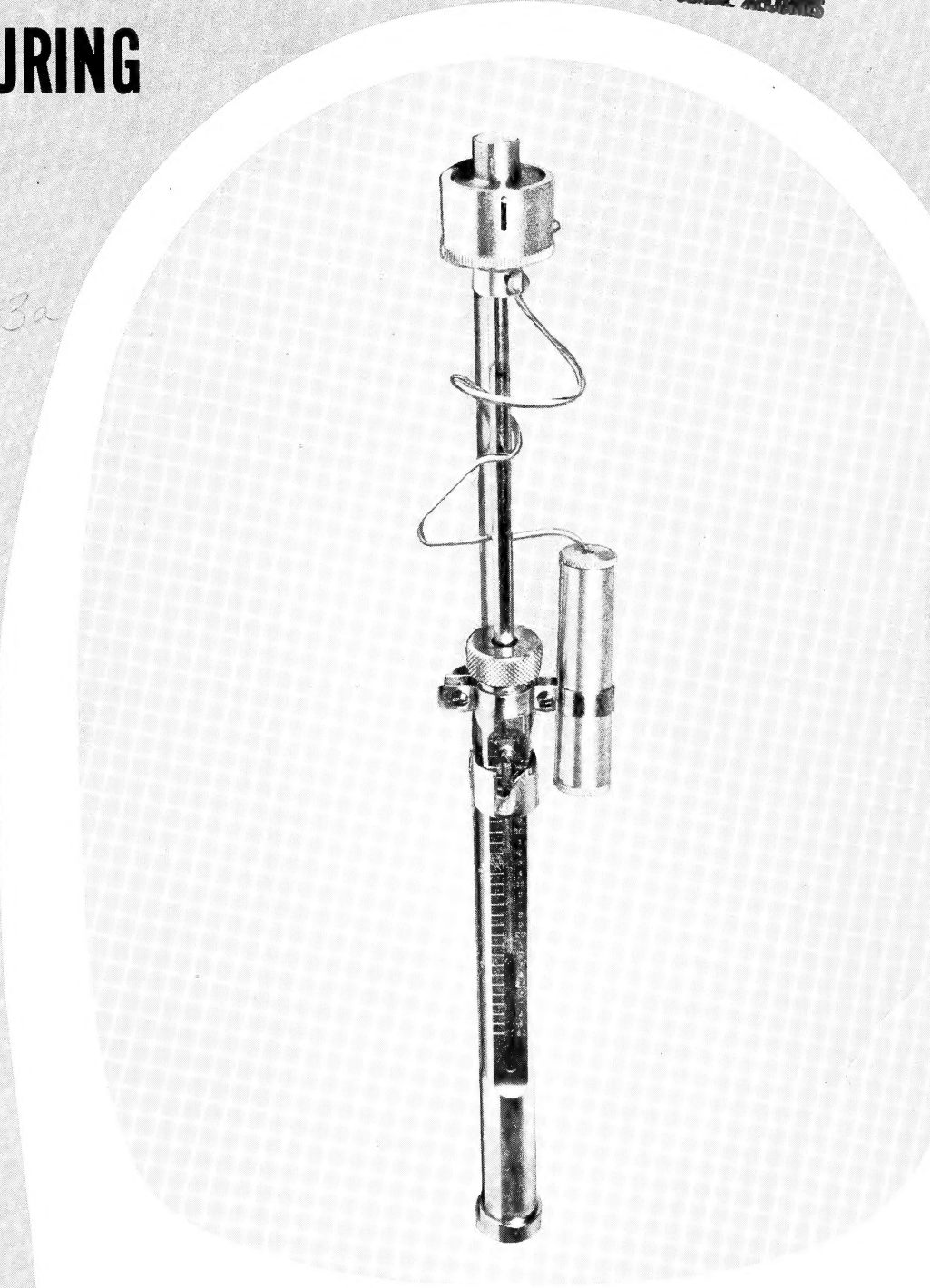
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A MECHANICAL THUMB FOR MEASURING FIRMNESS OF FRUITS

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Marketing Bulletin No. 25

U. S. DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service
Market Quality Research Division

A MECHANICAL THUMB FOR MEASURING FIRMNESS OF FRUITS

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Scientists of the Agricultural Marketing Service have devised a "mechanical thumb" with which fruit inspectors can measure objectively the firmness of the flesh of fruits, without cutting or discarding the samples. It is used as an attachment on the Magness-Taylor pressure tester by substituting it for the regular plunger at the end of the tester shaft (fig. 1).

The "thumb" consists of a plunger 1/2-inch in diameter, with a slightly convex end, encased in a close-fitting but free-sliding sleeve (fig. 2, p. 4). The plunger does not penetrate the fruit flesh, but, as it is pressed against the fruit, the sleeve is forced back as the plunger indents the fruit to a pre-set distance. At this point, an electrical contact is made which lights a small attached flashlight, and the firmness is read on the Magness-Taylor tester. These testers are available with scales reading either to 10 pounds or 30 pounds pressure, depending on the sensitivity desired and the product being tested. A tester reading to 30 pounds is used for apples.

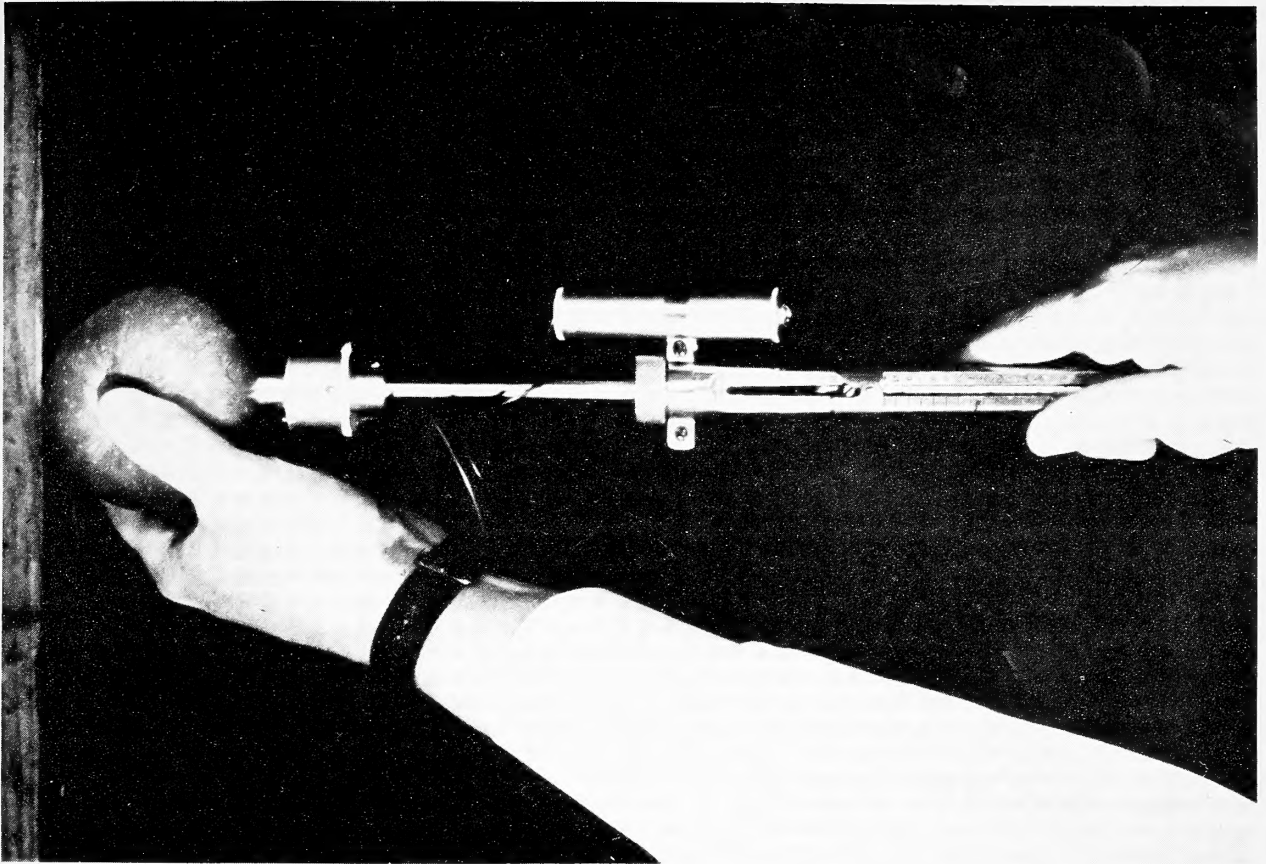
Material components:

Suggested material components shown in the scale drawing (fig. 2) are as follows, or as otherwise indicated in the drawing:

1. Plunger and housing of stainless steel or aluminum.
2. Sleeve of brass or synthetic material.
3. Spring wire of .032-inch diameter, 5 revolutions, steel.
4. All components easily accessible for purposes of maintenance and ease of calibration.

Specific requirements:

1. The plunger head is a segment of a 1-inch sphere. The actual height it extends above the sliding sleeve is not critical. It could actually be



BN-18679

Figure 1.--"Mechanical thumb" fruit firmness tester.

down inside the sleeve or extend out to nearly the depth that the plunger depresses the fruit tissue. It is critical that the head be uniform and that the instrument is set so that the plunger will depress the fruit tissue to a uniform depth, in the case of apples 0.055 inch.¹

2. The calibration adjusting screws should allow for at least .045-inch sleeve movement.
3. Exact specifications for the flashlight are not critical. All that is required is an indicator light which will go on when electrical contact is made in the "thumb" accessory.

Directions for use:

To give accurate readings, the tester must be used carefully. It must be held at a right angle to the surface of the product; otherwise erroneous readings will be obtained. The product, such as an apple, may be held in one hand

¹ Schomer, H. A., and Olsen, K. L. A Mechanical Thumb for Determining Firmness of Apples. ASHS, Vol. 81, pp. 61-66, 1962.

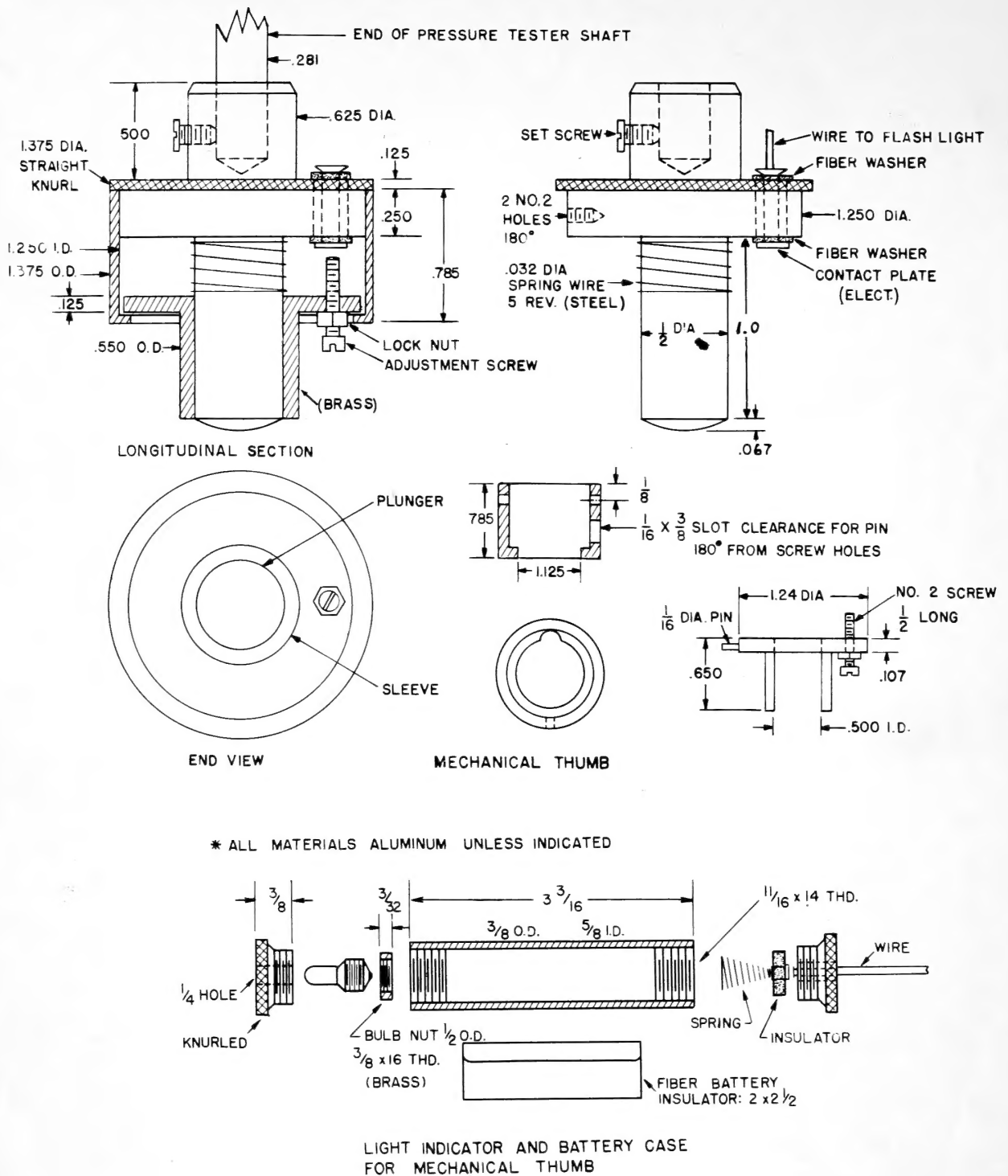


Figure 2.--Scale drawing of "mechanical thumb" attachment to Magness-Taylor pressure tester.

and the pressure applied with the tester in the other hand. However, more uniform results are obtained when the tester is clamped to a bench or table. Another method is to hold the product rigidly against a stationary surface with application of the "mechanical thumb" perpendicular to the product surface, as shown in figure 1. Pressure should be applied steadily and slowly.