No. 626,876. Patented June 13, 1899.

F. SPALDING & E. C. THURSTON.

MICROMETER CALIPERS.

(Application filed July 29, 1898.)

(No Model.)

Fig. 1.

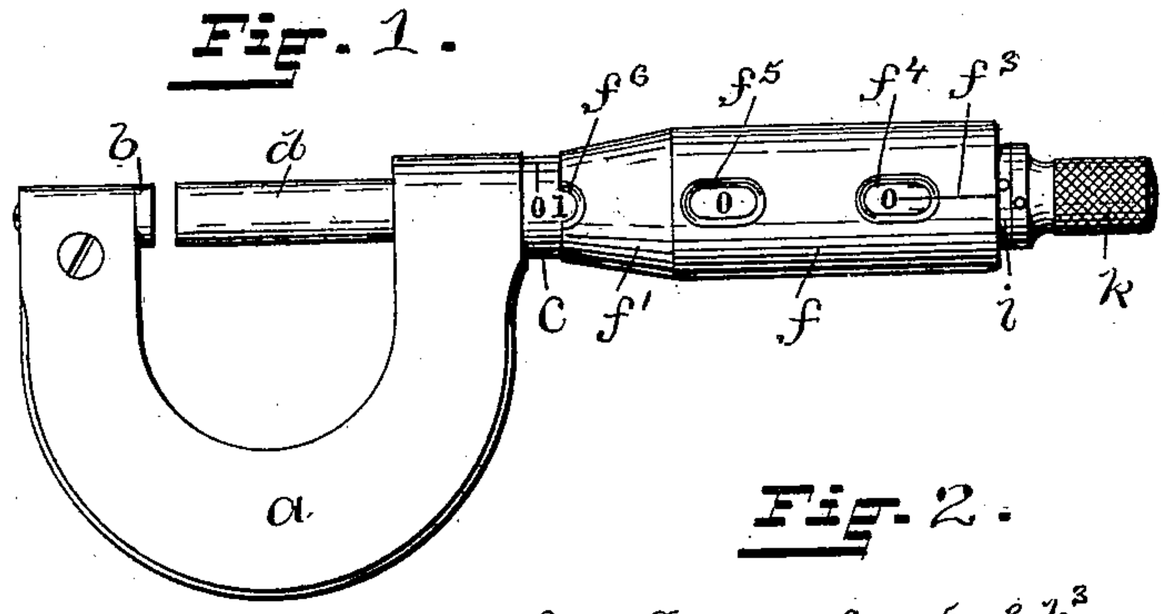


Fig. 2.

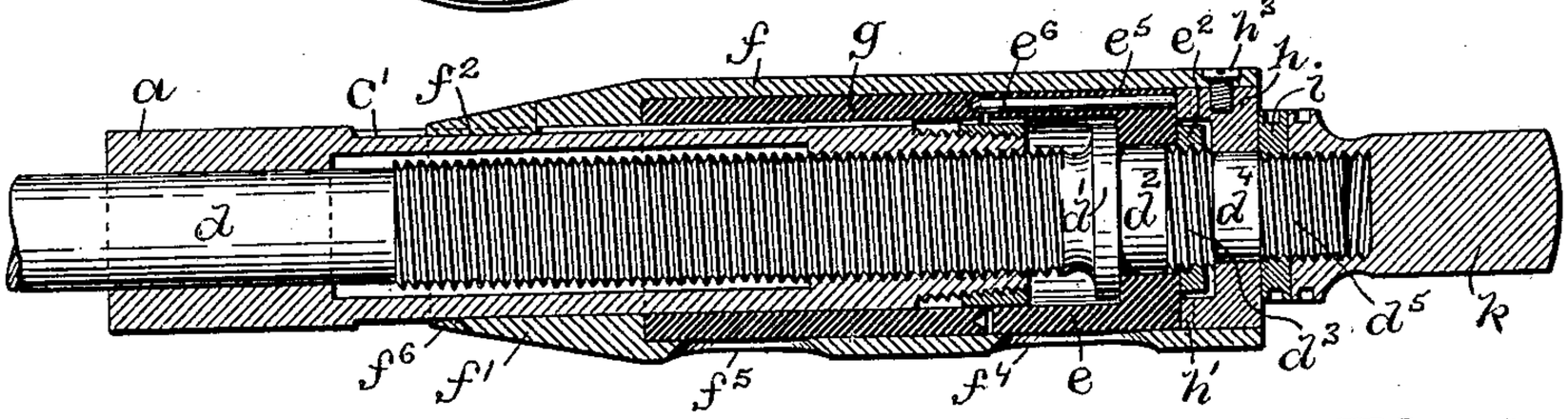


Fig. 3.

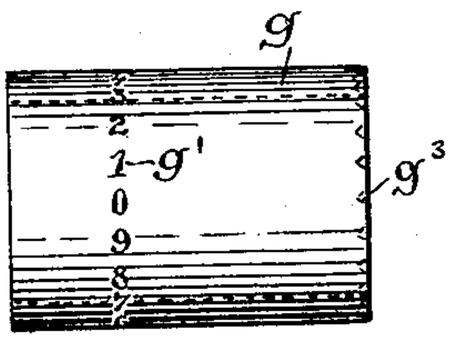


Fig. 4.

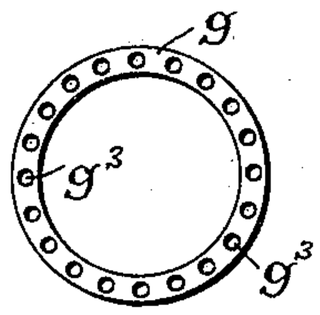


Fig. 5.

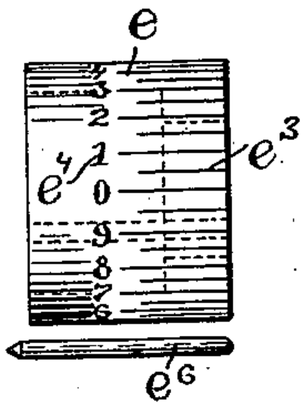


Fig. 6.

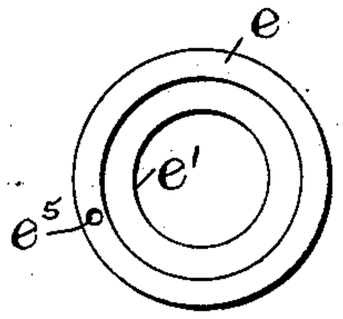


Fig. 9.

Fig. 10.

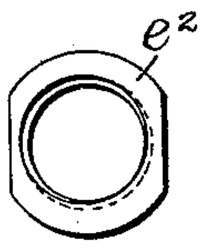


Fig. 7.

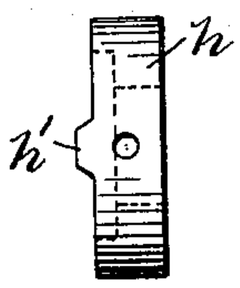
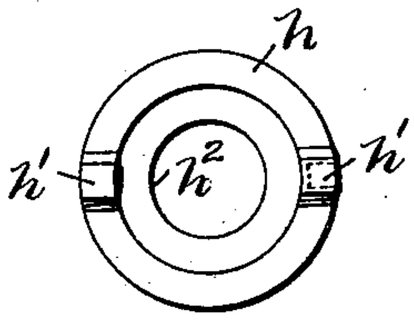


Fig. 8.



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UNITED STATES PATENT OFFICE.

FRANK SPALDING AND EDWIN C. THURSTON, OF PROVIDENCE, RHODE ISLAND, ASSIGNORS TO THE BROWN & SHARPE MANUFACTURING COMPANY, OF SAME PLACE.

MICROMETER-CALIPERS.

SPECIFICATION forming part of Letters Patent No. 626,876, dated June 13, 1899.

Application filed July 29, 1898. Serial No. 687,185. (No model.)

To all whom it may concern:

Be it known that we, FRANK SPALDING and EDWIN C. THURSTON, of Providence, in the county of Providence and State of Rhode Island, have invented a new and useful Improvement in Micrometer-Calipers; and we hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

This invention has reference to an improvement in calipers for making micrometric measurements.

In micrometer-calipers for measuring decimal fractions of an inch as heretofore constructed the barrel was graduated by lines extending transversely from a longitudinal or base line. The longer of these transverse lines were one-tenth of an inch apart and were marked by numerals. Three shorter lines divided the one-tenth-inch space into four parts. A sleeve secured to and turning with the screw-threaded spindle formed the handle, and its forward usually tapering end was graduated into twenty-five parts, each line of which represented a movement of the spindle equal to one one-thousandth of an inch. In reading the micrometric fractions of these calipers errors are frequently made, because the caliper does not indicate clearly the tenths, hundredths, and thousandths of the measurement. Another difficulty with these calipers is that the sleeve forming the handle or hand-hold part, which is usually provided with milled or otherwise roughened periphery, is secured to the screw-threaded spindle and is liable to be turned in handling the caliper, particularly in laying it down or taking it up.

One object of the invention is to provide a micrometer-caliper of the conventional form with a numerical index showing in figures the micrometric measurement in tenths, hundredths, and thousandths of an inch or other units of measurement.

Another object of the invention is to provide the micrometer-caliper with a handle inclosing the screw-spindle which does not turn with the screw-spindle or on the barrel and does not affect the measurement.

To this end the invention consists in the peculiar and novel construction of the micrometer-caliper, whereby the resultant of the measurement is indicated by decimal numerals, as will be more fully described hereinafter.

Figure 1 is a side view of our improved micrometer-caliper. Fig. 2 is a longitudinal sectional view of the handle portion of the same. Fig. 3 is a side view of one of the index-barrels, and Fig. 4 is an end view of the same. Fig. 5 is a side view of another index-barrel, and Fig. 6 is an end view of the same. Fig. 7 is a side view of the cam-ring, and Fig. 8 is an end view of the same. Fig. 9 is a side view of a lock-nut, and Fig. 10 is an end view of the same.

Similar reference-marks indicate corresponding parts in all the figures.

In the drawings, *a* indicates the yoke, which is shown in Fig. 1 in the usual U-shaped form. On one end of the yoke the anvil *b* is secured and from the other end the barrel *c* extends. The barrel is internally screw-threaded and engages with the screw-threaded portion of the spindle *d* in the same manner as is usual with micrometer-calipers of this class. The spindle *d* is provided with the annular flange d', the cylindrical portion d^2, the screw-threaded portion d^3, the cylindrical portion d^4, and the screw-threaded portion d^5 at the end of the spindle. The index-barrel *e* is secured to the spindle *d* by clamping the annular flange e' of the barrel between the shoulder formed by the annular flange d' and the lock-nut e^2 in screw-thread engagement with the screw-threaded portion d^3, so that the index-barrel *e* turns with the spindle *d*. The sleeve *f*, which forms the handle or hand-hold of the caliper, is in form like the sleeve heretofore used on this class of calipers, cylindrical at the greater portion of its length and having the tapering end f'. It is provided with the spline f^2, which enters the longitudinal groove c' on the outer surface of the barrel *c*, so that while the sleeve *f* can slide longitudinally on the barrel *c* it cannot turn on the same. The index-barrel *g* is placed between the barrel *c* and the sleeve *f*, and both the index-barrels *c* and *g* closely fit and are in frictional contact with the interior

of the sleeve *f*. The index-barrel *g* is provided on its outer surface with the graduated peripheral line of numerals *g'* from "1" to "0" and again from "1" to "0," indicating from "1" to "0," inclusive, ten figures for each half of the circumference. One end of the index-barrel *g* is provided with twenty small holes g^3. The index-barrel *e* is graduated by forty lines e^3 into forty spaces on its peripheral surface. Half or twenty of these lines are longer than the twenty intermediate lines. Opposite each one of the longer lines is a numeral of the line of numerals e^4, forming two consecutive sets of numbers from "1" to "10," represented by O, in the same manner as the numerals on the index-barrel *g*. A hole e^5 extends longitudinally through the wall of the index-barrel *e*, into which the wire e^6, having a tapering end, is inserted, so that the tapering end may enter any one of the holes g^3 at the end of the index-barrel *g*. The wire e^6 is longer than the index-barrel *e*. The end opposite the pointed end is slightly rounded, and the wire acts as a pawl by which the index-barrel *e* is from time to time connected with the index-barrel *g*, so that the two may rotate together.

The cam-ring *h* (shown in Figs. 7 and 8) has on its inner face the two cams *h' h'*. The peripheral surface of the cam-ring closely fits the interior of the sleeve *f*, and the bore h^2 of the cam-ring forms a journal-bearing for the cylindrical portion d^4 of the spindle *d*. The cam-ring *h* is secured to the sleeve *f* by the screw h^3. The screw-ring *i* is screwed on the screw-threaded portion d^5 to bear against the outer face of the cam-ring *h*, and the peripherally-milled head *k* is screwed on to bear against the screw-ring *i*, so as to lock each other firmly to the spindle *d*. The sleeve *f* is provided with the line f^3, the opening f^4 corresponding with the line of numerals e^4 on the index-barrel *e*, the opening f^5 corresponding with the line of numerals *g'* on the index-barrel *g*, and may be provided with the opening f^6, corresponding with the numerals on the barrel *c*, indicating the ten divisions of an inch or other units of measurement placed to correspond with the ten transverse lines marked on the barrel *c* one-tenth of an inch apart, the zero-line of which is shown in Fig. 1. The three shorter lines heretofore used to divide each tenth into four parts are omitted; but, if desired, they may be used.

To enable others skilled in the art to use our invention, we will now more fully describe the operation of our micrometer index-caliper.

In Fig. 1 the spindle *d* has been withdrawn from the anvil by turning the same by means of the head *k* to the left. The distance between the anvil *b* and the end of the spindle *d* is one-tenth of an inch. The end of the sleeve *f* is on the transverse line on the barrel *c* marked by the numeral "1," and one of the long lines on the index-barrel *e* is opposite the line f^3 on the sleeve *f*. The reading of the index of the caliper is "1 0 0," indicating that the measurement is one one-hundred-thousandth of an inch. By turning the head *k*, and thereby the spindle *d*, toward the left until the next line on the index-barrel *e* (which is a short line) is on line with the line f^3 on the sleeve *f* the caliper will show on the index the numerals "1 0" in the openings f^6 and f^5, but will show the numerals "0" and "1" below and above the line f^3 on the sleeve *f*, and the reading of the index will be "1 0 0 plus one-half of a thousandth," indicating the measurement to be one one-hundred and five ten-thousandths of an inch. As the index-barrel *e* turns with the spindle *d* and the cam-ring *h*, secured to the sleeve *f*, remains stationary, the rounded end of the wire e^6 projecting from the end of the index-barrel *e*, adjoining the cam-ring *h*, encounters the cam *h'* and is moved longitudinally by the incline on the cam, so that the pointed end of the wire e^6 enters one of the holes g^3 in the end of the index-barrel *g*, and the two index-barrels will move together while the numeral "1" or "9" of the index-barrel *e* is moving away from the line f^3 on the sleeve *f*, thereby exposing the next numeral on the index-barrel *g* in the opening f^5, adding or subtracting as the two index-barrels are moved to the right or to the left. The dwell on the cams *h'* is equal to the distance between two of the long lines e^3 on the index-barrel *e* and holds the wire e^6 in engagement in one of the holes g^3. The instant the rounded head of the wire e^6 passes the surface of the cam *h'* the conical-pointed end, acting on the periphery of the hole g^3, pushes the wire out of the hole and disconnects the index-barrel *g* from the index-barrel *e* after turning the same one space and exposing the next adjoining numeral at the opening f^5 in the sleeve *f*. For each ten numerals successively exposed at the opening f^4 the index-barrel *g* is moved one numeral, and for each ten successive numerals exposed at the opening f^5 the end of the sleeve *f* moves longitudinally on the barrel *c* one-tenth of an inch and either covers or exposes the next numeral.

The particular detail construction for securing the index-barrel *e* to the spindle *d* and the mechanism for automatically moving the index-barrel *g* one space at predetermined intervals, herein described, perform the required functions; but we do not wish to confine ourselves to the exact construction of these and other parts, as they may be varied without materially affecting the essential features of our invention by which we supply a micrometer-caliper with a non-rotatable sleeve forming a secure handle and having openings exposing numerals indicating the measurement.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. In a micrometer-caliper, the combination with the internally-screw-threaded barrel, a spindle in screw-thread engagement with the internal screw-thread of the barrel and a head

on the spindle for turning the same, of a sleeve connected with the barrel, held against rotation on the same and journaled on the spindle to move longitudinally with the spindle, index-barrels within the sleeve rotated by the spindle, and one or more openings in the sleeve; whereby the position of the spindle is indicated by the numerals exposed, as described.

2. In a micrometer-caliper, in combination, a screw-threaded spindle, a head at one end of the spindle for turning the same, a barrel extending from the frame of the caliper and in screw-thread engagement with the screw-threaded spindle, index-barrels, external to the barrel, extending from the frame, a sleeve having a recess for the index-barrels and one or more openings, and connections between the index-barrels and the sleeve with the spindle; whereby the sleeve and index-barrels move longitudinally with the spindle and the longitudinal position of the spindle is indicated by numerals, as described.

3. In a caliper, the combination with the externally-graduated and internally-screw-threaded barrel and the screw-threaded spindle, of a sleeve connected with the barrel and with the spindle, whereby the sleeve, while moving longitudinally with the spindle, is held against rotation and may be used as a convenient handle as by it the position of the spindle cannot be changed.

4. In a micrometer-caliper, the combination of the following instrumentalities: the frame of the caliper, a barrel extending from the frame, a spindle in screw-thread engagement with a fixed part of the frame, or barrel, a sleeve, external to the barrel, connected with the spindle so as to move longitudinally with the same, one or more index-openings in the sleeve, index-barrels rotatable independent of and moving longitudinally within the sleeve, and means for rotating one of the index-barrels at predetermined intervals with the other; whereby the measurement of the caliper is indicated at the index-opening in the sleeve, as described.

5. An index micrometer-caliper consisting of the usual spindle in screw-thread engagement with a fixed part of the frame, one or more cylindrical index-barrels having numerals on their peripheral surface and a perforated sleeve connected with and moving longitudinally with the spindle and inclosing the index-barrels; whereby numerals indicating the measurement are exposed to view, as described.

6. An index micrometer-caliper consisting of the usual spindle in screw-thread engagement with a fixed part of the frame, one or more cylindrical index-barrels having numerals on their peripheral surface, a non-rotatable perforated sleeve forming the end bearing of and inclosing the index-barrels and connections between the spindle and one index-barrel; whereby the index-barrel is rotated by and moves longitudinally with the spindle and the numerals are exposed to indicate the measurement, as described.

7. The combination with the frame of a micrometer-caliper and the internally-screw-threaded barrel extending from the frame, of the spindle d having the operating-head secured to one end thereof, the index-barrel e rigidly secured to the spindle and provided with the pointed wire e^6, the index-barrel g having the series of holes g^3, the cam-ring h journaled on the spindle d, the sleeve f connected with the barrel and held against rotation, graduations and numerals on the barrel dividing the units of measurement into ten parts, the numerals on the index-barrels and an opening, or openings, in the wall of the sleeve f; whereby the rotation of the spindle exposes numerals to view indicating the measurement, as described.

8. In a micrometer-caliper, the combination with the frame and the internally-screw-threaded barrel, of the screw-threaded spindle d having the annular flange d', the screw-threaded portion d^3, the cylindrical portion d^4 and the screw-threaded end d^5, the head k secured to the end of the spindle, the index-barrel e secured to the spindle by the nut e^2, the pointed wire e^6 in the wall of the index-barrel e, the index-barrel g, the holes g^3 in the end of the same, the sleeve f, the cam-ring h journaled on the spindle d and secured to the sleeve f, the two cams h' h' on the cam-ring, the graduation on the internally-screw-threaded barrel, the numerals on the index-barrels and an opening, or openings, in the side of the sleeve f; whereby the sleeve, held against rotation, moves longitudinally with the spindle and exposes the numerals indicating the measurement, as described.

9. In a micrometer-caliper, the combination with the usual internally-screw-threaded barrel graduated on its external surface by transverse lines into ten equal parts of a unit of measurement and the usual leading screw-spindle, of a sleeve perforated with the openings f^4 and f^5, the index-barrels e and g within and moving longitudinally with the sleeve each having a line of figures consisting of twenty numerals, and means, substantially as described, for operating the index-barrels; whereby, when the spindle is turned in either direction, numerals indicating the position of the end of the spindle with reference to the anvil are exposed to view in the openings of the sleeve, as described.

10. In combination with the usual frame of a micrometer-caliper, the externally-graduated and internally-screw-threaded barrel and the usual screw-threaded leading spindle, of the perforated sleeve f connected with the spindle so as to move longitudinally with the same, the index-barrel g, the two series of numerals from "0" to "9" each on the peripheral surface of the same, the index-barrel e, the two series of numerals from "0" to "9" each on the peripheral surface of the same, the lines e^3 on the peripheral surface of the index-

barrel *e* dividing the periphery into forty parts by alternately long and short lines, and a connecting mechanism; whereby, at predetermined intervals, the index-barrel *e* moves the index-barrel *g* through a fixed distance and numerals indicating the decimals, the result of the measurement, are exposed at the opening, or openings, in the sleeve, as described.

In witness whereof we have hereunto set our hands.

FRANK SPALDING.
EDWIN C. THURSTON.

Witnesses:
B. M. SIMMS,
J. A. MILLER, Jr.