

Jan. 12, 1926.

1,569,352

P. H. BRACE
WIRE TESTING EXTENSOMETER

Filed May 12, 1919

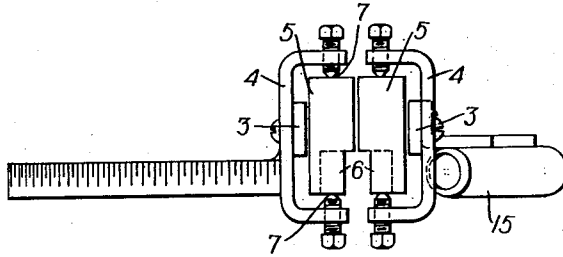


Fig. 1.

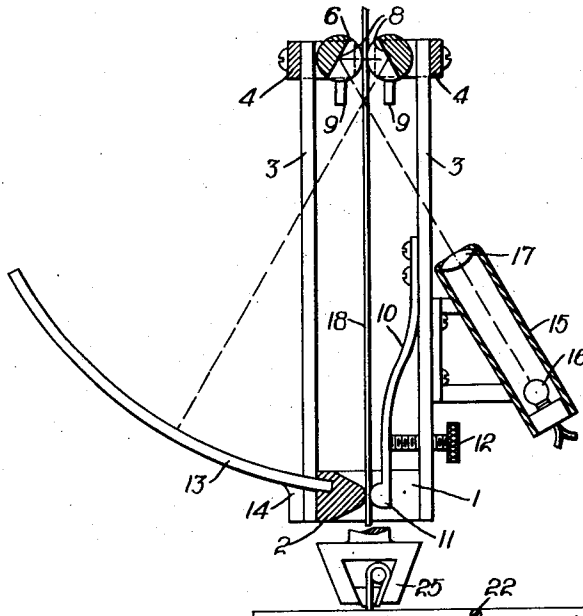


Fig. 2.

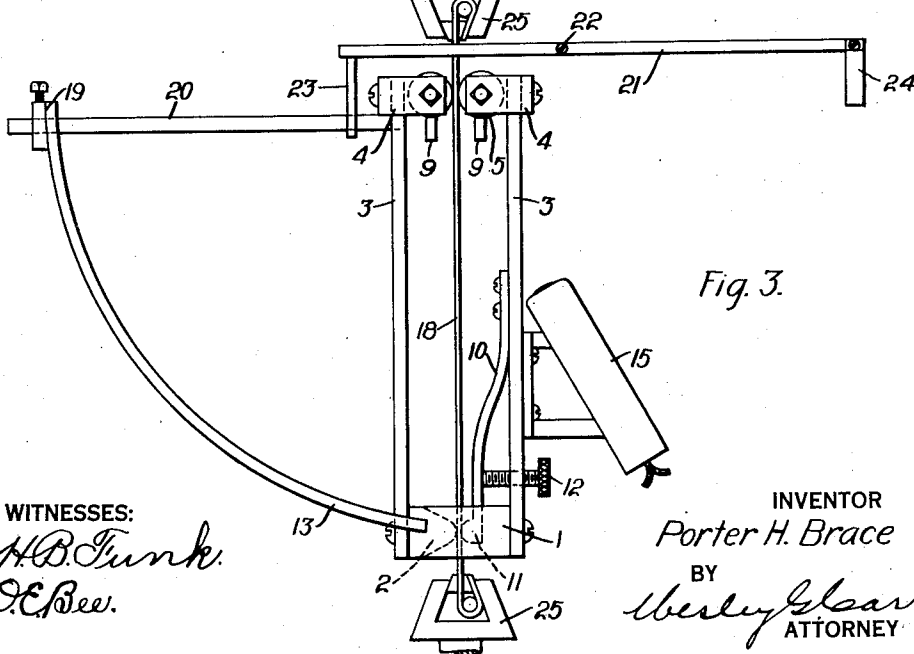


Fig. 3.

WITNESSES:

H. B. Funk.
O. E. Bee.

INVENTOR

Porter H. Brace

BY

Wesley G. Carr
ATTORNEY

Patented Jan. 12, 1926.

1,569,352

UNITED STATES PATENT OFFICE.

PORTER H. BRACE, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

WIRE-TESTING EXTENSOMETER.

Application filed May 12, 1919. Serial No. 296,572.

To all whom it may concern:

Be it known that I, PORTER H. BRACE, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Wire-Testing Extensometers, of which the following is a specification.

My invention relates to extensometers and it has, for its primary object, the provision of devices of the above mentioned character which may be employed in measuring the elastic properties of wire or other similar products.

Heretofore, the lack of proper facilities for determining the elastic properties of certain materials has been a source of great inconvenience. While, in many cases, ordinary commercial tests of strength and ductility are satisfactory, it has been found that they do not form a safe guide in selecting material for employment where dependence is placed upon the elastic properties rather than upon the ultimate strength. Although the ultimate strength and ductility should be considered, an accurate knowledge of the elastic properties of some materials is often necessary. In view of this, one object of my invention is to provide a device which may be employed in determining the elastic properties of certain materials and which device may be easily manipulated to obtain a high degree of accuracy.

A still further object of my invention is to provide a device for determining the elastic properties of materials which shall be light in weight, simple in construction and inexpensive to manufacture.

With these and other objects in view, my invention will be more fully described, illustrated in the drawings, in the several views of which corresponding numerals indicate like parts, and then particularly pointed out in the claims.

In the drawings, Fig. 1 is a plan view of an extensometer constructed in accordance with my invention; Fig. 2 is a side view, partially in section and partially in elevation, of the extensometer shown in Fig. 1, and Fig. 3 is a side view of an extensometer which embodies my invention, illustrating the manner of employing it with a standard testing machine.

As shown in Figs. 1 and 2, an extensometer may be provided, which embodies my

invention, by employing a block or base 1 having an opening provided therethrough and which is formed with a rounded shoulder 2 extending into the opening. Resilient members 3 may have corresponding ends secured to opposite sides of the block 1 and may have bearing members 4, of U-shape, attached to their other ends. A plurality of cylindrical rolls 5, having flattened portions 6 adjacent their corresponding ends, may be rotatably mounted upon the members 4, as indicated at 7. The flattened portions 6 of the rolls 5 may be provided with suitable reflectors or mirrors 8 and the rolls may also have levers 9 so secured to their opposite ends as to project at right angles from their axes. The rolls 5 are so mounted that a plane through their line of contact is tangent to the rounded end of the shoulder 2. A resilient member 10, having a rounded shoulder 11 at one end, may be so secured, at its other end, to one of the resilient members 3 as to extend into the opening in the base 1. The member 10 may be so adjusted, by means of a thumb screw 12, that the shoulder 11 shall engage the shoulder 2 of the base 1.

A suitable scale 13 may be secured to one of the resilient members 3, adjacent to the base 1, as indicated at 14. A tubular member 15, containing a suitable lamp 16 and a lens 17, may be so mounted upon the resilient member 3 as to direct light from the lamp 16 to the reflector upon one of the rolls 5 from which it may be reflected to the mirror or reflector upon the other roll and thence to the scale 13.

In operation, a test piece 18 may be disposed in the device by extending it through the opening in the base 1 and passing it between the rolls 5 by separating the resilient members 3 which normally hold the rolls in engagement. The device may be clamped to the test piece 18 by so advancing the thumb screw 12 that the rounded end 11 of the resilient member 10 engages it and forces the test piece into engagement with the shoulder 2. The device is thus secured to the test piece and may, therefore, move with the test piece as a whole but relative to it at the rolls 5.

When the test piece has been disposed in the device, the rolls may be so adjusted, by means of the levers 9, that the light directed from the lamp 16 upon the mirrors

may be reflected upon the zero division of the scale 13. It will be apparent that an elongation of the test piece will impart rotative movement to the rolls and, therefore, cause the reflected light to move along the scale and thus indicate the amount of elongation. By reflecting the light, as above described, an angular movement is given the emergent beam which is equal to 4 times that of the roll. This permits of securing high magnifications of the elongation of the test specimen without mechanical complications.

The scale employed may be divided in any manner desired, and the calibration may be accomplished by employing a micrometer screw to advance a piece of smooth, straight drill rod between the rolls while the extensometer is held rigidly to the same support that carries the micrometer. The elongation of a test specimen may thus be imitated. For example, the mean of three successive concordant determinations, over a range of 0.04" gives an average scale value of 0.0008233" per centimeter. From the above scale value, it will be apparent that, by reading to a fifth of the smallest division, length changes as small as 0.00002" may readily be detected.

As will be noted, the scale is curved and is preferably on an arc of a circle, the center of which is the axis of the roll from which the light is reflected to the scale. Although the scale, as ordinarily divided, indicates only a small elongation of the test piece, such elongation may be read and the rolls readjusted so that the light may be drawn back on the scale and further readings taken until the desired result has been reached.

In practice, the extensometer may be attached to a machine of standard type for testing the elastic properties of materials, as shown in Fig. 3. As here shown, the scale 13 may be secured, at one end, as indicated at 19, to a rod or tube 20 which may, in turn, be secured to one of the resilient members 3. The device may be attached to a machine by employing a rod or lever arm 21 which may be pivotally mounted upon the machine, as indicated at 22. The lever arm may have a hook 23 secured to one of its ends which may engage the tube 20 and may have a counterweight 24 attached to its other end. The weight 24 may be employed to balance the weight of the extensometer and thus insure easy attachment thereof to the test piece without danger of mechanical injury thereto. As the machine for stretching the test piece is of well known construction, only the jaws 25 thereof are shown. The test piece is disposed in place with respect to the extensometer and is then secured within the jaws 25 in the usual manner, after which the weights or other means of stretching the

piece are applied and the amount of the applied force is noted together with the scale reading indicated by the reflected light ray.

Although I have described an extensometer which is constructed in accordance with my invention, it will be obvious that minor changes may be made in the construction thereof without departing from the spirit of my invention and I desire, therefore, that no limitations shall be imposed except such as are indicated in the appended claims.

I claim as my invention:

1. An extensometer comprising means for detecting the elongation of a test piece and for indicating the amount of elongation, said means including a scale, and a plurality of reflectors adapted to be moved by the test piece and co-operating to reflect a single beam of light upon the scale for magnifying the degree of elongation of the test piece.

2. An extensometer comprising a plurality of cylindrical members having flattened portions adjacent their ends, light reflectors mounted upon the flattened portions, means for maintaining the members in engagement with a test piece disposed between them, a scale carried by said means, and means for so directing a light ray upon one of the reflectors that it will be reflected by the other upon the scale.

3. An extensometer comprising a plurality of resilient supporting members, means for mounting the members in spaced positions upon opposite sides of work to be tested, a plurality of cylindrical rolls having flattened portions adjacent their ends, reflectors mounted upon said portions, means, carried by the resilient members, for rotatably supporting the rolls in engagement with the work, a scale attached to one of the resilient members and means for directing a ray of light upon one of the reflectors whereby it will be reflected by the other upon the scale.

4. An extensometer comprising a base provided with an opening, a plurality of resilient members secured thereto, bearing members mounted upon the resilient members, a plurality of cylindrical rolls rotatably mounted upon said bearing members and having flattened portions provided with mirrors, a scale attached to one of the resilient members, and means for directing a ray of light upon one of the mirrors whereby it will be reflected upon the scale by the other mirror.

5. An extensometer comprising a base provided with an opening, means for securing a test piece within the opening, a plurality of resilient members fastened to said base, bearing members mounted upon the resilient members, a plurality of cylindrical rolls rotatably mounted upon said bearing members and having flattened portions provided with

mirrors, a plurality of lever arms secured to the rolls and projecting therefrom, a scale attached to one of the resilient members, and means for so directing a light ray
5 upon one of the mirrors that it will be reflected upon the scale by the other mirror.

6. An extensometer comprising a base provided with an opening, resilient means for securing a test piece within the opening, a
10 plurality of resilient members fastened to said base, bearing members mounted upon the resilient members, a plurality of cylindrical rolls rotatably mounted upon said

bearing members and having flattened portions provided with mirrors, a plurality of 15 lever arms secured to the rolls and projecting therefrom, an arcuate scale attached to one of the resilient members, and means for so directing a light ray upon one of the mirrors that it will be reflected upon the scale by 20 the other mirror.

In testimony whereof, I have hereunto subscribed my name this 29th day of April, 1919.

PORTER H. BRACE.