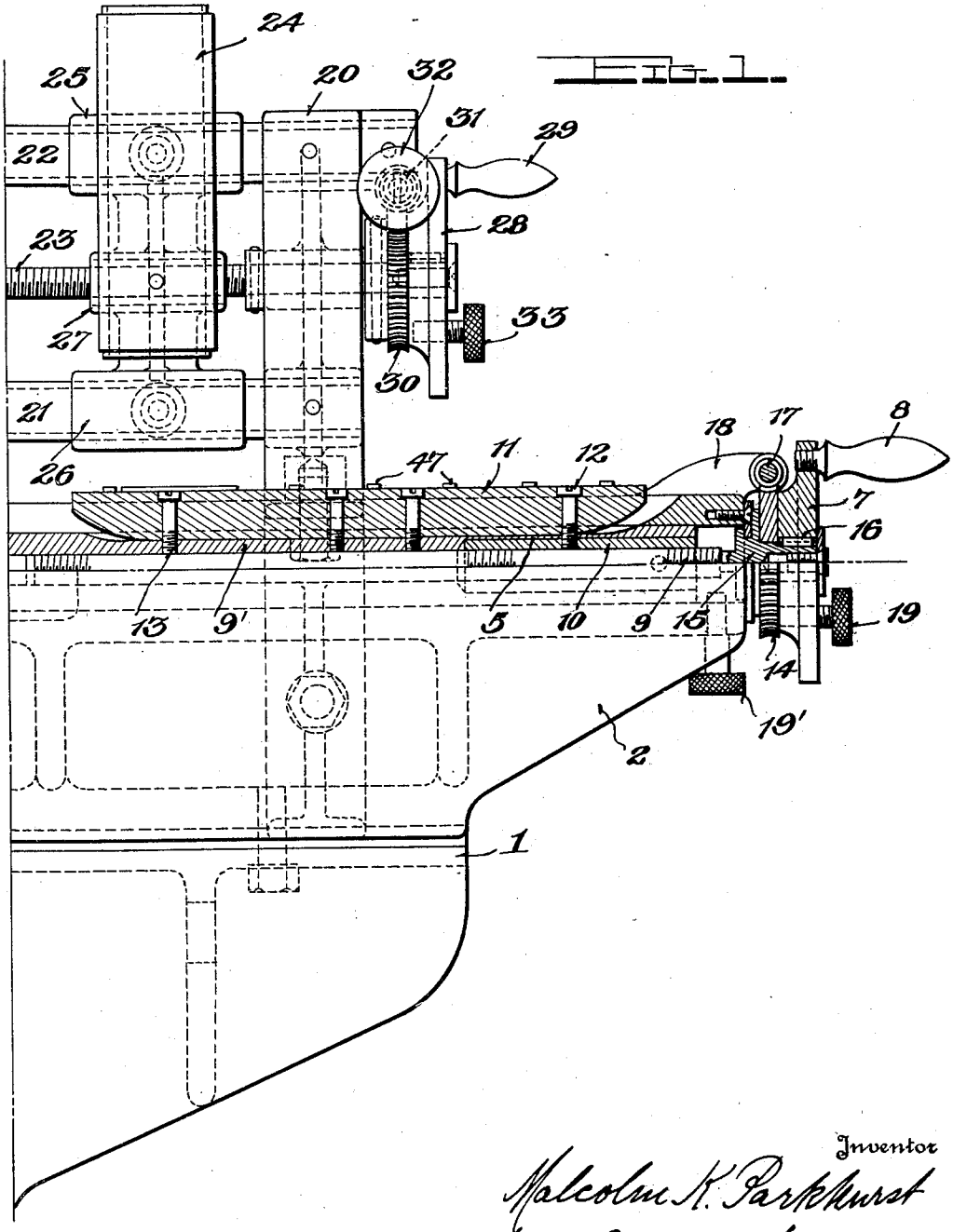
May 3, 1932. M. K. PARKHURST 1,857,088

MEASURING MACHINE

Filed Dec. 28, 1928 5 Sheets-Sheet 1



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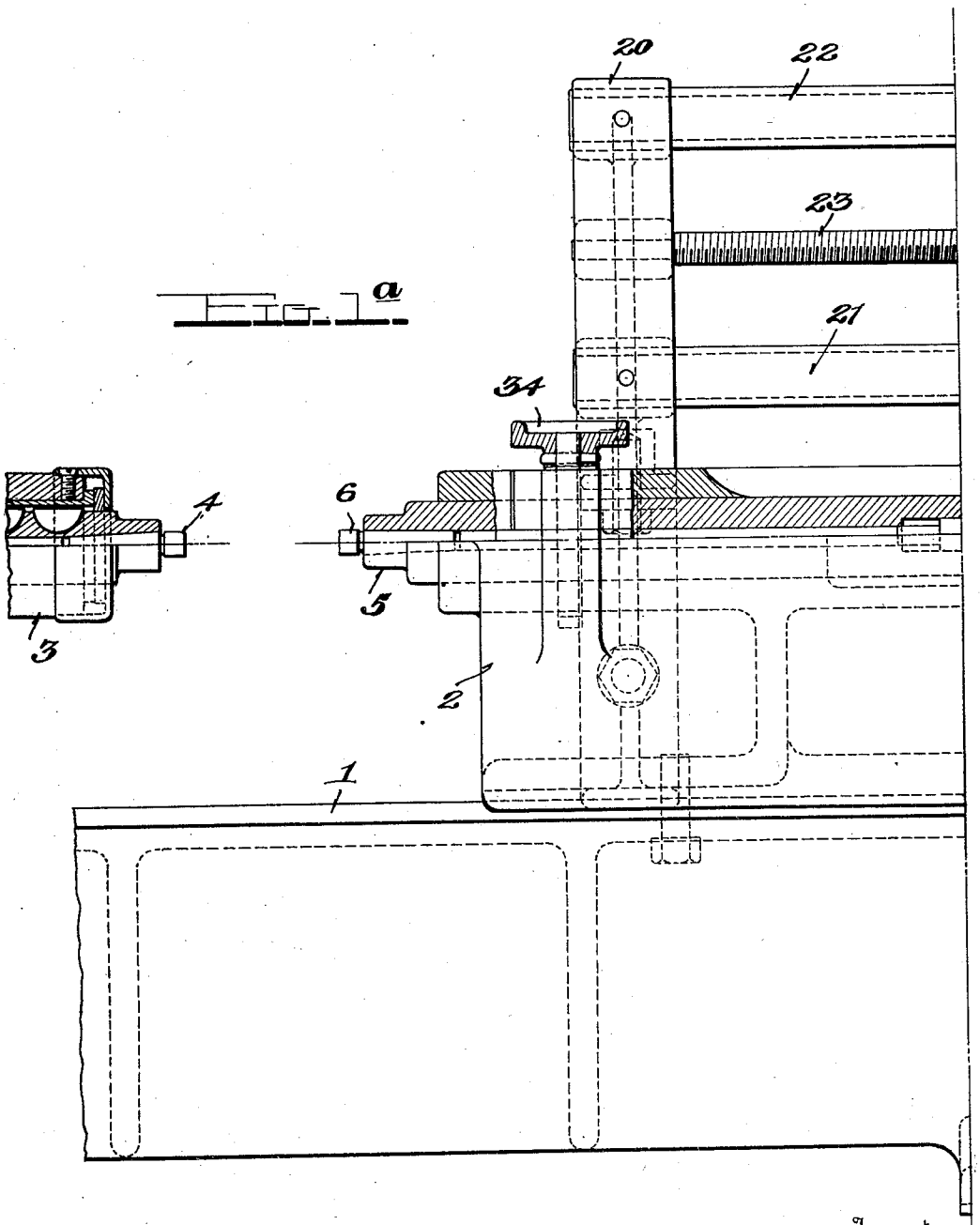
MEASURING MACHINE

Filed Dec. 28, 1928 5 Sheets-Sheet 2



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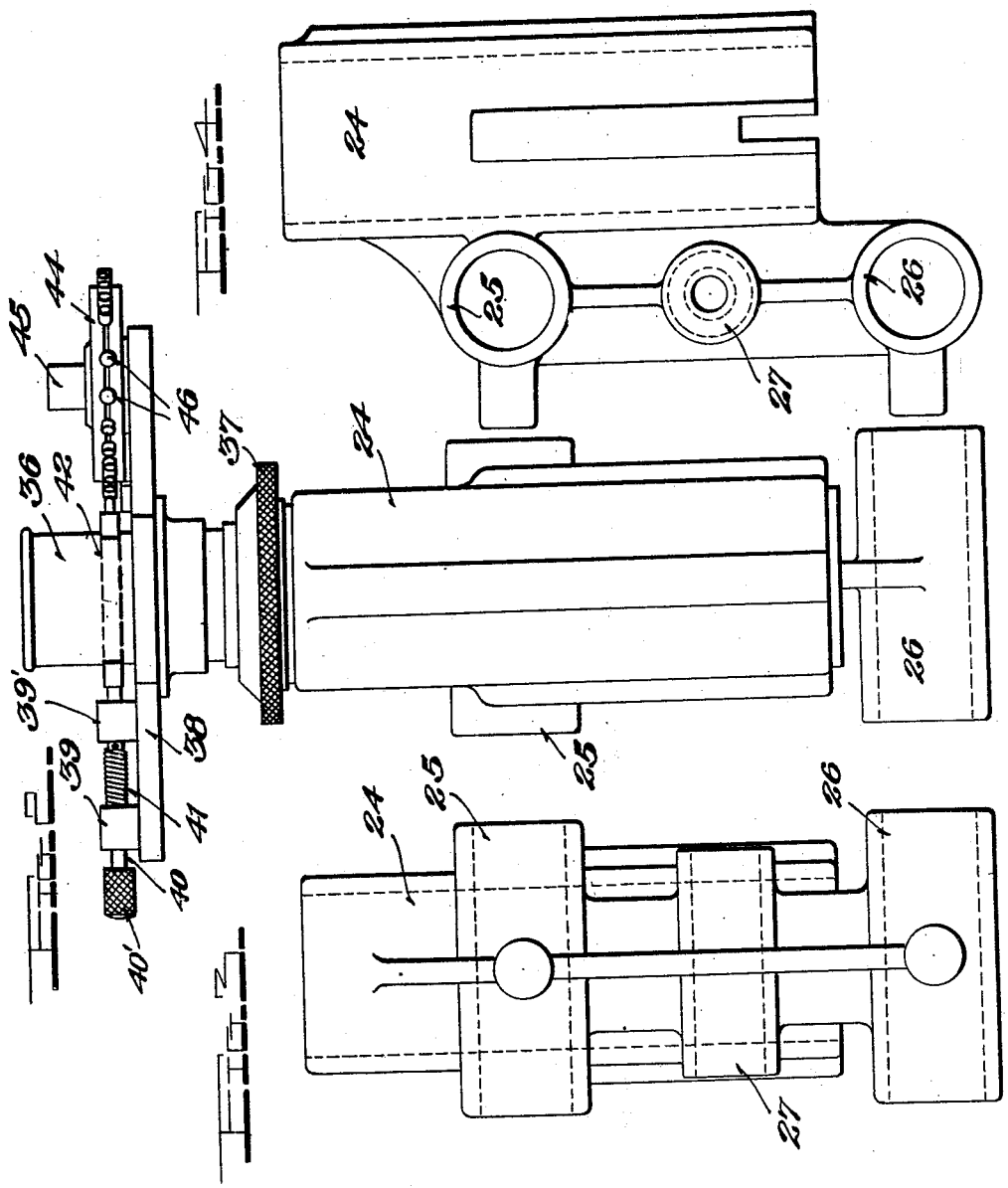
MEASURING MACHINE

Filed Dec. 28, 1928 5 Sheets-Sheet 3



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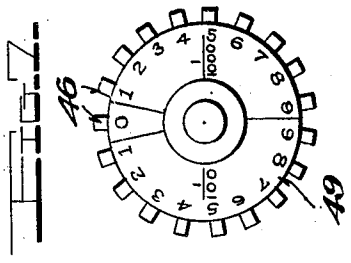
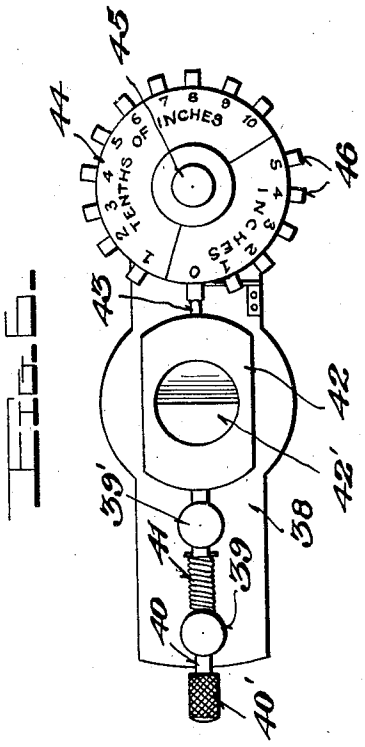
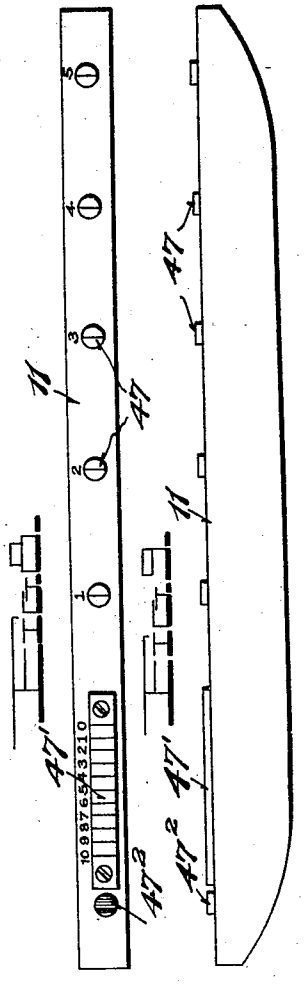
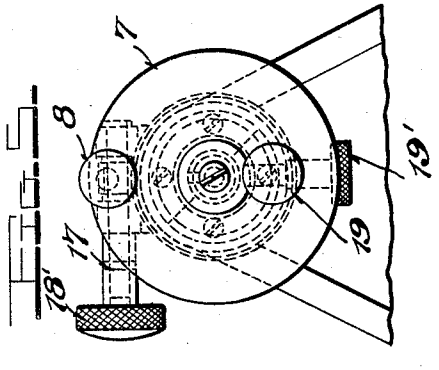
MEASURING MACHINE

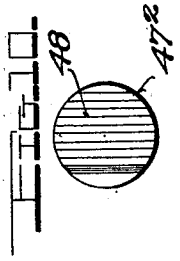
Filed Dec. 28, 1928 5 Sheets-Sheet 4











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MEASURING MACHINE

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Fig. 11

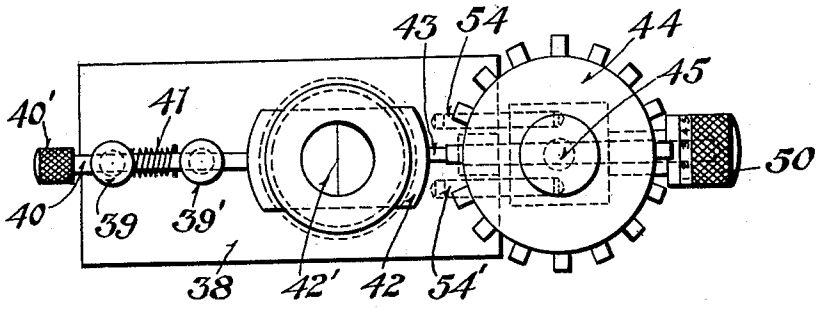


Fig. 12

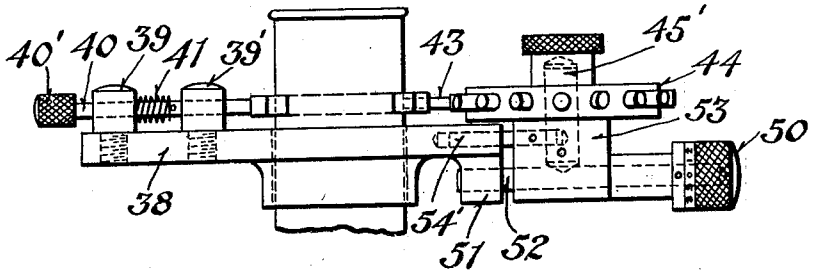
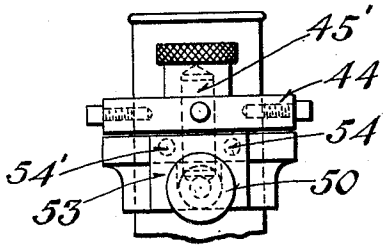


Fig. 13



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Patented May 3, 1932 1,857,088

UNITED STATES PATENT OFFICE

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MEASURING MACHINE

Application filed December 28, 1928. Serial No. 328,986.

This invention relates to certain new and useful improvements in measuring machines, and the primary object thereof is to provide a machine of this type which enables measurements to be accurately and at the same time easily and quickly obtained.

In the drawings:—

Figures 1–1*a* are longitudinal sectional views of the invention;

Figure 2 is a detail view showing the microscope and associated parts in front elevation;

Figure 3 is a rear elevation of the base portion of Figure 2;

Figure 4 is a side elevation of Figure 3;

Figure 5 is an end elevation of the means for actuating the measuring bar;

Figure 6 is a top plan view of Figure 2;

Figure 7 is a top plan view of one of the measuring disks;

Figure 8 is a top plan view of the graduated or measuring bar;

Figure 9 is a side elevation of Figure 8, and

Figure 10 is an enlarged detail view of the plug showing the lines of graduations for one one-hundredth of an inch thereon;

Figure 11 is a top plan view of Figure 12;

Figure 12 is a detail view of the eyepiece section of the microscope showing the micrometer and associated parts in front elevation;

Figure 13 is an end elevation showing the eyepiece and associated parts.

In proceeding in accordance with the present invention a bed 1 is employed, on which is mounted a headstock 2. In Figure 1*a*, a tail stock 3 is shown which has a work engaging anvil or point 4. A spindle 5 is mounted in the headstock and has a work engaging end 6 which confronts the anvil 4. The spindle 5 is movable longitudinally of the headstock, by means of a rotating wheel 7 having a handle 8 thereon. The wheel 7 is connected to a threaded member 9 which extends longitudinally within the spindle, the member 9 engaging the interior threads of a sleeve 10 which latter is connected to spindle 5 and to a graduated bar 11 by screws 12. Other screws 13 secure the bar 11 to the part 9′ of the spindle 5 as shown in Figure 1. A worm gear 14 is mounted on a sleeve 15, the latter providing a support for the wheel 7 to which it is keyed at 16, the sleeve being connected to the spindle 5. The worm gear 14 is in mesh with a worm 17 mounted on an arm 18 the worm having an operating handle 18′ as shown in Figure 5. A screw 19 is employed for locking the wheel 7 to the worm gear 14.

A pair of standards 20 extends upwardly from the head stock and are connected by upper and lower horizontal bars or rods 21 and 22, between which latter a threaded rod 23 is disposed and mounted for rotary movement in the standards 20. A microscope 24 is provided and has upper and lower bearings 25 and 26 which latter are slidable on the connecting rods 21 and 22. The microscope further has a threaded portion 27 which is engaged by the threaded rod 23 whereby upon rotation of the rod the microscope can be adjusted lengthwise of the headstock. For the purpose of rotating the threaded rod 23 a wheel 28 is affixed thereto having a handle 29. A worm gear 30 is loosely mounted on the rod 23 and is in mesh with a worm 31 having a hand engaging wheel 32 thereon by means of which the rod 23 can be adjusted. A locking screw 33 is provided for securing the rod 23 against rotation. As shown in Figure 1*a*, a locking screw 34 is provided for locking the spindle 5 against movement.

Referring to Figure 2 it will be seen that the microscope has the usual eyepiece section 36 and the knurled wheel 37 for vertical adjustment of the eyepiece. A supporting plate 38 is mounted near the top of the microscope on the eyepiece section 36, the plate 38 being provided with bosses 39 and 39′ through which a pin 40 loosely passes, the pin 40 being provided with a crosspin and spring 41 and abuts against the plate 42 by reason of the action of the spring 41.

The plate 42 has a central opening across which there is the usual microscope hair line 42′ and is provided with a pin 43 the plate 42 being slidable with the pin 43 in the eyepiece section of the microscope.

A graduated disk 44 is rotatably and re-

movably mounted on a stud 45 carried by the plate 38 and is provided with radially extending pins 46 adapted to engage with the pin 43.

The pins 46 are of varying length to compensate for minute errors in graduations appearing on the graduated bar 11.

Referring to Figures 8, 9 and 10, the bar 11 is shown as provided with a series of plugs 47 each having a central hair line. A strip or scale 47′ is secured to bar 11 and has a series of graduations mounted so as to obtain readings of the range of one inch by tenths and the plug 47^2 is also mounted to provide readings to one one-hundredth of an inch and also carries a second series of graduations so spaced as to give readings of one one-thousandth of an inch.

The graduated disk 49 shown in Figure 7 is adapted to be placed on the stud 45 of the microscope to obtain final readings.

The screw 33 is employed to disconnect the disk 28 from the worm gear 30 for quick movement of the microscope and the wheel 32 and its worm 31 is used to obtain fine adjustment of the miscroscope. The screw 19 disconnects the disk 7 from the worm gear 14 for quick adjustment of the spindle 5 and the worm 17 with its wheel 18′ is for the fine adjustment and corresponds in action to wheel 32.

The eyepiece structure shown in Figures 11, 12 and 13 is for use when it is desirable to make very fine adjustments as readings in ten thousandths (.0001). In this form a micrometer structure is adjustably secured to the supporting plate 38′ and carries the stud 45′ upon which the disk 44 is mounted in such manner that the disk 44 may be advanced to bring the pin in use to the desired point by operating the knob 50 of the micrometer. The supporting plate 38′ has the downwardly extending part 51 into which the micrometer screw 52 is screwthreaded, the disk carrying part 53 is slidably secured to the part 51 by two pins 54 and 54′.

In operation and referring to Fig. 1, it will be noted that the spindle 5, which moves the graduated bar 11 in unison therewith, is at the extreme right of the drawing. Now if we consider the work engaging part 4 as fixed or the zero point, the following steps are necessary to obtain a space or distance of 2.8645 between the work engaging parts 4 and 6. As the parts 4 and 6 are widely separated in the drawings Fig. 1 and 1*a*, it is necessary that the part 6 be moved to contact with the part 4 and at the same time the graduated bar 11 is moved toward the left until the part 6 contacts with the part 4 or the zero point, whereupon the spindle 5, which carries the graduated bar is then locked against movement. The device is now in position to start the setting of the same to form an open space between the parts 4 and 6 for the above reading. The disk 44 is first placed on the stud 45 of the microscope support 38 with the zero pin 0 in contact with the pin 43 of the movable part 42 which carries the hair line 42′, as shown in Fig. 6. The next step is to rotate the disk 44 to bring the pin 2 of the inches section in line with the pin 43 to move the hair line, minus or plus, as the case may be, depending upon setting of the line 2.0″ on the bar 11, whereupon the microscope is moved to the point where the hair line 42′ coincides with the 2.0″ line of the bar 11.

The dial 44 is now turned so as to bring the pin 8 of the tenths section into alignment with the pin 43, which action further displaces the hair line 42′ as above described. The spindle 5 is then released and with the bar 11 is moved by revolving the handle 8 to the right until stops number 8 of the tenths division 47′ on the bar 11 coincides with the hair line of the microscope. At this point the end 6 of the spindle 5 will have been moved 2.8″ from the anvil 4, and both the spindle and the microscope are locked. The disk 44 is now removed from the microscope structure and replaced by the disk 49, whereupon the microscope is released and the disk 49 is revolved to bring pin No. 6 on the hundreths section into register with the pin 43 of the miscroscope structure. The spindle 5 is then released and the bar 11 moved to bring the number 6 on the hundredths section of the bar 11 into register with the microscope hair line and locked in place, whereupon the dial 49 is then turned to bring the pin 4 of the thousandths group in contact with the pin 43 thus adjusting the microscope hair line. The micrometer is adjusted to number 5 which gives the .0005 reading, and spindle 5 with the bar 11 is then released and the spindle and bar 11 adjusted until the fourth line of the thousandths group plug 47^2 coincides with hair line of the microscope, whereby the measuring points 4—6 are separated for measuring 2.8645 and then the spindle 5 is finally locked.

The above covers the setting of the machine to a predetermined measurement but where there are a number of pieces to be tested as to minus or plus, the spindle 5 with the work engaging end 6 becomes a locked fixed point and the device described in an application filed December 28, 1928, No. 328,984 is substituted for the anvil 4 which will give a reading of plus or minus or zero or the device disclosed in application filed December 28, 1928, No. 328,985, may be used in place of the anvil 4.

From the foregoing it will be noted that parts 4 and 6 being in contact, the spindle 5 and bar 11 are locked in that position, and with the dial 44 in position, the number 2 pin is brought in line with pin 43 which controls the position of the microscope hair line 42′. This pin number 2 may be zero, plus or minus depending upon the pre-determined setting of the hair line 2 on the bar 11, and

will afford such setting by reason of moving the microscope hair line 42′. When the hair line is in absolute correction with the end 6 in zero position, the microscope is released and moved so that the hair line is absolutely in line with the line 2 of bar 11 and locked against all movement. When the dial 44 is turned to bring the pin 8 in the tenths section into line with pin 43, the microscope hair line 42′ is moved to correct any discrepancy in the location of the 8 tenths line on the bar 11. Up to this point 4 and 6 are still in contact. The spindle 5 being released by the operation of the handle 8, the part 6 moves away from 4 until the hair line 8 tenths of the bar 11 coincides with the hair line of the microscope and then the spindle 5 is locked, the two points 4 and 6 being separated by 2.8″; thus step by step the machine is adjusted.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:—

1. In a measuring apparatus, a bed, a head stock and tail stock on the bed, spindles carried by the head stock and tail stock to engage the work therebetween, means to adjust the spindle of the head stock relative to the latter, a microscope carried by the head stock, means to adjustably move the microscope relative to the head stock, a graduated bar carried by the spindle of the head stock and disposed beneath the microscope, a slidable member carried by the microscope and having an opening registrable with the microscope eye piece and provided with a cross hair, a pin on the member, means to tension the member, and a rotatable dial carried by the microscope and having radial pins of predetermined lengths selectively engageable with the pin of said member to position the member to compensate for discrepancies of said graduated bar.

2. In a measuring apparatus, opposed movable work engaging members, a graduated bar, means to connect said bar to one of said members for movement therewith, a microscope, means to adjustably mount the microscope over the bar a slidable member associated with the microscope and having an opening for registry with the microscopic eye piece and having a cross hair in the opening, means to tension the slidable member, a pin on said slidable member, and a graduated dial rotatably supported by said microscope and having radial pins of varying lengths associated with its graduations for selective engagement with the pin of the slidable member to position the cross hair.

3. In a measuring apparatus, opposed movable work engaging members, a graduated bar, means to connect said bar to one of said members for movement therewith, a microscope, means to adjustably mount the microscope over said bar, a slidable member associated with the microscope having an opening for registry with the microscope eye piece and having a cross hair in the opening, means to tension the slidable member, a rotatable dial supported on the microscope and having parts associated therewith to selectively engage said slidable member so as to control movement thereof in setting, and a micrometer adjustment for said slidable member.

4. In a measuring apparatus, opposed movable work engaging means, graduated means actuated by one of the said work engaging means, a microscope, means to adjustably mount the microscope over said graduated means, slidable means associated with and movable relative to the eye piece of the microscope and having a cross hair for registry with the graduated means, and rotatable means having radial projections of predetermined lengths to selectively engage and position said slidable means and thereby the cross hair.

5. In a measuring apparatus, a movable work engaging element, a graduated bar having connection with said element for movement therewith, a microscope overlying the bar, means to adjust the microscope relative to the bar, a slidable means having an opening and having a cross hair there-across for registry with the microscope and the graduated bar, means to mount the slidable means on the microscope, a rotary graduated dial mounted on the microscope and having abutments of varying lengths associated with its graduations to selectively engage the slidable means and means to tension the slidable means.

6. In a measuring apparatus, a movable work engaging element, a graduated bar having connection with said element for movement therewith, a microscope overlying the bar, means to adjust the microscope relative to the bar, a slidable member having an opening and having a cross hair, means to mount the slidable member on the microscope, a rotatable dial having projections of varying lengths associated therewith for selectively engaging the movable member, and a micrometer carried by the miscroscope to adjust the cross hair.

7. In a measuring apparatus, opposed movable work engaging means, graduated means carried by one of said work engaging means, a miscroscope for observation of said graduated means having a cross hair carrying member, means to mount the cross hair carrying member for lateral movement relative to the eye piece whereby to compensate for discrepancies of said graduated means, a series of devices each for positioning the member in a predetermined location, and means for mounting the devices for selective operation.

8. In a measuring apparatus, opposed movable work engaging means, graduated means carried by one of said work engaging means,

a microscope for observation of said graduated means having a cross-hair carrying member, and a rotatable member having projections of predetermined lengths to selectively engage and position the cross-hair carrying member and thereby compensate for discrepancies of said graduated means.

In testimony whereof I have signed my name to this specification.

MALCOLM K. PARKHURST.