A. E. WHITMORE.
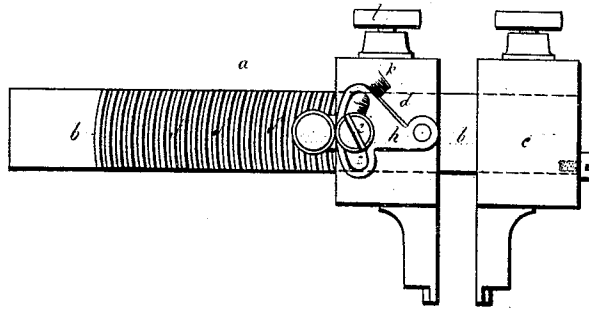## Calipers.
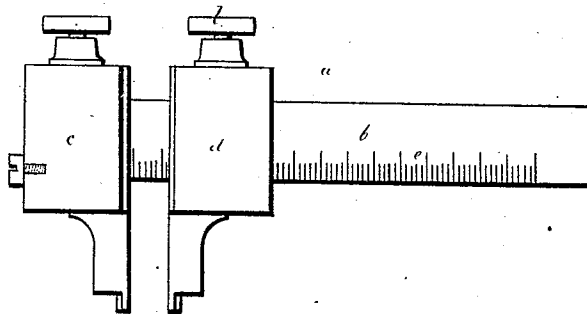
No. 101,689.

Patented April 5, 1870.
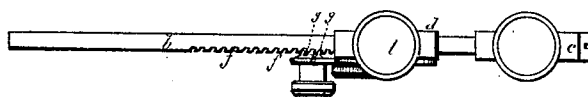
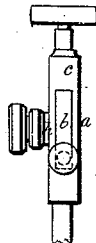Fig. 1.

Fig. 2.

Fig. 4.

Fig. 3.

Witnesses.

A.E.Whitmore.
by his Attorney.
Frederick Curtis

ANDREW E. WHITMORE, OF SOMERVILLE, MASSACHUSETTS.

IMPROVEMENT IN SLIDING CALIPERS

The Schedule referred to in these Letters Patent and making part of the same

To all to whom these presents shall come:

Be it known that I, ANDREW E. WHITMORE, of Somerville, in the county of Middlesex and State of Massachusetts, have made an invention of a certain new and useful Improvement in Beam or Sliding Calipers; and do hereby declare the following to be a full, clear, and exact description thereof, due reference being had to the accompanying drawings making part of this specification, and in which—

Figures 1 and 2 are opposite side elevations;

Figure 3, an end elevation; and

Figure 4, a plan of an instrument embodying my improvement.

The invention herein described and constituting the subject matter of these Letters Patent, is an improved construction of a class of calipers now coming into use among mechanics for obtaining accurate measurements, known as beam-calipers, or those embodying in themselves both gauge and measure, and which consists, briefly, in the employment of a box or beam carrying two jaws, a stationary and a movable one, mounted thereupon, one jaw being susceptible of traversions to and fro of the major portion of the beam, and, with respect to the stationary jaw, the recession and approach of the two jaws being accurately determined by means of mechanical devices and the aid of scales of measurement, different in mode with various manufacturers.

Instruments of this class, as heretofore produced, are more or less complex in their nature and expensive in manufacture, and the chief object I have had in view in the present invention is to originate an instrument which, while susceptible of noting the most accurate and minute measurements, shall be simple and comparatively cheap of construction.

To this end, and as one feature of economy to which the simplicity of my instrument give me peculiar possession, I produce it nearly entire from sheet metal, thus avoiding the expense of boring, turning, cutting screws, &c., to which others are now subject.

The drawings accompanying and illustrating this description of my invention exhibit, at *a*, a beam-caliper, of which—

b is the bar or beam;

c, the stationary jaw, fixed to one extremity of the beam and at right angles thereto; and

d, the movable jaw, which is mounted and slides freely upon the beam *b*, and to and fro thereof in respect to the stationary jaw *c*.

Both the primary and movable jaws are slotted and embrace the beam *b*, the former being confined in place by means of a screw, which is screwed into the end of the beam, and whose head overlaps the contiguous edges of the jaw, the purpose of the screw being to advance the jaw upon the beam, in order to compensate for any wear which may result to the measuring-face of such jaw.

The movements of coincidence and departure of the movable jaw *d*, in its relation to the primary jaw, and, consequently, the measurements ascertained by the instrument, are effected as follows:

Upon one face of the beam *b* of the instrument, preferably the rear side, or that most remote from the user, I engrave a scale, *e*, of measurements of inches, subdivided, preferably, into twenty-fifths, as that is the fraction of an inch upon which the action of the instrument is, in the present instance, based.

Upon the opposite or front side of the beam *b* I cut or impress, for a greater part of its entire length, a range of grooves or scores, *f f*; while, taking into these grooves, and fitting tightly therein to prevent back-lash, will be seen one or more teeth *g g*, &c., fixed to or making part of the inner side of a sectoral plate, *h*, such plate being pivoted at its opposite end to the front face of the sliding jaw *d*, and being capable of short vibrations thereupon through an arc of a circle, the extreme movements of the sectional plate being determined by a screw, *i*, passing through a slot, *j*, formed therein, and screwing into the jaw.

The grooves *f f*, &c., may be curved or straight, but in either case are tangential to a circle whose center is the fulcrum of the sectoral plate *h*, the extent of this departure of the tangent from the said circle being, in the present instance, one twenty-fifth part of an inch, in order that, upon causing the sectoral plate and its teeth *g g* to travel across the face of the beam, the movable jaw shall be drawn thereupon and away from the stationary jaw to the extent of such a fractional measurement.

The instrument, as in this case adapted, is to determine measurements as minute as one-thousandth part of an inch, as this is sufficiently minute for all purposes to which an instrument would be applied.

As we have now seen how we may obtain movements of the movable jaw upon the beam and away from the stationary jaw of twenty-fifths of an inch, it remains for me to provide a scale or means of ascertaining, accurately, the said thousandths of an inch, and, to effect this, I engrave or affix upon the front face of the movable jaw, in rear of the sectoral plate *h*, and concentric with its pivot, an arc of divisions, *k*, composed of fortieths of an inch, or, I should say, of such fractions of an inch as shall produce variations of a thousandth of an inch in the teeth *g g*, before mentioned as taking into the grooves *f f*.

It will be seen, by depressing the sectoral plate from one to the next adjacent division of the scale *k*, that the movable jaw will be caused to slide upon the beam *b* and recede from the primary jaw the distance of one-thousandth part of an inch, as this fraction is the

multiple of the minute divisions of the arc of divisions k and of the tangential departure of the grooves f from a concentric path struck from the pivot of the plate h as a center.

The minuteness of measurement, of which my present instrument is susceptible, is, of course dependent upon the infinitesimal divisions of the scale k, and of the extent of the tangential departure of the grooves $f f$ from a circle whose center is the fulcrum of the plate h.

This degree of exactitude of measurement may, of of course, be varied should occasion require.

To obtain measurements of the larger fractional parts of an inch, the movable jaw is to be moved upon the beam in harmony with the scale of inches upon its back, the teeth $g g$ being raised from out the grooves $f f$ to enable this to be done, it being understood that the divisions of this scale of inches are to correspond with the grooves $f f$, that is, to effect such relationship of the movable jaw therewith, that is, the inner and measuring-face of such jaw shall coincide with some one of such divisions at the time the teeth $g g$ are about to take into the grooves $f f$.

In the present instance, the upper edge of the sectoral plate h is employed as a marker to the scale k, and it should be borne in mind, as it undoubtedly will be apparent to the intelligent reader, that as the teeth $g g$ are about entering the grooves $f f$, or at the point of impact of the two, the said edge of the plate shall coincide with the starting or zero-point of the scale k.

It should further be understood that the indicating-edge of the plate h should stand at the zero of its scale when the two jaws are in contact; hence, upon lowering the said plate the extent of one division of the scale, a separation of the two jaws would ensue to the extent of a thousandth part of an inch.

The thumb-screw l, which is seen in the annexed drawings as screwing through the upper end of the movable jaw and upon the beam, is to insure the fixture of the two after a measurement may have been taken, should this be found desirable.

In the use of my invention, ordinary measurement of inches to fractions of twenty-fifths are obtained by the use of the scale of inches on the obverse side of the beam of the instrument.

The minute fractions of an inch, to the extent of one-thousandth, are obtained by means of the grooves $f f$ and the scale k, as before stated, and this factional multiplication may be carried to any practicable extent by variations in such parts.

I claim the combination of the beam b with its scale e and grooves $f f$, the jaw d with its scale k, the plate h with its teeth $g g$, and the jaw c, the whole being organized and operating as herein referred to and described.

A. E. WHITMORE.

Witnesses:
    FRED. CURTIS,
    E. GRIFFITH.