Oct. 21, 1924.

1,512,823

P. J. DARLINGTON

MICROMETER CALIPER

Filed May 4, 1922

3 Sheets-Sheet 1

Fig 3

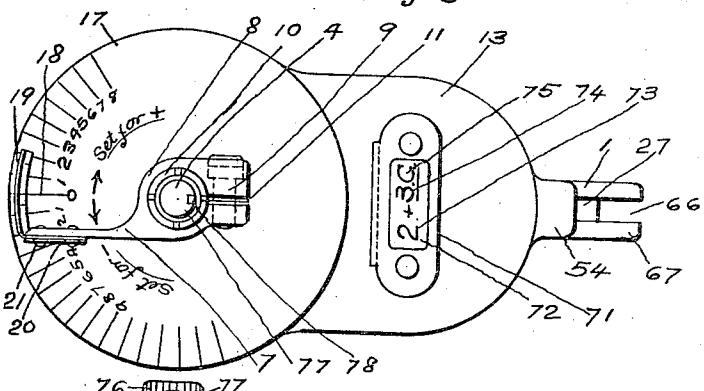


Fig 4

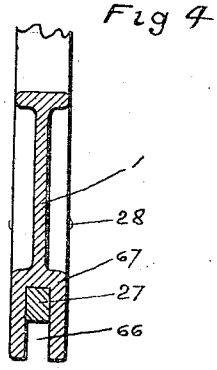


Fig 1.

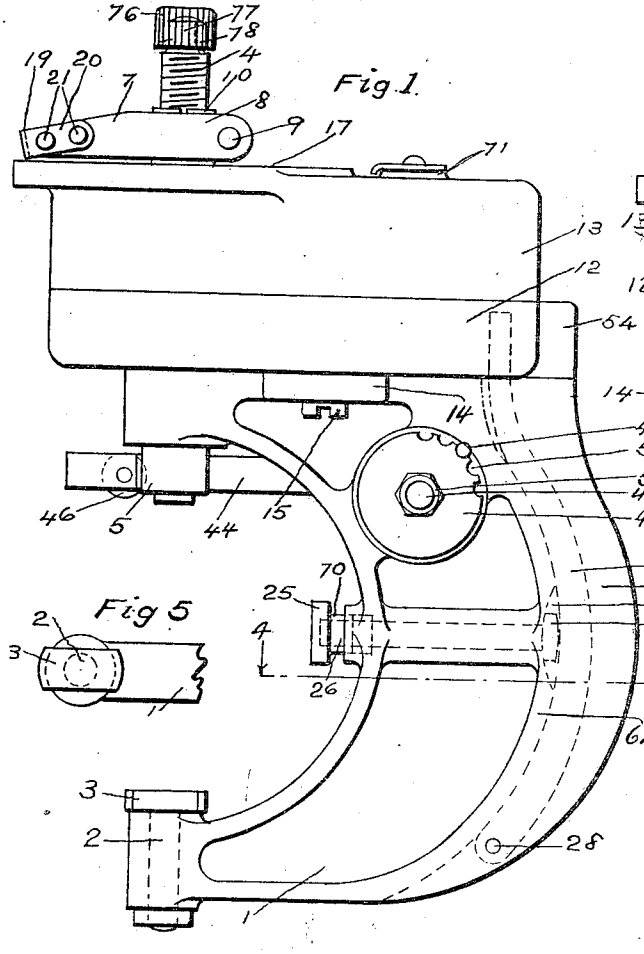


Fig 2

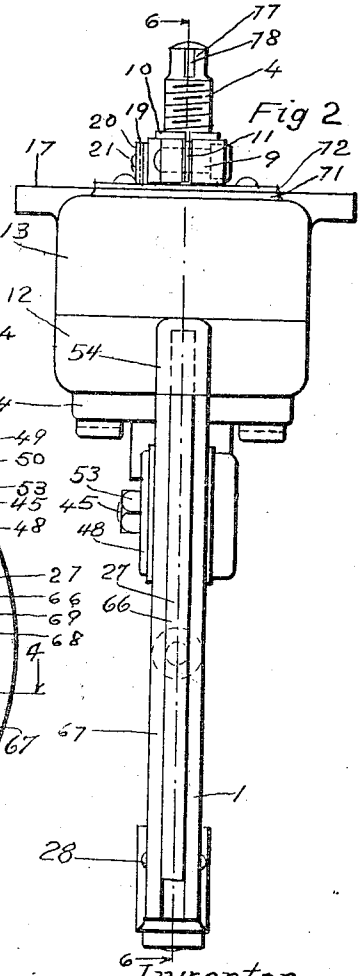


Fig 5

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Fig.11

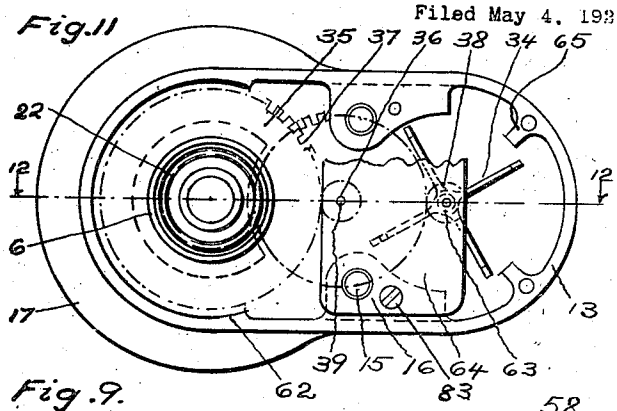


Fig.8

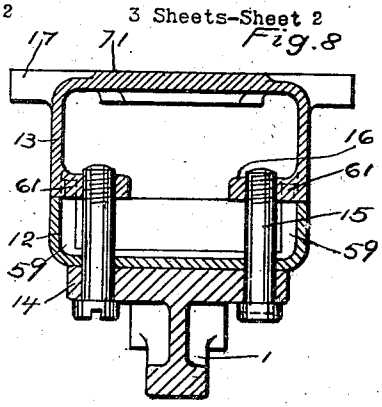


Fig.9.

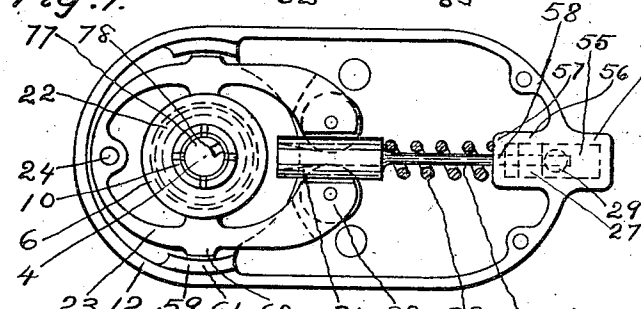


Fig.10.

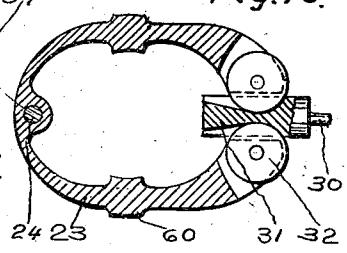


Fig.6

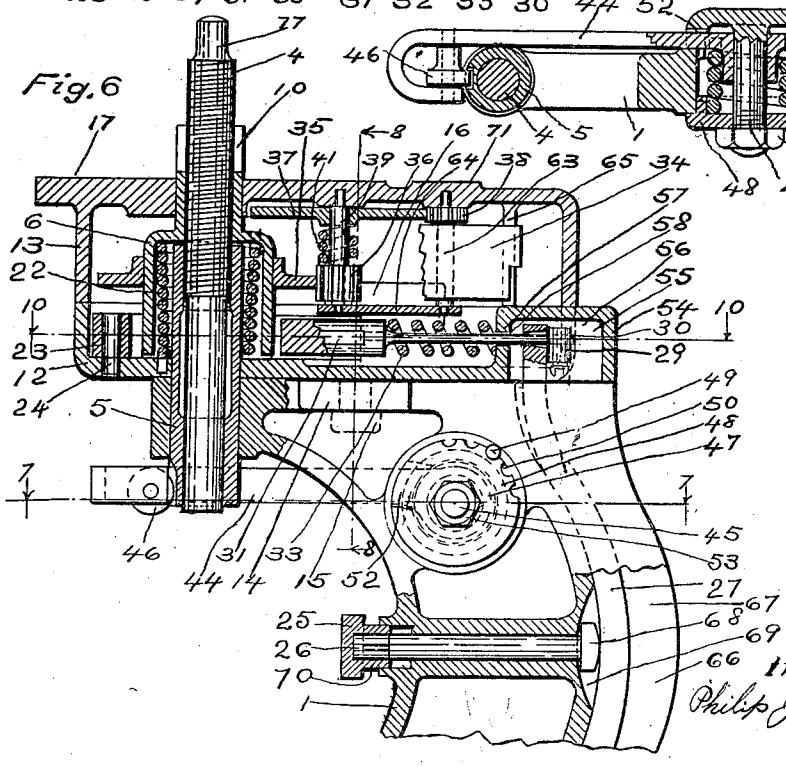


Fig.7

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Fig. 14

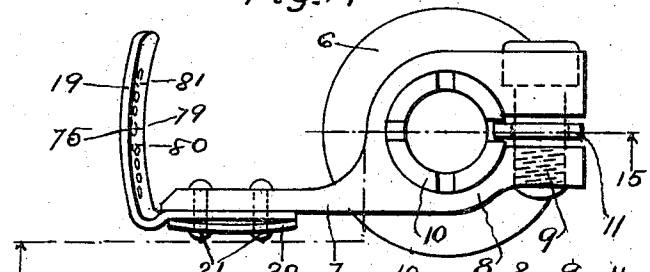


Fig. 17

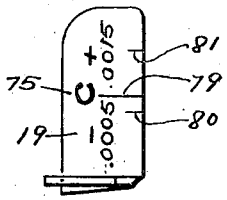


Fig. 15

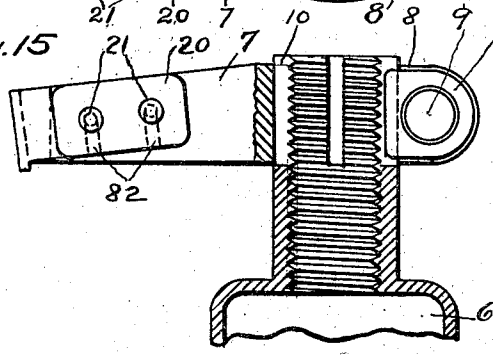


Fig. 16

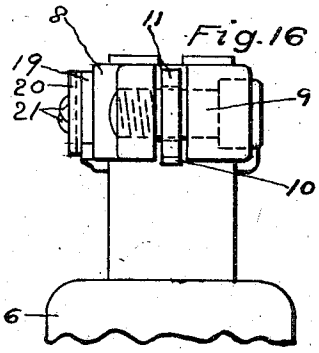


Fig. 12

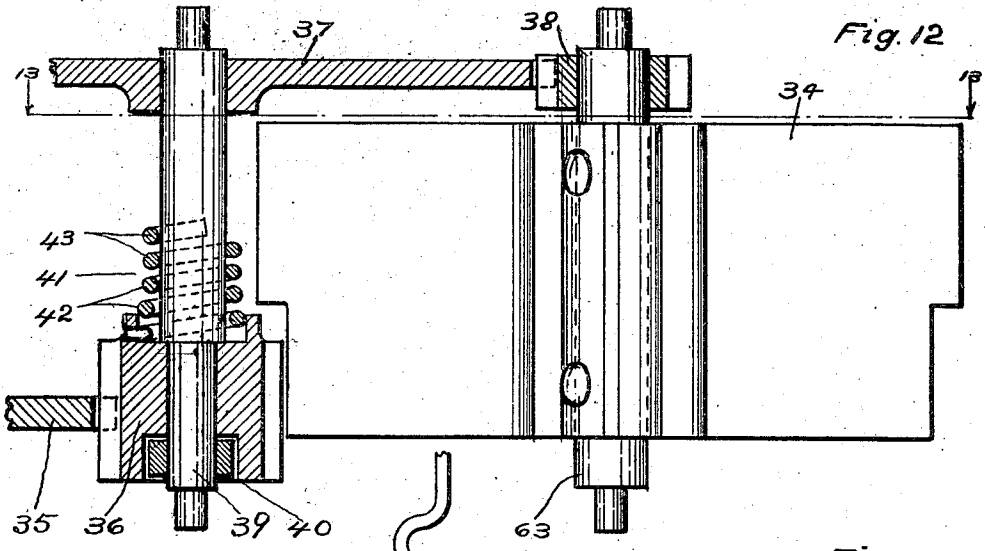
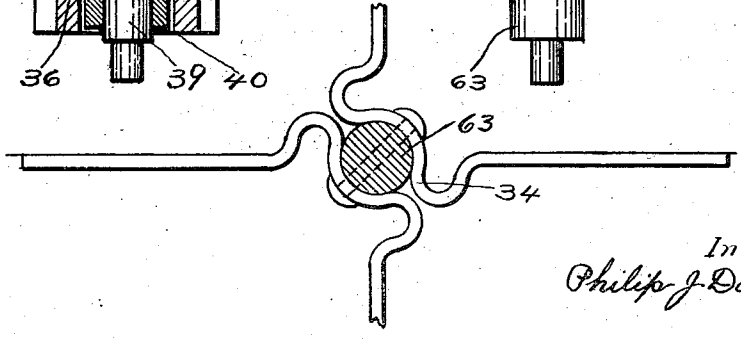


Fig. 13



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Philip J. Darlington

Patented Oct. 21, 1924. 1,512,823

UNITED STATES PATENT OFFICE.

PHILIP J. DARLINGTON, OF BOSTON, MASSACHUSETTS.

MICROMETER CALIPER.

Application filed May 4, 1922. Serial No. 558,516.

To all whom it may concern:

Be it known that I, PHILIP J. DARLINGTON, a citizen of the United States, residing at 60 West Cedar Street, in the city of Boston, county of Suffolk, and State of Massachusetts, have invented a new and useful Micrometer Caliper, of which the following is a specification.

The micrometer-caliper herein described has some features and some uses in common with the micrometer-calipers of my application No. 535010, filed February 8, 1922, and my application #558,824 filed May 5, 1922.

My invention relates to improvements in micrometer-calipers designed for use in producing and for inspecting a dimension of an object, and especially for taking successive measurements of diameter during the reduction of the diameter of an object toward a desired diameter and to within specified limits of tolerances therefrom.

The objects of my improvements are, first, to provide a micrometer-caliper which is rapid, accurate and reliable in use, independently of the skill, training, intelligence and good eye-sight of the user, and independently of differences in skill or judgment between the man who sets the micrometer-caliper and the workman who uses it as set; second, to provide a micrometer-caliper which can be quickly adjusted to measure small differences from a standard basic size-plug and which can be quickly equipped to show any one of several standardized tolerance limits; third, to provide a micrometer-caliper which can be cheaply manufactured and equipped for a large variety of uses on different forms and sizes of objects; fourth, to provide a micrometer-caliper of such quickly interchangeable and adjustable standardized parts that it may be used in cooperation with simplified drawings in the production of machine parts to specified dimensions within specified tolerance limits; and, fifth, to provide a micrometer-caliper which is durable and strong.

The nature of my invention will be best understood by reference to the accompanying drawings, in which I have shown the preferred embodiment thereof and which will now be described, it being premised, however, that various changes can be made in the construction and arrangement of the various parts without departing from the spirit and scope of the invention as defined in the appended claims.

Figure 1 is a side elevation view of the micrometer-caliper; Fig. 2, a rear elevation view; Fig. 3, a plan view; Fig. 4, a section on the line 4—4, Fig. 1; Fig. 5, a plan view of the anvil; Fig. 6, a vertical part-section on the line 6—6, Fig. 2, the arm being removed; Fig. 7, a horizontal section on the line 7—7, Fig. 6; Fig. 8, a vertical part-section on the line 8—8, Fig. 6, the mechanism being omitted from the casing; Fig. 9, a plan view of the lower casing and its contents; Fig. 10, a horizontal section of the retaining brake on the line 10—10, Fig. 6; Fig. 11, an inverted plan view of the upper casing and the mechanism therein; Fig. 12, an enlarged view in part section, on the line 12—12, Fig. 11, showing the retarding and absorbing mechanism; Fig. 13, a horizontal part section of the retarding fan on the line 13—13, Fig. 12; Fig. 14, a plan view of the indicating arm and drum; Fig. 15, a vertical part section of same on the line 15—15, Fig. 14; Fig. 16, a rear elevation of same; and Fig. 17 is a rear elevation view of the index segment of the arm.

Similar numerals refer to similar parts throughout the several views.

The frame 1 supports an anvil 2, which is normally stationary but removable and rotatable when the nut which secures it is loosened, to place the elongated head 3 in any desired angular position to the frame.

The spindle 4 is journaled and adjustably threaded into the bush 5 fixed relatively to the frame and carries the drum 6 adjustably screwed, but normally clamped, onto a continuation of the same screw thread as in the bush 5, whereby the drum 6 normally travels with the spindle 4 but, when unclamped, may remain stationary while the spindle 4 is screwed through both the bush and the drum to adjust the caliper to a new range of work.

An index arm 7, having a split hub 8 and a clamping screw 9, is adjustably clamped onto the split hub 10 of the drum 6. The segments of the hub 10 are sprung inward to produce an initial friction with the spindle 4 sufficient to resist the turning effort of the spring 22 but permitting the manual

adjustment of the spindle 4 through the drum 6 and bush 5 when the arm 7 is unclamped. A key 11 is loosely mounted on the clamping screw 9 in the slot of the hub 8 and extends into a slot in the hub 10 so as to allow free axial, but limited angular, adjustment of the arm 7 on the drum 6 when the arm is unclamped.

A lower casing 12 and an upper casing 13 are secured to lugs or ears 14 on the frame 1 by means of screws 15 passing through the lower casing 12 and threaded into internal flanges 16 of the upper casing 13.

The upper casing 13 is formed with a stationary graduated disc dial 17 concentric with the spindle 4. The dial 17 is graduated around its circumference into equal unit divisions which are serially numbered from the zero mark 18 in both directions.

An index segment 19 is removably secured to the arm 7 and has an index line 79 and low limit and high limit tolerance lines 80 and 81, respectively, reading on the scale of the dial 17.

The segment 19 is removably held in place on the arm 7 by means of a spring clip 20 permanently secured to the arm by means of rivets 21. Slots 82 in the segment 19 allow the segment to pass by these rivets into place under the spring clip 20. The face of the segment is slightly inclined outwardly from the vertical to facilitate reading its index lines on the graduations of the fixed dial 17. A set of several segments 19, but with different standard tolerance lines, is preferably furnished with each micrometer-caliper.

The driving spring 22, inside the drum 6, connecting the casing 12 with the drum 6, is normally in tension to turn the spindle 4 to screw it toward the object to be measured. The flexible retaining brake 23, pivoted on the pin 24, is normally sprung upon the drum 6 with sufficient force to hold it against the turning effort of the spring 22.

The shoe 25, on the plunger 26, is so located as to be engaged and displaced by the object to be measured, as the said object is moved into place for the measurement.

The lever 27, pivoted at its lower end on the pin 28, is arranged to amplify and transmit the movement of the plunger 26 to the tappet 29 on the brake rod 30, which is attached to the wedge cam 31, supported between the antifriction rollers 32 in the arms of the brake. The return spring 33 is in compression to return the parts to their normal position and allow the brake to spring closed against the drum when the object and the micrometer-caliper are moving apart but before the measured diameter has passed from between the measuring surfaces.

The retarding fan 34 is mounted in the casing 13 and is geared to the drum 6 through the driving gear 35, intermediate pinion 36, intermediate gear 37, and driven pinion 38.

The intermediate pinion 36 is freely mounted on the intermediate shaft 39 and is held in place thereon by the forced-on collar 40. The spring clutch 41 is attached at one end to the pinion 36 and coiled around the intermediate shaft 39. The first coils, forming the spring coupling portion 42, of clutch 41 are larger than the shaft, while the remaining coils, forming the frictional absorber portion 43 of clutch 41, are wound closely upon, and in frictional contact with, the shaft. Clutch 41 is wound in the direction to be tightened upon the shaft 39 when the drum is driving the retarding fan forward but to be loosened, and slipped upon the shaft, when the fan and its gearing attempt to return their momentum to the drum and when the spindle is being turned back to open the micrometer-caliper.

For the purpose of relieving the spindle of all the weight of the device, and ensuring the close engagement of the anvil head with the part being calipered, a lifting arm 44 may be pivoted on the transverse shaft 45 and provided with a roller 46, which will bear upon the object being measured, preferably in line with, and in front of, the spindle 4. The spiral spring 47 engages the arm 44 and is anchored to the rotatable washer 48, which is angularly adjustable for a desired tension of the spring and is secured in its adjusted position by the dowel pin 49 engaging one of the peripheral notches 50.

The flanged washer 51, preferably integral with the shaft 45, is formed with a radial window 52 through which the arm 44 projects. The window 52 is sufficiently wider than the arm 44 to permit but limit the movement of the arm in any angular position, in which the washer 51 may be set and clamped by the nut 53.

The lower casing 12 is formed with a rear extension 54 and a rear chamber 55 which opens downward for the entrance of the lever 27, but is isolated from the interior of the casing by the dust proof side walls 56 and end wall 57, which has a small hole 58 through which the brake rod 30 freely, but closely, fits.

The lower casing 12 is formed with two opposite longitudinal abutments 59 which are internally bored concentric with the spindle 4 and to a diameter substantially that of the brake centering lugs 60 when the brake is open.

The abutments 59 have upward extensions 61, the outer walls of which are concentric with the spindle 4 and project into, and fit, the inner wall 62 of the upper casing 13 so as to center the casings when assembled.

The lower ends of the fan shaft 63 and the intermediate shaft 39 are carried by a bear-

ing plate 64, which is removably secured by the screws 83 to the internal flanges 16 of the upper casing.

The lever 27 lies in the channel 66 formed in the rear flange 67 of the frame 1, and which registers with the open chamber 55 of the lower casing.

The plunger 26 has a flat head 68 lying in a sub-channel 69 in the bottom of the channel 66. The shoe 25 has a split hub 70 fitted to removably wring over the end of the plunger 26.

The upper casing 13 has a raised pad 71 to which may be attached a clip adapted to hold a card 72 on which is marked figures or symbols which indicate the dimensions for which the gage is to be used in any particular measurement. For instance the numeral 2, indicated by 73 on Fig. 3 represents two inches, the basic size or size of a 2″ hole to be fitted; the numeral 3 indicated by 74 on Fig. 3 represents three thousandths, the fit differential or amount less than 2″ of the part to be fitted into the 2″ hole; while the symbol C indicated by 75 arbitrarily represents the particular tolerance allowed, for example .0005 or—.00010, or range of allowable variation above or below exact size. These figures and symbols preferably agree with corresponding markings on the drawing of the object to be produced.

The spindle 4 is formed with a tool receiving extension 77 and a key-way 78 at its upper end to receive the knurled thimble 76 for setting the spindle relatively to the dial and to the drum, bush and arm.

The operation of the micrometer-caliper may be illustrated as follows:

In machinery manufacture it is almost universal practice, and recommended by all scientific commissions, to make all inside diameters to basic sizes of exact units, for which reamers and plug-gages are standard equipment. The fit allowances for running fit, sliding fit, and forcing fit are made in the outside diameter of the shaft.

There is, therefore, usually available the basic-sized plug-gage to which the hole is to be formed. This micrometer-caliper is used to reproduce in the shaft the basic size of the plug gage plus or minus the fit allowance, and accurately to within specified limits. As the fit allowance is usually only a few thousandths of an inch, it will be seen that this device utilizes the extreme accuracy of solid plug-gages and sizing-blocks recently developed with the aid of the United States Bureau of Standards, while the results are but little dependent upon exactness of pitch in the spindle thread of the micrometer-caliper.

In preparing the micrometer-caliper for a specified diameter, it is equipped with suitable anvil and shoe to bring it within range, and with the index segment of the specified tolerance limits. It is then placed on the basic plug-gage. The arm 7 is unclamped and held slightly in advance of the division representing the allowance, while the spindle is screwed through the drum and the brush onto the plug-gage. The arm is then released and the micrometer-caliper operated by its own spring onto the plug-gage, after which the arm is slipped on the hub of the drum, as permitted by the looseness of the key, until the zero line of the segment reads exactly on the allowance graduation of the dial. The arm is then clamped and the micrometer-caliper is ready to produce the specified fit allowance when reading on the zero of the stationary dial.

If the micrometer-caliper is to be used vertically, that is, when held vertically for calipering horizontal surfaces, and the lifting arm 44 employed, the nut 53 is loosened, allowing the flanged washer 51, with its window 52, to revolve sufficiently to allow the roller 45 to rest on the plug-gage. The nut 53 is then tightened to clamp the washer 51 in position. The spring 47 is preferably adjusted to cause the arm to lift the weight of the micrometer-caliper and so relieve the driving spring and spindle of that gravity load. The lifting arm serves the added purpose, especially in large sizes, of supporting the frame 1 in such manner that the weight of the upper and lower arms, or parts of the frame, is deflected in the same direction by gravity, so that the micrometer-caliper reads the same when used vertically as when used horizontally, that is when held horizontally for calipering vertical surfaces. The arm 44 may be turned down against the frame when not in use.

The loosely coiled part 42 of the clutch 41 acts as an elastic coupling to allow the driving spring 22 to start the spindle 4, or even to advance it for a small reading, before overcoming the friction to fan gearing and shafts. The tightly coiled part 43 of the clutch 41 serves to drive the fan, and thereby retard the spindle, while the driving spring 22 is advancing the spindle to the object being measured, but when the spindle strikes the object and suddenly stops, the momentum of the fan and its gearing is slowly and harmlessly absorbed by the friction of the then loosened coils 43 as they slip around the shaft.

Wings 65 extend inward from the wall of the upper casing toward the path of the fan blades. These by obstructing the air currents and preventing the free circulation of air with the fan blades, increase the resistance offered by the fan and thus add to its effectiveness.

I claim:

1. In a micrometer-caliper the combination of a frame, an anvil mounted on the frame, a graduated dial carried by said

frame, a rotatable micrometer member adjustably supported by the frame opposite the anvil, spring mechanism adapted to transmit a closing movement to the micrometer member, means adapted to retain the micrometer member in any position with the spring mechanism under tension, a trigger mechanism adapted to release said retaining mechanism, an index arm carried by and rotatable with the micrometer member, and an index scale detachably fastened to said arm and movable adjacent to the dial.

2. In a micrometer-caliper the combination of a frame, a graduated dial carried by said frame, a rotatable micrometer member adjustably supported by the frame, spring mechanism adapted to transmit a closing movement to the micrometer member, means adapted to retain the micrometer member in any position with the spring mechanism under tension, a trigger mechanism adapted to release said retaining mechanism, an index arm carried by and rotatable with the micrometer member, and an index scale graduated to show tolerance limits, fastened to said arm and movable adjacent to the dial.

3. In a micrometer-caliper, the combination of a frame, a tubular member having an interior thread supported by the frame, a micrometer spindle having a threaded portion fitting the thread of and adjustable longitudinally in said member, a driving member adjustably supported on said threaded portion of the spindle, and means whereby said driving member may be held stationary while the micrometer screw is adjusted with relation to said tubular member and driving member.

4. In a micrometer-caliper, the combination of a threaded stationary member, a rotary micrometer member threaded therein, a driving member threaded on said micrometer member, an indicating member adjustably attached to said driving member, means whereby said driving member may be held while axially adjusting said micrometer member to said stationary member and said driving member, and means whereby said indicating member may be angularly adjusted on said driving member.

5. In a micrometer-caliper, the combination of a frame, a micrometer screw adjustably supported by the frame, a driving member threaded on said screw, and an indicating member loosely keyed on and normally clamped to said driving member.

6. In a micrometer-caliper, the combination of a frame, an anvil mounted on the frame, a micrometer screw supported by the frame opposite the anvil, a hub threaded on said screw, an indicator arm on said hub, means clamping said arm to said hub, and driving means having a lost motion engagement between said arm and said hub whereby a limited angular adjustment of said arm on said hub is possible when said clamping means is released.

7. In a micrometer-caliper, the combination of a frame, an anvil mounted on the frame, a spring driven threaded micrometer member rotatably supported by the frame opposite the anvil, a retarding fan, and a gear train connecting said fan with said micrometer member.

8. In a measuring device, the combination of a casing containing a spring driven measuring member, a retarding fan geared thereto and means on the casing for obstructing the air currents produced by said fan.

9. In a micrometer-caliper, the combination of a casing containing a spring driven micrometer member, a retarding member, a gear train connecting said retarding member to said micrometer member, and a yielding coupling between gears of said gear train.

10. In a micrometer-caliper the combination of a casing, a rotatable threaded micrometer spindle supported by the casing, spring mechanism for imparting a closing rotation to the micrometer spindle, a brake for retaining the micrometer spindle with the spring under tension, mechanism for releasing said brake, a fan for retarding the speed of closing movement of the micrometer spindle, and multiplying gearing connecting the fan with the micrometer rotating mechanism.

11. In a micrometer-caliper, the combination of a frame, an anvil mounted on the frame, a threaded micrometer member supported by the frame opposite the anvil, and a retarding member driven from said micrometer member, with a shock absorbing clutch interposed between the micrometer member and retarding member.

12. In a micrometer-caliper, the combination of a casing containing a spring driven micrometer member, and a retarding member driven therefrom, with clutching means arranged intermediate said members to drive said retarding member when the micrometer member is turned forward but to slip frictionally when said micrometer member is turned backward.

13. In a micrometer measuring device, in combination with the frame and the measuring mechanism, means yieldingly connected to the frame and adapted to engage the object being measured and support the weight of the frame and measuring mechanism.

14. In a micrometer-caliper, the combination of a frame, an anvil mounted on the frame, a micrometer member supported by the frame opposite the anvil, and a spring-controller lifting member attached to the frame and adapted to bear on and hold the anvil against the object being measured.

15. In a micrometer-caliper, the combination of a frame, a rotatable micrometer member supported by the frame, a drum carried by said member, a yoke-shaped retaining brake pivoted on the frame and adapted to grip said drum, and a wedge adapted to expand said brake and release it from the drum.

16. In a micrometer-caliper, the combination of a frame, a rotatable micrometer member supported by the frame, a drum attached to said member, a spring for rotating said drum, a yoke-shaped brake pivoted on the frame and adapted to grip said drum and hold it against the tension of the spring, a wedge adapted to expand said brake and release the drum, and anti-friction means interposed between said wedge and the ends of said yoke-shaped brake.

17. A micrometer-caliper comprising a frame provided with an anvil, a rotatable micrometer screw supported by the frame opposite the anvil, a spring for rotating the micrometer screw, a brake for obstructing the rotation of the micrometer screw, means for releasing the brake and permitting the spring to rotate the micrometer screw, a lever for actuating said brake releasing means, and a plunger mounted on the frame and adapted to be displaced by the object being measured for causing the brake releasing movement of said lever.

18. A micrometer-caliper comprising a frame provided with an anvil, a rotatable micrometer screw supported by the frame opposite the anvil, a spring for rotating the micrometer screw, a brake for obstructing the rotation of the micrometer screw, a wedge for releasing the brake and permitting the spring to rotate the micrometer screw, a spring for holding the wedge disengaged from the brake, a lever for causing the wedge to engage and release the brake, and a plunger mounted on the frame and adapted to engage the lever and cause it to move the wedge so as to release the brake.

19. A micrometer-caliper comprising a frame having a casing at one end, an interiorly threaded tube supported by the casing, a micrometer screw threaded into and extending through said tube, a drum threaded on and adapted to be clamped to said screw, a spring for rotating said drum in one direction, an indicating arm mounted on said drum and rotatable therewith, a brake for holding the drum against rotation, a wedge for releasing the brake, a spring for holding the wedge in one position, a lever for moving the wedge against the tension of said spring, and a plunger supported by the frame and adapted to engage said lever.

20. A micrometer-caliper comprising a frame having a casing at one end, a bushing having an interior thread fixed in said casing, a micrometer screw threaded into and extending through said bushing, a drum clamped on said screw, a spring for rotating said drum, an indicating arm clamped to and rotatable with said drum, a brake for holding the drum against the rotatory tension of the spring, means for releasing the brake, a gear attached to and rotatable with the drum, a retarding fan mounted within the casing, and gears connecting the retarding fan with the gear on the drum, one of said gears being connected with its spindle by means of a spring friction.

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