(No Model.)

J. H. LYNCH.

VERNIER CALIPERS.

No. 506,703. Patented Oct. 17, 1893.

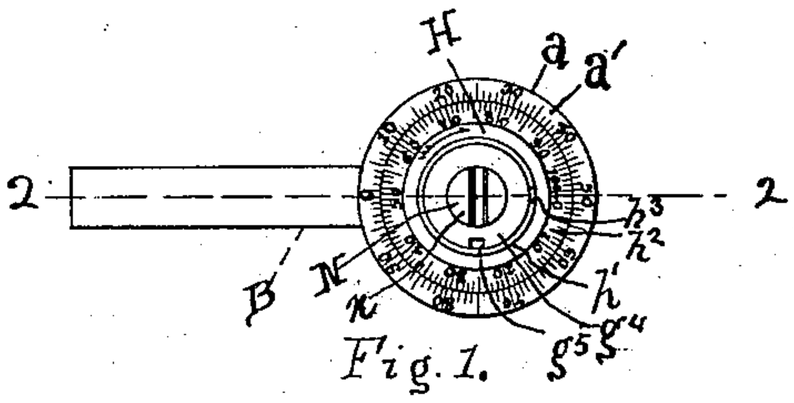

Fig. 1.

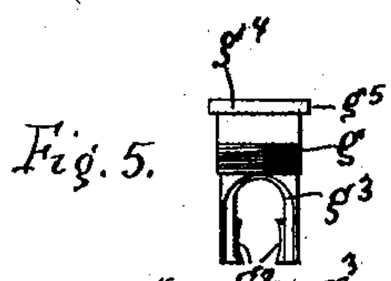

Fig. 5.

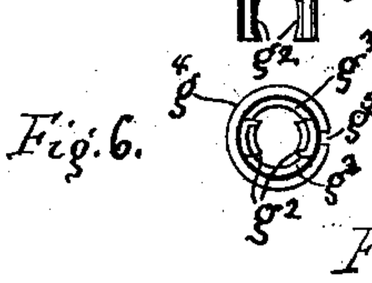

Fig. 6.

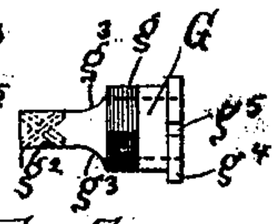

Fig. 7.

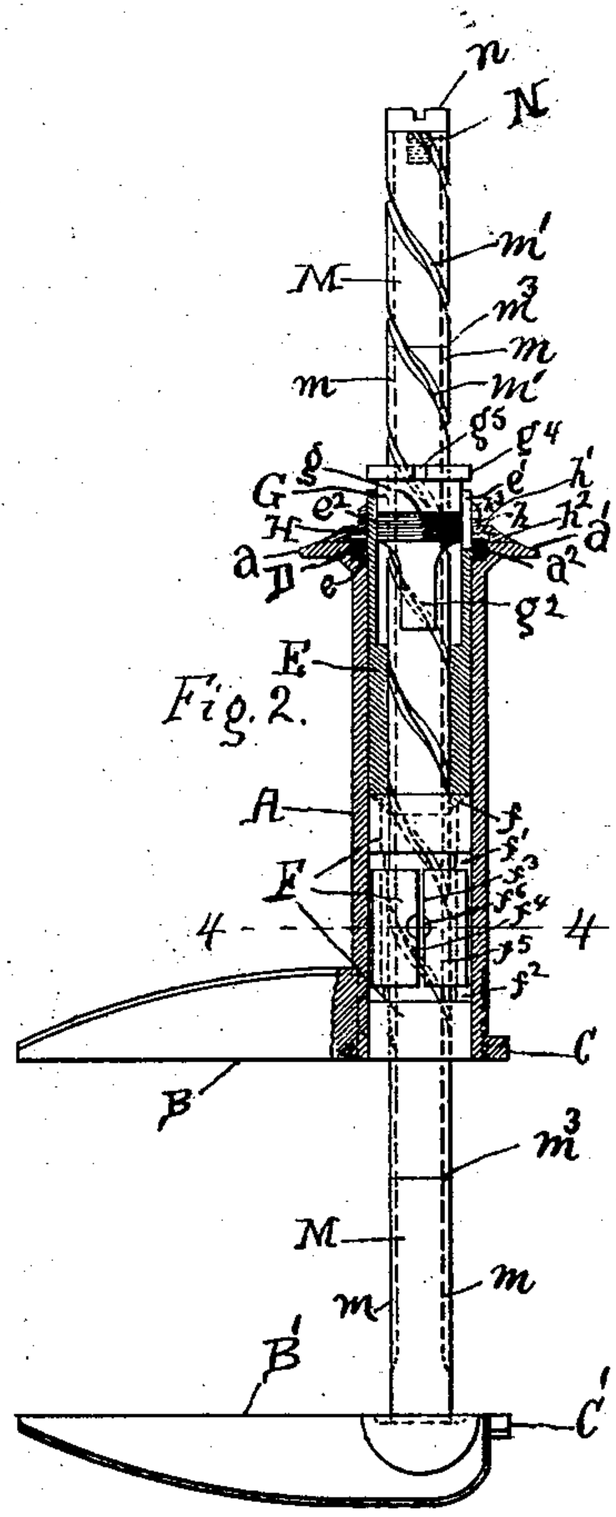

Fig. 2.

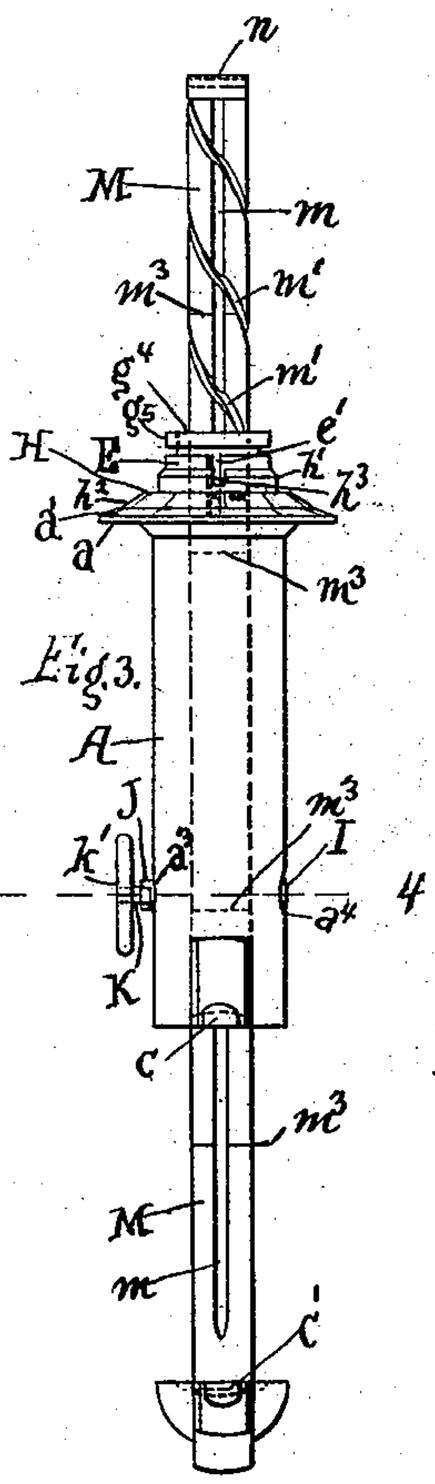

Fig. 3.

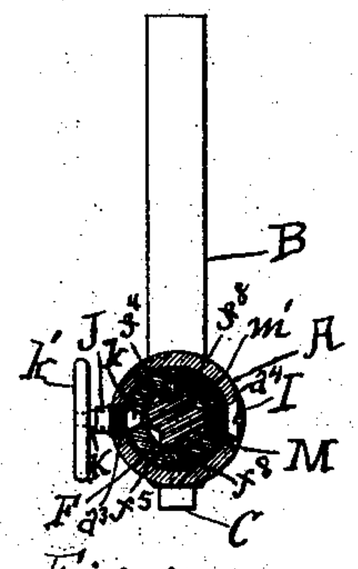

Fig. 4.

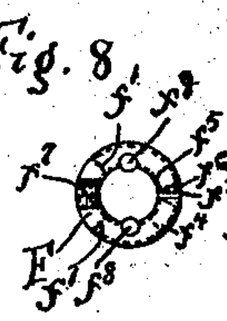

Fig. 8.

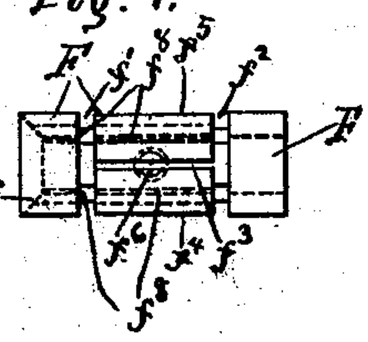

Fig. 9.

Witnesses —
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By Albert M. Moore,
His Attorney.

UNITED STATES PATENT OFFICE.

JOHN HENRY LYNCH, OF LOWELL, MASSACHUSETTS.

VERNIER-CALIPERS.

SPECIFICATION forming part of Letters Patent No. 506,703, dated October 17, 1893.

Application filed May 23, 1893. Serial No. 475,234. (No model.)

To all whom it may concern:

Be it known that I, JOHN HENRY LYNCH, a citizen of the United States, residing at Lowell, in the county of Middlesex and Commonwealth of Massachusetts, have invented a certain new and useful Improvement in Vernier-Calipers, of which the following is a specification.

My invention relates to vernier calipers and consists in the combination, in a caliper, of a bar or measuring-rod, provided with a spiral, a non-rotary circular scale and a circular vernier adapted to slide on said bar and to be rotated by said spiral, and in the other combinations and devices hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a plan of a caliper containing my improvement; Fig. 2 a side elevation of the same, showing the sleeve, bushing and tube in central section on the line 2 2 in Fig. 1; Fig. 3 a rear elevation of the same; Fig. 4, a section on the line 4 4 in Figs. 2 and 3; Fig. 5, a front or rear elevation; Fig. 6, a bottom view and Fig. 7, a side elevation of the nut which slides on the grooved bar or measuring rod and causes the rotation of the vernier; Fig. 8, an end elevation and Fig. 9, a side elevation of the clamping bushing.

A is a sleeve which surrounds the graduated bar or measuring rod M and may be moved thereon to vary the distance between the outside caliper jaws B B′ respectively secured to said sleeve A and bar M. Said sleeve A and bar M are also provided with inside caliper jaws C C′, as shown in Figs. 2 and 3, in a well known manner. The sleeve A is not in direct contact with the bar M, the latter being surrounded by a clamping-bushing F and a vernier carrying-tube E, arranged within said sleeve A.

The bushing F is of the form shown in Figs. 2, 4, 8 and 9, the upper end of its central opening flaring, at f, to receive the lower end of the tube E and said bushing being in two places cut nearly, but not quite through, at f' f^2. The middle section of the bushing is slotted, at f^3, through from cut f' to cut f^2, at equal distances from the ends of said cuts, forming two equal spring clamping jaws f^4 f^5, adapted to grasp the bar M and prevent its movement in said jawed section, and the bushing F is secured in the sleeve A by a screw I which passes radially through a countersunk hole a^4, in the side of said sleeve and enters a correspondingly screw-threaded hole f^7 in the middle section of the bushing F, diametrically opposite the longitudinal slot f^3. The end sections of the bushing F are counterbored and may slip on the bar M when the jaws f^4 f^5 are slightly opened. Midway between the ends of the slot f^3 is shown an inwardly tapering hole f^6 formed equally in the jaws f^4 f^5, and concentrically with said hole f^6 a screw-threaded hole a^3 is formed in the sleeve A. In the hole a^3 is screwed an externally threaded guide-sleeve J through which extends a pin K, having an enlarged conical head k at the inner end of said guide-sleeve, which head k may be pressed into the hole f^6 to open the jaws f^4 f^5, said enlarged head k preventing said head k from being lost out of said guide-sleeve and rendering it necessary that said pin should be placed in said guide-sleeve before the the latter is screwed into the hole a^3. A disk or button k' may be riveted on the outer end of the pin K, to receive the pressure of the finger. When pressure is removed from the pin K the elasticity of the jaws f^4 f^5 causes them to approach each other and forces the conical head k out of the tapering hole f^6.

The clamping bushing F is provided with two internal longitudinal ribs f^8 which are represented as round in cross-section, but which may be V-shaped or semi-elliptical and these projections f^8 enter and fit two corresponding grooves m, formed in the bar M diametrically opposite each other, allowing the bushing F and jaw B to be moved on the bar M longitudinally, but prevent said bushing and jaw from turning on said bar.

The bar M or measuring rod is graduated in inches, from the jaw B′, as indicated at m^3, in the usual manner, and the sleeve A is provided at the end farthest from the jaw B with a graduated circular disk or scale a, rigidly secured to said sleeve A, said scale a being beveled for a space from its edge all the way around, as shown at a', and this beveled surface is divided into one hundred equal divisions. This end of the sleeve A is counterbored and threaded at a^2 to receive an annu-

lar nut D which nut may be provided with slots or holes in any well-known manner, to enable it to be adjusted by means of a spanner wrench. The inner diameter of the nut D is the same as that of the sleeve A and the lower inner edge or corner of said nut is beveled to fit a correspondingly beveled collar *e* on the vernier-carrying tube E and said vernier-carrying tube E, while turning freely in the sleeve A, is prevented from longitudinal movement in said sleeve by the bushing F and said nut D. The upper end of the tube E is slotted longitudinally, at *e'*, to allow said upper end of said tube to be expanded and also to enable a spanner to be applied to said tube, to hold the same while the nut G is being secured therein. The nut G is provided with an external screw-thread *g* which engages a screw-thread e^2 in the tube E, the internally-screw-threaded portion of said tube E being slightly smaller than the corresponding portion of the nut G, so that when said nut is screwed into said tube, said tube is slightly expanded and fills the central aperture of the vernier H.

The vernier H is a circular disk of a diameter equal to the flat or unbeveled upper surface of the scale *a* and at its outer edge is beveled at h^2 at the same angle with the bevel *a'* of the scale or disk *a*. On the beveled surface h^2 an angular space equal to that occupied by ninety nine divisions of the scale *a* is divided into one hundred parts, so that, one ten-thousandth part of a revolution of said vernier, or one ten-thousandth part of a complete circle may be read by means of said scale *a* and vernier H. The vernier H is counterbored underneath, at *h*, to admit the nut D, and has an annular projection *h'*, provided with a slot h^3 to receive a spanner, to enable the vernier to be adjusted on the tube E.

The bar or measuring-rod M is provided with two diametrically-opposite spirals or grooves *m'* which grooves may be V-shaped, semi-circular or semi-elliptical in cross-section. The pitch of the spiral grooves *m'* is one inch, as represented, and the nut G is provided with two internal spirals or screw-thread sections g^2 of a corresponding pitch and adapted to enter the spiral grooves *m'* in the bar M, so that, when the sleeve A and with it the tube E, vernier H, and nut G are moved longitudinally on the bar M for the space of an inch, said tube E and vernier H will make one complete revolution. For convenience in forming the spiral or grooved sections g^2 the nut G is cut away, at g^3, between said sections, and said nut G has also a flange g^4 having a slot g^5 to receive a spanner, to enable said nut G to be screwed into the tube E. A stop-screw N having a head *n*, the diameter of which is equal to the greatest diameter of the bar M serves as a stop, to close the ends of the grooves *m m'*. The bar M is also graduated from the upper end in inches, enabling the instrument to be used for a depth gage, the distance being taken from the outside of the head of the stop-screw N to the flange g^4 of the nut G, the indicated dimension being read off on the scale *a* and vernier H, from right to left, or in the opposite direction from that indicated by the arrow on said vernier, said arrow showing the direction in which said vernier H turns when measuring external and internal diameters. The inside caliper jaws are each one tenth of an inch wide and therefore two tenths of an inch should be added to the indicated dimension in making internal measurements. A metal case might be used to cover the upper end of the measuring-rod M, fitting tightly on the flange g^4.

The advantage of the herein described circular vernier calipers over the ordinary right line vernier calipers, is that the scales can be made larger and therefore more easily read in the former, without making the scale and vernier unduly large and cumbersome and avoiding the necessity of using a microscope or magnifying glass. To measure with a right line vernier and scale to the one ten-thousandth of an inch by having one hundred divisions to the inch on scale and having ninety-nine of them for the sum of those on the vernier would require a microscope to read an indicated measurement, or, if the inch on the beam were divided into the visible fortieth of an inch, which is about the size of the divisions in the circular vernier shown, it would require two-hundred and forty-nine fortieths, or over six inches in length for the vernier.

The advantage which my device has over the ordinary micrometer calipers, adapted to measure to the same degree of accuracy, is, that in my device the measurement can be read by looking at one place on the vernier, whereas with the micrometer calipers it would be necessary to look in two places, that is, on the graduated bar and on the rotary sleeve. Furthermore my instrument can be immediately adjusted to the distance to be measured, while the micrometer must be set by slowly turning a screw.

The scale *a'* and vernier H, of course, might be graduated to the metric system.

I claim as my invention—

1. The combination, in calipers, of a bar or measuring rod, provided with a spiral, a non-rotary circular scale and a circular vernier adapted to slide on said bar and to be rotated by said spiral, as and for the purpose specified.

2. In calipers, the combination of the bar or measuring-rod, having a jaw fixed thereto and having a spiral, a movable jaw, a sleeve, secured to said movable jaw and adapted to slide on said bar, a circular scale, fixed on said sleeve, a tube, capable of rotation in said sleeve but prevented from longitudinal movement therein and rotated by the movement of said sleeve on said bar, and a circular vernier, fast on said tube, as and for the purpose specified.

3. In calipers, the combination of the bar, a sleeve, adapted to slide thereon, spring jaws, secured in said sleeve and adapted to grasp

said bar and to prevent a movement of said sleeve on said bar, and a wedge, carried by said sleeve and adapted to be pushed between said jaws, to force them apart and release said rod, as and for the purpose specified.

4. In calipers, the combination of the bar, a sleeve, adapted to slide thereon, spring jaws, secured in said sleeve and adapted to grasp said bar and to prevent a movement of said sleeve on said bar, a tubular guide, secured radially in said sleeve, a pin, arranged in said tubular guide and projecting from the outside of said sleeve and having an enlarged wedge-shaped head, arranged within said sleeve and adapted to be pushed between said jaws, to force them apart and release said rod, as and for the purpose specified.

5. In calipers, the combination of a cylindrical bar, having a jaw fixed thereto, a movable jaw, a sleeve, secured to said movable jaw and adapted to slide on said bar, a split spring-bushing, secured in said sleeve and adapted to surround said bar and provided with an inward projection adapted to enter and fit a longitudinal groove with which said bar is provided, to prevent said movable jaw from turning on said bar, a circular scale, secured on said sleeve, a tube, arranged to turn within said sleeve and having an external annular flange or collar, an annular nut, arranged in a screw-threaded counterbore, with which said sleeve is provided, to bear against the flange or collar on said tube and to hold said tube against the end of said bushing, said tube being provided at the end farthest from said bushing with a longitudinal slit, a circular vernier, surrounding said slitted end, and a nut, screwed into said slitted end, to expand said sleeve and to secure said vernier thereon, said nut having an internal spiral or screw-thread section, to engage a spiral with which said bar is provided, as and for the purpose specified.

In witness whereof I have signed this specification, in the presence of two attesting witnesses, this 17th day of May, A. D. 1893.

JOHN HENRY LYNCH.

Witnesses:

ALBERT M. MOORE,

NELLIE GOOD.