

March 30, 1937.

A. E. WILLIAMS

2,075,754

ADJUSTABLE SPRING RATCHET FOR MICROMETER SPINDLES

Filed Nov. 7, 1935

2 Sheets-Sheet 1

Fig. 1

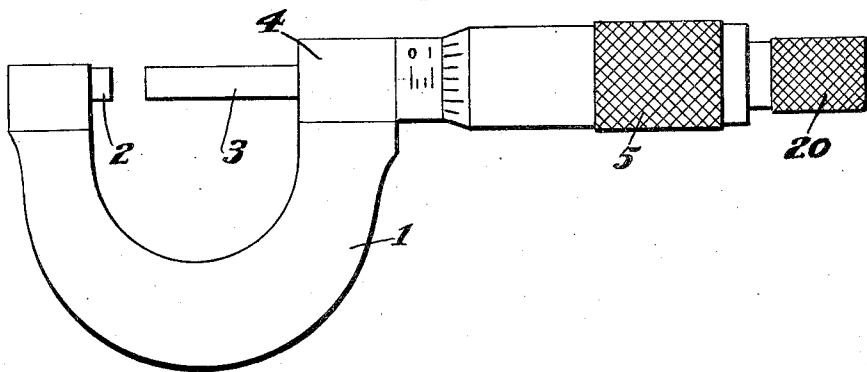


Fig. 2

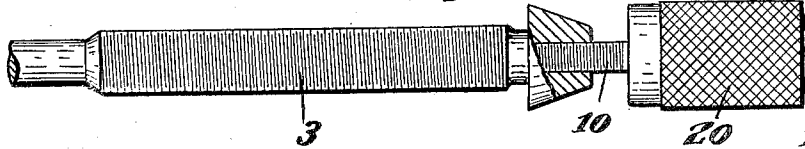


Fig. 3

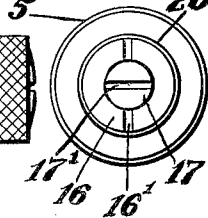


Fig. 4

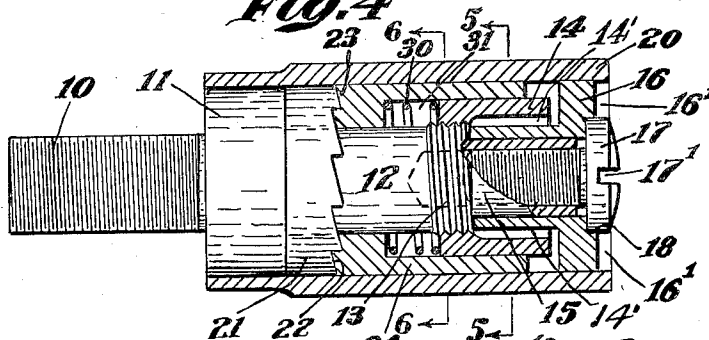


Fig. 5

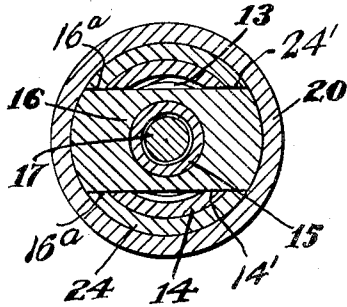
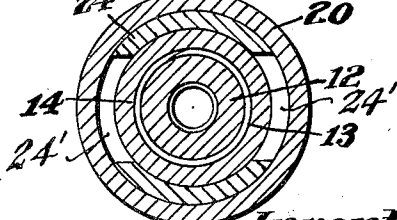


Fig. 6



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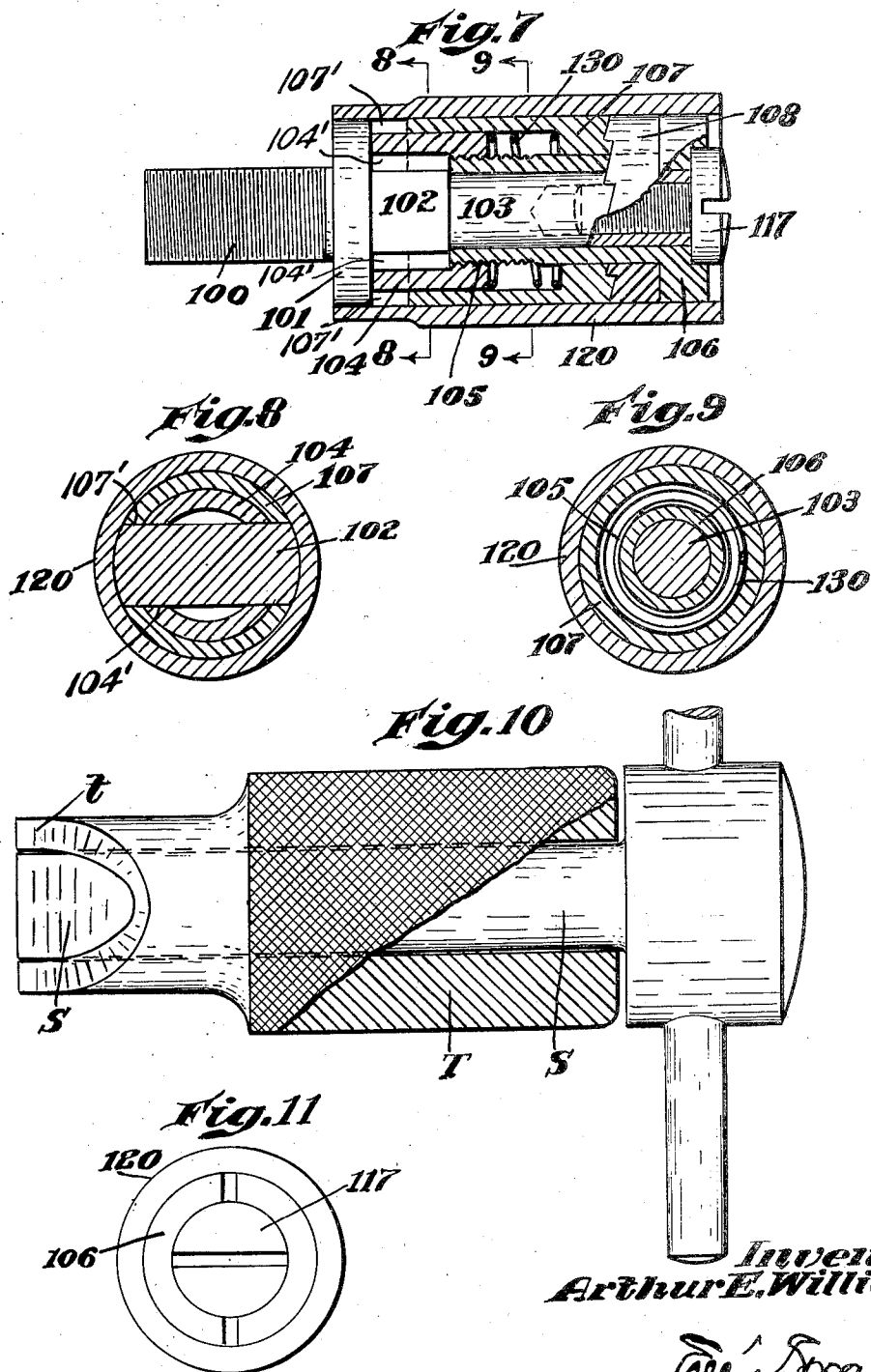
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ADJUSTABLE SPRING RATCHET FOR MICROMETER SPINDLES

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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ADJUSTABLE SPRING RATCHET FOR
MICROMETER SPINDLES

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13 Claims. (Cl. 33—164)

In the manufacture of micrometer calipers for making precision measurements, much difficulty has been experienced in providing for a basis of methodical procedure under which pressures are applied to different materials or samples in making successive or alternate measurements.

This has been particularly true where the material or its surface is compressible, as for example, paper, fabric, leather, insulating tape, or like materials. For certain standards, whether for routine measurements or comparative tests or checks in case of dispute, the maximum error is sometimes so exacting as to be of the order of 0.005 in.

In such instances the familiar ratchet stop usually available in different makes of micrometers lacks sufficient sensitiveness and by reason of lack of adjustment cannot be adapted to different materials in successive measurements with the same instrument. Such devices are, of course, readily distinguishable from the previously mentioned old ratchet stops as in previous Letters Patent No. 647,910 or 1,922,758, granted to applicant's assignee on April 17, 1900 and August 15, 1933, respectively.

I provide, therefore, for an improved basis of pressure control by quick and easy adjustment so that different materials may be measured with great accuracy, and the factor of temperament in the individual operator reduced to a minimum.

My concept contemplates the accomplishment of such operations without departure from otherwise satisfactory and acceptable features in the general structure of the instrument with which the individual is familiar and with which he is accustomed to work.

As illustrative of embodiments according to my concept, I have shown in the accompanying drawings forms of micrometers, or so much thereof as are immediately involved in the solution of the foregoing problem. In the drawings:

Fig. 1 is a general view of a standard type micrometer equipped with my invention.

Fig. 2 is an elevation of the spindle of such a micrometer removed and partly sectioned to show the adjustable ratchet attachment but not showing the thimble of the micrometer in the assembly.

Fig. 3 is an end view of the micrometer stem of Fig. 2 but including the micrometer sleeve.

Fig. 4 is an enlarged partial longitudinal section through a spring ratchet unit in accordance with my invention.

Fig. 5 is a transverse section on the line 5—5, of Fig. 4.

Fig. 6 is a similar section on the line 6—6, of the same figure.

Fig. 7 is a partial longitudinal section of a modified form of spring ratchet unit.

Fig. 8 is a transverse section on the line 8—8, of Fig. 7.

Fig. 9 is a similar section on the line 9—9, of the same figure.

Fig. 10 is a partly broken partly sectioned view of a combined screw driver and spanner for adjusting such a unit, and

Fig. 11 is an end elevation of either of the forms shown in Figs. 4 and 7.

I have indicated in Fig. 1 the frame 1, anvil 2 and spindle 3 in a conventional micrometer assembly. The spindle 3 is guided in bearing 4 and threaded in a nut (not shown) within the knurled shell 5 by which it may be given approximate adjustment by positive rotation. The outer end of the shell 5 has an opening giving axial access to the outer end of the spindle 3 which is tapped to receive the screw stud 10 of the ratchet unit and so connect it independently to the spindle for secondary or adjusted yielding ratchet adjustment.

The screw stud 10 is provided with a flange or shoulder 11 from which an axial extension 12 projects oppositely of the screw stud 10. It is externally threaded as at 13 to receive the nut 14 beyond which its end is reduced as at 15 to receive the adjusting block 16 to which it is held by the clamp screw 17 tapped into its end.

The clamp screw 17 as shown in Fig. 3 has an enlarged retaining head slotted as at 17¹ for engagement by the central screw driver member of the combined adjusting spanner tool indicated in Fig. 10.

The adjusting block 16 has a shallow recess 18 within which the head of the clamp screw is seated so as to lie substantially flush with its outer annular face. This outer annular face is notched or radially slotted at 16¹ for engagement by the adjusting spanner T (Fig. 10).

The ratchet unit in this form is enclosed in a knurled shell 20 having adjacent its stud receiving end an inner ratchet ring or short sleeve 21 firmly pressed in place and constituting the fixed ratchet member. It has on its inner face inclined teeth 22 adapted to be interengaged with similar inclined teeth 23 on a movable ratchet sleeve 24 slidable on the axial extension 12 within the shell 20.

A spring 30 within the enlarged bore 31 of the movable ratchet 24 tends to keep its inclined teeth 23 yieldingly engaged with those of the

fixed ratchet 21. The spring 30 is backed up by the nut 14. The cylindrical wall of the nut 14 is provided with a pair of opposed slots 14' extending longitudinally of the nut from the outer 5 towards the inner end thereof. The cylindrical wall of the movable ratchet piece 24 is also provided with a pair of opposed slots 24' extending longitudinally of the ratchet piece from the outer towards the inner end there- 10 of. The inner end of the adjustment block 16 is slabbled off at two opposite sides as indicated at 16a and this slabbled off portion 16a is adapted to enter the slots 14' and 24' respectively of the nut 14 and ratchet piece 24 and hold said parts 15 from rotation while however permitting them longitudinal movement.

In adjusting the ratchet unit shown in the above form, a spanner tool as shown in Fig. 10 is used. The outer ends of the tubular spanner 20 T are pointed as at t for engagement with the notches or slots 16¹ in the outer face of the adjusting block 16. Before this is actually turned the clamp screw 17 is slacked to unlock the adjusting block after which the block 16 can be 25 slightly rotated to turn the nut 14 and so give it a relative movement axially to compress or relieve the tension of the spring 30. This varies the pressure on the movable ratchet member 24 against its opposed fixed ratchet 21. After the desired degree of friction is established the clamp 30 screw 17 is then tightened while holding the adjusting block 16 against rotation with the spanner T.

In the modification shown in Figs. 7 and 8, I 35 have provided a ratchet unit generally similar to that above described, but with a reversal of the action of the spring which moves the movable ratchet member outwardly against the fixed ratchet spring.

Referring to Fig. 7 the screw stud 100 carries a flange or shoulder 101 from which an axial extension or hollow stem 103 projects. This flange 101 has a portion of its face milled off at two 40 opposite sides as at 102 to provide a flat face portion or tongue. Threaded on the stem is a nut 104 beyond which the end of the axial extension 103 projects as a cylindrical bearing to receive the adjusting block 106 to which it is held by the clamp screw 117.

In this form the adjusting block is a headed tubular member having its end threaded as at 105 to engage the nut 104. The portion 102 affords a non-rotative engagement with the end 50 of the nut 104, the nut 104 being provided with a pair of opposed slots 104' extending longitudinally from the inner towards the outer end thereof, and the movable ratchet piece 107 being likewise provided with a pair of opposed slots 107' extending longitudinally thereof from the 60 inner towards the outer end thereof, which slots 104' and 107' fit over the slabbled off portions 102 of the screw stud 100 so that said parts are prevented from turning relative to the screw stud while however being free to move longitudinally therealong. The nut 104 is adapted to be axially moved by the threaded end of 106 for adjusting the spring 130 which bears against the inner face of the movable ratchet piece 107 so as to move it outwardly into yielding engage- 70 ment with the fixed ratchet 108.

In this modification the adjustment of the spring tension is made as by the combined spanner and screw driver T and S shown in Fig. 10. This is done by slacking the clamp 75 screw 117 then turning the head of the tubular screw

106 and then resetting the clamp screw 117 by the screw driver member S of the spanner tool T as before described to hold the spring adjustment.

With the ratchet mechanism properly ad- 5 justed micrometers equipped according to my invention may be used in accordance with the usual methods of making precision measurements. According to standard specifications these may vary so that a pressure of not more 10 than 27 nor less than 23 pounds per square inch is developed when the spindle surface is contacted with a polished steel surface, the ultimate contact being effected by a gradual closing of the spindle on the specimen against the anvil. The usual technique specified being such a 15 closing, say at a rate in which the scale divisions may be easily counted as they move past the reference mark which is at the rate of about 0.002 in. per second. The method favored for 20 high precision is that of turning the ratchet until three "clicks" have been counted and then making the reading. While capable of a great variety of uses, micrometers in accordance with 25 my invention are particularly adapted to high precision measurements and standards as above set forth.

What I therefore claim and desire to secure by Letters Patent is:—

1. A feeler device for the spindle of a microm- 30 eter gage, comprising a shell and a stud, toothed yieldably engaging annular members one member being fixed in the shell and the other member being slidable along said stud, a spring disposed in said shell and yieldably urging said 35 slidable member into contact with said fixed member, an adjusting block in the shell end, a nut held against rotation in said shell and having threaded engagement with said stud and longitudinally movable under the influence of the adjusting block, for adjusting said slidable member towards and away from said fixed member to change the effective spring pressures and vary the ratchet engagement.

2. A feeler device for the spindle of a microm- 45 eter gage, comprising a shell and a stud, toothed yieldably engaging annular members one member being fixed in the shell and the other member being slidable along said stud, a spring disposed in said shell and yieldably urging said 50 slidable member into contact with said fixed member, an adjusting block in the shell end, a nut keyed to said block and threaded on the stud for adjusting said slidable member towards and away from said fixed member to change the effective spring pressures and vary the ratchet 55 engagement, and a headed screw axially of said shell and threaded into the stud through the adjustable block.

3. An adjustable spring ratchet for the spindle 60 of a micrometer gage, comprising a shouldered stud, an axial extension from the stud shoulder having a threaded portion adjacent its inner end, a tubular shell carried on said stud shoulder, a toothed ratched ring fixed in said shell adja- 65 cent said end, a hollow oppositely toothed ratchet member slidable in said shell, a hollow nut threaded on said extension and nested within said hollow ratchet member, a spring disposed about said extension and between the nut end and the 70 bottom of the slideable ratchet cavity, the walls of said nut and ratchet member having similar alignable key notches, an adjusting block on the extension end and exposed at the opposite end 75 of the shell, said adjusting block having a key

disposed for slidable non-rotative engagement with the notches of the nut and slidable ratchet member, a headed clamp through said block and having adjustable engagement with the extension end, whereby to hold said block against turning after it has adjusted the tension of the ratchet clamp.

4. An adjustable spring ratchet for the spindle of a micrometer gage, comprising a shouldered stud, an axial extension from the stud shoulder having a threaded portion adjacent its inner end, an open ended tubular shell carried on said stud shoulder and receiving said shoulder within one of its ends, a toothed ratchet ring fixed in said shell adjacent said end, a hollow oppositely toothed ratchet member slidable in said shell, a hollow nut threaded on said extension and nested within said hollow ratchet member, a spring disposed about said extension and between the nut end and the bottom of the slidable ratchet cavity, the walls of said nut and slidable ratchet member having similar alignable key notches, an adjusting block on the extension end and exposed at the opposite end of the shell, said adjusting block having a key disposed for slidable non-rotative engagement with the notches of the nut and slidable ratchet member, a headed clamp screw through said block and having threaded adjustable engagement with the extension end, whereby to hold said block against turning after it has adjusted the tension of the ratchet spring.

5. An adjustable spring ratchet for the spindle of a micrometer gage, comprising a stud, an axial extension from the stud having a threaded portion adjacent its inner end, a tubular shell carried on said stud shoulder and receiving said shoulder within one of its ends, a toothed ratchet ring fixed in said shell adjacent said end, a hollow oppositely toothed ratchet member slidable in said shell, a hollow nut threaded on said extension and nested within said hollow ratchet member, a spring disposed about said extension and between the nut end and the bottom of the slidable ratchet cavity, the walls of said nut and slidable ratchet member having slots, an adjusting block having a key disposed for non-rotative engagement in said slots, a headed clamp for said block and having adjustable engagement with the extension end, whereby to hold said block against turning after it has adjusted the tension of the ratchet spring.

6. An adjustable spring ratchet for the spindle of a micrometer gage, comprising a stud for the spindle end, said stud having a shoulder an axial extension from the stud having a threaded portion adjacent its inner end, a tubular shell carried on said stud shoulder, a toothed ratchet ring fixed in said shell adjacent one end, a hollow oppositely toothed ratchet member slidable in said shell, a spring disposed about said extension and between the nut end and the bottom of the slidable ratchet cavity, a spring compressing member, an adjusting block on the axial extension and exposed at the opposite end of the shell, said block having engagement with said spring compressing member to adjust it axially, a headed clamp for said block and having adjustable engagement with the extension end, whereby to hold said block against turning after it has adjusted the tension of the ratchet spring.

7. In a micrometer gage having a spindle, an adjustable spring ratchet therefor comprising a screw stud having an external thread series adjacent its outer end and beyond said thread se-

ries being extended axially as a reduced interiorly threaded portion, a shell rotatable on said stud and having a relatively fixed internal ratchet, a ratchet adjustable along said stud into and out of coactive relationship with said fixed ratchet, a nut having threaded engagement with the external thread series of said stud, a spring confined between said nut and said movable ratchet, a hollow adjusting member at the outer end of said shell, and a clamping screw disposed through said adjusting member and engaging the internal threads at the reduced end of said stud.

8. The gage of claim 7, the adjusting member having an inwardly extending portion serving as a key, and the movable ratchet and the nut having slots enabling said parts to straddle said key and be held against rotation thereby.

9. In a micrometer gage having a spindle, an adjustable spring ratchet therefor comprising a positioning member having an external thread series adjacent its outer end, a shell rotatable on said positioning member and having a relatively fixed internal ratchet, a ratchet adjustable along said positioning member into and out of coactive relationship with said fixed ratchet, a nut having threaded engagement with the external thread series of said positioning member, a spring confined between said nut and said movable ratchet, and a hollow adjusting member at the outer end of said shell and having threaded engagement with said nut.

10. In a micrometer having a spindle, an adjustable spring ratchet therefor comprising a screw stud having an internally threaded hollow axial extension, a nut and a ratchet adjustable along said axial extension, a spring confined between said nut and said movable ratchet, a shell rotatable on said stud and having a relatively fixed internal ratchet adapted to coact with said movable ratchet, a hollow adjusting member at the outer end of said shell and having threaded engagement with said nut, and a clamping screw disposed through said adjusting member and engaging the internal threads of said stud.

11. The gage of claim 10, the stud having a shouldered portion intermediate of its ends formed to provide a key, and the movable ratchet and the nut having slots enabling said parts to straddle said key and be held against rotation thereby.

12. In a micrometer having a spindle, an adjustable spring ratchet therefor comprising a positioning member, a nut and a ratchet adjustable along said positioning member, a spring confined between said nut and said movable ratchet, a shell rotatable on said positioning member and having a relatively fixed internal ratchet adapted to coact with said movable ratchet, and a hollow adjusting member at the outer end of said shell and having threaded engagement with said nut.

13. In an adjustable spring ratchet mechanism for the spindle of a micrometer gage, a positioning member mounted on the micrometer spindle, a shell rotatable on said positioning member and having an internal ratchet fixed therein, a ratchet adjustable along said positioning member towards and from said fixed ratchet, a spring yieldingly urging said adjustable ratchet into engagement with said fixed ratchet, an adjustable device active upon said spring to compress the same, and adjustment means at the outer end of said shell for adjusting said adjustable device.

ARTHUR E. WILLIAMS.