HOW TO USE MICROMETERS

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The total movement of a micrometer spindle is exactly I" regardless of the size of the work being measured. In automotive engine repair work almost all of the accurate parts are less than 6" in diameter. The best, although most expensive way to be equipped to measure the outside diameter of these parts, is to have a set of micrometers with different size frames, namely, 0 to I", I" to 2", 2" to 3", 3" to 4", 4" to 5", and 5" to 6". The barrel, thimble and spindle in each size is identical so that each is read exactly the same except for adding the low number of the range to the decimal reading. The drawing in Fig. 3 shows a 1"-2" micrometer and the names of the principal parts.

A separate micrometer for each I" range of diameters is quickest to use, but it is more economical and therefore more practical for the average repairman or distributor's shopman to buy only the large 6" frame size of the type that has a replaceable anvil so a set of extensions can be used to reduce the range by I" increments to the small I" size. However, with this type of micrometer, the accuracy should be checked with a size standard each time the anvil is changed to a different size.

In regard to measuring inside diameters, the size of the regular barrel, spindle and anvil takes up 2" in length and so the range of an inside micrometer starts at 2" and goes up by I" increments obtained by inserting different length anvils. The movement is still I" the same as for an outside micrometer. Holes smaller than 2" are measured with a telescoping gauge which can be locked and then measured between the faces of an outside micrometer. See Fig. 1.

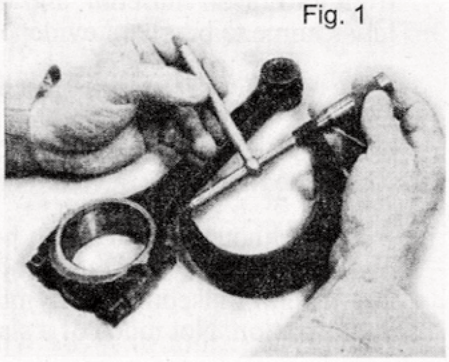

Fig. 1

Whenever the clearance between mating parts is being measured most machinists prefer to read only the outside micrometer so there will be less chance for error. After the inside micrometer has been adjusted to the hole size (Fig. 2) it is placed between the measuring faces of the outside micrometer. Actually, therefore, a telescoping gauge will take the place of an inside micrometer.

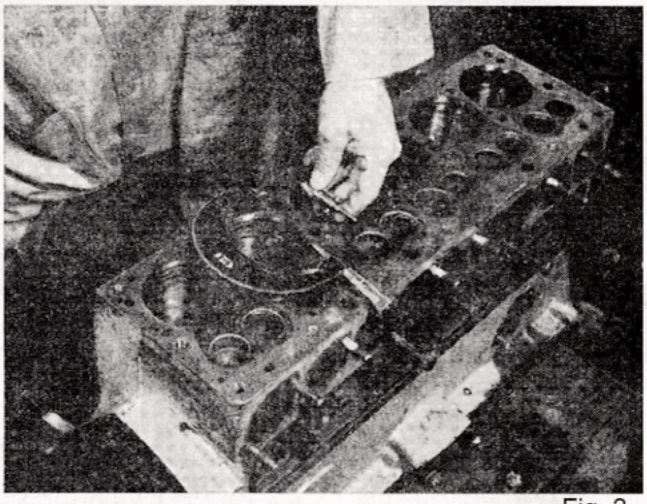

Fig. 2

The use of a micrometer is not very complicated and so every conscientious mechanic with average eyesight should learn how, so he will do his daily repair work more accurately and correctly. By acquiring and using this skill, a mechanic will up rate himself in his chosen profession. Efficient use of micrometers is a principal qualification of a good machinist.

The measuring faces of a micrometer are feelers and the user must develop a sensitive touch so that his readings will be accurate. The frame of an outside micrometer is held securely in one hand, always being conscious that an instrument capable of measuring in thousandths of an inch will be damaged if dropped. The measuring faces are brought in close range of the part to be measured and the thimble turned between the thumb and index finger of the other hand till the measuring faces just pass over the largest diameter of the part. The hand holding the frame merely supports the micrometer so it will not be

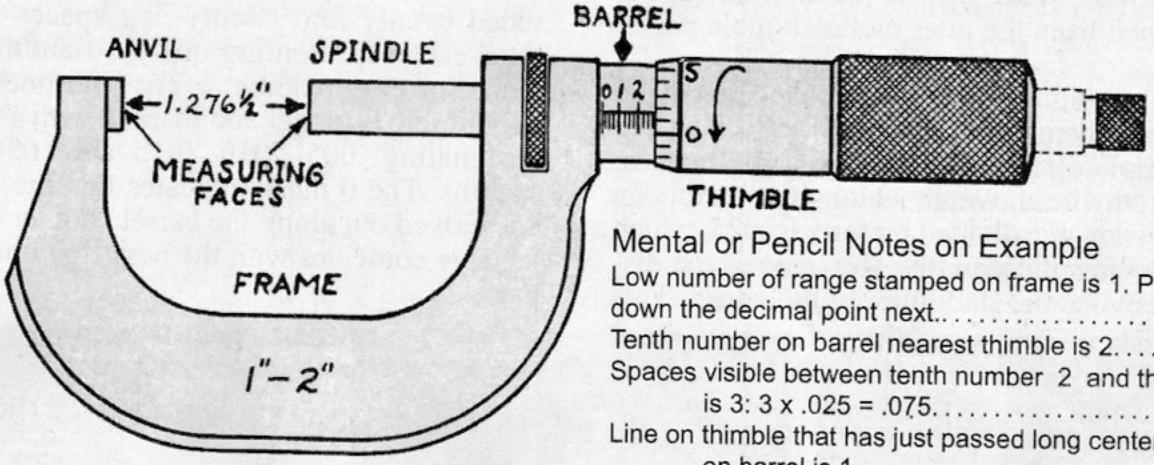

Fig. 3

Mental or Pencil Notes on Example

Low number of range stamped on frame is 1. Put down the decimal point next..... **1**
Tenth number on barrel nearest thimble is 2..... **.2**
Spaces visible between tenth number 2 and thimble is 3: 3 x .025 = .075..... **.075**
Line on thimble that has just passed long center line on barrel is 1..... **.001**
Estimate of portion of next space is ½..... **.000½**
Correct reading of micrometer drawing is 1.276½

dropped. The hand on the thimble feels for the correct measurement by not only moving the spindle face back and forth over the part but sideways to get it square. See Fig. 4. The thimble is slowly tightened till all side movement is eliminated and the spindle face will just pass over the high point of the part with a definite drag but no binding or squeaking. Once the setting has been made, the spindle and the thimble must not turn till the measurement has been read.

To assist in getting the proper feel each time a measurement is taken, one style of micrometer has a small ratchet at the end of the thimble which is merely tightened until it starts to slip. Also some micrometers have a lock nut in the frame which prevents movement of the spindle while the measurement is being read. To measure the wall thickness of any cylindrical part such as a sleeve or bearing, a ball bearing can be held between the inside of the part and the flat anvil of the micrometer, but it is best to get a special ball point anvil. See Fig. 5.

There is nothing difficult about reading a micrometer so long as one understands the use of the decimal point to express a length less than I". The first digit placed to the right of the decimal point tells the number of tenths of an inch, for example, .2 means two tenths of an inch. The second digit tells the number of hundredths, for example, .07 means seven hundredths of an inch. Likewise, the third digit tells the number of thousandths, for example, .006 means six thousandths of an inch. The fourth digit tells the number of ten thousandths, but is seldom used in shop work. Instead, an even fraction is usually used after the third figure, for example .006½ meaning six and one-half thousandths. Putting the above together for a final example we have 0.276½, meaning two hundred and seventy-six and one-half thousandths.

Now to read the micrometer setting in Fig. 3 we either mentally or with a pencil put down the low number of the range stamped on the micrometer frame, which gives us the number of whole inches. Next put down the decimal point because the barrel and thimble give only the amount of reading that is less than I". For the first digit put down the number nearest to the thimble that is stamped on the barrel. This gives the number of tenths of an inch.

Notice that the distance on the barrel between each tenth number is divided into fourths by three fine lines. Each space is therefore one-fourth of a tenth or .025 by long division. We must now count the spaces that are visible between the stamped number and the thimble edge and put down .025 (twenty five thousandths) for each one. Count only the whole spaces because

the part of the space next to the thimble edge is determined from the lines on the thimble itself.

The thimble turns the threaded spindle in the barrel. There are 40 threads to an inch so that one complete revolution is one-fortieth of an inch lengthwise movement along the barrel. By long division one divided by forty is .025, which is twenty-five thousandths, the same as the distance between the fine lines on the barrel. This explains why the thimble circumference is divided evenly into twenty-five spaces by fine lines each representing one-thousandths of an inch. For easy reading, every fifth line around the thimble is longer and marked with a number designating .005, .010, .015 and .020 thousandths. The 0 mark indicates that the thimble has moved out along the barrel another .025, so its edge coincides with the next fine line on the barrel.

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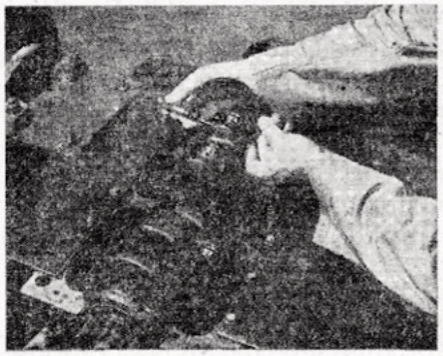

Fig. 4

Fig. 5

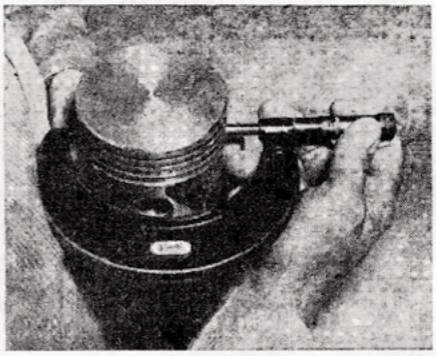

Fig. 6

Our thanks to the McQuay-Norris Manufacturing Co. for making this information available to us through their publication.

Reading a Micrometer Simplified

It is a valuable and important tool for us; rather than over-complicate a micrometer, we would like to pass a shortcut along to you.

The most important readings are the Thimble and the Barrel. The Barrel does not move. It looks like a ruler with ten numbers. The space between each number is divided into quarters. As the Thimble rotates around this Barrel it covers up, or reveals the numbers marked on the Barrel.

It is easy to read a micrometer, if you think of the markings on the Barrel as dollars and quarters. If you think of the lines on the Barrel as dollars and quarters, then the lines on the Thimble represent 'pennies' or cents.

As the thimble rotates, you add those pennies to the dollars and quarters

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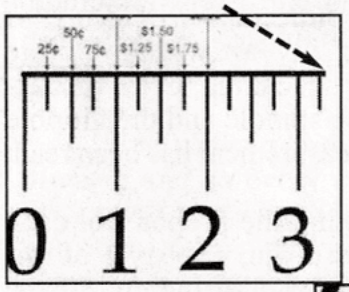
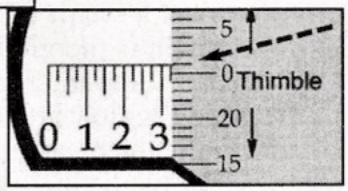


In the example to the left, the number '3' on the barrel is fully exposed, plus one small line shows. Converted to dollars and quarters, it indicates 3 dollars and 25 cents.

The thimble example to the right shows '1' at the horizontal line of the barrel. That indicates one cent.



Finally, in the example to the right, the '3' is fully exposed indicating 3 dollars. One line beyond the '3' shows, indicating a quarter (25¢) and one line on the thimble above the horizontal line on the barrel indicates 1¢. Add them together and we have 326 or 0.326 (three hundred and twenty-six thousandths of an inch.)