Nov. 8, 1927. 1,648,497

M. F. MOORE ET AL

MICROMETER

Filed Sept. 30, 1926

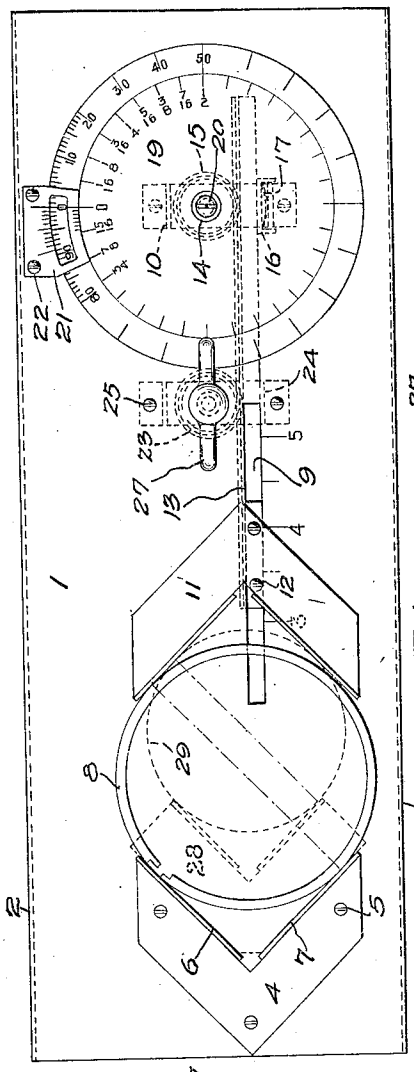


Fig. 1

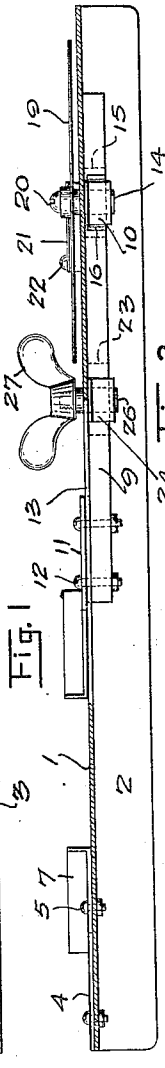


Fig. 2

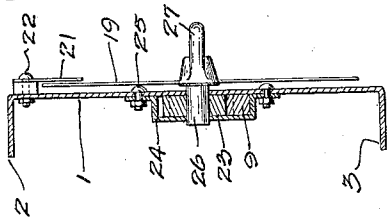


Fig. 3

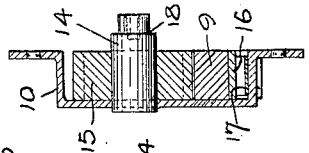


Fig. 4

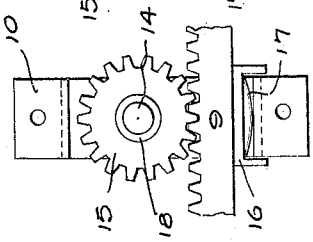


Fig. 5

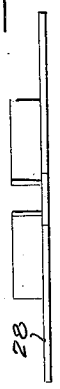


Fig. 7

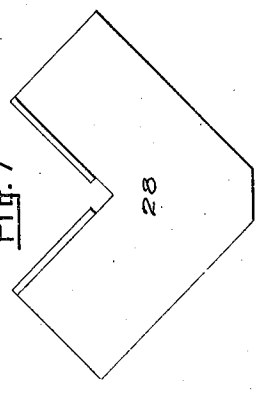


Fig. 6

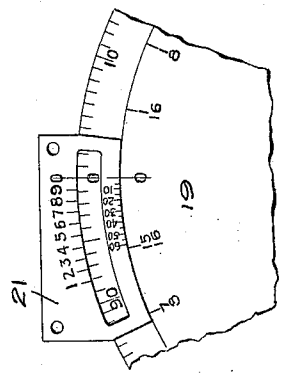


Fig. 8

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Patented Nov. 8, 1927. 1,648,497

UNITED STATES PATENT OFFICE.

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MICROMETER.

Application filed September 30, 1926. Serial No. 138,599.

The present invention relates to improvements in measuring devices, and more particularly to those of micrometrical character adapted to the dimensional measurements of circular and rectangular bodies, and is especially adaptable for securing the speedy and exact measurements of piston-rings and bodies of like construction.

The primary object of our invention is the provision of an instrument of precision of the character designated for securing accurately and speedily the diameters of closed piston-rings and similar bodies.

A further object of the present invention is the provision of an instrument of the precision class of the character designated that is of simple and substantial construction, of ready manipulation, of utmost accuracy, and speedily adjustable to whatever and all measurements required to be made.

Other objects and advantages will be made to appear as this specification progresses, and be more clearly brought out in the claims hereto appended.

In the accompanying drawings, forming a part of this specification, and in which similar characters of reference refer to like parts, throughout:

Figure 1 is a plan view showing a preferred embodiment of our invention, including the base, dial-plate, vernier, rack, stationary gauge-plate, movable gauge-plate, and a piston-ring in place between the two gauge-plates in readiness for compression preliminary to its diametrical measurement;

Figure 2 is a longitudinal sectional view, taken through the device, showing the several members and parts in their related positions;

Figure 3 is a transverse sectional detail, taken through the base and operating pinion;

Figure 4 is a sectional detail, showing the method of mounting the recording pinion and rack in close and retained contact, for the prevention of back-lash;

Figure 5 is a face view of the pinion and rack, as further illustrative of the method of mounting these parts;

Figure 6 is a plan view of a substitute gauge-plate for adoption in measurements smaller than ordinarily provided for, the dot-and-dash lines, Figure 1, indicating the use of such a gauge-plate in the measurement of rings of less than the usual diameter;

Figure 7 is an edge view of the gauge-plate shown in Figure 6; and

Figure 8 is an enlarged detail view of a portion of the dial-plate and vernier, showing the graduations arranged in accordance with the requirements of our invention.

Referring more particularly to the drawings, in which a preferred embodiment of our invention has been shown, 1, in a general way, indicates the base-plate, which consists of a piece of rectangular metal having flanged sides 2 and 3 forming supports for and giving rigidity to the base-plate 1.

The base 1 is provided at one end with a rigidly mounted right-angularly shaped gauge-plate 4 held in place by screws 5 and having up-turned flanges 6 and 7 providing means for engaging the peripheral surface of a piston-ring, or like body, 8, the ring being manually placed in position for measuring with its open section resting against one of the flanges and there supported by the base-plate 1.

A rack 9 is mounted on the underside of the base-plate 1, the outer end thereof being supported by a housing 10, the inner end thereof being provided with a right-angularly shaped gauge-plate 11 secured thereto by means of screws 12 and in form similar to that of the stationary gauge-plate 4 but differing in that it is slidable along and upon the smooth upper surface of the base-plate 1, in manner to be hereinafter described. The base-plate 1 is further provided with an elongated slot 13 forming a guideway for the inner end of the rack 9 and plate 11, this guide-slot being of a length sufficient to permit the plate 11 to slide toward and almost contact the plate 4.

The housing 10 is provided with a shaft 14, which, in turn, carries a recording pinion 15, this pinion being held in mesh with the rack 9 by means of a U-shaped member 16, being held in retained contact therewith through the urge of a flat spring 17, which removes possibility of back-lash between these parts.

The outer end of the shaft 14 is reduced to form a shoulder 18 upon which the dial-plate 19 is fitted and held in rigid relation thereto by means of a cap-screw 20, the dial surface being provided with concentrically

arranged rows of graduations adapted to register with similar graduations carried by the vernier 21, the vernier itself being secured to the base-plate 1 by means of screws 22.

The rack 9 meshes with an operating pinion 23 mounted below the base-plate 1 by means of a clip 24 secured thereto by screws 25, the pinion being borne by a shaft 26 carried by the clip 24 and the base-plate 1, there being secured at its upper end a thumb-nut, or other suitable means of manipulation, 27, as indicated in Figures 2 and 3.

In applying the device to measurements, the manipulation of the operating pinion through the action of the means 27 causes the rack 9 and the gauge-plate 11 mounted thereon to move either toward or from the gauge-plate 4, thereby decreasing or increasing the distance between the two gauge-plates, these varying movements serving as measures of dimension and being recorded through the action of the pinion 15 causing the dial 19 to rotate to bring the divisions on the face thereof successively past the vernier 21 and its graduations.

In Figures 6 and 7 a gauge-plate 28 has been shown that may be used as an auxiliary to the stationary gauge-plate 4 in the measurements of dimensions of bodies smaller than those provided for in the instrument as ordinarily constructed.

The principle upon which the measurements are dependent is that of the relation, geometrically, existing between the sides and diagonals of squares, the sides of the squares being considered as having been paralleled by a number of equally spaced lines the intersection of which with a diagonal divides it into a like number of equal parts proportional to the spacing between the parallel lines, these divisions being in inches and fractions thereof, either common or decimal. As here applied, a pinion, or other circular device, is employed whose circumference is equal to the diagonal of the square selected, and this in making a complete revolution must cause a point adapted to travel along the diagonal to pass from one end thereof to the other. Should the circumference of the pitch line of the pinion be twice that of the length of the diagonal, it follows that a complete revolution of the pinion will cause this point to travel a distance twice that of the length of the diagonal.

By dividing the circumference, or pitch line, of the pinion into a number of divisions corresponding to those of the diagonal and drawing radial lines through these points to the circumference of a concentric, divisions as minute as 1/100 of an inch may be secured, divisions scarcely discernable by the naked eye, and these again enlarged to any convenient size for ready reading and further sub-divided to 1/1000 of an inch, by means of a vernier proportioned to the divisions carried by the selected concentric circle.

The dial shown in Figures 1 and 8 has been graduated to correspond to two inches upon the side of the square, the divisions being in tenths and hundredths, with the vernier graduated to read to thousandths of an inch.

Another division, in fractional parts of an inch reading to sixteenths, has been made upon an inner circle and a set of divisions indexed on the vernier reading to ten-thousandths (.010) and five-thousandths (.005) of an inch. The reason for these readings in the measurement of piston-rings is that the diameters that are in commercial use are measured by inches and 16ths of an inch plus thousandths—thus, for instance, a ring of 4.0725 diameter is known to the trade as 4 1/16 inches plus ten-thousandths (.010) of an inch, or as 4 1/14, 4.0625, plus .010, which equals 4.0725.

It is obvious that other standards of measurements than the inch may be used, so long as the circumference of the pitch line of the measuring pinion is equal to or some multiple of the length of the diagonal of the square a side of which is selected as the unit of measurement.

Having thus described our invention, we claim, and desire to secure by Letters Patent of the United States:

1. In a micrometer, a base-plate, gauge-plates carried by said base-plate constituted of opposite sections of a diagonally divided square, means for slidably moving one of said plates along the extended other diagonal of said square, and means for registering the degree of said movement.

2. In a micrometer, a base-plate, a pair of gauge-plates borne by said base-plate constituted of opposite sections of a diagonally divided square, means for slidably moving one of said plates along the extended other diagonal of said square, and means co-operatively associated with said movable plate for registering the movement thereof relative to the other of said plates.

3. In a micrometer, a base-plate, a pair of gauge-plates borne by said base-plate constituted of opposite sections of a diagonally divided square, one of said plates being rigidly mounted and the other adapted for slidable movement relative thereto along the extended other diagonal of said square, actuating means co-operatively associated with said movable plate, and means co-operatively associated with said actuating means and plate for registering the degree of movement of said movable plate.

4. In a micrometer, a base-plate, a stationary right-angularly formed gauge-plate, a movable right-angularly formed gauge-plate, means operating to slide said movable

gauge-plate toward and from said stationary gauge-plate, and additional means in co-operative association with said movable plate for registering the degree of movement imparted thereto.

5. In a micrometer, a base-plate bearing a stationary gauge-plate and a movable gauge-plate mounted for slidable movement relative thereto, means co-operatively associated with said movable gauge-plate for sliding said plate toward and from said stationary plate, a dial co-operatively associated with said movable plate, means operable through the aforesaid means for the actuation of said dial for indicating the degree of movement imparted thereto, and a vernier in association with said dial for reading the minute sub-divisions in the graduations thereof.

6. In a micrometer, a longitudinally slotted base-plate bearing a stationary gauge-plate mounted at one extremity of said slot, a movable gauge-plate mounted in opposition to said stationary gauge-plate and at the other extremity of said slot, a rack secured to said movable plate and adapted to move said movable gauge-plate along said slot toward and from said stationary gauge-plate, operable means borne by said base-plate adapted to transmit movement to said rack, a dial-plate, and means operable through the action of said rack for the actuation of said dial.

7. In a micrometer, an elongated longitudinally slotted and flanged base-plate, a stationary gauge-plate secured to said base-plate, a slidable gauge-plate mounted in opposition to said stationary plate, a rack secured to said slidable plate, an operating pinion in association with said rack, and additional means in association with said rack for registering the degree of movement imparted to said slidable plate.

8. In a micrometer, a base-plate, a stationary gauge-plate secured to said base-plate, a guide-slot in said base-plate, a gauge-plate mounted in opposition to said stationary plate and adapted for slidable movement relative thereto along said guide slot, a rack secured to said slidable plate and adapted for guidance along said guide-slot, an operating pinion in association with said rack adapted to impart movement thereto, a dial-plate provided with registering indicia in co-operative association with said rack and adapted to be actuated therethrough, and a vernier mounted upon said base-plate in association with said dial for registering minute degrees of movement of said slidable-gauge-plate.

9. In a micrometer, a rectangular base-plate provided with flanged supports and bearing longitudinally an elongated guide-slot, a right-angularly formed stationary gauge-plate secured to the upper face of said base-plate at the farther extremity of said slot, a rack slidably borne by said base-plate and adapted for movement along and in parallelism with said slot, a right-angularly formed gauge-plate borne by said rack and adapted for slidable movement along the upper surface of said base-plate in unison and connected relation with said rack, means in co-operative connection with said rack whereby it may be moved longitudinally in opposed directions, a dial-plate bearing registering indicia revolubly supported by said base-plate, operative means connecting said dial-plate with said rack whereby said dial-plate may be actuated through the movements of said rack, and means for indicating such degrees of movements upon said dial-plate as may be imparted through said rack to said movable gauge-plate.

10. In a micrometer, a rectangular base-plate having flanged sections constituting supports and bearing longitudinally an elongated guide-slot, a rack slidably borne beneath said base-plate and adapted for longitudinal guidance along and in parallelism with said guide-slot, gauge-plates constituted of the two parts of a diagonally divided square frame, one of said gauge-plates being fixedly secured to the upper surface of said base-plate, while the other of said gauge-plates is connectedly secured through said slot with the said rack and adapted for to-and-fro movements, relative to said fixedly secured gauge-plate over the upper surface of said base-plate as carried by its connected rack, an actuating means for the movement of said rack comprising a shaft borne by said base-plate bearing a pinion meshing with said rack and means for shaft manipulation, a dial-plate bearing registering indicia, actuating means for said dial-plate comprising said rack, a pinion meshing therewith borne by a shaft bearing said dial-plate, and a vernier carried by the said base-plate and co-operatively associated with said dial-plate for reading minute divisions as indicated upon the dial-plate.

11. In a micrometer, a rectangular base-plate having flanged sections constituting supports and bearing longitudinally an elongated guide-slot, a rack slidably borne beneath said base-plate and adapted for longitudinal guidance along and in parallelism with said guide-slot, gauge-plates of similar and right-angular form, one of which is fixedly secured to the upper surface of said base-plate at the farther extremity of said slot, the other being connectedly secured through said slot with said rack and adapted for to-and-fro movement over the upper surface of said base-plate as borne by said rack, an actuating means governing the movements of said rack comprising a shaft supported by said base-plate bearing a pinion meshing with said rack and a means for shaft manipulation, a dial-

plate bearing registering indicia, means for the support and actuation of said dial-plate comprising a shaft supported by a housing carried by said base-plate and bearing a pinion in mesh with said rack and operable through the movements thereof, and a spring means borne by said housing adapted to urge and retain in close contact said rack and said pinion to prevent back-lash.

12. In a micrometer, a rectangular base-plate provided with flanges constituting supports and bearing longitudinally an elongated guide-slot, a rack slidably supported beneath said base-plate and adapted for longitudinal guidance along and in parallelism with said guide-slot, a pair of gauge-plates of similar and right-angular form, one of which is fixedly secured to the upper surface of said baseplate at the farther extremity of said slot, the other being connectedly secured through said slot with said rack and adapted for to-and-fro movement therewith in alignment with said fixedly secured gauge-plate, a means for imparting said to-and-fro movement to said rack comprising a shaft borne by said base-plate and bearing a pinion in mesh with said rack at its one extremity and at its opposite a means through which it may be manipulated, a means operable through the action of said rack for the registration of such movements as may be imparted to said rack comprising a shaft bearing a pinion at its one extremity in mesh with said rack and at its opposite a dial-plate bearing registering indicia, said dial-plate being held securely upon the shoulder borne by said opposite extremity of said shaft by means of a cap-screw, or other suitable device, a housing for said shaft, a spring means borne by said housing for urging said pinion into close and retained contact with said rack, and a vernier borne by said base-plate and arranged for co-operative relation with said dial-plate and its indicia for the better reading of minute sub-divisions of graduation thereon.

In testimony whereof we hereunto affix our signatures.

MILES F. MOORE.
JOSEPH M. SMITH.