Leaflet No. 4054.

"Taylor" — "Cambridge"

THE CAMBRIDGE SCIENTIFIC INSTRUMENT CO., LTD., CAMBRIDGE, ENGLAND

THE CAMBRIDGE EXTENSOMETER

U.K. Patent No. 2983/08. U.S.A. Patent applied for.

This instrument is used for measuring the amount of the extension of test pieces when subjected to tensile loads in a Testing Machine. It will take round bars as large as 20 mm. or $\frac{3}{4}$ inch in diameter. It has no mirrors or microscopes for magnifying the movement but the extension of the test piece is measured by a micrometer screw and a modified form of contact measurement.

The instrument has no delicate parts likely to get out of order and can be roughly handled without any danger of it becoming damaged, and in this respect is more like a workshop tool than a delicate scientific instrument.

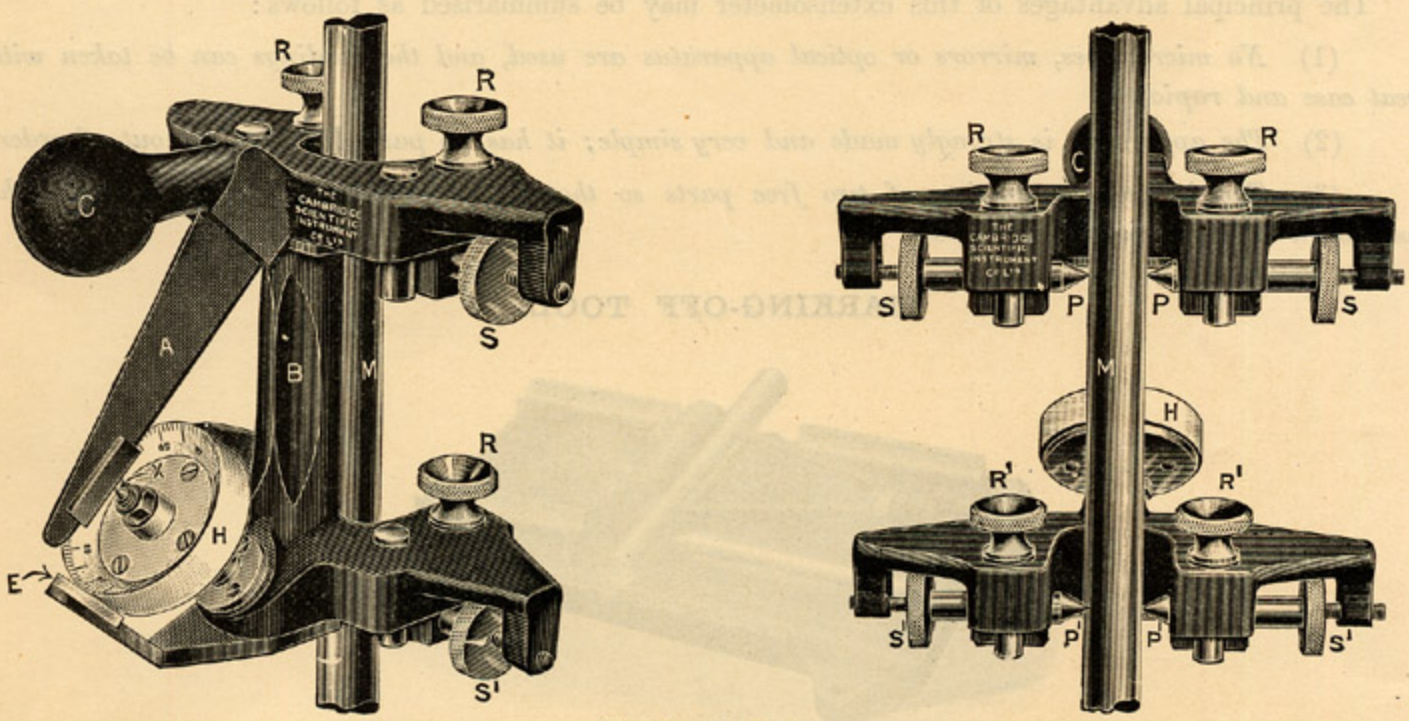

Fig. 1. $\frac{1}{3}$ full size.

The instrument is made in two separate pieces, the lower piece carries the micrometer screw with the divided head *H* and the upper piece carries a flexible tongue *A* made of a thin nickel plated sheet of steel. These are fixed to the test piece by pressing the conical points of hard steel rods *PP* and *P'P'*, into centre-punch marks in the side of the test piece. These steel rods are driven forward in geometrical slides by screws and are clamped firmly in position by means of the milled heads *RR* and *R'R'*. It is important that the points should not be driven with too much force into the centre punch marks in the test piece. Both parts of the instrument should be capable of rotating quite freely about the points but there must be no back lash. A vertical arm *B* forms part of the lower piece, and has a knife edge at its upper end. This knife edge rests in a notch in the lower side of the upper piece. The weight of both the upper and lower pieces tend to make them rotate about the points; this rotation is prevented by the knife edge resting in the notch and they are held in a definite position till the test piece stretches when the upper piece rotates and the end of the tongue approaches the point on the micrometer screw head. The upper piece forms a lever which magnifies the movement so that the part of the tongue opposite the point on the micrometer head moves five times the amount of the extension of the test piece. By means of an adjustment the ratio of the arms of the lever can be made so that this multiplication of the extension can be made exact.

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We require to measure the relative movement of the tongue *A* and the point *X* of the micrometer screw in order to obtain the extension of the test piece. If the tongue is caused to vibrate, the hard steel knife-edge fixed near its outer end passes rapidly backwards and forwards in front of the hard steel point. The divided head is then turned till the knife just touches the point each time it passes it. This is a most delicate way of setting the micrometer screw; if the point advances by 1/1000 mm. the sound produced is much louder and the vibrating tongue is quickly brought to rest. A reading is taken with a small load on the test piece; the load is then increased and another reading taken, and the difference of these readings gives the extension of the test piece. If the test piece is of small diameter the spring does not vibrate in so satisfactory a manner; the cause of this is the flexibility of the test piece, the instrument itself vibrating as well as the spring. Still very delicate readings can be taken by simply deflecting the spring with the finger and noting the contact as it passes the point. No damage can be done by advancing the micrometer screw too far forward; all that happens is that the point passes the knife edge on one side or the other.

The micrometer screw has a pitch of ½ mm. and and the head is divided into 100 parts; as the lever multiplies five times each division on the head corresponds to an extension of 1/1000 mm. and as the tenths of divisions can be estimated by eye, readings can be taken to 1/10,000 mm. although it is not claimed that the results are trustworthy to this degree of accuracy. The effective length of the test piece is 100 mm., thus by estimation readings can be taken to 1/1,000,000 of the length of the test piece.

ADVANTAGES.

The principal advantages of this extensometer may be summarised as follows:

(1) *No microscopes, mirrors or optical apparatus are used, and the readings can be taken with great ease and rapidity.*

(2) *The apparatus is strongly made and very simple; it has no parts likely to get out of order.*

(3) *The instrument consists of two free parts so that if a specimen unexpectedly breaks the instrument is not seriously damaged.*

MARKING-OFF TOOL.

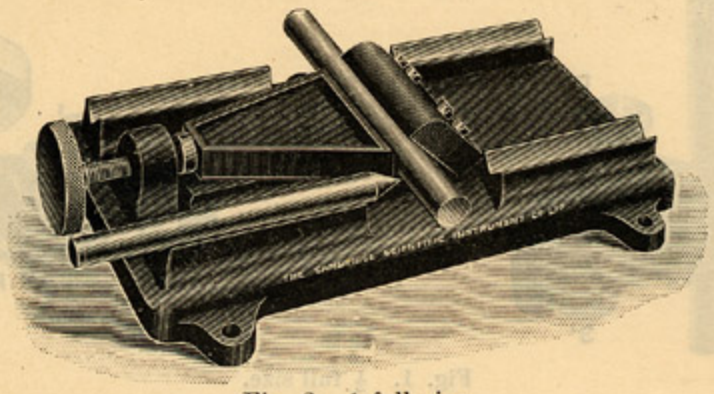

Fig. 2. ⅓ full size.

This is for marking off the specimens for the extensometer, and consists of a cast-iron base having two V grooves exactly 100 mm. apart running lengthwise along it. These grooves are cut away at the centre, permitting the specimen to lie across them at right angles, in which position it is held by a screw clamp gripping it in another V groove at right angles to the first two. A hardened steel centre punch is supplied to slide in the grooves, and by tapping it with a hammer the specimen is truly marked off. The centre of the cross V groove is level with the point of the centre punch so that the tool will take any sized specimen within its limits. The point of the centre punch has three small flats on it so that it actually makes a triangular hole in which the conical points of the extensometer fit geometrically without any play.

PRICES, DUTY PAID.

	$	Code Word
Extensometer, in case complete	92.00	*Milliped*
Marking-off tool for marking centres 100 mm. apart, suitable for use with Cambridge Patent Extensometer	17.00	*Maygame*

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