

(No Model.)

J. E. SWEET.  
MICROMETER GAGE.

No. 313,552.

Patented Mar. 10, 1885.

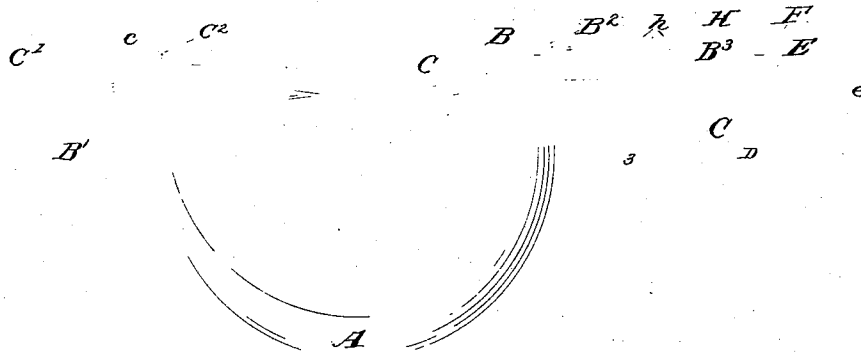


Fig. 1.

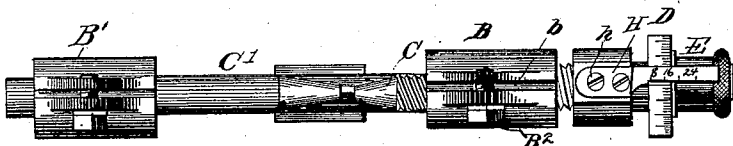


Fig. 2.

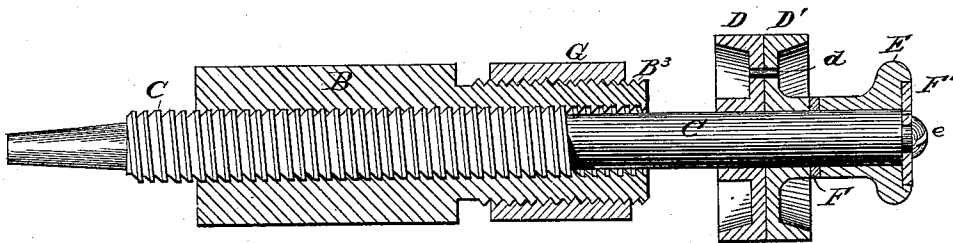


Fig. 3.

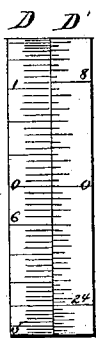


Fig. 4.

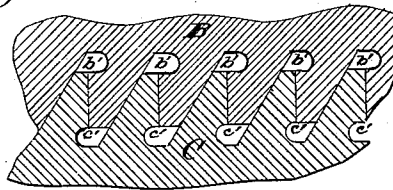


Fig. 5.

Witnesses:  
Wm. Durall  
J. L. Fracker.

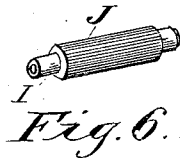


Fig. 6.

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by E. B. Stocking  
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# UNITED STATES PATENT OFFICE.

JOHN E. SWEET, OF SYRACUSE, NEW YORK, ASSIGNOR TO THOMAS HOOKER, OF SAME PLACE.

## MICROMETER-GAGE.

SPECIFICATION forming part of Letters Patent No. 313,552, dated March 10, 1885.

Application filed March 26, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN E. SWEET, a citizen of the United States, residing at Syracuse, in the county of Onondaga and State of New York, have invented certain new and useful Improvements in Micrometers, of which the following is a specification, reference being had therein to the accompanying drawings.

The object of this invention is to provide a micrometer or measuring-instrument which will combine accuracy, precision, convenience of manipulation, and adaptability for use upon the work-bench or at the lathe or planer, and which shall possess characteristics and construction which will render it capable of taking up wear in its movable parts, of correcting unavoidable errors in its construction, and of indicating the same in use.

Other objects and advantages of the invention will appear in the following description thereof, and its novel features will be specifically set forth in the claims.

Figure 1 is a side elevation of a micrometer-gage or measuring-machine constructed in accordance with my invention. Fig. 2 is a plan, and Fig. 3 is a section showing slight modifications. Fig. 4 is an elevation of the compound scale-disks. Fig. 5 is an enlarged sectional detail of a portion of the threads of the measuring-screw and its nut head or bearing, and Fig. 6 is a perspective of the distance-piece.

Like letters refer to like parts in all the figures.

A represents the frame-work of the micrometer, which is substantially U-shaped, and has at its apex a projecting lug or standard, A', which serves as means for sustaining the frame-work in an upright position when the standard is inserted in a suitable aperture formed in a suitable base or holding device.

At the ends of the U-shaped frame are split bearings B and B', respectively, the former adapted to receive the measuring-screw C, and the latter an adjustable tail-spindle, C', and a clamping screw or bolt, C<sup>2</sup>, is arranged in the lugs c on the head B', so that by the use of a suitable wrench the screw or bolt may be loosened and the tail-spindle moved longitudinally through the head, to adjust it to differ-

ent positions relative to the measuring-screw, whereby the micrometer is adapted for the measurement of objects of varying lengths without projecting the screw unduly from its head B. The inner end of the tail-spindle is preferably brought to a diameter less than its main portion, as is also the inner end of the screw, and the ends of both are accurately ground or otherwise finished, so that the bores of the heads B B' being exactly in line with each other, there is an accurate contact of the points of the screw and the tail-spindle when they are brought together. The head or bearing B is also split, as at b, and provided with binding-bolt B<sup>2</sup>, screw-threaded interiorly, and provided with an integral projecting parallel portion, B<sup>3</sup>, of the head, and both the head and its projection are interiorly screw-threaded—in this instance the pitch being sixteen to the inch—whereby a quick adjustment of the screw and convenient division of the scales employed in connection with the instrument are secured.

In Fig. 2 the interior screw-thread is shown to be of ratchet form—that is to say, with a rear wall to each thread, in a plane at right angles to the axis of the screw, while the front wall of each thread is inclined, as shown. The thread cut or formed in the head B and its extension B<sup>3</sup> is similar in character to that of the screw C.

In practice it is found extremely desirable and advantageous to construct the head and the threaded portion of the screw in substantially equal lengths, whereby uniformity of wear of the parts is secured. In this instance the movement of the measuring-screw C is limited to one inch, and its threaded portion and that of the head are extended to three inches.

D represents a scale-disk mounted rigidly upon the screw C, and E represents a friction thumb piece or nut freely mounted upon the end of the screw, and between these is a spring-washer, F, bearing against the disk and against the thumb-piece, so that by tightening or loosening the screw e, which confines the thumb-piece against its longitudinal removal from the shaft, the pressure of the spring-washer is regulated at will. The outer surface of the periphery of extension B<sup>3</sup> is

screw-threaded, to agree in pitch with the interior screw-thread of the head and extension, and a collar, G, is interiorly screw-threaded to agree with the exterior thread of the extension, and is split and provided with a binding-screw or bolt, *g*.

Upon the collar G is mounted an index-bar, H, which is adjusted in each instrument to register accurately with the disk scale or scales thereof, and secured in position by screws *h*. The upper surface and front edge of the index-bar is divided into a scale, hereinafter described, and projects above the periphery of the scale-disk D and parallel with or at such an angle to the axis of the screw as may be necessary to correct its inaccuracy.

In Figs. 3 and 4 are illustrated compound scale-disks D D', which are mounted rigidly upon the screw C, and which are united by bolt, rivet, or screw *d*, and between the outer disk, D, and the friction thumb-piece E is mounted upon the screw a washer, F, of leather or any suitable textile fabric, and seated in the face of the thumb-piece is a second washer, F', in this instance, and preferably of steel, the binding-screw *e* passing there-through into the screw, as above described.

In order to secure perfect uniformity of wear between the measuring-screw and its nut, and prevent a collection of dirt, dust, and grit upon the operating-faces of the threads of the measuring-screw, they are provided with clearance-channels *c'* and *b'* at the base of the threads of the screw C and of the head B, respectively. These channels are formed by continuing the incline surface of the thread in a straight line, and by cutting under in the vertical surface of each thread and uniting the termination of the inclined and cut-under portions by a horizontal line parallel to the axis of the thread. Now, it will be seen that in the operation of the screw in the head the contact-surfaces of both threads have a tendency to clean each other, and to deposit dirt, dust, and grit in the clearance-channels, and that by means of the clamping-bolt B<sup>2</sup> the head B may be drawn together, and thus bring the threads into more intimate contact with each other, so that the wear of the threads is taken up and rendered more uniform than if the threads were of the usual ratchet or V-shaped forms, which are more apt to wear unevenly, especially when the head or nut is frequently clamped more firmly or mostly at one end. Distance-pieces I—such as that shown in Fig. 6—are provided of standard gage as to length, ground or otherwise squarely finished at their ends, and incased or coated with a rubber cover, J, which extends nearly to the ends, so that it may be held without undue communication of heat from the hand, which would cause said pieces to expand. Such pieces, of one, two, and three inches, or of any other desired standard or special lengths, may be provided, so that in a micrometer of a capacity of from 0 to 4 inches, the tail-spindle C' may be set to-

ward the measuring-screw for the measurement of shorter pieces and from the same for measurement of longer pieces, and by this means exact and minute subdivisions of measurement may be had on long specimens without excessively projecting the measuring-screw from its head, whereby a long bearing is secured, or the larger majority of the threads of the measuring-screw are intermeshed with those of the head, and the capacity of the machine is largely increased without loss of precision and undue wear, and accurate adjustment of the tail-spindle is not essentially required.

In regard to the double-scale disks it is not important that they be constructed separate from each other, as the scales may be formed upon a single disk, if desired. The graduations are made on each side of the circumferential line. Each division on the left is one two-thousandth of an inch, and the numbers appearing thereon indicate hundredths. Each division on the right-hand scale is one two-thousand-and-forty-eighth, being one sixty-fourth of one thirty-second. The numbers indicate one ten-hundred-and-twenty-fourth, or one thirty-second of one thirty-second, and like those of the index-bar, are 0, 8, 16, and 24. The zero-marks of the two scales coincide at a point which measures the sixteenths, and diametrically opposite is a zero (not shown) upon the right scale D, which indicates the odd thirty-seconds. No mark is needed for this on the index-bar H, and it is omitted to avoid confusion.

As before stated, the index-bar is arranged at an angle to the axis of the measuring-screw, and mounted independently of the screw, concentrically with its axis, and adjustably upon a collar or part which is mounted upon a thread of the same pitch as that of the measuring-screw. By this construction any errors existing in the threads of the measuring-screw or that of its head may be corrected as they are found existing in each instrument, and the index-bar of that instrument may be adjusted at such point upon the collar or part on which it is mounted as shall be indicated by the errors found to exist, so that this defect in the instrument is eliminated from all the measurements made thereby. Again, the collar or part is not only mounted concentrically with the screw and its disk, so that the index-bar may be moved in a circle along the periphery of the scale-disks; but in so moving it, the collar being mounted on a thread of similar pitch to the measuring-screw, the relative arrangement and adjustment of the index-bar with the measuring-screw is preserved and maintained in perfection, no matter what the extent of the rotation of the same about the disks is.

Mounting the index-bar on a part which is itself mounted on a thread of similar pitch to that of the measuring-screw avoids the necessity of setting the tail-spindle relative to the measuring-screw, so that the zero-marks of the

disk or disks accurately coincide. Any difference in their coincidence, when the measuring-points are brought together at a given adjustment of the tail-spindle, may be overcome by simply rotating the collar and index-bar until the zero-marks of the disk do accurately register with the edge of the bar.

These are important features of my invention, as they add to the accuracy and convenience of the instrument. In the adjustment of the index-bar its angle with reference to the axis of the screw is determined according to the increased or diminished motion or partial turns necessary above or below sixteen turns to move the measuring-screw exactly one inch longitudinally.

The index-bar has marked upon it divisions corresponding with the pitch of the screw, so that when the zero of the disk or disks corresponds with the index the graduations on the index shall denote the number of turns of the screw, and by the arrangement of the threads on the outside and inside of the projection B<sup>3</sup> the zero on the disk will correspond with the divisions on the index, in whatever relative position they may be. Let it be supposed that a piece of work, which is intended to be exactly one inch in length or thickness is to be tested as to the accuracy of its dimension. The instrument is set for measurement by bringing the measuring-points of the screw and tail-spindle lightly together, turning the screw by means of the friction-piece until it slips upon the screw. This insures exactly the same pressure of the points upon each other and upon the article at each usage of the micrometer, as it is practically impossible for the wear of the friction washer or washers, in setting the points as described, to cause a variation of the pressure at the next immediately succeeding use of the same devices to determine the pressure of the points or the article to be measured. When the friction thumb-piece slips, the double zero of the scale should come accurately at the edge of the index-bar H. If it should not, then important features of my novel construction come into use, as heretofore described, the index-bar being rotated until it registers with the 00-line. When measuring an object larger than an inch, bring the index to the zero-point, loosen the tail-spindle, and insert the proper distance-piece, clamping the spindle again firmly. Bring the screw to exact contact with the distance-piece, held squarely between the measuring-points. When the friction slips, leave the distance-piece held between the points, while attention is given to the adjustment of the index-bar with the 00-line, as above described, then proceed with the measurement.

In Fig. 1 but a single disk is shown, but it is preferable to employ two, as by the additional disk D', I secure the nearest measurement to one two-thousandth of an inch, while the second disk gives binary fractions of a similar magnitude. To approximate to the ten-thousandth of an inch, imagine the

space between any two lines on the index to be divided into five equal parts and estimate which division comes nearest to the index-bar. In this way exceedingly minute measurements can be accomplished. In a measure clearances would be provided by simply removing the periphery of the threads of the measuring-screw; but in forming the channels removal is not necessary, and I do not limit myself to a thread the periphery of which is flat or parallel with the axis of the screw.

It will be noticed that the divisions on the index-bar are the ordinary divisions of an inch, while that upon the left disk are hundredths and thousandths, and that upon the right are sixty-fourths of thirty-seconds of an inch, so that when the distance-pieces are used the instrument is capable of measuring whole inches and binary and decimal fractions thereof, and I do not limit myself to the use of two disks, as a single disk will serve for many practical purposes.

Having described my invention and its operation, what I claim is--

1. A measuring-screw provided with clearance-channels, substantially as specified.
2. In a micrometer, a head for the measuring-screw having a ratchet-thread provided with clearance-channels, substantially as specified.
3. The combination of a measuring-screw, the threads of which have clearance-channels, with a split head or bearing for the same having clearance-channels, substantially as specified.
4. The combination of the measuring-screw C, the rigid disk D D', the rotatably-mounted thumb-piece E, the textile washer F, the metallic washer F', and the screw e, substantially as shown and described.
5. A frame having a split head or bearing provided with a concentric extension, in combination with an index-bar mounted thereon, whereby the latter may be rotated concentrically with the measuring-screw operating in said bearing, substantially as specified.
6. In a micrometer, an index-bar mounted to rotate concentrically with its measuring-screw, substantially as specified.
7. In a micrometer, an index-bar, an edge of which is arranged at an angle to the axis of the measuring-screw, substantially in the manner and for the purpose as specified.
8. In a micrometer, an index-bar mounted upon a collar or part which is mounted upon a frame-work, and adapted to be rotated concentrically with the measuring-screw thereof, substantially as specified.
9. In a micrometer, an index-bar-supporting collar or part mounted upon a screw-thread formed on the frame and of a pitch agreeing with that of the measuring-screw, substantially as specified.
10. In a micrometer, a compound scale arranged upon a disk rigidly secured to the measuring-screw and indicating at one side of

a circumferential line decimals of an inch, and at the opposite side of the line binary fractions of an inch, substantially as specified.

11. A double-index disk having a circumferential line and scale upon one side thereof to indicate decimal fractions, and a scale at the other side thereof to indicate binary fractions of an inch, proportioned to the pitch of the thread of the screw upon which said disk is mounted, substantially as specified.

12. In a micrometer, a fixed index-bar adjusted and arranged at an angle to the axis of the screw, substantially as specified.

13. An index-bar mounted on a screw-threaded projection of the frame, the thread being of the same pitch as and concentric with the measuring-screw, in combination with a longitudinally-adjustable tail-spindle and with said measuring-screw, substantially as specified.

14. In a micrometer, the combination of the measuring-screw and adjustable tail-piece and a distance-piece of predetermined length, whereby substantially the same portion of the

measuring screw is employed for gaging long and short pieces, substantially as specified.

15. A distance-piece provided with a cover adapted to prevent expansion or contraction by contact with the hand to expose the ends of the piece, substantially as specified.

16. A distance-piece provided with a rubber cover, substantially as specified.

17. In a micrometer, a disk mounted on the measuring-screw and provided with a double scale, one indicating decimal fractions and the other binary fractions, substantially as specified.

18. In a micrometer, the measuring-screw having a ratchet-thread, in combination with the head having a similar thread, the threaded portions of each being of equal length, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN E. SWEET.

Witnesses:

JNO. L. KING,  
THOS. HOOKER.