June 16, 1925. 1,541,796

P. J. DARLINGTON

MICROMETER CALIPER

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Fig. 3.

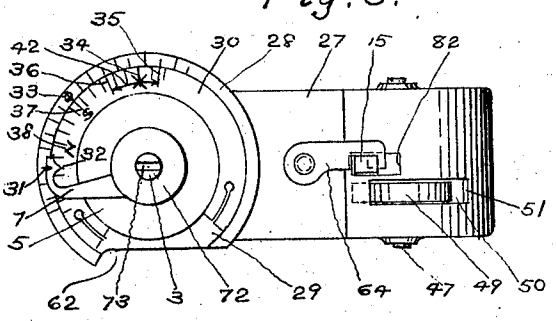

Fig. 4.

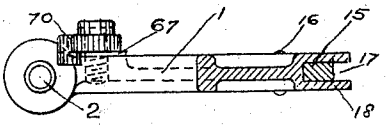

Fig. 1.

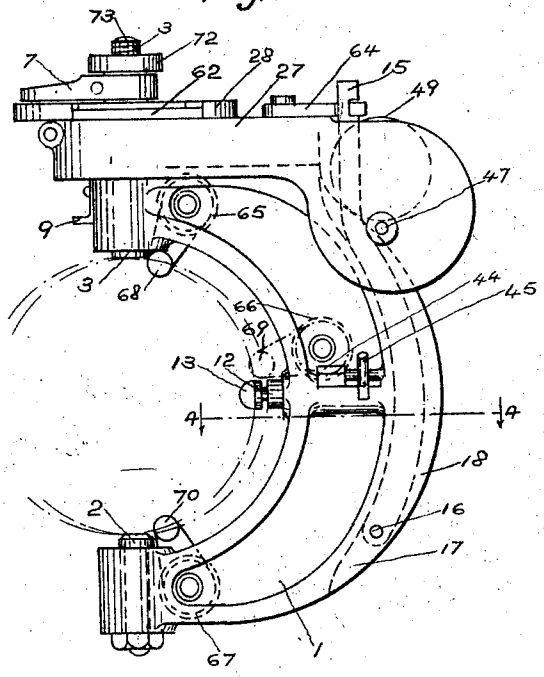

Fig. 2.

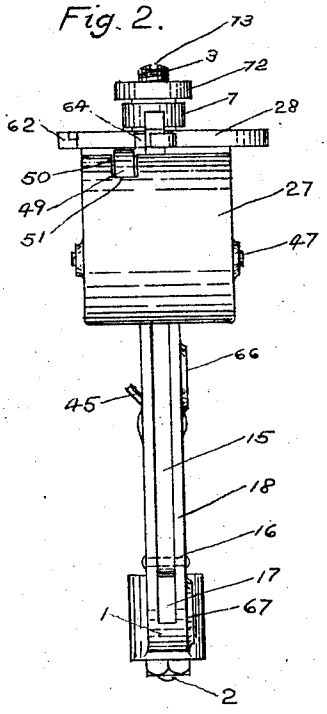

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Fig. 5.

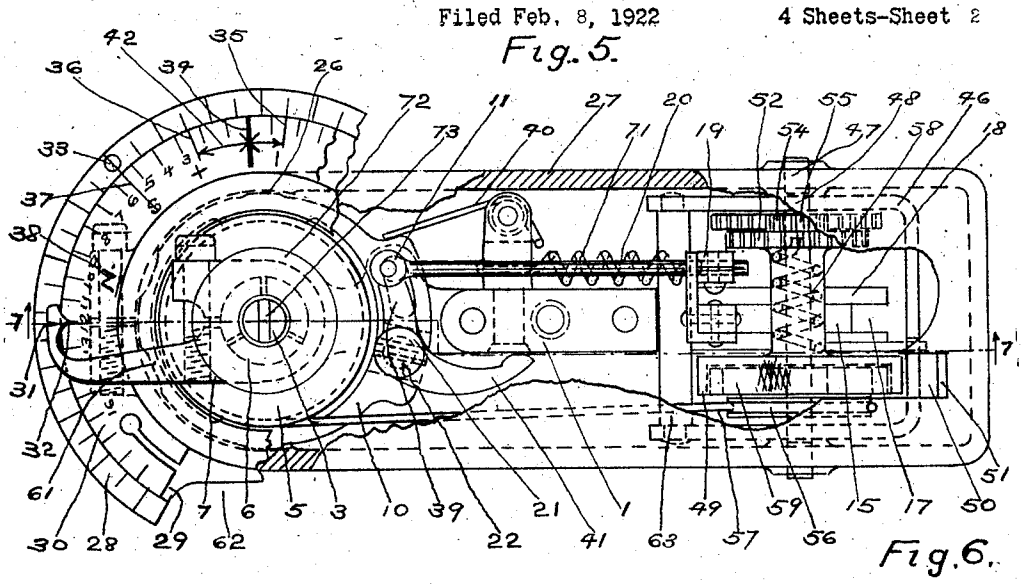

Fig. 6.

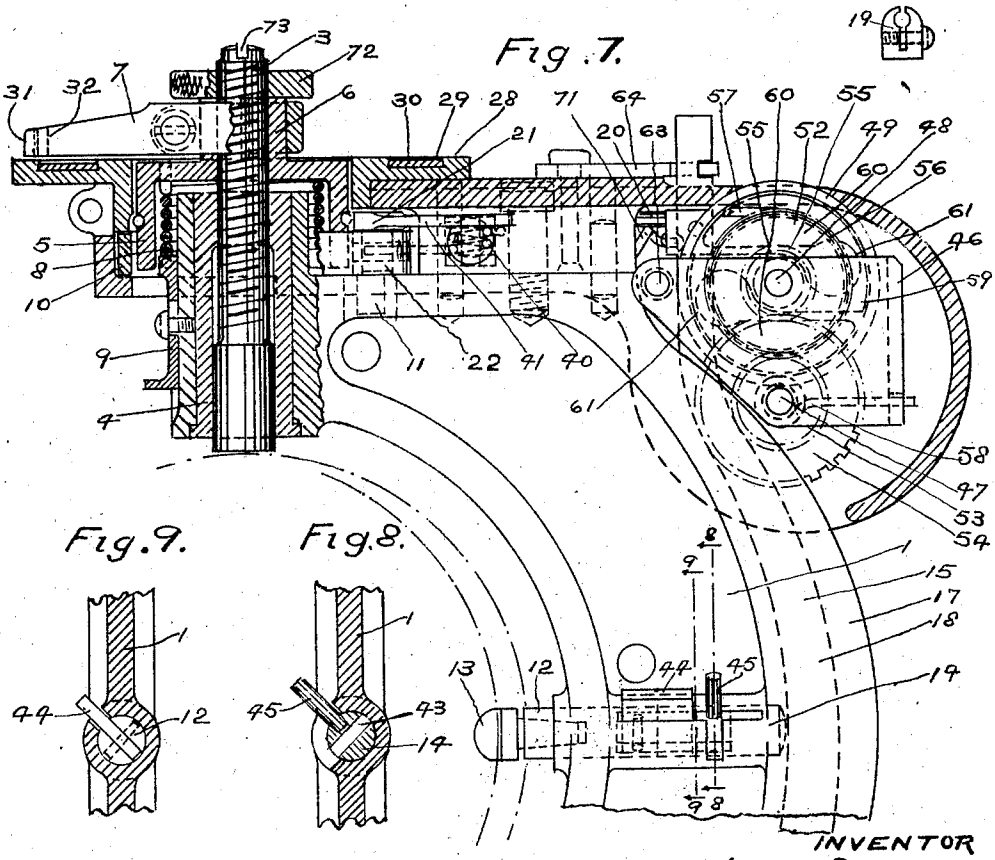

Fig. 7.

Fig. 9.

Fig. 8.

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Fig. 10.

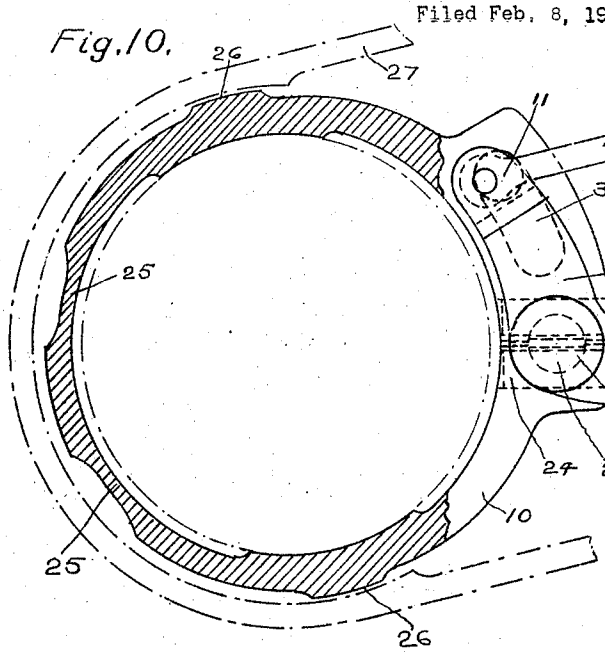

Fig. 11.

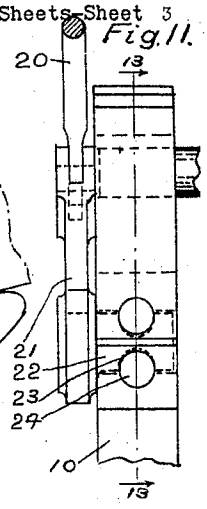

Fig. 12.

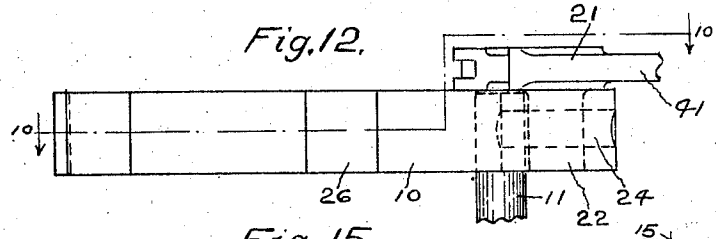

Fig. 13.

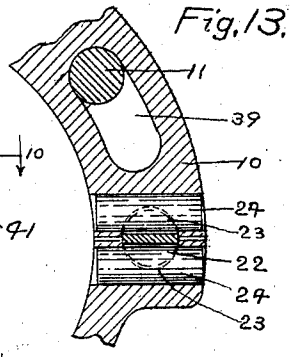

Fig. 15.

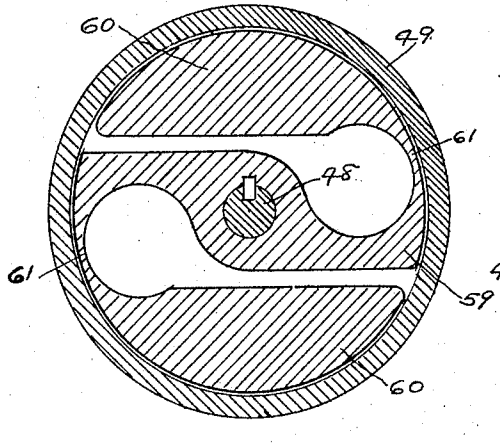

Fig. 14.

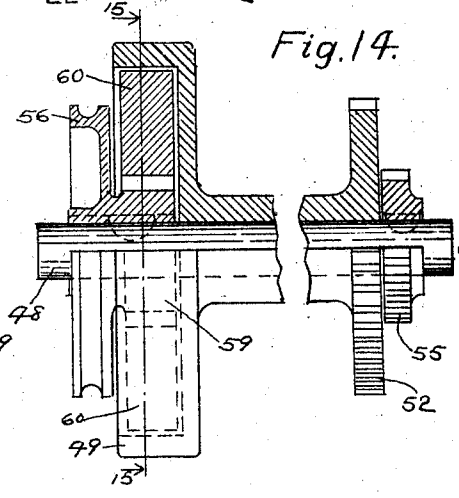

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Fig. 17.

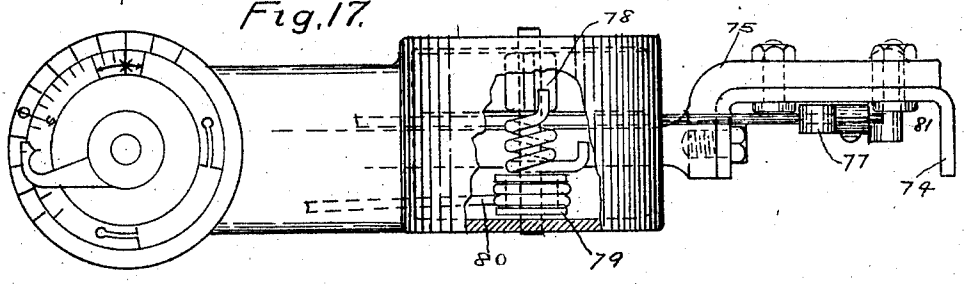


Fig 16

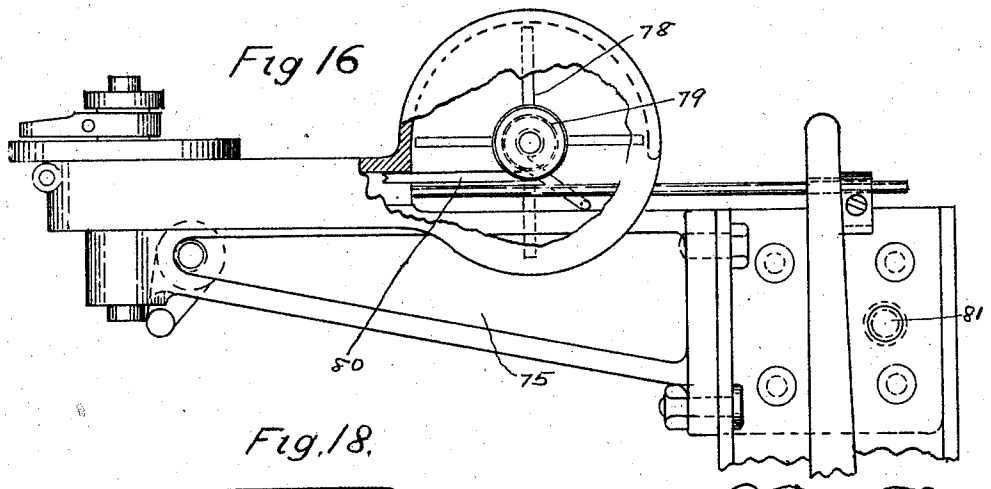
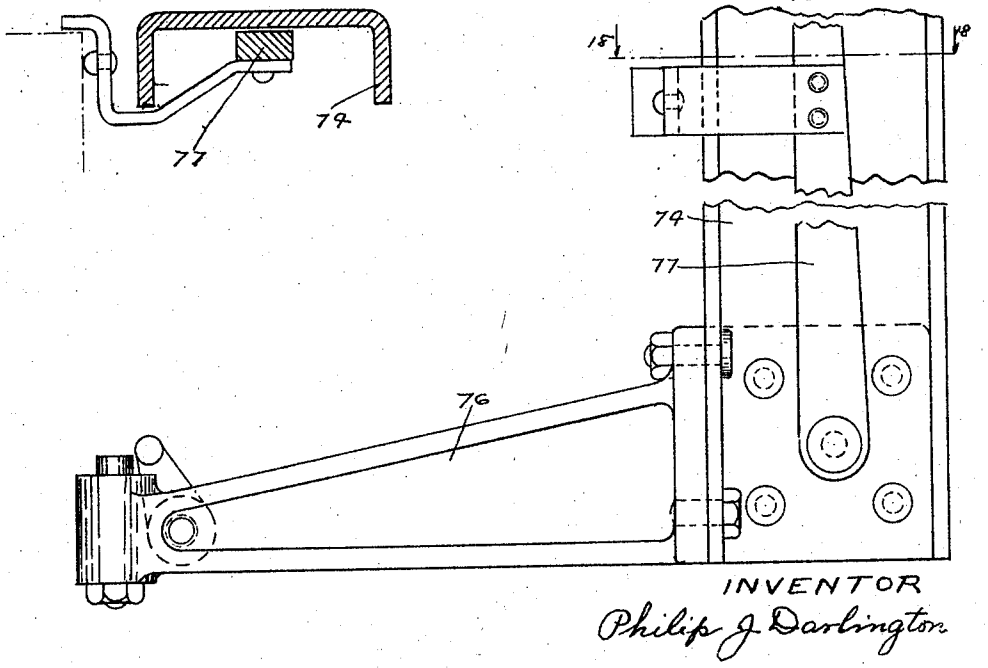


Fig. 18.



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Philip J. Darlington

Patented June 16, 1925. 1,541,796

UNITED STATES PATENT OFFICE.

PHILIP J. DARLINGTON, OF BOSTON, MASSACHUSETTS.

MICROMETER CALIPER.

Application filed February 8, 1922. Serial No. 535,010.

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.

My invention relates to improvements in micrometer-calipers designed for producing and inspecting a dimension of an object, and especially with consideration of a desired size and of the extreme allowable deviations therefrom or tolerance limits.

The objects of my improvements are, first, to provide a micrometer-caliper for use in the rapid and cheap production of machine parts averaging a desired size and all within a specified limit, either above or below that size, or within specified limits both above and below it; second, to provide such a micrometer-caliper of increased accuracy and reliability, demanding less intelligence or skill and less dependent on good eye-sight or good lighting in its use; third, to provide a micrometer-caliper which will reduce the personal factor of the user and contribute to uniformity of size in the products of workmen of different sense or judgment; fourth, to provide means whereby such a micrometer-caliper may be quickly and surely adjusted by the use of the nearest standard or basic sized reference plug or size-block, either smaller or larger; fifth, to provide means for quickly and surely equipping a standard size of frame for any one of several standardized combinations of size and tolerance limits, which combinations may each be identified by a symbol on a drawing of the part to be made; sixth, to provide means for quickly equipping such a micrometer-caliper for rapid and accurate use on any one of several special forms of parts to be made; seventh, to provide a construction of micrometer-caliper which may be cheaply made in a large variety of sizes from a small investment in stock or parts; and, eighth, to provide a durable micrometer-caliper subjected to but little sliding action and wear while in use.

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 entire micrometer-caliper; Fig. 2, a rear elevation view without the work guides; Fig. 3, a plan view; Fig. 4, a horizontal section on the line 4—4, Fig. 1; Fig. 5, a plan view, to enlarged scale, with a part of the roof of the casing broken away to show the parts underneath; Fig. 6, a detailed view of the adjustable tappet; Fig. 7, a side elevation view of the upper part of the micrometer-caliper, partly in section on the line 7—7, Fig. 5; Fig. 8, a part vertical section on the line 8—8, Fig. 7; Fig. 9, a part vertical section on the line 9—9, Fig. 7; Fig. 10, a detailed plan view of the brake, to further enlarged scale, and partly in section on the line 10—10, Fig. 12; Fig. 11, a rear elevation view of a part of the brake; Fig. 12, a side elevation view of the brake; Fig. 13, a horizontal section of a part of the brake on the line 13—13, Fig. 11; Fig. 14, a detailed view, to enlarged scale, of a part of the resetting mechanism, partly in rear elevation and partly in section through the center line of the shaft; Fig. 15, a vertical section of the same part of the resetting mechanism on the line 15—15, Fig. 14; Fig. 16, a side elevation view of a modified form of the micrometer-caliper, adaptable to large sizes; Fig. 17, a plan view of the same modified form; and Fig. 18, a horizontal section of the same modified form on the line 18—18, Fig. 16.

Similar numerals refer to similar parts throughout the several views.

The frame 1 supports a stationary, but flanged and easily removable, gage anvil 2 and an adjustable micrometer screw 3, threaded in a bush 4.

A pulley 5, having a split hub 6, is threaded onto the screw 3 and clamped thereon, in any desired position, by the split hub of a pointer 7, which is adjustable, both axially and circumferentially, on the hub 6.

A spiral spring 8, reacting against a withdrawable stop 9, acts to turn the pulley 5. A flexible brake-band 10, pivoted to the frame 1 by a pin 11, normally clamps upon the pulley 5 with sufficient force to hold it against the turning effort of the spring 8.

A centering plunger 12, having a remov-

able shoe 13, is movably supported by the frame 1 in such position as to be engaged and displaced by the object being measured, as said object and the micrometer-caliper are brought together into relative positions for the measurement. The shoe 13 is of a form to conform with, or fit upon, the object to be measured. The plunger 12 normally engages a space-bar 14, which engages a lever 15, swinging on a pivot-pin 16 at its lower end, and buried in a channel 17, which is formed in a thickened flange 18 along the rear edge of the frame 1. The upper end of the lever 15 engages a tappet 19, adjustably clamped onto a brake-rod 20, which is attached to the brake operating lever 21, carried by the brake-band 10. The brake-rod 20, is, in all positions of its operation, substantially in the plane of the axis of the pivot-pin 11, to avoid appreciable turning effort on the brake-band 10. The brake operating lever 21 has a stem 22 loosely pivoted in the free ends of the contractible brake-band 10 and formed in the side of this stud are two semi-cylindrical cross-grooves 23 23, producing a thin cross-section, which is slightly less in thickness than the corresponding space between the two parallel pins 24 24 set into the opposite faces of the free ends of the brake-band 10, which is formed with thin flexible portions 25 25 to localize the flexure. The brake-band 10 has two external centering pads 26 26 of slightly less diameter, when the brake is open, than the concentric bore of the supporting casing. When the lever 21 is oscillated by the pull of the brake rod 20 and the stem 22 is turned, the reduced section of the stem engages the pins 24 and forces the free ends of the brake band apart and releases the grip of the brake on the pulley.

A casing 27 is removably secured to the frame 1 and adjustably carries a flanged, part circular and graduated index disc 28, the upper face of which is formed with a concentric dovetailed recess 29, in which is mounted a graduated scale segment 30, removably held in place by its split and sprung ends, and adjustable circumferentially against the friction thereof.

The pointer 7 has a vertical line 31 on its outer surface, reading on the scale of the disc 28. The pointer 7 is also formed with a vertical knife edge 32, pointing inward and on the same radius as the line 31, but reading on the scale of the segment 30.

A calibrating mark 33 is located in a convenient place on the rim of the disc 28, and the pointer 7 is adjusted to read on this mark 33, when the micrometer-caliper is set upon a convenient, basic-sized standard plug-gage or sizing-block. On the adjustable scale segment 30, a very prominent mark 34 represents the desired size to be produced and prominent marks 36 and 35 are measured distances on opposite sides of mark 34 indicating the plus and minus tolerance limits. A setting mark 37 is located at a distance from mark 34 representing the difference between the desired size and the size of the basic-sized standard plug-gage or sizing-block by which the mark 33 was located and the pointer 7 set. The scale segment 30 is turned to register the mark 37 with the calibrating mark 33 of the disc 28. For further convenience, the entire scale space between the marks 35 and 36 may be marked, as at 42, to distinguish it as the tolerance zone. The scale segment graduations may be serially numbered from the mark 34 to show, at any reading, how many units the object is to be reduced. The unit of division of the scale may correspond to the equivalent graduation of the machine tool with which the micrometer-caliper is to be used. An identifying symbol 38, on the scale segment 30, may correspond with a symbol on a drawing of the object being made and may identify a standard combination of size and tolerance limits in a tabulated list of such.

The brake-band 10 has a slot 39 extending circumferentially from the pivot-pin 11, against which the end of the slot is normally held by a spring 40. The lever 21 has an arm 41 extending radially from the brake-band and bearing against a boss on the under side of the casing 27 and fastened to the top of the frame 1.

The space-bar 14 has a longitudinal open slot 43 in its forward end, registering with a blade 44 carried by the plunger 12, when the space-bar is turned with its handle 45 downward, but crossing said blade when turned into normal position as shown in the drawings.

A swinging frame 46 is pivoted in the casing 27 on a shaft 47 and carries a shaft 48, on which is freely mounted a drum 49, whose knurled rim extends radially through and beyond an elongated window 50 in the curved roof of the casing 27. The rear end of the window 82 in the casing acts as a stop for the lever 15. This drum 49 carries a first gear 52, driving a first pinion 53 and a second gear 54 on the shaft 47. This second gear 54 drives a second pinion 55, which is keyed to the shaft 48, to which a sheave 56 is also keyed. This results in a back-gear arrangement to speed up the sheave 56 from the drum 49. A flexible line 57 is wound around the sheave 56 and around the pulley 5. A spiral spring 58 on the shaft 47 is in tension to keep the line 57 taut.

A retarding or speed governing member 59 is carried by the sheave 56 and preferably comprises two centrifugally arranged weights 60 60 flexibly supported by two thin sections 61 61 and proportioned to contact

with the inner surface of the rim of the drum 49 under the centrifugal action of excessive speed of the sheave 56. The centers of flexibility of the thin sections 61 61 are angularly behind the centers of contact of the weights 60 60 when the line 57 is unwinding from the sheave 56.

A cross-bar 63, on the frame 46, passes in front of the lever 15, in a position to engage and operate the lever when the frame swings backward. A latch 64 is pivoted on the top of the roof of the casing 27 and is formed to be swung either in front of or behind the lever 15 to lock the lever in its extreme rearward or forward position respectively.

Top, center and bottom guide-seats, 65, 66 and 67 respectively, are formed on the frame 1, to which are bolted corresponding work-guides 68, 69 and 70, which are formed and adjusted on the frame 1 to support the micrometer-caliper on the object to be measured.

In my preferred construction, a spring 71, anchored to the casing 27 at one end and attached to the lever 15 at the other end, is in tension to draw forward the lever 15 into its normal position, as shown. An opening 62 is formed in the disc 28 to give a view of the object. A knurled thumb collar 72 is screwed onto the micrometer screw 3 and locked against the hub 6 of the pulley 5. A screw-driver slot 73 is formed in the upper end of the micrometer screw 3.

In the modified form of my invention shown in Figures 16, 17 and 18, the frame is composed of a channel-bar 74, to which are bolted an upper arm 75 and a lower arm 76. The lever 77 lies between the flanges of the channel-bar 74. The swinging frame and the drum are dispensed with in this construction, the large size of which may demand the use of both hands in resetting and operating. The retarder 78 is of the fan type, attached to a small diameter sheave 79 on which the flexible line 80 is wound. A stop 81 is the limit stop for the lever 77.

Uses and operations of my invention are as follows:

In mechanical production the exact dimensions are usually in pairs, each pair comprising a standard basic inside size of one part and a slightly larger or smaller outside size of another part to fit therewith. The basic sizes are usually in exact units, such as eighths of an inch, and machine works are usually equipped with a plug or block of each such basic size.

The micrometer-caliper, complete excepting the scale segment 30, is adjusted to read on the calibrating mark 33 when set on a basic plug or block, and is placed in stock. On application by a workman, and his presentation of a drawing marked with the symbol 38, a correspondingly marked segment scale 30 is inserted and set with its mark 37 registering with the mark 33 and the micrometer-caliper is delivered for use.

The micrometer-caliper is placed on the object to be measured and is forced forward until the plunger 12 is forced backward as far as it will go. The movement of the plunger is amplified by the lever 15 and opens the brake-band 10, allowing the spring 8 to turn the screw 3 slowly, as regulated by the retarder 59, until the object to be measured is held between the screw 3 and the anvil 2, at a pressure determined by the strength of the spring 8. As the micrometer-caliper is withdrawn from the object, a reverse movement of parts applies the brake before the gaging surfaces have left the opposite ends of the dimension measured. The set and locked micrometer-caliper may then be held beside the graduation of the feed mechanism of the machine tool, while the tool is set for the exact feed required for a finish cut.

To open the micrometer-caliper, the operator may turn backward the projecting knurled rim of the drum 49. This movement first swings back the frame 46, carrying with it the lever 15 and opening the brake-band 10. Further movement rotates the sheave 56 and raises the screw 3. The retarding device 59 offers a reduced resistance to this reversed movement, as the weights 60 60 are pulled away from, instead of pushed against the friction surface. When the drum is released, the frame springs back into normal position, applying the brake to hold the screw in its new position.

In very exact and comparative measuring, as in adjusting the pointer 7, the spring 8 may be released and rendered inoperative by withdrawing the stop 9. The brake may be held open by the latch 64. The plunger 12 may be rendered inoperative by turning the handle 45 downward to allow the slot 43 to telescope over the blade 44 and the screw 3 may be turned by means of the collar 72. Under conditions rendering the drum 49 inaccessible, the screw 3 may be turned back by means of the collar 72 against a reduced brake action, resulting from the pressure of the casing 27 against the arm 41 as the brake-band 10 floats around with the pulley 5.

The end of the window 82 receives the excess of pressure of the lever 15, when said lever is forced back by the plunger 12. This results in relieving the frame 1 of flexure forces.

I claim:

1. A micrometer-caliper comprising a frame provided with graduations, a set of interchangeable scale members differently graduated and adapted to be applied to the frame with their graduations reading with

the graduations on the frame, and a micrometer member supported by the frame and having a rotatable and longitudinal movement with relation thereto and carrying a pointer bearing a mark readable with the graduations on the scale member applied to the frame.

2. A micrometer-caliper comprising a frame provided with graduations, a set of interchangeable scale members differently graduated and adapted to be applied to the frame with their graduations reading with the graduations on the frame, a micrometer member supported by the frame and having a rotatable and longitudinal movement with relation thereto, and a pointer adjustably mounted on and movable with said micrometer member and readable with the graduations on the scale member applied to the frame.

3. A micrometer-caliper comprising a frame having an index mark, a scale provided with graduations, adjustably applied to said frame with its graduations reading with said index mark, and a micrometer member supported by the frame and having a rotatable and longitudinal movement with relation thereto, said micrometer member carrying a pointer bearing a mark readable with the graduations on the scale.

4. A micrometer-caliper comprising a frame having an index mark, a removable graduated scale adjustably applied to the frame with its graduations reading with said index mark, a micrometer member supported by the frame and having a rotatable and longitudinal movement with relation thereto, and a member axially adjustable on and movable with the micrometer member and having a mark readable with the graduations on the scale.

5. A micrometer-caliper comprising a frame having an index mark, a removable graduated scale adjustably applied to the frame with its graduations reading with said index mark, a micrometer member supported by the frame and having a rotatable and longitudinal movement with relation thereto, and a pointer axially and circumferentially adjustable on said micrometer member and movable therewith, said pointer reading with the graduations on the scale.

6. A micrometer-caliper comprising a frame provided with graduations, a micrometer member supported by the frame and having a rotatable and longitudinal movement with relation thereto, a pointer attached to and movable with said micrometer member, and a graduated scale readable with the graduations on the frame and with the pointer, said scale being rotatably applied to the frame concentric with the micrometer member.

7. A micrometer-caliper comprising a frame provided with graduations, and a graduated scale adjustably mounted on the frame with the graduations reading with the graduations on the frame, said scale having a working mark representing a desired size, limit marks spaced from said working mark and representing the allowable variation from the desired size, and a setting mark spaced from said working mark and representing a basic size, a micrometer member, and a pointer mounted on said micrometer member and readable with the graduations on the scale member.

8. A micrometer-caliper comprising a frame provided with graduations, a graduated scale applied to the frame with the graduations reading with the graduations on the frame, a micrometer screw supported by the frame and having a rotatable and longitudinal movement with relation thereto, means for imparting a rotary inward movement to the screw, means for retaining the screw against such movement, and means actuated by the object to be measured for releasing said retaining means.

9. A micrometer-caliper comprising a frame having an index mark, a graduated scale applied to the frame with its graduations reading with said index mark, a micrometer screw supported by the frame and having a rotatable and longitudinal movement with relation thereto, and means automatically actuated by the application of the caliper to the object to be measured for adjusting and retaining said screw in adjusted position.

10. A micrometer-caliper comprising a frame having an index mark, a graduated scale applied to the frame with its graduations reading with said index mark, a micrometer screw supported by the frame and having a rotatable and longitudinal movement with relation thereto, means automatically actuated by the application of the caliper to the object to be measured for adjusting and retaining said screw in adjusted position, and means for amplifying the action of said means.

11. A micrometer-caliper comprising a frame having an index, a scale applied to said frame with its graduations reading with said index, a micrometer screw supported by the frame and having a rotatable and longitudinal movement with relation thereto, and means automatically actuated by the application of the caliper to the object to be measured for rotating said screw.

12. A micrometer-caliper comprising a frame having an index, a scale applied to the frame with its graduations reading with said index, a micrometer screw supported by the frame and having a rotatable and longitudinal movement with relation thereto, means automatically actuated by the application of the caliper to the object to be measured for rotating said screw, a brake

and means connected with the brake and actuated by the removal of the caliper from the object measured for causing the brake to retain the screw in the position to which it is rotated.

13. A micrometer-caliper comprising a frame having an index, a scale applied to said frame with its graduations reading with said index, a micrometer screw supported by the frame and having a rotatable and longitudinal movement with relation thereto, and means automatically actuated by the application of the caliper to the object to be measured for rotating said screw, said means including a spring whereby the pressure of the screw on the objects measured will always be the same.

14. A micrometer-caliper comprising a frame having an index, a scale applied to the frame with its graduations reading with said index, a micrometer screw supported by the frame and having a rotatable and longitudinal movement with relation thereto, means automatically actuated by the application of the caliper to the object to be measured for rotating said screw, a spring controlled brake and means connected with the brake and actuated by the removal of the caliper from the object measured for causing the brake to retain the screw in the position to which it is rotated.

15. A micrometer-caliper comprising a frame having an index, a scale applied to said frame with its graduations reading with said index, a micrometer screw supported by the frame and having a rotatable and longitudinal movement with relation thereto, a spring drum means intermediate the drum and screw for rotating the screw, a brake for retaining the drum with the spring under tension, and means automatically actuated by the application of the caliper to the object to be measured for releasing said drum.

16. A micrometer-caliper comprising a frame having an index, a scale applied to the frame with its graduations reading with said index, a micrometer member supported by the frame and having a rotatable and longitudinal movement with relation thereto, a spring normally connecting the frame and the micrometer member for effecting the adjustment of said member, and means whereby said spring may be disconnected to render it inoperative.

17. A micrometer-caliper comprising a frame, a micrometer member adjustable on said frame, an operating lever fulcrumed at one end, a stop adjusted to obstruct the movement of said lever at the other end, and a work contact member engaging said lever intermediate its fulcrum and said stop.

18. In a micrometer-caliper, the combination of an adjustable micrometer scale, a pointer co-operating with said scale, means for swinging the pointer over the scale, and a brake for restraining the action of said pointer swinging means, said brake comprising a flexible contractile band, pins set into the free ends of said band, a stem seated between said pins, and a means for rocking said stem and causing it to separate said pins.

19. In a micrometer-caliper, the combination of an adjustable member, a retaining means, and an operating means arranged to relieve said member from said retaining means and to adjust said member by a continuous manual movement.

20. In a micrometer-caliper, the combination of an adjustable member, a retaining means, an operating means arranged to release and adjust said member by a continuous manual movement, and automatic means for retaining said member in its new position on removal of the manual effort.

21. In a micrometer-caliper, the combination of an adjustable micrometer member, means for adjusting said member, and centrifugal means for retarding the speed of adjustment of said member.

22. In a micrometer-caliper, the combination of an adjustable micrometer member, elastic means for adjusting said member in one direction, manual means for readjusting said member in the opposite direction, a retarding means to prevent excessive speed of adjustment by said elastic means and means for reducing the retarding effect during readjustment by the said manual means.

23. A micrometer-caliper comprising a frame, a micrometer screw supported by the frame and having a rotatable and longitudinal movement with relation thereto, a spring normally in tension to rotate said screw, a brake normally closed to hold said screw against rotation, and a plunger arranged to be actuated by the object being measured to release said brake.

24. In a micrometer-caliper a frame, a measuring member adjustably supported thereby, a spring arranged to adjust said member, a brake arranged to hold said member against adjustment, and a releasing member arranged to be actuated by contact with the object being measured to release said brake and permit said spring to adjust said measuring member onto said object.

25. In a micrometer-caliper, a frame, a measuring member adjustably supported thereby, means for adjusting said member onto the object being measured, a retaining means, and a contacting means operated upon withdrawal of the frame from the object being measured to apply said retaining means and thereby retain said measuring member in adjusted position.

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