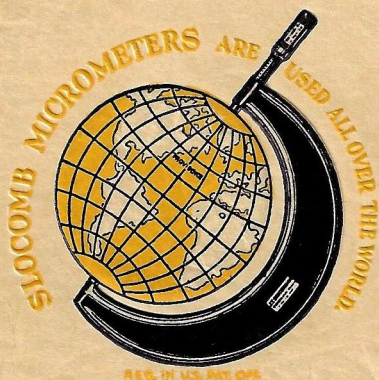


# J.T. SLOCOMB CO.

**MACHINISTS' TOOLS**  
*and* **MEASURING BOOK**



*Catalog No.18*

**PROVIDENCE • RHODE ISLAND • U.S.A.**









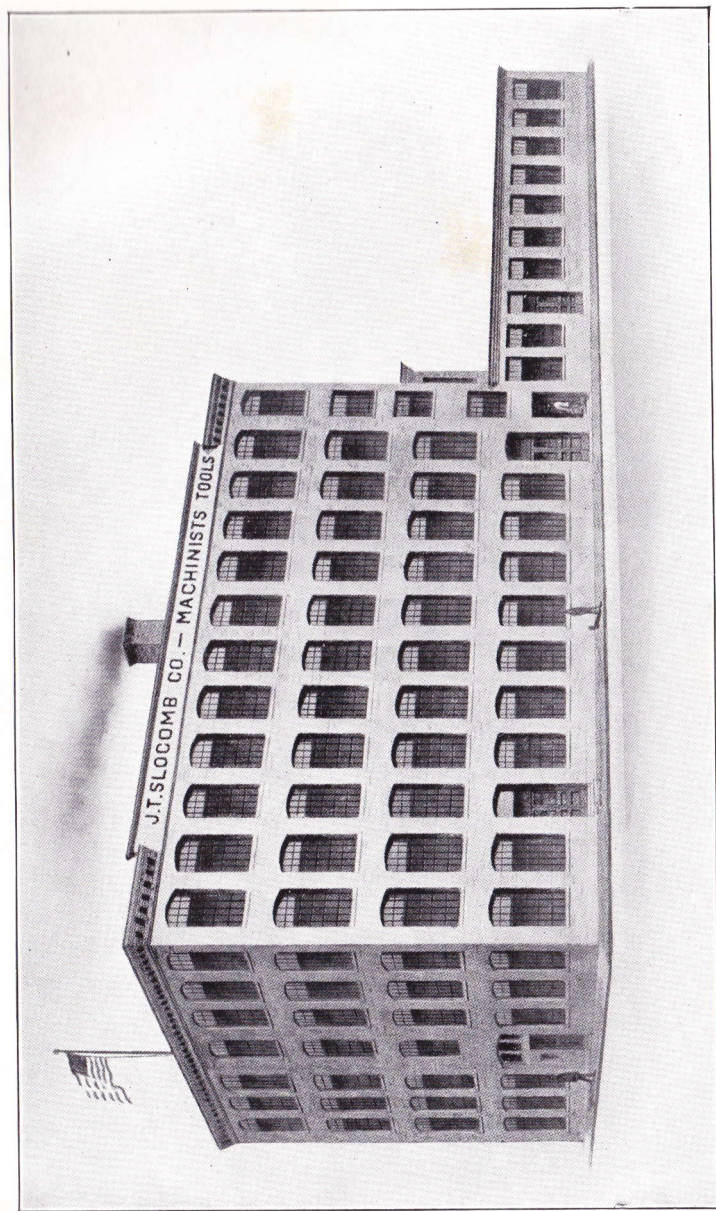










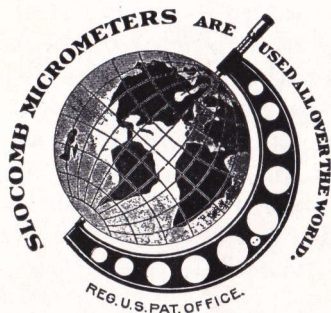


Fireproof construction, well built and well lighted, affording the best facilities for the production of high-grade tools



# J. T. SLOCOMB CO. MACHINISTS' TOOLS

CATALOG No. 18



W. U. T. CODE

CABLE ADDRESS MICROMETER, PROVIDENCE

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**J. T. SLOCOMB COMPANY**

**PROVIDENCE, RHODE ISLAND**

**U. S. A.**

PRINTED IN U. S. A.

# GUARANTEE

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☞ We warrant every tool of our manufacture to be of the highest grade of material and workmanship and accurate in every particular. We also warrant them free from any imperfections of materials or defects in workmanship and should any tool upon use prove defective we will replace it free of charge.

☞ We fully warrant them equal to any made.

☞ We cannot, however, assume the responsibility where original imperfection does not appear, nor can we replace tools which have been abused, or stamped with owner's name, changed, or otherwise experimented upon.



## INTRODUCTORY

**OF GENERAL INTEREST:** The business now conducted by J. T. Slocomb Company was established in 1891, for the manufacture of fine mechanics' tools, and has steadily grown since its establishment.

**OUR BUILDING:** Our building is of particularly heavy construction designed specially for our work.

The character of our tools and the great accuracy required in their manufacture suggested the most substantial type of construction to eliminate as far as possible all vibration.

It is complete in all details and equipped with every modern appliance. Our machinery is largely special in character and of our own design, built with the idea of producing the greatest possible accuracy in our Measuring Tools and Comparators, etc.

Our process for cutting Micrometer Screws represents the highest mechanical attainment and is the best that can be produced.

**OUR CLAIMS:** Without hesitancy we claim to manufacture the most accurate and long-lived Micrometer Calipers.

We guarantee our product in every particular. Our ability is devoted to just two lines, Micrometer Calipers and Combined Drills and Countersinks.

We also claim the largest and most complete plant for the manufacture of these two lines, and are therefore prepared to furnish what you require—**accuracy.**

**Our Micrometer Calipers** are regarded as the standard everywhere by the best mechanics. Our type is our own.

**Combined Drills and Countersinks** were developed and put first on the market by ourselves and are to be found in every shop.

**NEW TOOLS:** Since issuing our last catalog we have added several new tools, all of which are described and illustrated in this issue. As new tools may be added, special circulars or inserts will be furnished.

**OUR NEW CATALOG:** In this new catalog we endeavor to show our complete line of tools, together with a description, which we have tried to make cover points that are particularly of interest. Should more detailed description be required, we shall be pleased to give it.

**OUR NAME:** All our tools bear our name, and this name on a tool is our guarantee and your protection. Since the establishment of the business we have always endeavored to have every tool as nearly perfect as it is possible to make it. Our inspection is most rigid.

**OUR TOOLS:** We *specialize on Micrometer Calipers and Combination Center Drills*, and as specialists on these tools, we are able to give quality and service.

**ELECTROTYPES:** We are glad to furnish new electrotypes from any of the cuts in this catalog, and can furnish some reduced to the width of an ordinary reading column ( $2\frac{1}{2}$  inches).

## SUGGESTIONS FOR ORDERING

**REGULAR GOODS:** We recommend the use of tools regularly listed in our catalog rather than special ones. Regular tools are made in large quantities and carried in stock. Special tools must be made to order, taking a much longer time and costing much more.

**LANGUAGE OF ORDERS:** In making up orders from this catalog, if you will be careful to use the names, numbers, and general language of the catalog, we shall be sure to understand, and thus errors in filling and delays will be avoided.

**TERMS OF SALE:** To those satisfactorily rated in the mercantile reference books or those giving satisfactory references our terms are 30 days net. To all others the terms are cash with order.

**GUARANTEE:** The guarantee on page 6 covers every tool bearing our name, and purchasers are fully protected from defective goods; no risk is taken in sending cash with order.

**TO DEALERS:** We want to give every possible assistance to dealers who carry our tools in stock, and are ready to furnish cuts of our tools for use in advertisements of our customers, or in their catalog.

Catalogs and circulars of our tools will be furnished to dealers gratis at any time.

We want dealers to feel free to offer suggestions regarding our tools. Your ideas are always appreciated and will receive our careful consideration.

**TO THE USERS OF OUR TOOLS:** First we call your attention to our guarantee on page 6.

We are specialists in Micrometers and Center Drills, and endeavor in these lines to supply something better than it is possible to get elsewhere.

Any suggestions which you believe will help us to improve our line will be most welcome.

**SHIPPING INSTRUCTIONS:** Show clearly on your order how we are to send goods, whether by mail, express, or freight. Goods sent by mail are at purchaser's risk. If definite instructions are not given, we will use our own judgment.

**MAIL INSURANCE:** We have for some time, for the convenience of our customers, been insuring packages when sent by mail. The cost is small and, as it has evidently been so satisfactory, we shall continue it.

**REPAIRS:** We endeavor to keep our repair charges as low as possible. All tools sent back for repairs should be plainly marked with name and address of sender on the outside of packages. A letter should in all cases be sent us giving full instructions for the repairs desired. Any tools returned for repairs should be returned with transportation charges fully prepaid.

**SPECIAL TOOLS:** Special tools always mean special work and special prices, so we recommend regular stock goods whenever possible. However, in case any special tools are ordered, care should be taken to give full description of what is wanted.

**SPECIAL GOODS NOT RETURNABLE:** We cannot take back goods made up on customers' orders according to special specifications. As such goods are made to meet the particular requirements of our customers they cannot be sold as regular goods to another.

**MISSING GOODS:** Our goods are sold F. O. B. Providence, R. I., and we cannot be responsible for goods lost or damaged in transit.



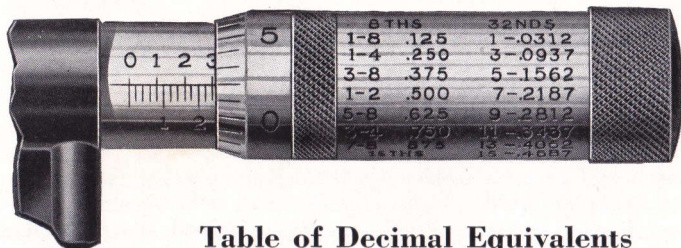
## Valuable and Exclusive Features of Slocomb Micrometers

**T**HE purpose of the Slocomb Micrometer is to meet the every day requirements of machine shops with an instrument that is accurate, reliable, and durable to stand the every day usage of the shop.

One of the exclusive features of the Slocomb is its *all tool steel screw*. The screw is the heart of the micrometer, and this hard tool steel screw, working in a nut that gives about four times the bearing surface of other micrometers, accounts for the extreme long life of the Slocomb.

The "I" section frame gives great rigidity with little weight, and while it may be of lesser importance on the 1 inch size, it grows rapidly in importance on the larger sizes.

The light weight contributes to the long life of the tool for the reason that it does not pound itself to pieces by handling.



**Table of Decimal Equivalents  
on Thimble**

A table of decimal equivalents consisting of 8ths, 16ths, and 32ds is stamped on thimbles of all our micrometers having the black enamel frame, as per above cut. This is on all sizes from the 1 inch to the 60 inch inclusive. The ribs on the edges of frame help to make a good finger hold, so that the instrument is held in a sensitive manner, contributing to accuracy in measuring.

Valuable features of the Slocomb are described to greater length in the Measuring Book at back of this catalog.

**The Longest Lived Micrometer That Can Be Bought**

## Sectional View – Micrometer Caliper

Arrangement of nuts insuring long bearing in spite of wear.

Short nut—D to compensate for wear in threads.

No split in sleeve to admit dust and dirt and cause rapid wear.

Nut—C  $\frac{5}{8}$ " long, twice as long as bearing in other micrometers. Can be replaced when worn.

.270" diameter screw and anvil. This gives  $16\frac{1}{2}\%$  more wearing surface at this point than .250" diam.

Solid inserted anvil—G.

I section frame—B drop forged from bar steel.

Decimal equivalents stamped on thimble.

F—Thimble.

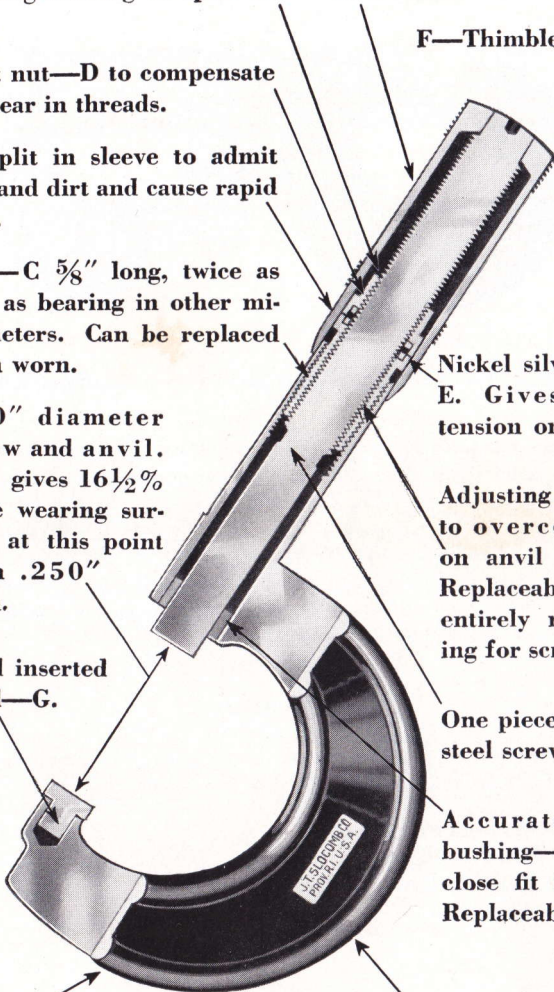
Nickel silver spring E. Gives uniform tension on screw.

Adjusting nut — C to overcome wear on anvil or screw. Replaceable, giving entirely new bearing for screw.

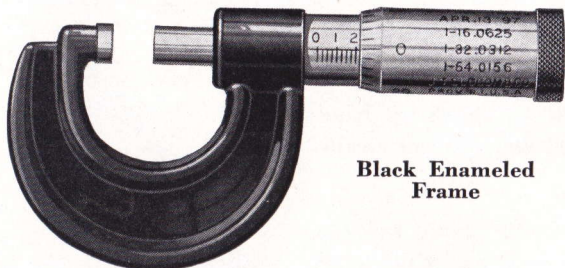
One piece hard tool steel screw—A.

Accurately fitting bushing—H insures close fit for screw. Replaceable.

Black enameled or polished frame.



## Micrometer Caliper No. 22 — One Half Inch



**Black Enameled  
Frame**

### Plain — Graduated to Read Thousandths

This Caliper measures all sizes from 0 to  $\frac{1}{2}$  inch by thousandths of an inch. Where much measuring is done on lathe or grinder on sizes within the range of this caliper, it is preferred by many over the larger and heavier instruments. It weighs only  $1\frac{3}{4}$  ounces and is readily carried in the vest pocket. This is the lightest micrometer made. The frame is drop forged from bar steel of an I section and is finished in black enamel. The general construction and adjustments are the same as in the larger instruments and this caliper is of the same high class.

### Metric Measure

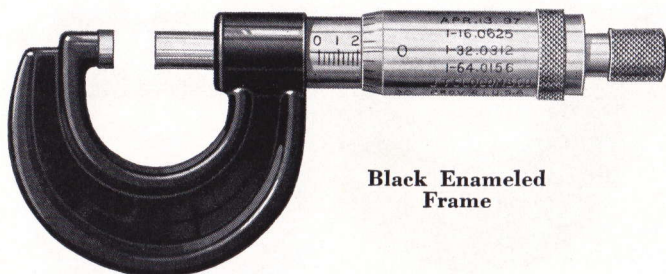
When instructed we can furnish at same price this micrometer for measuring 0 to 13 millimeters by hundredths of a millimeter.

<b>No. 22.</b>	<b>Without Friction Stop</b> .....	<b>\$5.50</b>
<b>No. 22.</b>	<b>With Lock Nut</b> .....	<b>6.50</b>
<b>No. 22.</b>	<b>Graduated to read .0001, extra</b> .....	<b>1.75</b>

**The Longest Lived Micrometer That Can Be Bought**



## Micrometer Caliper No. 22 — One Half Inch



**Black Enameled  
Frame**

### With Friction Stop — As Illustrated

This Caliper is the same as the No. 22 illustrated on previous page except for the addition of the Friction Stop on end of thimble. This Friction Stop is a device that limits the amount of pressure that can be applied to the anvil or work, and is intended to prevent mismeasurements through careless handling. This attachment can be applied to any Slocomb Micrometer. It is illustrated and described on page 93, Measuring Book, at the back of this catalog.

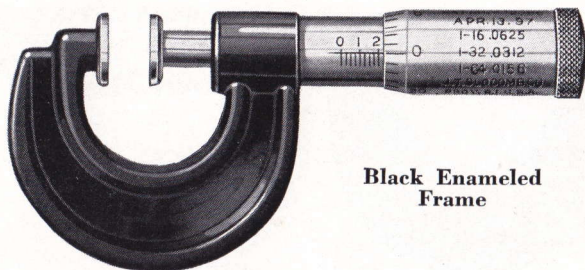
### Metric Measure

When instructed we can furnish at same price this micrometer for measuring 0 to 13 millimeters by hundreds of a millimeter.

No. 22.	With Friction Stop.....	\$6.00
No. 22.	With Lock Nut.....	7.00
No. 22.	Graduated to read .0001, extra.....	1.75

**The Longest Lived Micrometer That Can Be Bought**

## Micrometer Caliper No. 24 — For Paper



**Black Enameled  
Frame**

### Plain — Graduated to Read Thousandths

This Caliper is intended for measuring paper or other soft material and has a large anvil and a wide cap on screw, so that when in use it has more bearing on the article being measured.

The frame is drop forged from bar steel and finished in black enamel.

It measures all sizes from 0 to .350 inch by thousandths of an inch.

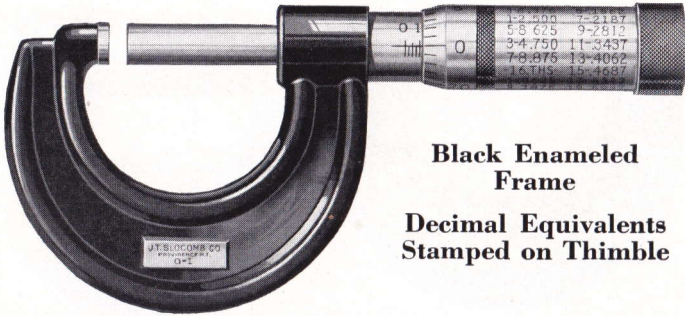
### Metric Measure

When instructed we can furnish at same price this micrometer graduated to read to hundredth millimeters, size 0 to 9 millimeters.

<b>No. 24. Without Friction Stop</b> .....	<b>\$7.00</b>
<b>No. 24. With Friction Stop</b> .....	<b>7.50</b>
<b>No. 24. Graduated to read .0001, extra</b> .....	<b>1.75</b>

**The Longest Lived Micrometer That Can Be Bought**

## Micrometer Caliper No. 25 — One Inch



**Black Enameled  
Frame**

**Decimal Equivalents  
Stamped on Thimble**

### Plain — Graduated to Read Thousandths

This Caliper measures all sizes from 0 to 1 inch by thousandths of an inch.

Finished in black enamel. Has drop-forged frame of I section style giving great strength and rigidity with little weight. Decimal equivalents stamped on thimble.

### Metric Measure

When instructed, we can furnish at same price this micrometer for measuring 0 to 25 millimeters by hundredths of a millimeter.

- |  |               |
|--|---------------|
| <b>No. 25. Without Friction Stop (as above)</b> .....                  | <b>\$6.25</b> |
| <b>No. 25. Graduated to read to .0001, extra</b><br>(see page 91)..... | <b>1.75</b>   |
| <b>No. 25. With Tantalum Measuring Terminals, extra</b>                | <b>11.00</b>  |

**Cases for this micrometer are listed on page 68.**

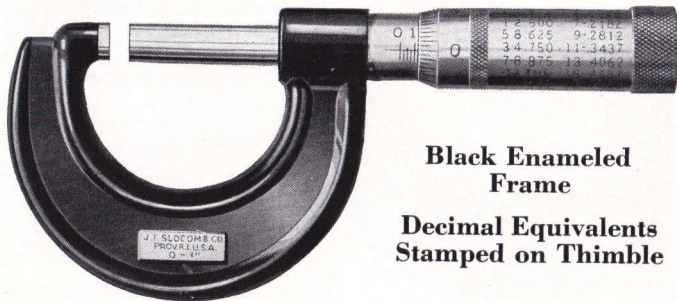
For larger sizes, see pages 30 and 31.

N.B. Above can be furnished with cutaway anvil when so desired at no extra cost.

**The Longest Lived Micrometer That Can Be Bought**



## Micrometer Caliper No. 25 — One Inch



**Black Enameled  
Frame**

**Decimal Equivalents  
Stamped on Thimble**

### Graduated to Read to Half Thousandths

This Caliper is the same as the one shown on previous page except that the thimble is graduated to read to half thousandths of an inch. This has been done by doubling the number of graduation lines around the thimble and is of advantage in estimating ten thousandths when closer work is desired but a micrometer graduated to ten thousandths is not at hand.

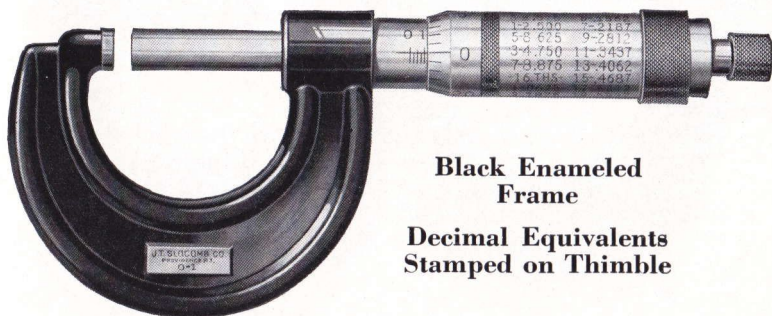
<b>No. 25.</b>	<b>Graduated to read to .0005, as above.....</b>	<b>\$6.25</b>
<b>No. 25.</b>	<b>As above with Friction Stop.....</b>	<b>6.75</b>
<b>No. 25.</b>	<b>As above with Lock Nut.....</b>	<b>7.25</b>
<b>No. 25.</b>	<b>As above with Lock Nut and F. S. ....</b>	<b>7.75</b>
<b>No. 25.</b>	<b>With Tantalum Measuring Terminals, extra</b>	<b>11.00</b>

Cases for this micrometer are listed on page 68.

For larger sizes, see pages 30 and 31.

**The Longest Lived Micrometer That Can Be Bought**

## Micrometer Caliper No. 25 — One Inch



**Black Enameled  
Frame**

**Decimal Equivalents  
Stamped on Thimble**

### With Friction Stop — As Illustrated

This Micrometer is like the No. 25, except the addition of the Friction Stop as shown above.

This illustration is given to show the appearance of the micrometer with this attachment, and it will serve to show what this attachment will add to any of the outside micrometers listed on the following pages.

### Metric Measure

When instructed, we can furnish at same price this micrometer for measuring 0 to 25 millimeters by hundredths of a millimeter.

**No. 25. With Friction Stop, as above..... \$6.75**

**No. 25. Graduated to read to .0001, extra  
(see page 91)..... 1.75**

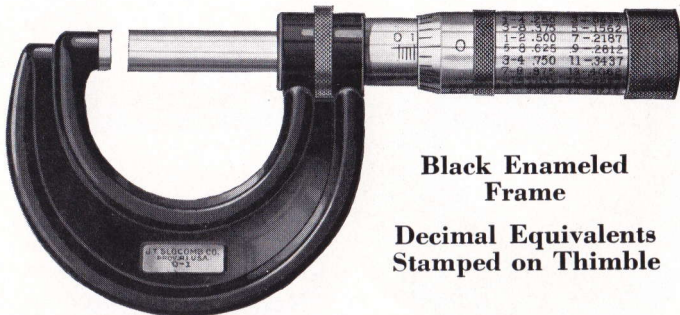
**No. 25. With Tantalum Measuring Terminals, extra 11.00**

**Cases for this micrometer are listed on page 68.**

For larger sizes, see pages 30 and 31.

**The Longest Lived Micrometer That Can Be Bought**

## Micrometer Caliper No. 25 — One Inch



**Black Enameled  
Frame**

**Decimal Equivalents  
Stamped on Thimble**

### With Lock Nut — As Illustrated

This micrometer is like the No. 25, except the addition of the Lock Nut as shown above.

This Lock Nut is a device for locking the spindle in position and preserving the setting. A slight turn on the knurled ring firmly locks the spindle.

### Metric Measure

When instructed, we can furnish at same price this micrometer for measuring 0 to 25 millimeters by hundredths of a millimeter.

- |   |               |
|---|---------------|
| <b>No. 25. With Lock Nut, as above.....</b>                             | <b>\$7.25</b> |
| <b>No. 25. Graduated to read to .0001, extra<br/>(see page 91).....</b> | <b>1.75</b>   |
| <b>No. 25. With Tantalum Measuring Terminals, extra</b>                 | <b>11.00</b>  |

**Lock Nut furnished on all micrometers except  
Nos. 35 and 45 at \$1.00 per tool extra.**

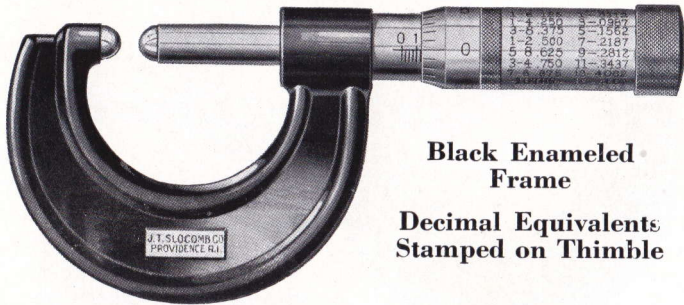
**Cases for this micrometer are listed on page 68.**

For larger sizes, see pages 30 and 31

**The Longest Lived Micrometer That Can Be Bought**



## Micrometer Caliper No. 25 — One Inch



**Black Enameled  
Frame**

**Decimal Equivalents  
Stamped on Thimble**

### Ball Point on Anvil and Spindle

This Micrometer is like the No. 25, except that it has ball points on both anvil and spindle as shown above.

This arrangement adapts the tool to many jobs where it is necessary to measure on a curved surface and a flat point will not do.

### Metric Measure

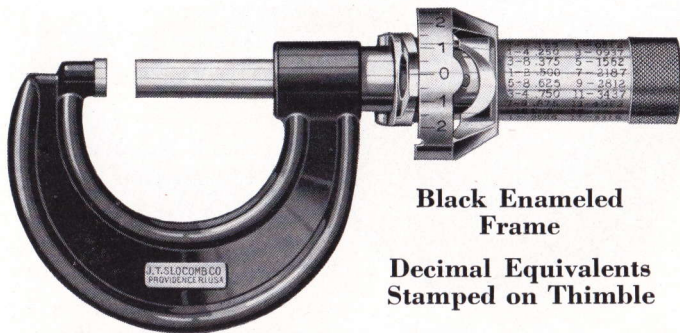
When instructed, we can furnish at same price this micrometer for measuring to 25 millimeters by hundredths of a millimeter.

<b>No. 25.</b>	<b>Ball Point on Anvil and Spindle.....</b>	<b>\$8.25</b>
<b>No. 25.</b>	<b>As above, with Friction Stop.....</b>	<b>8.75</b>
<b>No. 25.</b>	<b>With Lock Nut, extra.....</b>	<b>1.00</b>

Cases for this micrometer are listed on page 68.

**The Longest Lived Micrometer That Can Be Bought**

## No. 25 Quantity Production Micrometer



**Black Enameled  
Frame**

**Decimal Equivalents  
Stamped on Thimble**

### 0-1 Inch Range — Shown Graduated to .0005

Where a large number of pieces are to be made of one size, and for inspection, this micrometer saves time, eye-strain, and insures accuracy.

The graduated sector is clamped to the micrometer thimble, and the indicator clamped to the sleeve or stationary part. The device is adjusted to zero at size and reads .002 each side, or *plus* and *minus*.

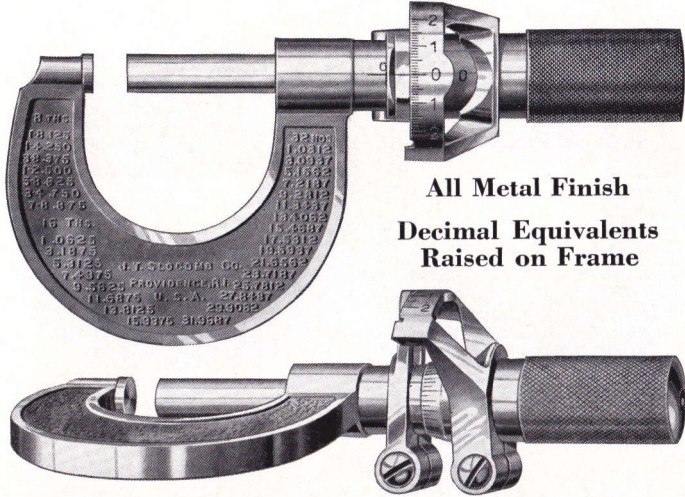
Because of the larger diameter the width of graduations is increased three times, making thousandths read  $\frac{3}{16}$  wide, and allows for reading ten thousandths direct. These parts are made of aluminum.

They are furnished to read in half thousandths and in ten thousandths. This micrometer is intended strictly for manufacturing purposes. We do not advise taking the device off so as to use the micrometer in the regular way.

Price, as illustrated, graduated to .0005.....	\$7.25
Price, as illustrated, graduated to .0001.....	7.75
With Friction Stop, extra per tool.....	.50
With Lock Nut, extra per tool.....	1.00
With Tantalum Measuring Terminals, extra.....	11.00

**The Longest Lived Micrometer That Can Be Bought**

## No. 26 Quantity Production Micrometer



### 0-1 Inch Range — Shown Graduated to .0001

This Micrometer works on the same principle as the No. 25 on opposite page. The attachments are the same, made of aluminum and made to read in half thousandths and ten thousandths. The frame is highly polished and next pressed in polished dies under a hydraulic pressure of 300 tons to the square inch, raising the figures showing decimal equivalents.

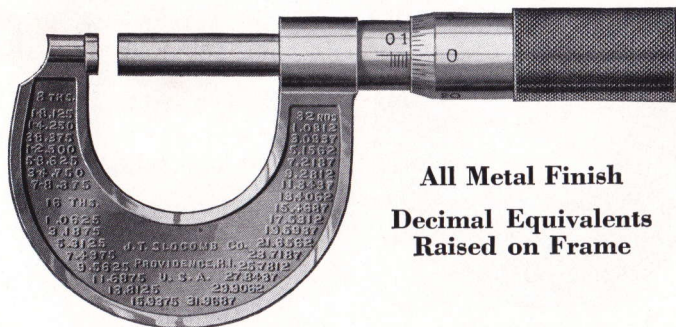
Price, as illustrated, graduated to half thousandths.....	\$8.50
Price, as illustrated, graduated in ten thousandths.....	9.00
With Friction Stop, extra per tool.....	.50
With Lock Nut, extra per tool.....	1.00
With Tantalum Measuring Terminals, extra.....	11.00

The Longest Lived Micrometer That Can Be Bought





## Micrometer Caliper No. 26 — One Inch



**All Metal Finish  
Decimal Equivalents  
Raised on Frame**

### Graduated to Read Half Thousandths

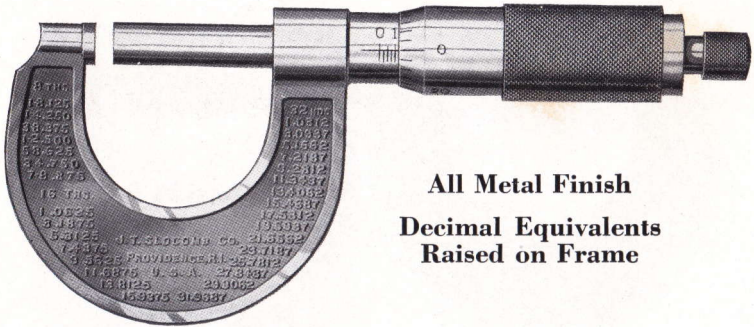
This Micrometer is the same as the No. 26 shown on opposite page except that the thimble is graduated so that the micrometer will read to half thousandths direct. This has been done by doubling the graduation lines around the thimble and makes it possible to get a more accurate measurement of fine work than the No. 26 graduated to thousandths only will give.

<b>No. 26.</b>	<b>Graduated to .0005 as above.....</b>	<b>\$7.50</b>
<b>No. 26.</b>	<b>As above with Friction Stop.....</b>	<b>8.00</b>
<b>No. 26.</b>	<b>As above with Lock Nut, extra.....</b>	<b>1.00</b>
<b>No. 26.</b>	<b>As above with Tantalum Measuring Terminals, extra .....</b>	<b>11.00</b>

Cases for this micrometer are listed on page 68.

**The Longest Lived Micrometer That Can Be Bought**

## Micrometer Caliper No. 26 — One Inch



All Metal Finish  
Decimal Equivalents  
Raised on Frame

### With Friction Stop — As Illustrated

This Caliper differs from the No. 26 only in one point, i. e., it has a Friction Stop.

This attachment is fully described on page 93, Measuring Book. The objection to the click in the ratchet stop is overcome and its life is as long as the tool, as the spring does not require lubrication, and there is so much of the spring that it will not lose its tension.

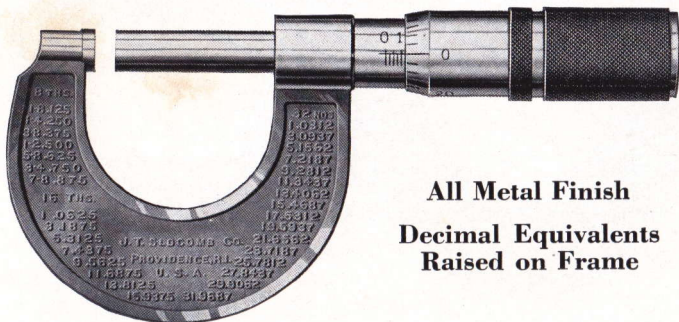
No. 26. With Friction Stop, as above.....	\$8.00
No. 26. With Friction Stop and Lock Nut.....	9.00
Graduated to read to .0001, extra (see page 91).....	1.75
No. 26. With Tantalum Measuring Terminals, extra...	11.00

Cases for this micrometer are listed on page 68.

**The Longest Lived Micrometer That Can Be Bought**



## Micrometer Caliper No. 26 — One Inch



**All Metal Finish**  
**Decimal Equivalents**  
**Raised on Frame**

### With Friction Thimble — As Illustrated

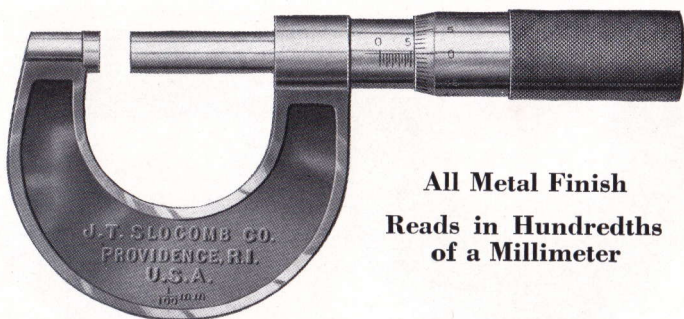
There is some disadvantage in a friction stop applied to the end of thimble of a 1 inch micrometer in the usual way. When holding the micrometer and trying to operate the stop by fingers of the same hand, its reach is often too great. By putting the stop further down on the thimble, it fits the hand better. It is right under your thumb. Construction of these stops is explained on page 93, Measuring Book, at the back of this catalog.

<b>No. 26. With Friction Thimble, as above.....</b>	<b>\$8.50</b>
<b>No. 26. With Lock Nut.....</b>	<b>9.50</b>
<b>Graduated to read to .0001, extra.....</b>	<b>1.75</b>
<b>No. 26. With Tantalum Measuring Terminals, extra...</b>	<b>11.00</b>

Cases for this micrometer are listed on page 68.

**The Longest Lived Micrometer That Can Be Bought**

## Micrometer Caliper No. 26M — Metric



**All Metal Finish**  
**Reads in Hundredths**  
**of a Millimeter**

### 0-25 Millimeters Range — Shown Above

This Caliper corresponds to our No. 26 English and is furnished like that one with either the friction stop or friction thimble. It is graduated to read in hundredths of a millimeter 0 to 25 millimeters. The frame is finished like the No. 26, except, of course, it does not have the table of decimal equivalents of the inch.

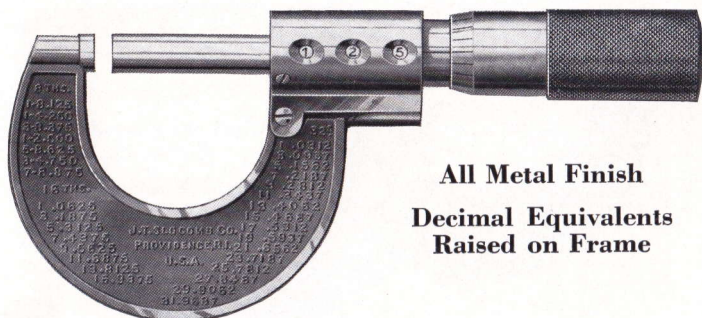
No. 26M.	Without Friction Stop.....	\$7.50
No. 26M.	With Friction Stop.....	8.00
No. 26M.	With Friction Thimble.....	8.50
No. 26M.	With Lock Nut, extra.....	1.00
No. 26M.	With Tantalum Measuring Terminals, extra	11.00

For large sizes of metric micrometers, see pages 30 and 31.

Cases for this micrometer are listed on page 68.

**The Longest Lived Micrometer That Can Be Bought**

## Direct Reading Micrometer No. 35—One Inch



All Metal Finish  
Decimal Equivalents  
Raised on Frame

### Balanced for One Hand Operation

Time saved, calculating saved, measurements made more easily, for there is less chance of error. A single, compact combination of a well-known and thoroughly tested counting device with the Slocomb Micrometer, which is world famed for accuracy and wearing qualities.

We invite unprejudiced trial by machinists who use micrometers continually. The Davenport Slocomb Direct Reading Micrometer will be found to read direct with perfect accuracy to thousandths of an inch—light in weight, splendidly finished and nicely balanced.

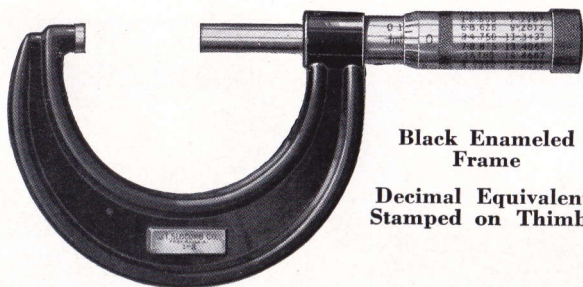
A Slocomb feature that is more and more valued every time the micrometer is used. The counting device is so compactly designed and so centrally placed as to balance the micrometer nicely. It is held with perfect ease in one hand and operated in the usual way. Furnished in English system only.

Price (including genuine Morocco Case).....	\$17.50
Price with Friction Stop.....	18.00
Price with $\frac{1}{2}$ " , $\frac{5}{8}$ " or $\frac{3}{4}$ " Measuring Terminals.....	20.00
N. B. Prices for larger sizes with black enameled frames, see page 31.	

**The Longest Lived Micrometer That Can Be Bought**



## Micrometer Caliper No. 27 — Two Inch



**Black Enameled  
Frame**  
**Decimal Equivalents  
Stamped on Thimble**

### Plain — Graduated to Read Thousandths

This Caliper measures all sizes from 1 to 2 inches inclusive. The frame is drop forged from bar steel and finished in black enamel. Decimal equivalents are stamped on thimble. Has I section frame giving great strength and rigidity.

### Metric Measure

When instructed, we can furnish this micrometer for measuring in hundredths of a millimeter, size from 25 mm. to 50 mm., at same price.

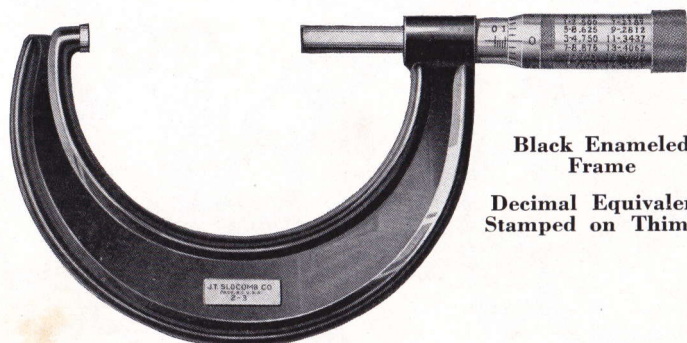
<b>No. 27. Without Friction Stop.....</b>	<b>\$7.00</b>
<b>No. 27. With Friction Stop.....</b>	<b>7.50</b>
<b>No. 27. With Lock Nut, extra.....</b>	<b>1.00</b>
<b>Graduated to read to .0001, extra.....</b>	<b>1.75</b>

**Cases for this micrometer are listed on page 68.**

For larger sizes, see pages 30 and 31.

**The Longest Lived Micrometer That Can Be Bought**

## Micrometer Caliper No. 28 — Three Inch



**Black Enameled  
Frame**

**Decimal Equivalents  
Stamped on Thimble**

### Plain — Graduated to Read Thousandths

This Caliper measures all sizes from 2 to 3 inches by thousandths of an inch. Frame is forged from bar steel and finished in black enamel. Decimal equivalents are stamped on thimble, I section frame, etc.

### Metric Measure

When instructed, we can furnish at same price this micrometer for measuring in hundredths of a millimeter from 50 to 75 millimeters.

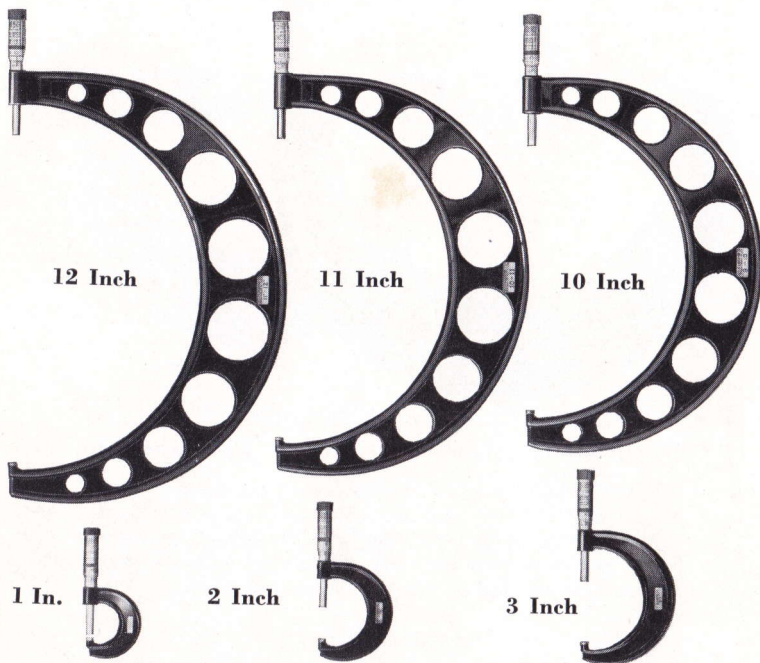
<b>No. 28. Without Friction Stop</b> .....	<b>\$7.75</b>
<b>No. 28. With Friction Stop</b> .....	<b>8.25</b>
<b>No. 28. With Lock Nut, extra</b> .....	<b>1.00</b>
<b>Graduated to read to .0001, extra</b> .....	<b>1.75</b>

Cases for this micrometer are listed on page 68.

For large sizes, see pages 30 and 31.

**The Longest Lived Micrometer That Can Be Bought**

## Micrometer Calipers from 1 to 24 Inches



We list here micrometers having a range of one inch or 25 millimeters for each size, covering all sizes to 24 inches inclusive and from 0 to 600 millimeters Metric Measure.

The frames on sizes 1 to 9 inches inclusive are drop forged from bar steel, and sizes 10 inches and larger are of high grade malleable castings with holes through them for lightness.

The heads and measuring screws on all are the same. Each has a range of one inch or 25 millimeters.

The size given on the cut shows the maximum, the minimum being one inch or 25 millimeters less in each case.

Frames are finished in black enamel. Micrometers for English measurements sent unless otherwise instructed.

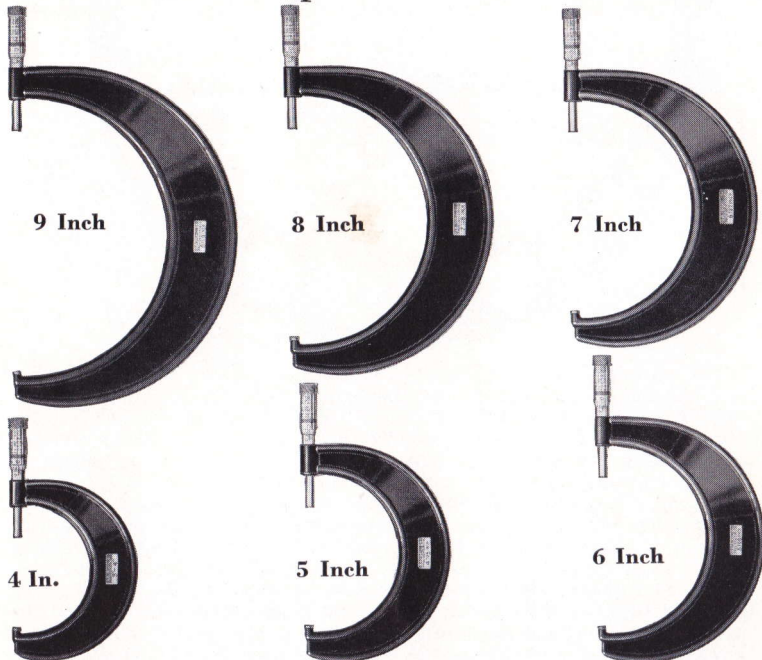
For detailed description of these micrometers see pages 87 and 88, Measuring Book.

These micrometers are put up in sets containing different sizes; see pages 47 to 56.

**The Longest Lived Micrometer That Can Be Bought**



## Micrometer Calipers from 1 to 24 Inches



### Price List

No.	Inches	Metric	Without Friction Stop	Inches	Metric	Without Friction Stop
No. 25	0 to 1 in.	0 to 25 mm.	<b>\$6.25</b>	13 to 14 in.	300 to 325 mm.	<b>\$17.00</b>
No. 27	1 to 2 in.	25 to 50 mm.	<b>7.00</b>	12 to 13 in.	325 to 350 mm.	<b>18.00</b>
No. 28	2 to 3 in.	50 to 75 mm.	<b>7.75</b>	14 to 15 in.	350 to 375 mm.	<b>19.00</b>
	3 to 4 in.	75 to 100 mm.	<b>8.50</b>	15 to 16 in.	375 to 400 mm.	<b>21.00</b>
	4 to 5 in.	100 to 125 mm.	<b>9.25</b>	16 to 17 in.	400 to 425 mm.	<b>23.00</b>
	5 to 6 in.	125 to 150 mm.	<b>10.00</b>	17 to 18 in.	425 to 450 mm.	<b>25.00</b>
	6 to 7 in.	150 to 175 mm.	<b>11.00</b>	18 to 19 in.	450 to 475 mm.	<b>27.00</b>
	7 to 8 in.	175 to 200 mm.	<b>12.00</b>	19 to 20 in.	475 to 500 mm.	<b>30.00</b>
	8 to 9 in.	200 to 225 mm.	<b>13.00</b>	20 to 21 in.	500 to 525 mm.	<b>33.00</b>
	9 to 10 in.	225 to 250 mm.	<b>14.00</b>	21 to 22 in.	525 to 550 mm.	<b>36.00</b>
	10 to 11 in.	250 to 275 mm.	<b>15.00</b>	22 to 23 in.	550 to 575 mm.	<b>39.00</b>
	11 to 12 in.	275 to 300 mm.	<b>16.00</b>	23 to 24 in.	575 to 600 mm.	<b>42.00</b>

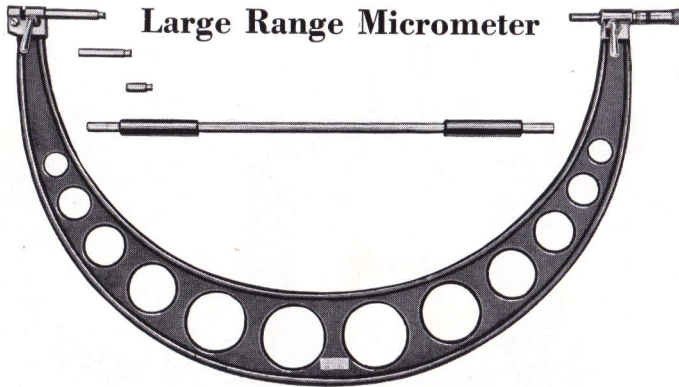
Any of above micrometers graduated to read to .0001", extra, **\$1.75**

Lock Nut Micrometers 1/2" to 24" inclusive, \$1.00 additional.

Any of above micrometers furnished with Tantalum Measuring Terminals, \$11.00 extra per tool.

Above English Micrometers can be furnished with Direct Reading Feature (See page 27). Price, \$10.00 extra per tool.

**The Longest Lived Micrometer That Can Be Bought**



The above cut shows a Caliper we make in sizes above 18 inches English and 450 millimeters Metric. The frame is a malleable iron casting. Each tool is provided with three Anvils, a 1-inch, 2-inch and 3-inch (or 25, 50, and 75 mm. in case of metric), which are held by split clamp and rest against adjusting screw. Also one Standard End Measure as shown in cut for adjusting to smallest size. A feature of this tool is in the gap at anvil end, allowing face of End Measure and adjusting screw to be wiped clean before contact is made, and then allowing for inspection by sighting through at any time. This tool is also provided with clamp for locking spindle in any desired position. The frame is finished in black enamel.

We list and carry in stock the ten sizes given below, the first six each having a range of three inches English or 75 millimeters Metric, and the last four each having a range of six inches in English or 150 millimeters in Metric. Numbers 57, 58, 59 and 59A are each provided with six anvils, 1-inch, 2-inch, 3-inch, 4-inch, 5-inch and 6-inch, or in Metric, sizes to correspond. We call attention that we can furnish on special order this style of micrometer in larger sizes. Prices on application.

### Metric Measure

Micrometers of this style for measuring in hundredths of a millimeter can be furnished at same prices.

	Price		
	English	Metric	
No. 51.	18 to 21 inches;	450 to 525 mm.	\$50.00
No. 52.	21 to 24 inches;	525 to 600 mm.	60.00
No. 53.	24 to 27 inches;	600 to 675 mm.	70.00
No. 54.	27 to 30 inches;	675 to 750 mm.	80.00
No. 55.	30 to 33 inches;	750 to 825 mm.	100.00
No. 56.	33 to 36 inches;	825 to 900 mm.	120.00
No. 57.	36 to 42 inches;	900 to 1050 mm.	180.00
No. 58.	42 to 48 inches;	1050 to 1200 mm.	240.00
No. 59.	48 to 54 inches;	1200 to 1350 mm.	320.00
No. 59A.	54 to 60 inches;	1350 to 1500 mm.	400.00

N. B. Above English Micrometer can be furnished with Direct Reading Feature when so desired (see page 27).

Price, extra \$10.00 per tool.

## Screw Thread Micrometer Caliper No. 29



**Black Enameled  
Frame**

**Decimal Equivalents  
Stamped on Thimble**

### Graduated to Read to Thousandths of an Inch

This Caliper will not measure the actual diameter of a V thread screw, but for purposes of comparison it has a wide range of uses.

It is valuable for making a tap same diameter as some other tap or screw, or a few thousandths larger or smaller.

For cutting screw threads in the lathe to fit nuts the tap may be measured and then the threads readily cut to same size and to fit nuts, without the common cut-and-try method and its consequent loss of time.

The terminals are not made to a sharp point, but instead are flatted to about  $\frac{1}{64}$  inch diameter, and the tool is adjusted to 0 when these flat points are in contact, so it may be used same as any other micrometer, when it is desired to measure at the bottom of a groove or a small recess, the thickness in the center of twist drills, or similar work.

### Metric Measure

When instructed, we can furnish at same prices this style micrometer for measuring in hundredths of a millimeter.

	English	Metric	
No. 29A.	0 to 1 inch,	0 to 25 mm.	\$7.00
No. 29C.	1 to 2 inch,	25 to 50 mm.	8.00
No. 29E.	2 to 3 inch,	50 to 75 mm.	9.00

For larger sizes, add \$2.00 to regular list shown on page 31.

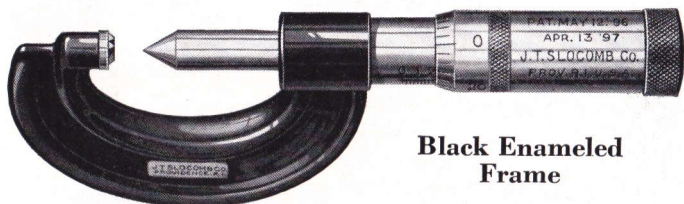
With Friction Stop, extra	\$ .50
With Lock Nut, extra	1.00

Cases for this micrometer are listed on page 68.

**The Longest Lived Micrometer That Can Be Bought**



## Standard Screw Thread Micrometer No. 30



**Black Enameled  
Frame**

### Decimal Equivalents Stamped on Thimble

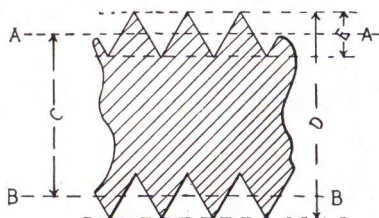
These Screw Thread Micrometers provide the best means known for the accurate measuring of screw threads.

Our micrometer is especially adapted on account of all the adjustments being made inside the thimble and we are able to use a solid anvil, which is much more reliable than when this piece is fitted loosely.

The anvil is V shaped, and the end of the screw pointed. The V in the anvil is sharp enough and the pointed end of the screw flattened enough so that they will not rest on the top or bottom of the thread being measured, but instead will rest only on the angle or cut surface of the thread. It is a well-known fact that the outside diameter has little to do with the actual size of a screw, and this micrometer provides a way of making the actual measurement on the angle.

Referring to the small sectional cut: *A-B* are the pitch lines of the thread and *C* is the measurement which is shown by these micrometers. This is the outside diameter, less one-half the double depth of thread or one depth of thread less than the outside diameter.

This depth may be found as follows:



Depth of Metric threads	= .6495 ÷ number of threads to 1 inch.
Depth of A.N. threads	= .6495 ÷ number of threads to 1 inch.
Depth of V threads	= .866 ÷ number of threads to 1 inch.
Depth of Whitworth threads	= .640 ÷ number of threads to 1 inch.
Depth of N. F. threads	= .6495 ÷ number of threads to 1 inch.
Depth of British Asso. threads	= .60 ÷ Pitch.

For further matter and tables, see pages 84 to 86, Measuring Book, at the back of the catalog.

**The Longest Lived Micrometer That Can Be Bought**

For U. S. S., Whitworth and International threads, the point of the spindle has to be flatted. This makes the range of caliper somewhat more limited than for V threads. The fixed anvil is limited in its capacity, for if made large enough to measure a 10 pitch, it would be too wide at the top to measure a 20 pitch. The anvil, therefore, largely governs the range of the micrometer. It will be seen that a micrometer with small anvil will measure large sizes, but in practice the small anvil does not cover enough of a coarse thread, is hard to handle and it is found better to use a number of different size anvils; the exact number required is a matter largely of opinion, but for stock sizes we list the following:

**No. 30C. 1 in. capacity 0 to 1 in., range 8 to 13 pitch \$9.00**

**No. 30E. 1 in. capacity 0 to 1 in., range 14 to 20 pitch 9.00**

**No. 30G. 1 in. capacity 0 to 1 in., range 22 to 30 pitch 9.00**

**No. 30J. 1 in. capacity 0 to 1 in., range 32 to 40 pitch 9.00**

**No. 30L. 2 in. capacity 1 to 2 in., range 4½ to 7 pitch 10.50**

**No. 30M. 2 in. capacity 1 to 2 in., range 8 to 13 pitch 10.50**

**No. 30P. 3 in. capacity 2 to 3 in., range 6 to 10 pitch 11.00**

**N. B. We can furnish Screw Thread Micrometers in the  
1 inch size only with polished frame (our No. 26,  
page 23) at..... 10.25**

Tools are furnished for (1) V and American National or United States Standard, and (2) for Whitworth Standard Threads.

For large sizes add **\$4.00** to list on regular micrometers.

Range and form of thread are marked on the thimble.

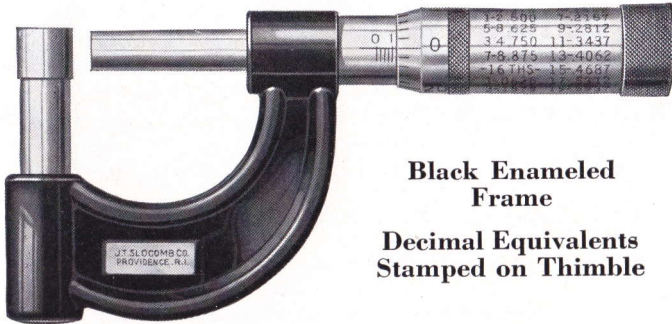
Micrometers for other forms of threads and other pitches as well as for metric threads made to order, prices quoted on application.

For table of constants for threads, see page 86, Measuring Book, at end of this catalog.

In ordering special thread micrometers, be sure to give form of thread, range of thread required and range of diameters.

**The Longest Lived Micrometer That Can Be Bought**

## Tube Micrometer Caliper No. 31



**Black Enameled  
Frame**

**Decimal Equivalents  
Stamped on Thimble**

### 0-1 Inch Range — Graduated to Thousandths

This Caliper is intended to measure the walls of tubes, the distance of a hole from the edge of a piece and other similar work. The anvil will enter a hole  $\frac{3}{8}$  inch diameter to a depth of  $\frac{1}{4}$  inch. The measuring screw has a range of one inch. These calipers can be furnished to special order at special price with anvil to enter holes as small as  $\frac{2}{10}$  inch.

### Metric Measure

When instructed, we can furnish at same prices these micrometers for measuring in hundredths of a millimeter.

	English	Metric	
No. 31.	Without Friction Stop, 0 to 1 inch,	0 to 25 mm.	\$7.50
No. 31.	Without Friction Stop, 1 to 2 inch,	25 to 50 mm.	9.50
No. 31.	Without Friction Stop, 2 to 3 inch,	50 to 75 mm.	11.50
No. 31.	Without Friction Stop, 3 to 4 inch,	75 to 100 mm.	13.50
No. 31.	Graduated to read .0001, extra.....		1.75
No. 31.	With Friction Stop, extra.....		.50
No. 31.	With Lock Nut, extra.....		1.00

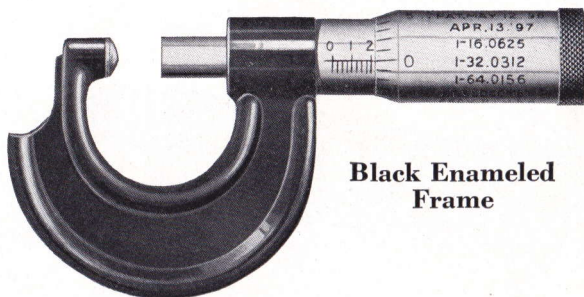
Micrometers for English Measurement sent unless otherwise ordered.

N. B. Prices on application for sizes larger than shown.

**The Longest Lived Micrometer That Can Be Bought**



## Tube Micrometer Caliper No. 33 with Rounded Anvil



**Black Enameled  
Frame**

### Graduated to Thousandths

This Caliper, like the No. 31, is intended to measure the walls of tubes, etc. The anvil of the  $\frac{1}{2}$  inch micrometer will enter a hole  $\frac{3}{8}$  inch diameter to a depth of  $\frac{3}{8}$  inch. The anvil of the 1 inch micrometer will enter hole  $\frac{7}{16}$  inch diameter to a depth of  $\frac{3}{4}$  inch.

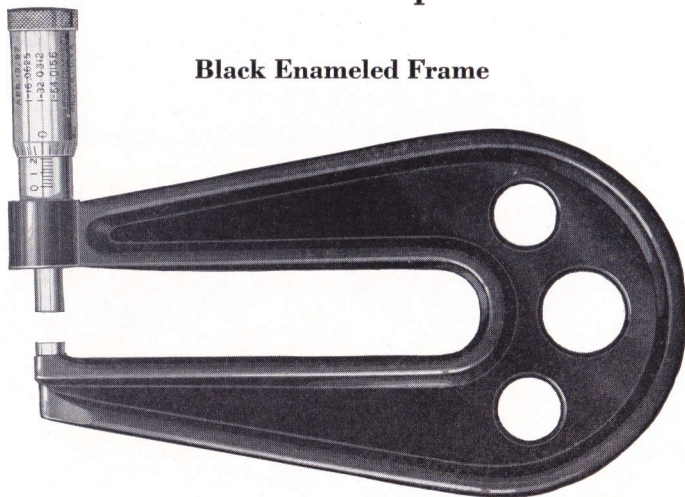
	English	Metric	
No. 33.	0 to $\frac{1}{2}$ inch,	0-13 mm,	Without Friction Stop \$5.50
No. 33.	0 to $\frac{1}{2}$ inch,	0-13 mm,	With Friction Stop ..... 6.00
No. 33.	0 to 1 inch,	0-25 mm,	Without Friction Stop 7.50
No. 33.	0 to 1 inch,	0-25 mm,	With Friction Stop ..... 8.00
	With Lock Nut,	extra.....	1.00
	Graduated to read .0001,	extra.....	1.75

Micrometers for English Measurement sent unless otherwise ordered.

**The Longest Lived Micrometer That Can Be Bought**

## Half Inch Rolling Mill Micrometer Caliper 3 Inch Gap

**Black Enameled Frame**



**Plain — Graduated to Read Thousandths**

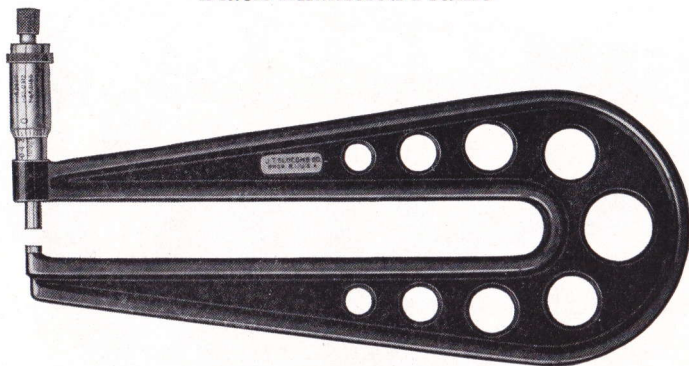
This Caliper measures from 0 to  $\frac{1}{2}$  inch or from 0 to 13 millimeters and will measure on a sheet 3 inches or to the center of a 6-inch sheet.

Price, either English or Metric Measure.....	\$8.00
With Friction Stop.....	8.50
Price with Lock Nut.....	9.00
Graduated .0001, extra.....	1.75

**The Longest Lived Micrometer That Can Be Bought**

## Rolling Mill Micrometer Caliper 6 Inch Gap

**Black Enameled Frame**



### Plain — Graduated to Read Thousandths

This Caliper will measure on a sheet 6 inches (150 mm.) or to the center of a 12-inch (300 mm.) sheet.

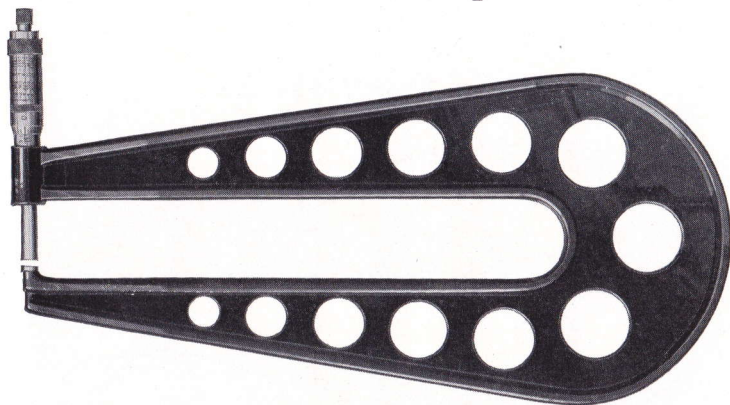
**Price, either English or Metric Measure, with Friction  
Stop as illustrated**

English	Metric	
0- $\frac{1}{2}$ inch	0-13 mm.....	\$11.00
0-1 inch	0-25 mm.....	12.00
Price with Lock Nut, extra.....		1.00
Graduated .0001, extra.....		1.75
Direct Reading Feature (see page 27) supplied on 0-1 inch micrometer only. Price, extra.....		10.00

**The Longest Lived Micrometer That Can Be Bought**



## Rolling Mill or Stereotyper's Micrometer Caliper



### With Friction Stop — As Illustrated

This Caliper will measure on a sheet 9 inches (225 mm.) or to the center of an 18-inch (450 mm.) sheet.

It is provided with our friction stop which serves the purpose of a speeder for the screw as well as guardian against springing the frame by applying too much pressure to the thimble.

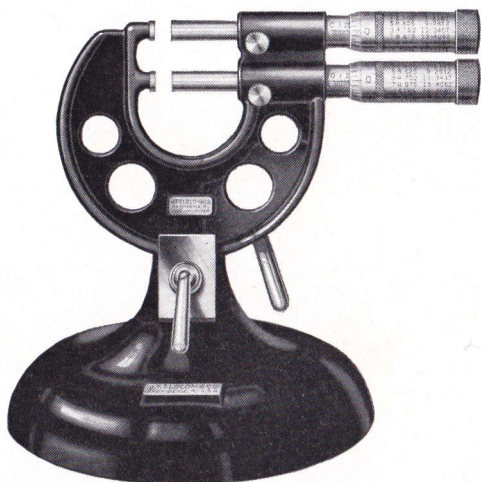
The anvil is made flat for measuring plates or rounded for use in measuring the curved stereotype plates. The micrometer adjustment is the same as used in all Slocomb Micrometers.

#### Price with Friction Stop and with Either Flat or Rounded Anvil

English	Metric	
0-1 inch	0-25 mm.....	\$13.00
1-2 inch	25-50 mm.....	16.50
2-3 inch	50-75 mm.....	20.00
Lock Nut, extra.....		1.00
Direct Reading Feature (see page 27) can be supplied		
on English micrometers only. Price, extra per		
tool .....		10.00

**The Longest Lived Micrometer That Can Be Bought**

## Slocomb Snap Gauge Micrometers



Slocomb Snap Gauge Micrometers are particularly adapted for inspection and production work. They will eliminate the necessity of buying a variety of snap gauges. The two screws can be set by standards and locked.

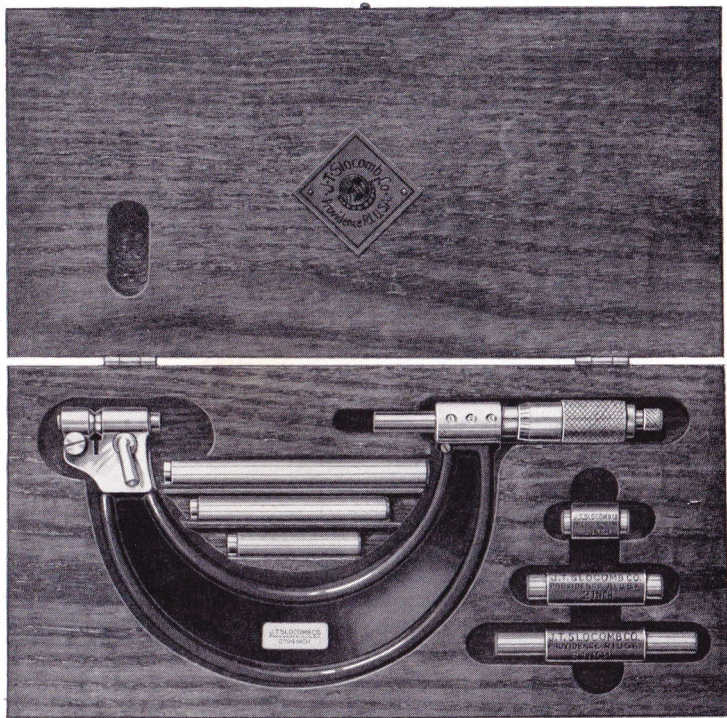
These tools save time in production work—the minimum limit screw can be locked and the other left to revolve freely, thus permitting the operator to measure work as same progresses, eliminating loss of time and guesswork.

Embodied in these tools are all the exclusive Slocomb features—one-piece all tool steel screw with long bearings in its nut, compensating nut, tool steel anvils and the other advantages found exclusively in Slocomb Micrometers.

	English	Metric	
Price, No. 36, Without Stand, 0-1",	0-25 mm.....		\$21.00
Price, No. 37, Without Stand, 1-2",	25-50 mm.....		24.50
Price, No. 38, Without Stand, 2-3",	50-75 mm.....		28.00
Price, No. 39, Without Stand, 3-4",	75-100 mm.....		32.00
Price, No. 40, Without Stand, 4-5",	100-125 mm.....		36.00
Price, No. 41, Without Stand, 5-6",	125-150 mm.....		40.00
Stand .....			5.00

**The Longest Lived Micrometer That Can Be Bought**

## Direct Reading Micrometer No. 45



This Micrometer, with range from 0 to 4" inclusive, is especially designed for automotive repair and regrinding work.

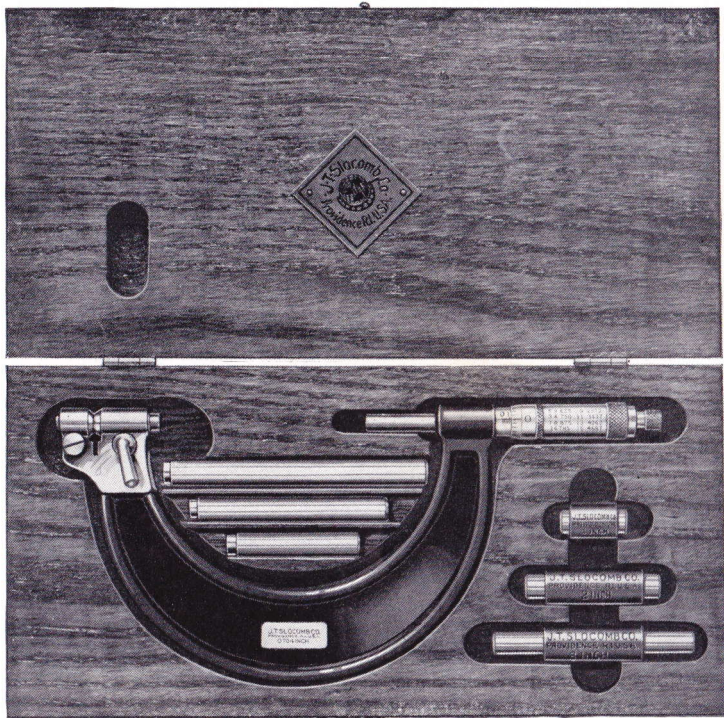
This set consists of one Direct Reading Micrometer, four interchangeable anvils, giving measurements from 0-4", by .001, and three end measures for checking purposes. Furnished in English system only.

**Price complete, with Friction Stop in Hard Wood Case \$32.00**

**The Longest Lived Micrometer That Can Be Bought**



## Micrometer Caliper No. 46



This Micrometer, with range from 0 to 4" or 0-100 mm. inclusive, is especially designed for automotive repair and regrinding work.

This set is like No. 45 on opposite page except that it has an ordinary micrometer head instead of the direct reading feature.

**Price complete, with Friction Stop in Hard Wood Case \$21.25**

**Price complete, with Friction Stop and Lock Nut in  
Hard Wood Case..... 22.25**

**The Longest Lived Micrometer That Can Be Bought**

## Fly Tool Micrometer Caliper No. 50



**Black Enamelled  
Frame**

**Decimal Equivalents  
Stamped on Thimble**

This Micrometer gives correct measurement of fly tool before boring, thus preventing guess-work.

The tool reads direct—i.e., if the fly tool is raised .0005, the bar will bore a hole .001 larger. This is compensated for by having the thimble graduated in thousandths for each .0005.

The use of the Slocomb No. 50 eliminates waste and loss of time by enabling the operator to set the fly tool of a boring bar to a predetermined size.

When ordering, specify the exact diameter of boring bar to be used.

**Price** ..... **\$13.00**

**N. B. Prices for larger sizes quoted on application.**

**The Longest Lived Micrometer That Can Be Bought**



## Direct Reading and Quick Acting Micrometer

**Black  
Enameled  
Frame**

This Caliper has a multiple pitch screw giving a lead of  $\frac{1}{4}$  inch, the complete range of caliper, so one revolution of screw only is used, allowing the graduations to be in one circle on dial. The caliper is held and operates as shown entirely by one hand, leaving the other to handle the work being measured. It measures on a sheet  $2\frac{3}{8}$  inches or to the center of a  $4\frac{1}{4}$  inch sheet. The dial revolves but the pointer and spindle do not.

This Caliper can be fitted with friction thimble so that different people always get the same measurement. This feature is principally valuable when measuring on soft material.

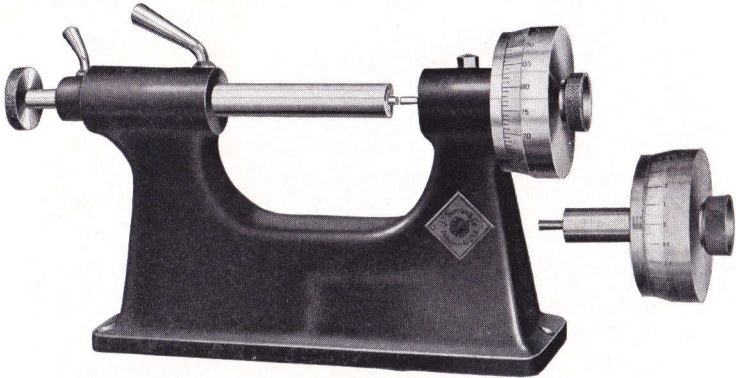
Made with large measuring terminals, it is successfully used in rubber mills for measuring sheet rubber, for accurately measuring the thickness of card clothing, for measuring cloth, paper and with small terminals as a sheet metal gauge.

<b>Price, without Friction Thimble reading to .001 inch</b>	<b>\$20.00</b>
<b>Price, fitted with Measuring Terminals <math>\frac{3}{4}</math> inch diameter for measuring soft material.....</b>	<b>24.00</b>
<b>Price, with Friction Thimble, extra.....</b>	<b>2.00</b>

Made to order for special purposes.



## Six-Inch Bench Micrometer Caliper



### Interchangeable Measuring Heads — As Illustrated

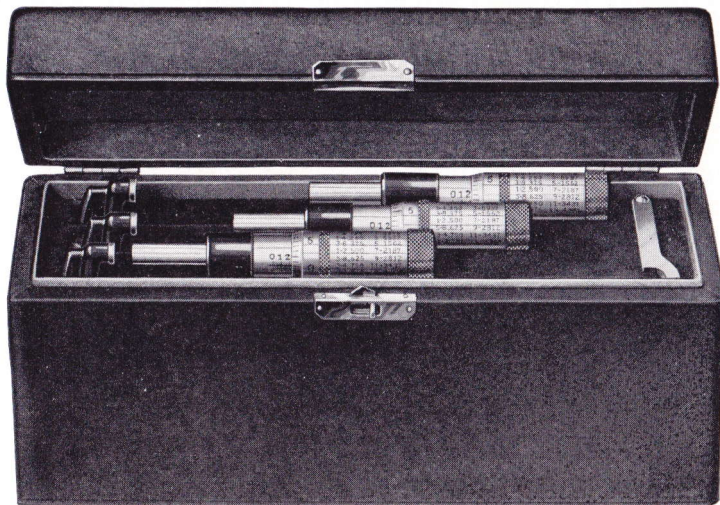
This Micrometer has a range from 0 to 6 inches and is provided with two interchangeable measuring heads. One of these is graduated to read in ten thousandths of an inch direct off the thimble, has a very accurate screw and is suitable for making gauges or in any work where extra fine measurements are required. The other head has a 10 pitch screw, is graduated to measure in thousandths of an inch, and is intended for work where rapid measuring is required to a degree of accuracy of one-quarter of a thousandth.

The thimbles are made of aluminum 4 inches in diameter, making the graduations coarse. The quick acting head is direct reading. The first figure is taken from the sleeve and the rest from thimble. Lines and figures are large so readings can be made two or three feet away. The anvil has two adjustments, first sliding through split clamp in frame, and second by fine screw adjustment through center.

Price, as shown with two heads.....	\$160.00
Price, as shown with one head.....	125.00
Price of heads alone, each.....	50.00
Price of set of end measures 1 to 6 inches inclusive (extra) .....	14.00

**The Longest Lived Micrometer That Can Be Bought**

## Micrometer Set No. 18 — 0 to 3 Inches



The Micrometers are all of our regular style, as shown singly on pages 30 and 31 of this catalog.

Each micrometer is graduated to read to thousandths of an inch, although they can, when so ordered, be graduated to read to ten thousandths of an inch, at an extra list of \$1.75 for each micrometer, or \$5.25 extra per set.

Furnished in a handsome, substantial case, covered with Morocco leather and velvet lined. Dimensions,  $8\frac{3}{4}$  x 3 x  $4\frac{1}{2}$  inches.

Set regularly sent without friction stops unless otherwise ordered.

### Metric Measure

This set is also furnished with micrometers measuring 0 to 75 millimeters by hundredths of a millimeter, at same prices.

Price complete, in Case as shown, without Friction Stops	\$23.00
Price complete, in Case as shown, with Friction Stops	24.50
Price, Case only	2.50
Price, Lock Nuts, extra per tool	1.00
Price, with Tantalum Measuring Terminals, see page 31.	
Tools furnished graduated to read .0005 at No Extra Charge.	
With Direct Reading Feature, see page 27. Price, extra per tool	\$10.00

**The Longest Lived Micrometer That Can Be Bought**



## Micrometer Set No. 21 — 0 to 3 Inches



The cut given gives a very good idea of this set of three micrometers with a range from 0 to 3 inches. All the micrometers are of our regular style, as listed singly on pages 30 and 31.

Each micrometer is graduated to read to thousandths of an inch, although they can be furnished, when desired, graduated to read to ten thousandths of an inch, at an extra list of \$1.75 for each micrometer, or \$5.25 per set.

The micrometers lie flat in a handsome velvet-lined Morocco-covered case. Dimensions,  $9\frac{1}{2}$  x  $6\frac{3}{4}$  x  $1\frac{1}{2}$  inches.

Set furnished, unless otherwise ordered, without friction stops.

### Metric Measure

This set is also furnished with micrometers measuring 0 to 75 millimeters by hundredths of a millimeter, at same prices.

Price complete, in Case as shown, without Friction Stops	\$23.00
Price complete, in Case as shown, with Friction Stops	24.50
Price, Case only	2.50
Price, Lock Nuts, extra per tool	1.00
Tools graduated to read .0005 at No Extra Charge.	
Price, with Tantalum Measuring Terminals, see page 31.	
Price, with Direct Reading Feature, see page 27; extra per tool	10.00



## Micrometer Set No. 23 — 0 to 4 Inches



Each micrometer is graduated to read to thousandths of an inch, although they can, when so ordered, be graduated to ten thousandths of an inch, at an extra list of \$1.75 for each micrometer, or \$7.00 per set. Furnished in a handsome, substantial case, covered with Morocco leather and velvet lined.

Set regularly sent without Friction Stops and Lock Nuts.

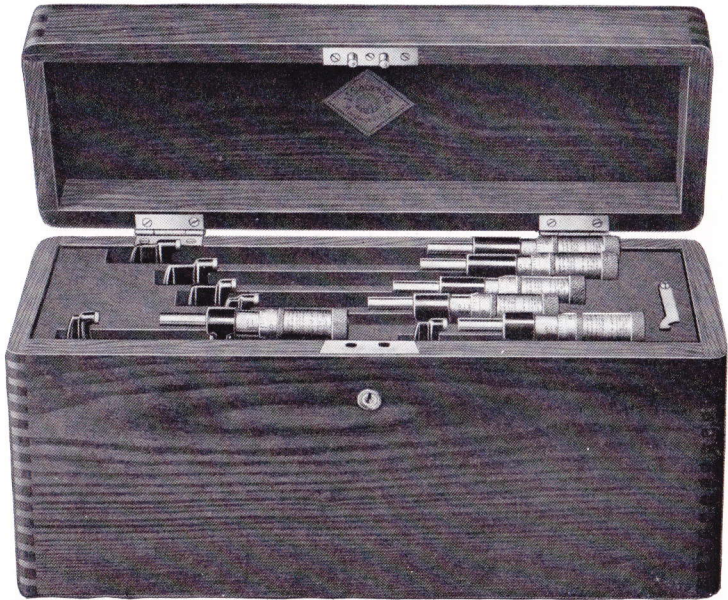
### Metric Measure

This set is also furnished with micrometers measuring 0 to 100 millimeters by hundredths of a millimeter, at same prices.

Price complete, in Case as shown, without Friction Stops	\$33.25
Price complete, in Case as shown, with Friction Stops.....	35.25
Price, Case only.....	4.00
Price, Lock Nuts, extra per tool.....	1.00
Tools graduated to read .0005 at No Extra Charge.	
Price, with Tantalum Measuring Terminals, see page 31.	
Price, with Direct Reading Feature, see page 27. Price, extra per tool.....	10.00

**The Longest Lived Micrometer That Can Be Bought**

## Micrometer Set No. 19 — 0 to 6 Inches



This set consists of one each of our regular micrometers, as shown on pages 30 and 31, 1, 2, 3, 4, 5 and 6 inches, and makes an excellent set for inspection or general shop use.

Each micrometer is graduated to read by thousandths of an inch, although they can be furnished, when so desired, graduated to read to ten thousandths of an inch, at an extra list of \$1.75 for each micrometer, or \$10.50 extra per set.

The micrometers are set with the frame down in the case, all being on an even plane at the top of the case. The case itself is of hard wood, beautifully finished, and has lock and key. Dimensions,  $14\frac{1}{4}$  x  $5\frac{1}{4}$  x 7 inches.

The micrometers are regularly furnished without friction stop.

### Metric Measure

This set is also furnished with micrometers measuring 0 to 150 millimeters by hundredths of a millimeter, at same prices.

Price complete, in Case as shown, without Friction Stops \$56.25

Price complete, in Case as shown, with Friction Stops..... 59.25

Price, Case only..... 10.00

Price, Lock Nuts, extra per tool..... 1.00

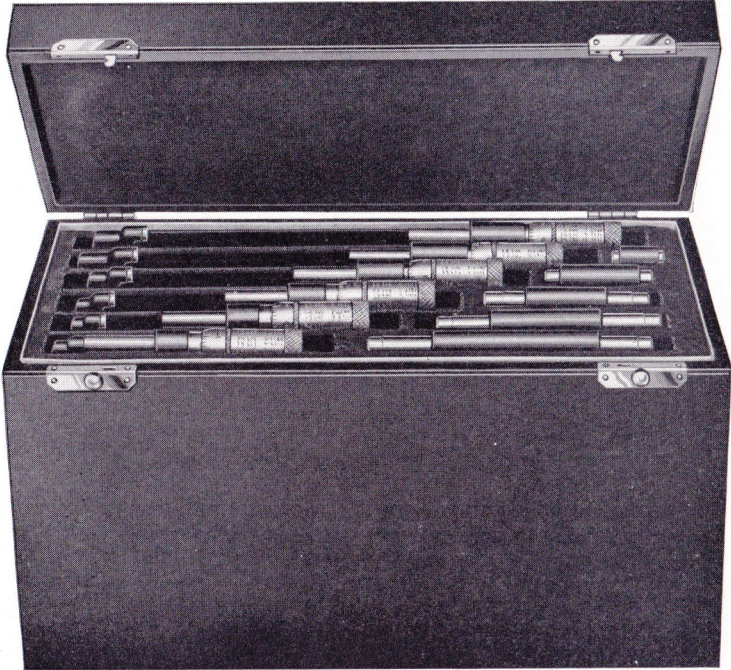
Tools Graduated to read .0005 at No Extra Charge.

Price, with Tantalum Measuring Terminals, see page 31.

Price, with Direct Reading Feature, see page 27. Price,  
extra per tool..... 10.00



## Micrometer Set No. 19A — 0 to 6 Inches With 5 End Measures, in Morocco Case



This set consists of one each of our regular micrometers, as shown on pages 30 and 31, 1, 2, 3, 4, 5 and 6 inches, and makes an excellent set for inspection or general shop use.

Each micrometer is graduated to read by thousandths of an inch, although they can be furnished, when so desired, graduated to read to ten thousandths of an inch, at an extra list of \$1.75 for each micrometer, or \$10.50 extra per set.

**Price, complete in Case**

Without Friction Stops .....	\$63.75
With Friction Stops in Case .....	66.75
Price, Lock Nuts, extra per tool .....	1.00
Tools Graduated to read .0005 at No Extra Charge.	
Price, with Tantalum Measuring Terminals, see page 31.	
Price, with Direct Reading Feature, see page 27. Extra per tool .....	10.00



## Micrometer Set No. 22 — 0 to 12 Inches



This set consists of 12 micrometers, 1 inch to 12 inches, each with a range of one inch, as shown on pages 30 and 31 Standard End Measure Rods by one inch steps from 1 inch to 11 inches inclusive, and a substantial and beautifully finished hard wood case.

Each micrometer is graduated to read in thousandths of an inch. The end measure rods are contained in a separate case as shown at the front in the illustration. This small case fits in the large slot in the front of the main case. The dimensions of the main case are  $20\frac{1}{2}$  x  $13\frac{1}{4}$  x 11 inches. Case is provided with good lock and closes tightly, keeping the set of instruments from dust and dirt. Unless otherwise ordered, micrometers are furnished without friction stops.

### Metric Measure

This set is also furnished with micrometers measuring 0 to 300 millimeters by hundredths of a millimeter, at same prices.

**Price complete, in Case as shown, without Friction Stops** \$164.00

**Price complete, in Case as shown, with Friction Stops** ..... 170.00

**Price, Case only**..... 20.00

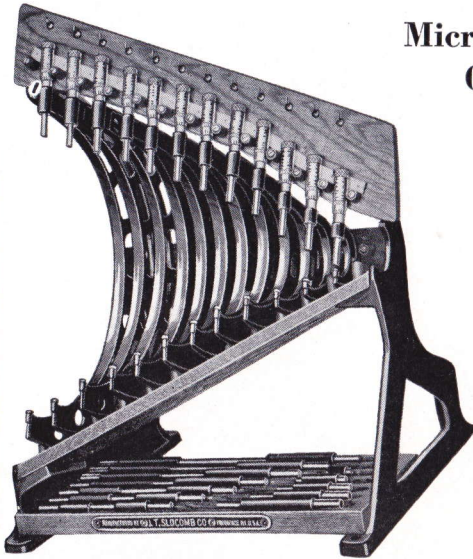
**Price, Lock Nuts, extra per tool**..... 1.00

**Tools Graduated to .0005 at No Extra Charge.**

**Price, with Tantalum Measuring Terminals, see page 31.**

**Price, with Direct Reading Feature, see page 27. Price, extra per tool** ..... 10.00

## Micrometer Set No. 20 0 to 12 Inches



**Black Enameled  
Frames**

**Decimal Equivalents  
Stamped on Thimbles**

**Furnished in Rack  
As Illustrated**

This set consists of twelve micrometers, one each 1 inch to 12 inches, giving a range from 0 to 12 inches inclusive, as shown on pages 30 and 31, and is a very serviceable set for tool room or general shop use.

Each micrometer is graduated to read in thousandths of an inch.

The rack is made with cast iron ends, black enameled finish with oak slats. The partitions are rubber buttons which keep the tools separated, and yet are not injurious to them. Hooks are provided above each tool for workman's check.

The lower oak slat is grooved, and contains set of 11 end measures from 1 to 11 inches inclusive.

The rack is 21½ inches high with a base dimension of 15¾ x 13 inches. Your tool room is not complete without this set.

Micrometers are furnished, unless otherwise ordered, without friction stop.

### Metric Measure

This set is also furnished with micrometers measuring 0 to 300 millimeters by hundredths of a millimeter, at same prices.

**Price complete, in Rack as shown, without Friction Stops \$164.00**

**Price complete, in Rack as shown, with Friction Stops..... 170.00**

**Price, Rack only..... 9.50**

**Price, Lock Nuts, extra per tool..... 1.00**

**Tools Graduated to read .0005 at No Extra Charge.**

**Price, with Tantalum Measuring Terminals, see page 31.**

**Price, with Direct Reading Feature, see page 27. Price,  
extra per tool..... 10.00**

**The Longest Lived Micrometer That Can Be Bought**



## Micrometer Set No. 24 12 to 18 Inches

**Black Enameled  
Frames**

**Decimal Equivalents  
Stamped on Thimbles**

**Furnished in Rack  
As Illustrated**

This set consists of six micrometers and six end measures measuring from 12 to 18 inches inclusive as listed on page 31.

Each micrometer is graduated to read in thousandths of an inch.

The rack is made with black enameled cast iron sides with oak slats and rubber button partitions. Hook above each tool for workman's check.

End measures are kept on lower slat, which is grooved for the purpose.

The rack is 27½ inches high, and has base dimensions of 19½ x 9½ inches.

Micrometers are furnished without friction stops, unless otherwise ordered. This set starts at 12 inches where the No. 20 set ends.

### Metric Measure

This set is also furnished when so desired with micrometers measuring 300 to 450 millimeters by hundredths of a millimeter, at same prices.

**Price complete, in Rack as shown, without Friction Stops \$160.00**

**Price complete, in Rack as shown, with Friction Stops..... 163.00**

**Price, Rack only ..... 16.00**

**Price, Lock Nuts, extra per tool..... 1.00**

**Tools graduated to read .0005 at No Extra Charge.**

**Price, with Tantalum Measuring Terminals, see page 31.**

**Price, with Direct Reading Feature, see page 27.**

**Price, extra per tool..... 10.00**

**The Longest Lived Micrometer That Can Be Bought**





## Micrometer Set No. 26 18 to 24 Inches

**Black Enameled  
Frames**

**Decimal Equivalents  
Stamped on Thimbles**

**Furnished in Rack  
As Illustrated**

This set consists of six micrometers and six end measures measuring from 18 to 24 inches as listed on page 31.

Each micrometer is graduated to read in thousandths of an inch.

The rack is made with black enameled cast iron sides with oak slats and rubber partitions. Hook above each tool for workman's check.

End measures are kept on lower slat, which is grooved for this purpose.

The rack is 33½ inches high and has base dimensions of 11½ x 26 inches.

Micrometers are furnished without friction stops unless otherwise ordered. This set starts at 18 inches where the No. 24 set ends.

### Metric Measure

This set is also furnished when so desired with micrometers measuring 450 to 600 millimeters by hundredths of a millimeter at same prices.

Price complete, in Rack as shown, without Friction Stops	\$260.00
Price complete, in Rack as shown, with Friction Stops.....	263.00
Price, Rack only .....	16.00
Price, Lock Nuts, extra per tool.....	1.00
Tools graduated to read .0005 at No Extra Charge.	
Price, with Tantalum Measuring Terminals, see page 31.	
Price, with Direct Reading Feature, see page 27.	
Price, extra per tool .....	10.00

**The Longest Lived Micrometer That Can Be Bought**



## Micrometer Set No. 28 12 to 24 Inches

**Black Enameled  
Frames**

**Decimal Equivalents  
Stamped on Thimbles**

**Furnished in Rack  
As Illustrated**

This set consists of twelve micrometers and twelve end measures from 12 to 24 inches inclusive, all furnished in one rack. This set in connection with Set No. 20 listed on page 53 gives a range 0 to 24 inches.

Each micrometer is graduated to read in thousandths of an inch.

The rack is made with black enameled cast iron sides with oak slats and rubber partitions. Hook above each tool for workman's check.

End measures are kept on lower slat, which is grooved for the purpose.

This rack is 33½ inches high and has base dimensions of 17½ x 26 inches.

Micrometers are furnished without friction stops unless otherwise ordered. This set starts at 12 inches where the No. 20 set ends.

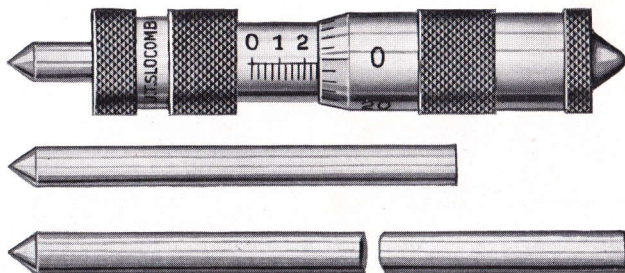
### Metric Measure

This set is also furnished when so desired with micrometers measuring 300 to 600 millimeters by hundredths of a millimeter at same prices.

<b>Price complete, in Rack as shown, without Friction Stops</b>	<b>\$410.00</b>
<b>Price complete, in Rack as shown, with Friction Stops</b>	<b>416.00</b>
<b>Price, Rack only</b>	<b>20.00</b>
<b>Price, Lock Nuts, extra per tool</b>	<b>1.00</b>
<b>Tools graduated to read .0005 at No Extra Charge.</b>	
<b>Price, with Tantalum Measuring Terminals, see page 31.</b>	
<b>Price, with Direct Reading Feature, see page 27.</b>	
<b>Price, extra per tool</b>	<b>10.00</b>

**The Longest Lived Micrometer That Can Be Bought**

## Inside Micrometer Gauge No. 11



This Caliper is intended to measure inside diameters above  $2\frac{1}{2}$  inches. The micrometer screw has a range of  $\frac{1}{4}$  inch and is graduated to thousandths of an inch. The four extension rods that accompany this caliper are  $\frac{5}{32}$  inch diameter and are held by split clamp chuck in any desired position. These rods are not graduated, the caliper being intended for comparisons for making small allowances in making fits, etc. The rods furnished measure to 9 inches. Furnished in English System only.

Price, complete as illustrated..... \$2.25

## Micrometer Gauge Extension Nos. 1 and 2



These extensions are for use in connection with our inside micrometers and combination gauges, and are made so as to screw on to the end of the micrometer. For lengths greater than 9 inches they are much better than long rods.

They can be made of any length, but for the matter of convenience we list two lengths which we carry in stock. Any others we can furnish at special prices when desired.

A long rod is furnished with each extension tube which will run through the micrometer and also the extension tube as far as the pointed tip.

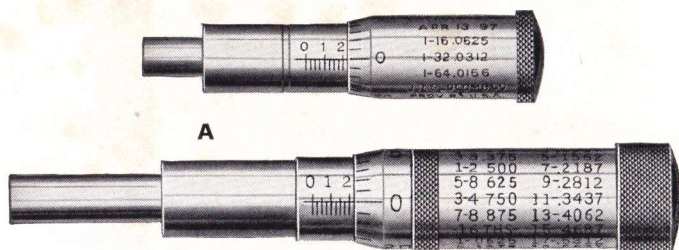
**No. 1. Extension is  $6\frac{1}{2}$  inches long, and in use with micrometer will measure from 9 to  $16\frac{1}{2}$  inches.**  
 Extension complete, with steel tip and rod..... \$1.25

**No. 2. Extension is 14 inches long, and in use with micrometer measures from  $16\frac{1}{2}$  to 32 inches.**  
 Extension complete, with steel tip and rod..... 1.50



## Micrometer Heads No. 32

### Plain — Graduated to Read to Thousandths



These Micrometer heads are useful for purposes of fine adjustments in tools or machines. They are intended to be fastened by sweating in with soft solder or split clamp. We carry in stock heads as shown in the illustrations.

The diameter *A* on the  $\frac{1}{2}$  inch head is  $\frac{3}{8}$  inch and the length is  $\frac{1}{2}$  inch. The diameter *A* on the 1 inch head is  $\frac{7}{8}$  inch and the length is  $\frac{3}{4}$  inch.

As the adjusting screw in our micrometer, for wear on end of screw and anvil, is inside the thimble, our micrometer heads are complete with adjustments, making them especially suited for such a purpose.

These heads have a range of  $\frac{1}{2}$  inch and 1 inch and are regularly graduated to read to thousandths of an inch, but, when desired, the 1 inch head can be furnished graduated to read to ten thousandths of an inch.

Either head can be furnished with friction stop.

### Metric Measure

When desired, we can furnish at same prices these micrometer heads graduated in size to read in hundredths of a millimeter. They have a range in metric sizes of 13 and 25 millimeters respectively.

	English	Metric	
No. 32A.	Without Friction Stop, 0 to $\frac{1}{2}$ inch,	0 to 13 mm.....	\$4.00
No. 32B.	With Friction Stop, 0 to $\frac{1}{2}$ inch,	0 to 13 mm.....	4.50
No. 32C.	Without Friction Stop, 0 to 1 inch,	0 to 25 mm.....	5.00
No. 32D.	With Friction Stop, 0 to 1 inch,	0 to 25 mm.....	5.50

N. B. 1 inch Heads furnished with Clamp Screw when desired at No Extra Charge.

Heads Furnished Graduated to .0005 at No Extra Charge.

Heads Furnished Graduated to .0001, Extra per Head \$1.75.

Micrometer Heads for English measurements sent unless otherwise ordered.

**The Longest Lived Micrometer That Can Be Bought**

## Inside Micrometers Nos. 15, 16, 17



### Decimal Equivalents Stamped on Thimble

This micrometer comes in ten sizes, giving measurements as listed below. These inside micrometers have the exclusive Slocomb features as embodied in the outside micrometers. Furnished with Lock Nut as shown.

### Prices

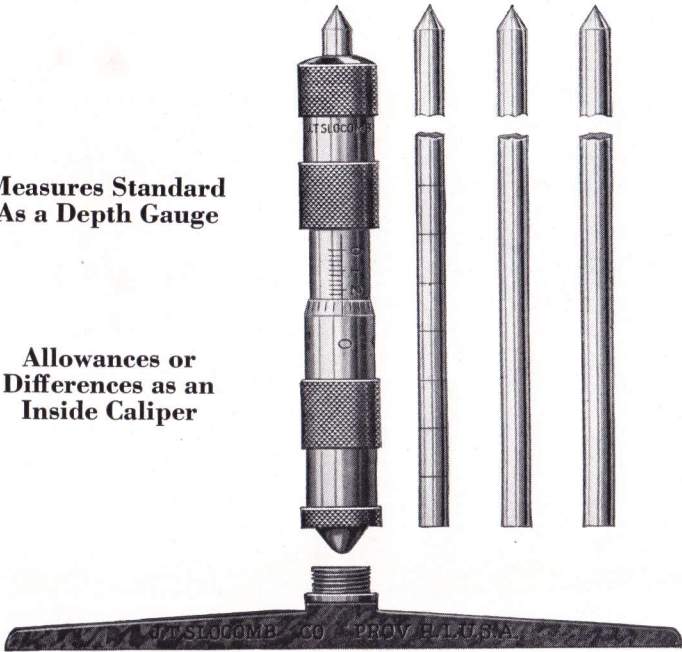
Range English Measure	Price Each	Range Metric Measure	Price Each
3 - 3½ inches .....	<b>\$7.00</b>	75- 88 mm. ....	<b>\$7.00</b>
3½- 4 inches .....	<b>7.00</b>	88-100 mm. ....	<b>7.00</b>
4 - 5 inches .....	<b>7.00</b>	100-125 mm. ....	<b>7.00</b>
5 - 6 inches .....	<b>7.50</b>	125-150 mm. ....	<b>7.50</b>
6 - 7 inches .....	<b>7.50</b>	150-175 mm. ....	<b>7.50</b>
7 - 8 inches .....	<b>7.50</b>	175-200 mm. ....	<b>7.50</b>
8 - 9 inches .....	<b>7.50</b>	200-225 mm. ....	<b>7.50</b>
9 -10 inches .....	<b>7.50</b>	225-250 mm. ....	<b>7.50</b>
10 -11 inches .....	<b>8.00</b>	250-275 mm. ....	<b>8.00</b>
11 -12 inches .....	<b>8.00</b>	275-300 mm. ....	<b>8.00</b>

**The Longest Lived Micrometer That Can Be Bought**

## Combination Micrometer Gauge No. 12

Measures Standard  
As a Depth Gauge

Allowsances or  
Differences as an  
Inside Caliper



The micrometer body and three plain rods are the same as in our Inside Micrometer Gauge, but the fourth rod is graduated, as shown, in  $\frac{1}{4}$  inch divisions for use with the depth gauge attachment. It measures standard as a depth gauge, but only allowances or differences as an inside Caliper. The tip shown at lower end of caliper screws out and the depth gauge base screws in its place. Then by pushing the rod down through this base the depth gauge is made.

**No. 12 Combination Micrometer Gauge with Micrometer body, base, three plain rods, 2, 3 $\frac{1}{2}$ , and 5 inches long, and one rod 6 $\frac{1}{2}$  inches long graduated to  $\frac{1}{4}$  inch for 4 inches for Depth Gauge complete** .....

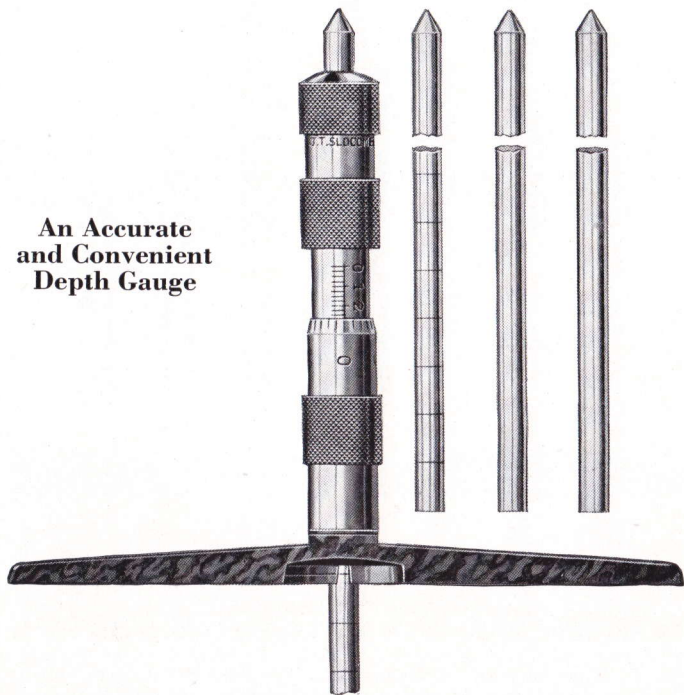
.....	\$3.25
Above, complete in Morocco case.....	4.25
Rod graduated to 6 inches for Depth Gauge.....	1.25
Rod graduated to 12 inches for Depth Gauge.....	2.00

**The Longest Lived Micrometer That Can Be Bought**



## Combination Micrometer Gauge No. 13

**An Accurate  
and Convenient  
Depth Gauge**



This tool differs from Combination Micrometer Gauge No. 12 only in the graduated rod and line in base to match, the object being to produce most particularly an accurate and convenient depth gauge.

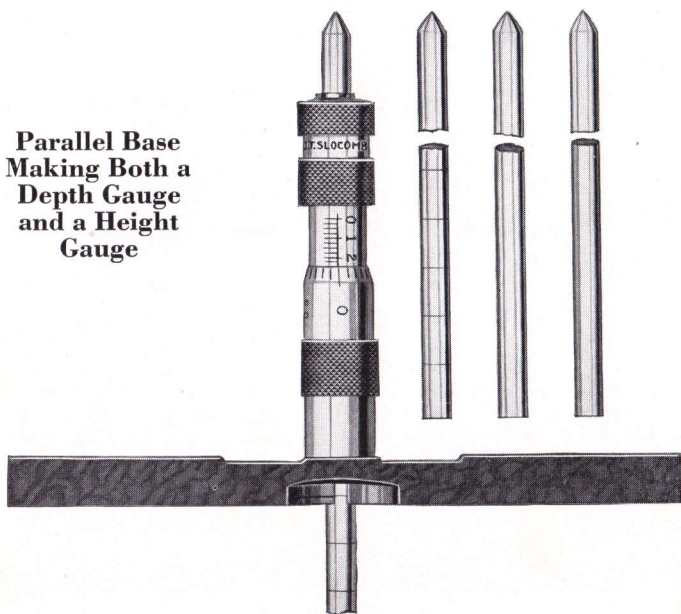
The graduated rod has lines running completely around. It must be fitted to the base in which it is used.

<b>No. 13. Combination Micrometer Gauge with Micrometer body, base, three plain rods, 2, 3½, and 5 inches long, and one graduated as described above for 4 inch Depth Gauge. Complete.....</b>	<b>\$4.50</b>
<b>Above, complete in Morocco case.....</b>	<b>5.50</b>
<b>Rod for 6 inch Depth Gauge, graduated as above.....</b>	<b>1.25</b>
<b>Rod for 12 inch Depth Gauge, graduated as above.....</b>	<b>2.00</b>

**The Longest Lived Micrometer That Can Be Bought**

## Combination Micrometer Gauge No. 14

**Parallel Base  
Making Both a  
Depth Gauge  
and a Height  
Gauge**



This tool differs from Combination Micrometer Gauge, No. 13 only in its parallel base, which allows of its being used inverted, so as to measure standard heights (as well as depths) above  $\frac{1}{4}$  inch which is the thickness of the base. The base is hardened and accurately ground on both top and bottom. This tool will be found of value in adjusting planer tools, as it covers about all the ground of a step-height gauge, also measuring all intermediate sizes by thousandths, and to the length of graduated rod. For use as a height gauge on planer work, the body of micrometer can be dropped through a hole in planer platen, or be allowed to overhang the edge of platen or work. The graduated rod must be fitted to the base in which it is used.

<b>No. 14. Combination Micrometer Gauge with micrometer body, base, three plain rods, 2, <math>3\frac{1}{2}</math>, and 5 inches long, and one rod graduated to <math>\frac{1}{4}</math> inch for 4 inch Depth Gauge. Complete.....</b>	<b>\$5.75</b>
<b>Above, complete in Morocco case.....</b>	<b>6.75</b>
<b>Rod for 6 inch Depth Gauge, graduated.....</b>	<b>1.25</b>
<b>Rod for 12 inch Depth Gauge, graduated.....</b>	<b>2.00</b>

**The Longest Lived Micrometer That Can Be Bought**

## Standard End Measures



These End Measures are particularly designed for testing micrometers and keeping them properly adjusted.

Sizes to 12 inches inclusive are made from tool-steel, .300 diameter, large sizes,  $\frac{7}{16}$  inch diameter. Ends are carefully hardened, ground and lapped to the highest accuracy. To avoid changes in temperature due to handling, the rods are protected by non-heat-conducting covers, as illustrated.

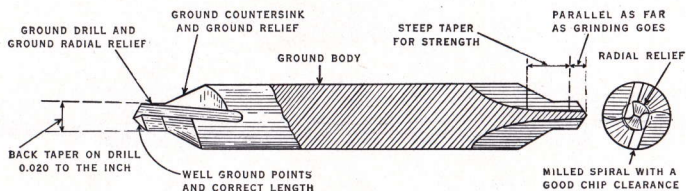
These same end measures are furnished with sets Nos. 19A, 20, 22, 24, 26, and 28, etc.

English Measure	Metric Measure	Price	English Measure	Metric Measure	Price
1 inch	25 mm.	<b>\$1.50</b>	13 inch	325 mm.	<b>\$6.50</b>
2 inch	50 mm.	<b>2.00</b>	14 inch	350 mm.	<b>7.00</b>
3 inch	75 mm.	<b>2.25</b>	15 inch	375 mm.	<b>7.50</b>
4 inch	100 mm.	<b>2.50</b>	16 inch	400 mm.	<b>8.00</b>
5 inch	125 mm.	<b>2.75</b>	17 inch	425 mm.	<b>8.50</b>
6 inch	150 mm.	<b>3.00</b>	18 inch	450 mm.	<b>9.00</b>
7 inch	175 mm.	<b>3.50</b>	19 inch	475 mm.	<b>9.50</b>
8 inch	200 mm.	<b>4.00</b>	20 inch	500 mm.	<b>10.00</b>
9 inch	225 mm.	<b>4.50</b>	21 inch	525 mm.	<b>10.50</b>
10 inch	250 mm.	<b>5.00</b>	22 inch	550 mm.	<b>11.00</b>
11 inch	275 mm.	<b>5.50</b>	23 inch	575 mm.	<b>11.50</b>
12 inch	300 mm.	<b>6.00</b>	24 inch	600 mm.	<b>12.50</b>

N. B. Prices for larger sizes quoted on application.



## The Slocomb Combination Center Drill



Slocomb Combination Center Drills are found the world over doing the work expected of the BEST.

We've been perfecting this tool since 1891; have designed special machinery for its manufacture; have developed new methods for heat-treating and have inaugurated many practical features that add to its usefulness.

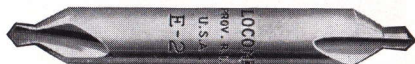
### Accuracy

Slocomb Combination Center Drills are supplied in  $\frac{1}{8}$  to  $\frac{3}{4}$  inch sizes (diameter of body) and with standard countersink angle of 60 degrees. Special sizes and angles can be supplied to order. Whatever the specifications, the finished drill always conforms to them within the closest limits.

### Economy

Refinements of design indicated in the diagram above result in the economy of production that comes from rapid cutting and accurate centering. Finish grinding of cutting points bodies and countersinks completes the effectiveness of correct design.

## Semi-High and High Speed Steel Combination Center Drills



Size	DIMENSIONS—INCHES			PRICE PER DOZ.	
	Dia. Body	Dia. Drill	Length Overall	Semi H. S. Steel	H. S. Steel
A-1	$\frac{1}{8}$	$\frac{3}{64}$	$1\frac{1}{4}$	<b>\$2.50</b>	<b>\$8.00</b>
C-2	$\frac{13}{64}$	$\frac{1}{16}$	$1\frac{7}{8}$	<b>3.00</b>	<b>8.00</b>
D-1	$\frac{15}{64}$	$\frac{5}{64}$	2	<b>3.25</b>	<b>8.00</b>
E-1	$\frac{3}{10}$	$\frac{3}{32}$	$2\frac{1}{8}$	<b>3.50</b>	<b>8.00</b>
E-2	$\frac{3}{10}$	$\frac{1}{8}$	$2\frac{1}{8}$	<b>3.50</b>	<b>8.00</b>
F-1	$\frac{7}{16}$	$\frac{5}{32}$	$2\frac{3}{4}$	<b>4.50</b>	<b>12.00</b>
F-2	$\frac{7}{16}$	$\frac{3}{16}$	$2\frac{3}{4}$	<b>4.50</b>	<b>12.00</b>
J-1	$\frac{1}{2}$	$\frac{7}{32}$	3	<b>5.75</b>	<b>18.00</b>
J-2	$\frac{1}{2}$	$\frac{9}{32}$	3	<b>5.75</b>	<b>18.00</b>
M-1	$\frac{5}{8}$	$\frac{7}{32}$	$3\frac{1}{4}$	<b>9.00</b>	<b>24.00</b>
M-2	$\frac{5}{8}$	$\frac{9}{32}$	$3\frac{1}{4}$	<b>9.00</b>	<b>24.00</b>
N-1	$\frac{3}{4}$	$\frac{1}{4}$	$3\frac{1}{2}$	<b>11.75</b>	<b>32.00</b>
N-2	$\frac{3}{4}$	$\frac{5}{16}$	$3\frac{1}{2}$	<b>11.75</b>	<b>32.00</b>

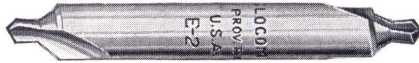
## CENTER DRILLS



Dia.	Length Over-all	Length of Flute	Price Semi H. S. Steel	Price High Speed Steel
$\frac{1}{8}$	$1\frac{1}{4}$	$\frac{3}{4}$	<b>\$1.80 Doz.</b>	<b>\$3.60 Doz.</b>
$\frac{5}{32}$	$1\frac{1}{2}$	1	<b>1.90 "</b>	<b>4.20 "</b>
$\frac{3}{16}$	$1\frac{1}{2}$	1	<b>2.25 "</b>	<b>4.85 "</b>
$\frac{7}{32}$	$1\frac{1}{2}$	1	<b>2.75 "</b>	<b>5.75 "</b>
$\frac{15}{64}$	$1\frac{1}{2}$	1	<b>3.00 "</b>	<b>6.25 "</b>
$\frac{1}{4}$	$1\frac{1}{2}$	1	<b>3.25 "</b>	<b>6.75 "</b>
$\frac{5}{16}$	$1\frac{1}{2}$	1	<b>4.35 "</b>	<b>9.00 "</b>
$\frac{3}{8}$	2	1	<b>6.00 "</b>	<b>9.65 "</b>
$\frac{7}{16}$	2	1	<b>8.50 "</b>	<b>12.80 "</b>
$\frac{1}{2}$	2	1	<b>12.00 "</b>	<b>16.20 "</b>
$\frac{5}{8}$	$2\frac{1}{4}$	$1\frac{1}{8}$	<b>1.05 Each</b>	<b>2.85 Each</b>
$\frac{3}{4}$	$2\frac{1}{4}$	$1\frac{1}{8}$	<b>1.25 "</b>	<b>3.95 "</b>
$\frac{7}{8}$	$2\frac{1}{2}$	$1\frac{1}{4}$	<b>1.60 "</b>	<b>4.70 "</b>
1	$2\frac{1}{2}$	$1\frac{1}{4}$	<b>2.15 "</b>	<b>6.30 "</b>



## Bell Type Center Drill



This bell type is a safety combination center drill, with a double angle countersink, designed to reduce the danger of chatter or eccentric work, caused by bruising the edge of the centered hole.

The outer angle serves two purposes. First, it squares the stock at the end of the centered hole. Second, it provides a protecting shoulder to the center bearing surface, thus insuring an accurate bearing for the lathe centers.

This type is very desirable in production plants because of this feature of safety.

They are also particularly adapted for the making of mandrels and arbors, or any work where an accurate and permanent center is desired.

List prices and sizes are the same as the regular type.



## Machinists' Sets Semi-High Speed Steel Combination Center Drills

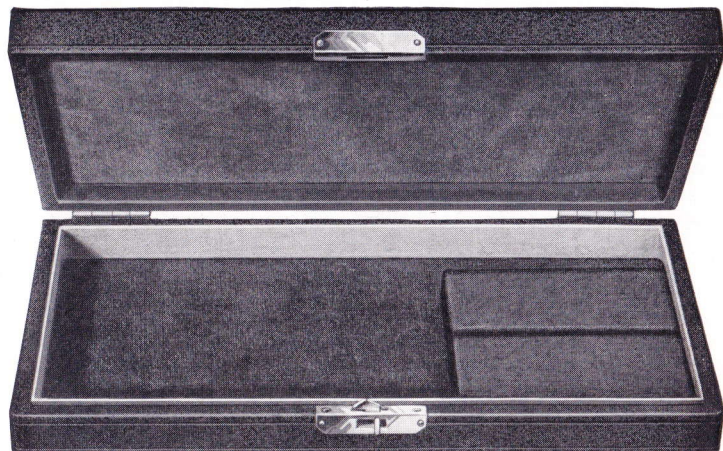


This Center Drill set as illustrated above comprises one drill each, A1, C2, D1, E1, E2, F, and F2, all combined in a neat and substantial wood box with close fitting cover. This is a valuable set for a Machinist's or Toolmaker's individual kit.

Price, complete as illustrated ..... \$2.80

Price, High Speed Steel ..... 6.45

## Morocco Cases

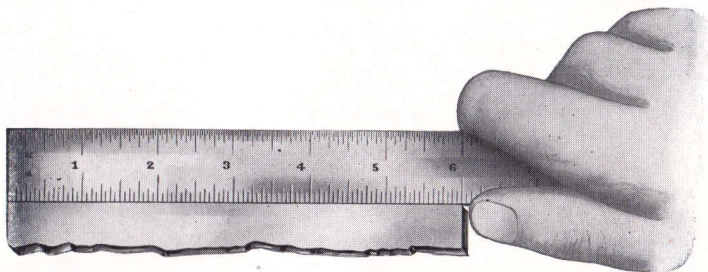


These cases are genuine Morocco covered, lined with velvet and made for service. They are intended to contain single micrometers from 1 inch to 6 inches.

<b>No. 61.</b>	<b>For 1 inch Micrometers.....</b>	<b>\$1.00</b>
<b>No. 62.</b>	<b>For 2 inch Micrometers.....</b>	<b>1.25</b>
<b>No. 63.</b>	<b>For 3 inch Micrometers.....</b>	<b>1.50</b>
<b>No. 64.</b>	<b>For 4 inch Micrometers.....</b>	<b>2.25</b>
<b>No. 65.</b>	<b>For 5 inch Micrometers.....</b>	<b>2.50</b>
<b>No. 66.</b>	<b>For 6 inch Micrometers.....</b>	<b>3.00</b>

# **J. T. SLOCOMB CO.**

## **MEASURING BOOK**



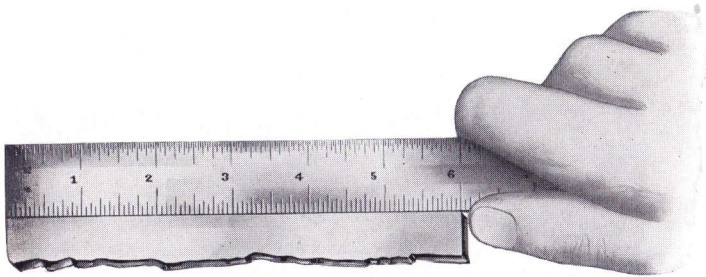
**With Suggestions in Regard to Accurate  
and Economical Measuring in  
Machine Construction  
by the use of**

**Micrometer Calipers**



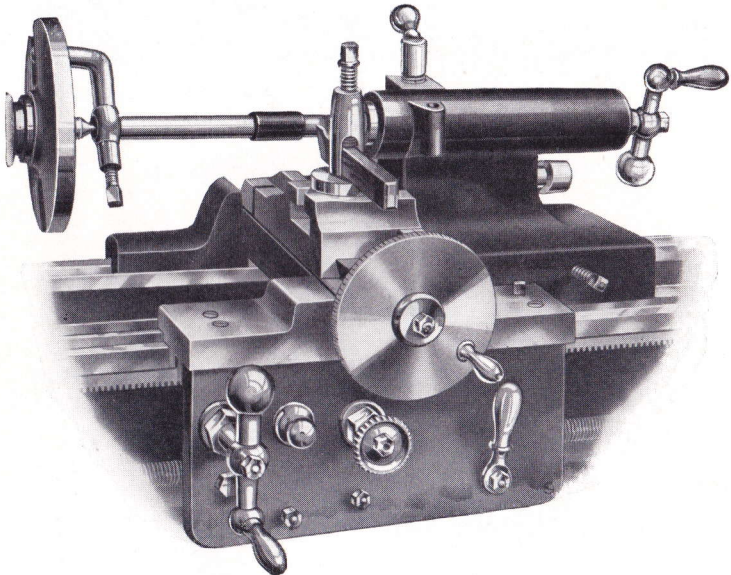
**J. T. SLOCOMB CO., PROVIDENCE, R. I.**





### Using a Common Rule

In measuring with an ordinary rule as shown above we not only know that the piece measured is the size wanted, but can know how much larger or smaller. When the machinists' trade was in its infancy, such measuring was in common use, but it did not prove fine enough for a large part of the work; consequently, the solid gauge or ordinary caliper was adopted.



Graduated Dial Lathe Cross Screw

This solid gauge provided a means of gauging more accurately than the common rule, but it lost entirely the feature of *measuring*; that is, the workman has no way with the solid gauge of knowing how near he is to the size, until the exact size is reached. This difficulty led to the adoption of the limit gauge. A limit gauge, as commonly made, has two sizes, one marked "To go on," the other marked "Not to go on," so that somewhere between these two sizes is the size required. This is much better than the single gauge, but it is a very incomprehensive way of measuring; besides where these limit gauges are carried out to fill all requirements, the system is very complicated, as it requires thousandths of such gauges, and such a complete set is very expensive. What the machinists require is a rule that can be used practically the same as the common graduated rule that will show when the exact size is reached, and also how near at any stage of the work, and show this in a way that is accurate. Such a tool is found in the micrometer caliper. A very common error in using a micrometer is in setting it to some particular size and locking the spindle fast, then using it like a snap gauge. In such a way it is only a solid gauge, and loses, practically, all its valuable features. The way to properly use a micrometer is to first become familiar with its reading so the exact size can be read quickly; then in every case measure the work with it, that is, whatever the work is, screw the caliper down to it and take its reading.

## Graduated Dial on Lathe Cross Screw

To make the best use of micrometers, all the adjusting screws on machines should be provided with graduated dials reading in thousandths. The illustration on page 70 shows the dial we use on small lathes. The quill is turned up straight for about  $1\frac{1}{4}$  inch, and the pointer is mounted on this by split clamp, so it can be moved to make the zeros coincide when desirable. Usually we do not move this pointer, but make calculation between graduations. It is not necessary that the screw be absolutely accurate to pitch, as the adjustments necessarily made by this dial are small, so a slight error is not harmful; also backlash in screw is not fatal, as this can be taken up before reading is started on dial. To turn to an accurate size, first round up the work, then measure with micrometer, after which make necessary adjustments by dial, being sure to be on safe side. Turn down first to about 5 or 10 thousandths of size. The last 5 thousandths can be adjusted accurately by dial, even if screw is not very accurate. This avoids the common "cut-and-try" method with its consequent loss of time and spoiled work. The thing, of course, required is that the user become accustomed to the dial, so that he makes his calculations quickly and accurately. Besides using to adjust for sizes, this dial is useful for other purposes, as in adjusting lathe for turning tapers, alignment of centers, gauging cuts in cutting screw threads, and many other cases too numerous to mention. For the longitudinal movement we use a micrometer head fitted in a bracket that is clamped on the ways of lathe. This is a most useful tool for adjusting side cuts accurately.

The cuts below illustrate dials used on shaping machines. Fig. 3 and Fig. 4 are of dial used on table feed screws. This is simply a cast iron disc with plain bore and split as indicated, so that it makes a spring fit on hub. In this case we use a stationary pointer, and turn dial to make zeros coincide. This is a cheap and handy dial. On the vertical feed screw, the dial is fitted on a taper quill, the pointer being stationary, and dial is moved by raising it slightly off its seat, and dropping it back again when the zeros coincide. The pointer used is simply a tap screw, with one side of head flattened off to correspond with angle edge of dial, with straight line cut across to match with lines on dial.

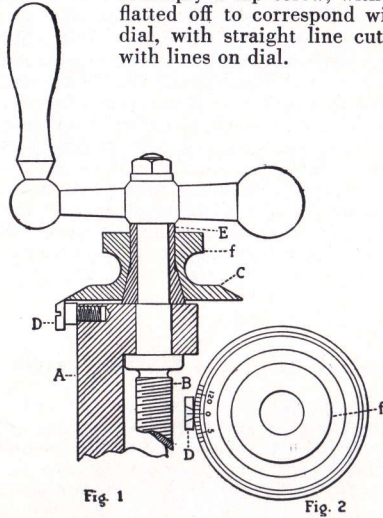


Fig. 1

Fig. 2

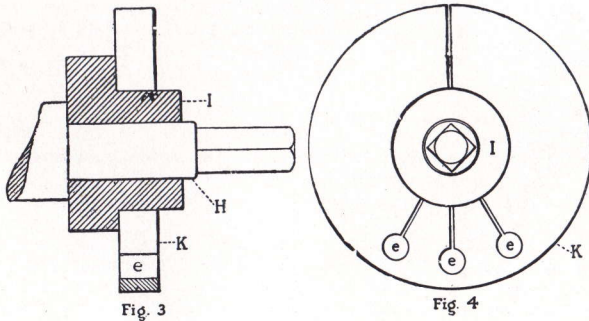


Fig. 3

Fig. 4

### Dials Used on Shaper



These dials we have used for many years. Our men have become used to them and they have proved great time savers. We find the following article in the *American Machinist* of January 28, 1915, and have its permission to use it here:—

If dials on the cross-feeds were graduated to read the diameters of the piece in the lathe instead of being graduated to indicate the amount the tool is advanced, we would get rid of some of the figuring and would know the diameter by inspection of the dial instead of repeated use of the micrometer. This advantage can be obtained by placing twice as many graduations on the circumference of the dial as there are thousandths of an inch in the lead of the screw and advancing the figures on the dial in a clockwise direction instead of counterclockwise as is now universally done.

### The Dial on a 20-Thread Feed-Screw

A front view of a diameter-measuring dial for a cross-feed left-hand screw having a lead of 0.050 inch is shown in Fig. 1, Page 74. One turn of the screw advances the tool 0.050 inch, representing a change of diameter of 0.100 inch. Thus the dial is divided into 100 parts, each representing 0.100 inch on the diameter.

Place a  $\frac{3}{4}$ -inch bar of steel to be turned to 0.625 inch in a lathe fitted with this dial; take a cut and then measure. The micrometer reads 0.6735 inch. The 0.6 is represented by whole turns of the screw and may be ignored, so the dial is set to 0.0735 inch, as shown in Fig. 2, the exact size the micrometer reads above the tenths and the inch. Advance the tool until the dial reads 0.050 inch and measure the piece with the micrometer. The size is found to be 0.650 inch. We are now sure of our ground and boldly advance the tool until the dial indicates 0.025 inch, as shown in Fig. 3, and cut with that setting. On measuring we find the diameter of the piece to be 0.625 inch, just what the dial indicated. Provided the tool point is level with the center, we can proceed to turn pieces having steps, shoulders, etc., referring only to the drawing and occasionally checking the dial setting for wear of tool or spring of work. The lathe for the time being acts as a micrometer, and we do not have to cover it with memoranda in chalk and keep on checking the figuring to see there is no mistake.

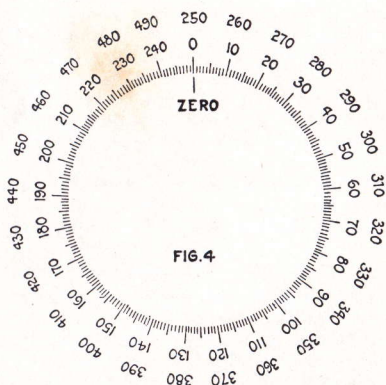
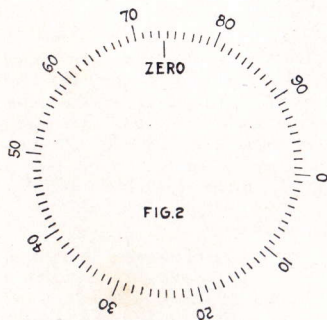
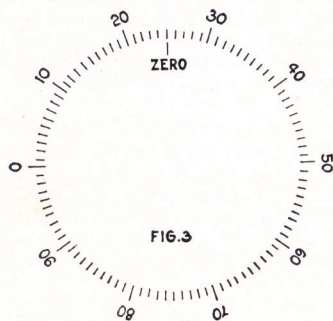
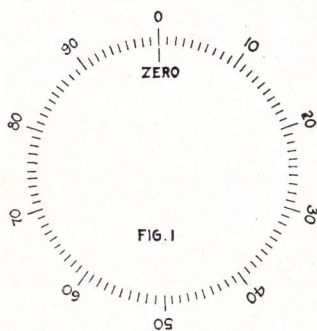
### Applied to Various Lead-Screws

Cross-feed screws having 20 turns to the inch are, of course, limited to small lathes, but the diameter-reading dial can be applied to the larger lathes just as readily if the screws have ten or five turns to the inch. If the cross-feed left-hand screw has a lead of one-tenth inch, the dial will be graduated into 200 parts and numbered (clockwise as before) from 0 to 100 on one half, and this repeated for the other half. If the screw has a lead of  $\frac{1}{5}$  inch, the dial will have 400 divisions and be numbered 0 to 100 four times on the circumference.

### The Dial on an 8-Thread Lead-Screw

Most lathes have cross-feed screws with a lead of  $\frac{1}{8}$  inch, and while the numbering and reading of dials on them is not so convenient as the above, it can be done as shown in Fig. 4. This dial has 250 divisions and is numbered clockwise from 0 to 250 in one turn. The figures are then

carried on from 250 to 500 on another circle more remote from the graduations. In working with such a dial the inches and half inches have to be ignored. For example, I have in the lathe a piece 4 inches in diameter to be turned down to 3.875 inches diameter, tool finish. I take a cut, and on measuring find the size to be 3.913 inches. I ignore the  $3\frac{1}{2}$  inches and set the dial to .413 inches. Turning the cross-feed screw till the dial indicates .375 inches, I take a cut and find the diameter to be 3.875 inches. In this



### Micrometer Dials on Lathes

case I have to subtract 0.500 inch from the size of my micrometer reads and have to keep in mind that the dial does not read the size of my job when the odd half inches have to be taken into account. However, half-inch errors are quickly located; it is the odd thousandths that bother us most.

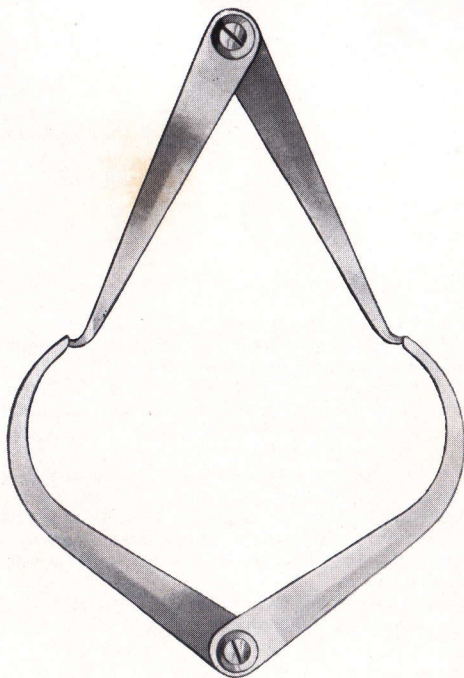
In boring holes, too, this system of dial numbering is just as effective. A trial cut is taken, the hole measured and the dial set to that size. It will be seen that as the tool is fed out and the hole enlarged, the dial continues

to read the size of the hole, thereby eliminating the necessity of readjustment.

Using dials in this way it will be noted that with fine 20 pitch screws, graduations are fewer and coarser and the reading is simplified. Adjusting screws on large machines are made coarse to enable quick traverse in the various manipulations. In connection with this method of tool adjustment we suggest as an improvement in machine tools an extra short screw adjustment in the thrust bearing, giving an advance of .050 per revolution so that quick, long adjustments can be made in the regular way and fine short dial adjustments by the auxiliary screw. This auxiliary screw would then get little wear and would remain accurate for a long time.

### Old-Fashioned Inside and Outside Caliper

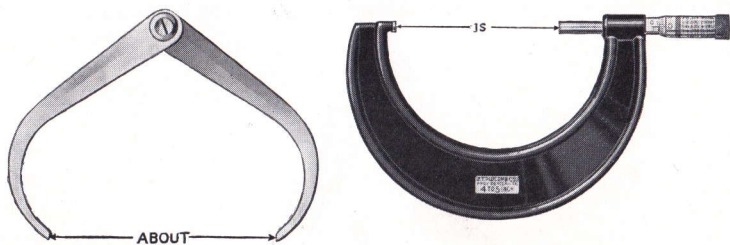
The cut on this page illustrates the fitting together of an old-fashioned inside and outside caliper. Note that the points are small, and on account



Old Calipers



of the different angles of legs, it is impossible to shape these points so that they can have any considerable bearing. To match these calipers together so they will exactly fit is a delicate operation and requires some skill, a good deal of time and lots of patience. In view of the fact that the micrometer caliper can be used so much easier in this operation, this process nowadays seems to be the height of absurdity. Using an outside micrometer with its large parallel measuring surfaces, it is a very easy matter to adjust an ordinary inside caliper to the exact size. All that is required is to hold one point against the anvil of the micrometer, and swing the other leg back and forth, finding the shortest distance. It is often the case that when the points touch, the user would like to know just how hard they touch; that is how much spring there is to the caliper. This is



easily ascertained by turning the micrometer screw back one thousandth or more, and note if the points will touch at all in this position, proving the amount of error in the adjustment of inside caliper.

The difference between "about" and "is" is often the difference between success and failure. The "about" caliper has its use today, but that use is not in finishing work accurately. The shop that persists in such ancient methods today is on the road to failure.

The thousandth part of an inch has been found the most convenient unit for the accurate part of machine work. This unit lends itself readily to most calculations and is much more convenient to use than ordinary fractions. There are many times when micrometer accuracy is not necessary, but when it is found advisable to use the micrometer, the decimal measurements are convenient.

The following illustrations are offered as suggestions as to how micrometers may be used for various kinds of measuring.

Fig. 1 illustrates a part of a machine frame with two bores with fixed center distance  $A$ . A pair of spur gears are required to run in close mesh on these centers and it is required to know if the center distance as bored

is correct. Place two lathe arbors in the bores so that they extend as shown. Then measure across outside with micrometer on line  $B$ , after which subtract from this measurement one-half the diameter of each arbor at the point where measurement is taken for exact center distance. In cutting a pair of gears to run nicely on this center distance, a few teeth only can be cut on each gear as illustrated. Then place the gears together and measure with micrometer over the two gears  $C$  as shown in Fig. 2. Then subtract from this measurement one-half the diameter of each gear blank for exact center distance. Of course a suitable allowance will have to be made for running clearance, but this is easily made with the micrometer.

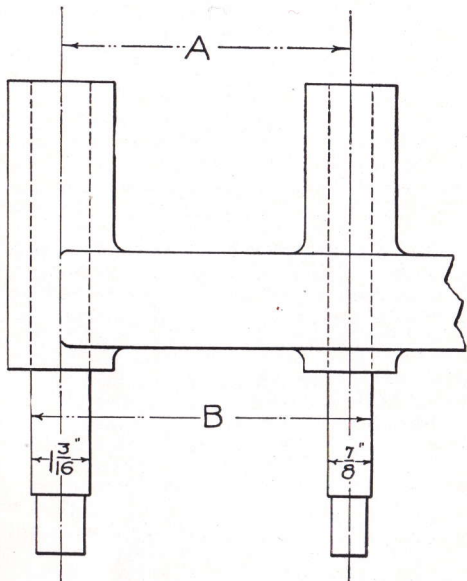


FIG. 1.

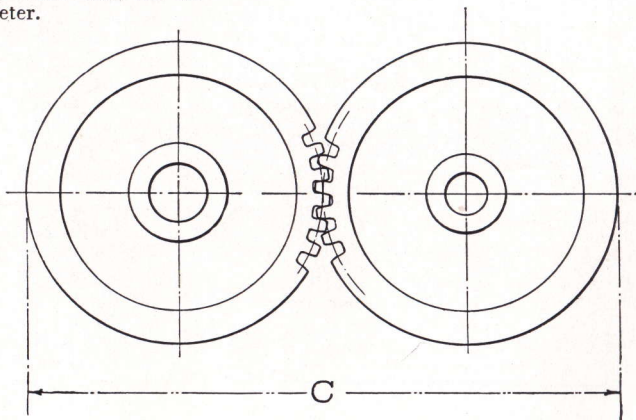


FIG. 2.

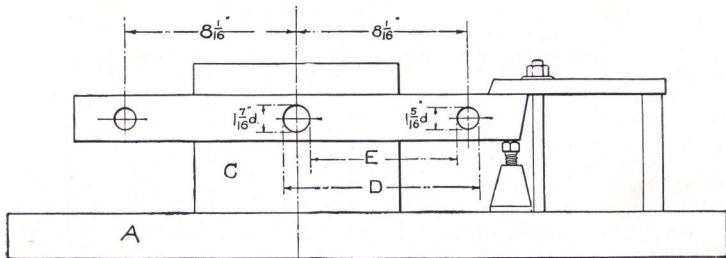


FIG 3

Fig. 3 illustrates the boring of the three hole jig *B* so that the holes are equidistant. This work was done on the milling machine. The piece was first clamped to the knee *C* on the milling machine table *A* and the center hole bored by the use of a single point cutter in boring bar. Then a stud was fastened to the knee nicely fitting the center hole, a spot was trued up on the boring bar, by holding a lathe tool in the milling machine vise, and then the milling machine table was nicely adjusted by micrometer measurement from the outside of stud on knee to the outside of spot trued on boring bar, as illustrated by *D*, making, of course, the necessary allowance for half the diameter of stud and boring bar. Where more convenient,

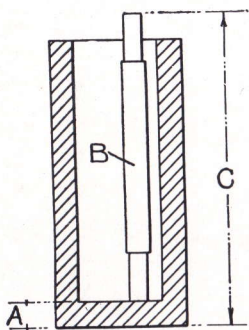


FIG. 4

an end measure rod, made to micrometer, or inside micrometer, can be made to measure between as at *E*. After making the adjustment of table, it was locked fast, the work was then put in place as shown and the first end hole bored to size. Then the piece was reversed both end for end and opposite sides, so that the same edge of piece came down and the other hole bored at the same table setting. It will be seen that any number of holes can be bored to any center distances by the same plan. The holes were first rough drilled on a drill press.

Fig. 4 illustrates the accurate measuring of the bottom *A* of cup. This is accomplished by using the end measure *B* as shown, and taking measurement *C* with micrometer, then subtracting length of end measure rod.

Fig. 5 illustrates the measuring of steps *A* and *B*. (This, as well as the measurement in

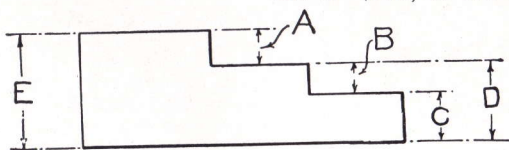


FIG. 5.

Fig. 4 can be taken by micrometer depth gauge, but is more accurately done by outside micrometer.) First measure the thickness *C*, then add step *B* for *D*, then add to *D*, step *A* for *E*.



Figs. 6, 7 and 8 illustrate the fitting of the bronze hub *E*. This hub is used in a screw machine for the center bearing for turret. It is mounted on a taper stud and is fitted so that it bears on the taper tightly and at the

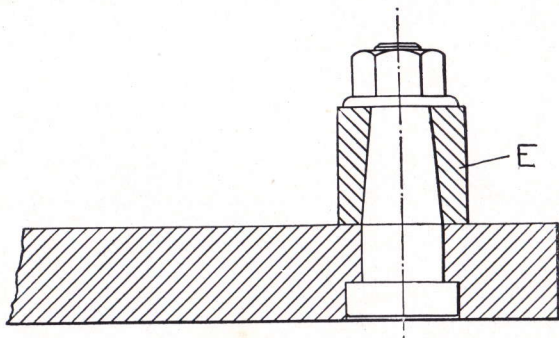


FIG. 6.

same time on the lower end. These were formerly fitted by the "cut-and-try" method, but a considerable saving of time was effected by measuring the distance *A*, Fig. 7, with micrometer. This was done directly by passing

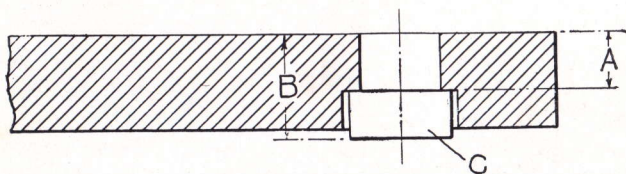


FIG. 7.

the micrometer through the hole, but where the hole is not large enough it may be done by using the plug *C* and measuring over the measurement *B*, then subtracting out the plug *C*. After this measurement is taken it is transferred to an inside caliper. The stud with bushing pressed into place is then mounted on lathe centers as shown in Fig. 8 and the space *A* is faced up according to the measurement taken.

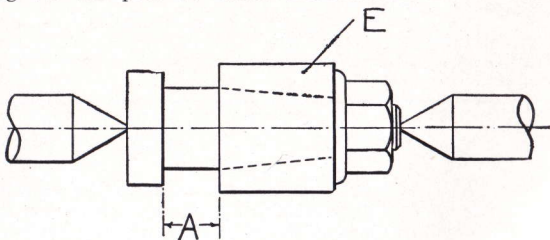


FIG. 8.

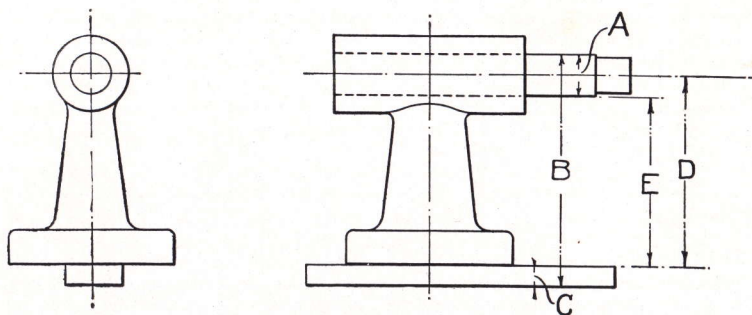


FIG. 9.

Fig. 9 illustrates the measuring of dimension *D*. This is accomplished by using the lathe arbor in the hole, and a small parallel against the flat base as shown, then measure dimension *B* and subtract one-half diameter of arbor and thickness of parallel *C*, or if more convenient, a rod can be made to micrometer measuring dimension *E*.

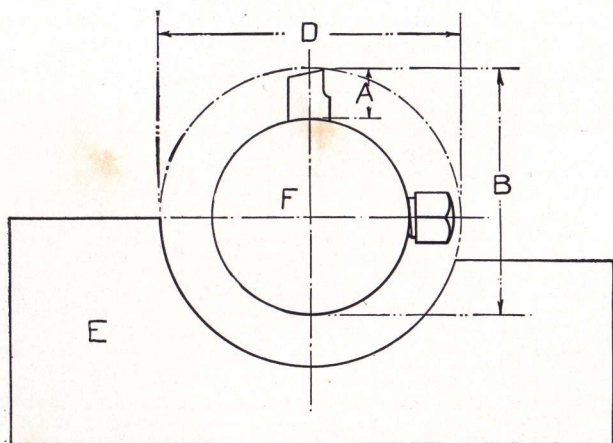


FIG. 10

Fig. 10 illustrates the boring with a boring bar of a segment of a circle. This segment *E* is less than half a circle, so it cannot be measured in the regular way. The boring bar *F* is made to run true on the lathe centers, and its diameter is measured with a micrometer. By subtracting one-half

the diameter of the boring bar from one-half the required diameter of the segment  $E$ , the overhang  $A$  of the boring tool is found. Now by adding this length  $A$  of the boring tool to the diameter of the boring bar gives the dimension  $B$ , which is easily measured across from back of the boring bar to the cutting edge of the tool with the micrometer, and so the adjustment is made to accurately cut the circle in segment.

Fig. 11 illustrates the measuring in milling, planing or grinding the square from a round. When this work is done with a dividing head on a milling machine, it is usually easy to get the size by a "cut-and-try" method, by taking alternate small cuts on opposite sides, but when the work is set up so it can not be readily indexed, the micrometer can be used to advantage by flattening first one side to dimension  $B$ . This dimension, of course, is found by subtracting  $A$  from  $C$ , and  $A$  is found by taking half the difference between  $C$  and  $D$ .

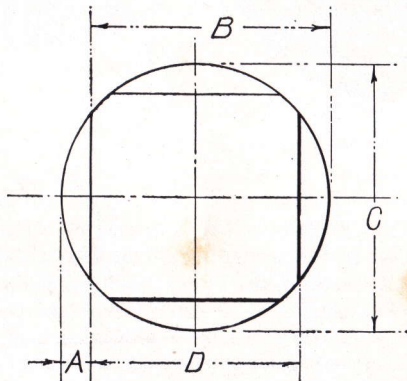
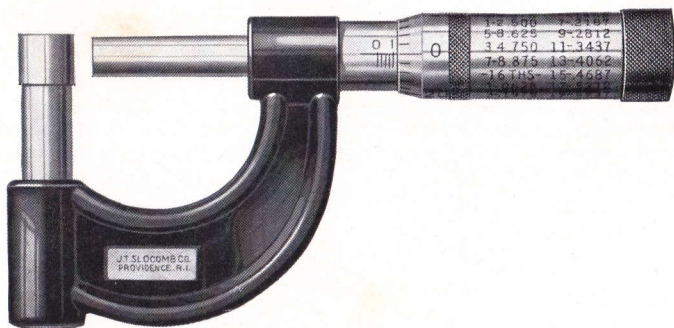


FIG. 11



## Tube Micrometer



In measuring the wall of a small tube or ring, we have a tube micrometer as illustrated above, but in the absence of such a special micrometer, a ball or plug can be used on the curved inside surface and measurement taken over the ball or plug, then its diameter subtracted for wall of ring. Steel balls are often used in this way in measuring ball races in making ball bearings, although we make special micrometers with ball points for such work.

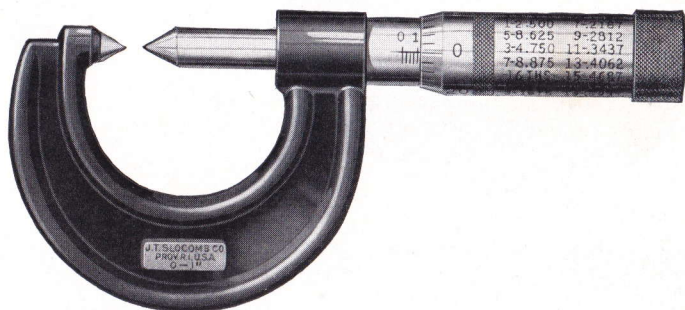
For measuring the wall of a tube or ring where the hole is large enough to permit we furnish a regular micrometer with rounded anvil.

The micrometer illustrated above can be furnished to measure in a hole as small as .200 inch.

In boring for an inside screw thread the necessary allowance can be accurately made by the use of a micrometer. To illustrate: In cutting an internal thread 4 inches in diameter, 12 pitch National Standard, the double depth of such a thread is .1082. We subtract .108 from 4 inches, leaving 3.892, proper size to bore for thread.

It is usually possible to accurately measure many kinds of work by some such methods as described.

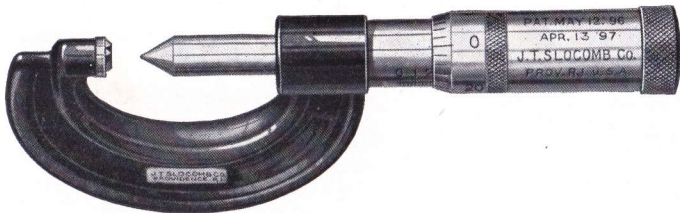
## Screw Thread Micrometer Caliper



### Measuring Screw Threads

A great many mistakes have been made in cutting screw threads that might have been avoided by the use of screw thread micrometers. In fitting plain work, it has been almost the universal practice to make caliper fits and avoid as much as possible "cut-and-try" methods, but owing to the want of a suitable screw thread micrometer, screw threads have usually been fitted by the "cut-and-try" methods. In cutting threads in the lathe, it is often the case that the first thread will be somewhat thick on account of the tool springing off when cutting on one side only. Then the first thread in nut is liable to be turned in some way so in trying the nut on it is often thought to be too tight when the real trouble is the thick or turned threads. Then the work is reduced by mistake and the fit is often spoiled. Our No. 29 screw thread micrometer, as illustrated above, is a most useful instrument for such fittings. In cutting such screw threads, first measure the tap or screw thread standard with the No. 29 micrometer, then in cutting the outside thread, this measurement can be accurately duplicated, or if some allowance is required, this can be accurately made. As this No. 29 micrometer does not measure across diametrically opposite points, it is objected to by some, but we wish to call attention to the fact that it measures the work the same as the standard micrometer and for purposes of reference or comparison, gives accurate and reliable results. Such a caliper has a greater range of threads, and is more easily used than the No. 30 screw thread micrometer which is described later.

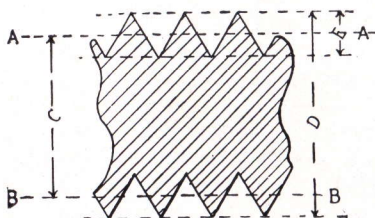
## Standard Screw Thread Micrometer



Many years ago, the fact was forced upon mechanics that some standard for screw threads was a necessity. Various attempts were made to establish such standards. Perhaps the first standard that came into prominence was the Whitworth. This was very carefully designed, but the designers failed to make any allowance for top and bottom clearance, that is, the design calls for the top and bottom of threads fitting perfectly around a certain size radius, which would be an impossibility to make without going to extraordinary means and expense. Then again, without a proper instrument for measuring diameters, the whole system fell far short of being an interchangeable one. To avoid the expense in making such rounded top and bottom of threads, the U. S. Standard form of thread was devised, but in this there was no allowance made for top and bottom clearance and no means of measuring the diameters accurately. The old time method of cutting such threads was to finish the outside diameter accurately, grind the thread tool to the proper flat on end, then cut the threads down until the top looked the same width as the bottom, as there was no way of accurately measuring them. In the Slocomb Standard Screw Thread Micrometer, we find an instrument that measures the pitch diameter of the threads from the angle sides and not from the top or bottom. With this instrument it is possible to allow a proper top and bottom clearance in the threads, and at the same time make perfect fits on their angular sides and to duplicate this measurement at any time or any place with accuracy. The Slocomb Micrometer is especially desirable for this work for the reason that all adjustments are on the spindle and we are, therefore, able to use a solid anvil which is more reliable than when this piece is fitted loose. This instrument can be made to measure any form of angle sided threads from the pitch line.

Referring to the small sectional cut, following page, *A* and *B* are the pitch lines of the thread and *C* is the measurement shown by these calipers. This is one depth of thread less than outside diameter. It will be seen that the only requirement is that the anvil and point of screw shall bear on the angle sides of thread and not on the extreme top or bottom. Such calipers are somewhat limited in their range for the reason that the anvil must be fitted to the smallest thread and for the coarser threads it will not extend far enough down on the angle sides to make an accurate measurement. Then again, for Whitworth or A.N. Standard threads, the point of screw has to be flattened enough for the coarsest thread of its range. This prohibits its use on





a thread so fine that the blunted point will not enter far enough to make a correct reading. It will be seen that for sharp V threads, such screw thread micrometers can have a greater range than for other forms of threads. For V threads one caliper with anvil fitted to 32 pitch, will measure satisfactorily from 20 to 32. A caliper fitted to 20 pitch will measure from 16 to 20, a caliper fitted to 16 pitch will measure from 10 to 16, and another fitted to 10 will measure all coarser pitches.

Referring again to the different designs for screw threads, it is evident that with these screw thread micrometers to measure with, it is possible to still further improve on the design by providing a proper clearance at top and bottom of threads. As there is nothing to be gained by making a screw thread bear at top and bottom, why try to do it and why the extra expense?

In an American National Thread it is a decided advantage to make the tap oversize on the outside diameter leaving the top of thread flatted less than  $\frac{1}{8}$  of the pitch and the bottom of thread flatted standard or  $\frac{1}{8}$  pitch. This is not a new idea, in fact, something like this is a necessity on some kinds of work and has been in use for years, but is made more practical through the use of screw thread micrometers.

For American National Standard or other forms of threads where the top or bottom is flatted, a number of calipers are required on the finer pitches. For further information in regard to range, see page 35, catalog. The depth of a V thread is found by dividing the constant .866 by the pitch number of threads to the inch, and for American National, dividing .6495 by the number of threads. The table on following page will be found useful in connection with these screw thread micrometers.

## Constants for Use with J. T. Slocomb Company's Screw Thread Micrometer

Subtract from the outside diameter the constant for pitch and form of thread for the correct micrometer reading.

*Example.* To find thread micrometer reading for  $\frac{1}{2}$ —13 N.C.

$\frac{1}{2}$  inch = .500    Constant for 13 American National thread is .0499.  
.500— .0499 = .4501 (thread micrometer reading).

Pitch	V	American National	Whitworth	Pitch	V	American National	Whitworth
40	.0217	.0162	.0160	12	.0722	.0541	.0533
38	.0228	.0171	.0168	11½	.0753		
36	.0241	.0180	.0177	11	.0787	.0590	.0582
34	.0255	.0191	.0188	10	.0866	.0649	.0640
32	.0271	.0203	.0200	9	.0962	.0721	.0711
30	.0289	.0217	.0213	8	.1082	.0812	.0809
28	.0309	.0232	.0228	7	.1237	.0928	.0914
26	.0333	.0250	.0246	6	.1443	.1082	.1066
24	.0361	.0271	.0266	5½	.1574	.1180	.1163
22	.0393	.0295	.0290	5	.1732	.1299	.1280
20	.0433	.0325	.0320	4½	.1924	.1443	.1422
18	.0481	.0361	.0355	4	.2165	.1624	.1600
16	.0541	.0406	.0400	3½	.2474	.1855	.1828
14	.0619	.0464	.0457	3¼	.2664	.1998	.1969
13	.0666	.0499	.0492	3	.2886	.2165	.2133

### Formulas

$$\text{Thread Micrometer reading for V threads} = D - \frac{.866}{P}$$

$$\text{Thread Micrometer reading for American National threads} = D - \frac{.6495}{P}$$

$$\text{Thread Micrometer reading for Whitworth threads} = D - \frac{.640}{P}$$

## Special Features of the Slocomb Micrometer

The construction of this micrometer differs considerably from all others.

One of the most important improvements embodied is in the adjustment between the measuring screw and its nut. This is done by drawing the spindle back in line with its axis, which keeps all threads in contact and does not shorten the length of wearing surface, as when the adjustment is made by pinching together one end of nut, as is usual. A long bearing on screw insures uniform wear. Large wearing surface, together with the hard stock the screws are made of, gives the Slocomb Micrometer a long life even under severe work.

The total area of surfaces in contact between one side of threads of screw and its nut is about  $\frac{3}{8}$  of a square inch, or about six times the area of face of anvil. It should be understood, in a tool where accuracy is so very essential, that its life and value depend upon the extent and nature of its wearing surfaces. A short bearing of the nut on measuring screw will wear the screw out of pitch. Besides these liberal wearing surfaces, the screw is made of *tool steel*, of as high temper as can be cut. These hard screws resist wear and abrasion. The Slocomb Micrometer will remain accurate after long use.

Another valuable feature not found in other micrometers lies in the spring. This spring produces a slight uniform friction on the spindle, so it is never loose at any point and will not move around of its own accord. Incidentally this spring keeps the spindle back in its seat, and does not call for a rigid fit between spindle and nut with its consequent danger of roughing up and seizing.

The anvil is a tool steel plug, hardened and forced in frame, and is practically solid with the frame. The bearing supporting the plain part of spindle is a bushing and is easily renewed when worn.

Then spindle is adjusted down to compensate for wear on anvil by turning the main nut. This is a differential screw adjustment and is very fine.

*We have improved lathes that cut the most accurate screws in the world.*

All frames to the 9 inch inclusive are drop forged from bar steel; larger sizes are malleable iron castings.

These Tools are not an experiment.

They have been in use since 1894 in the best shops all over the world, and have been thoroughly tested.



## Sectional Cut Micrometer

The illustration on page 89 represents a section through the Slocomb Micrometer. The spindle *A* is attached rigidly to thimble *F*. This spindle is threaded 40 pitch, and passes through main nut *C*, also is supported at *H* by bushing, which bushing is forced into frame *B*. The main nut *C* is threaded externally 32 pitch, and is a tight screw fit in frame *B*. Now, with parts in place as shown, turning nut *C* will advance spindle *A* the amount of difference in pitches between 32 and 40, or  $.006\frac{1}{4}$  per revolution. This is the adjustment for wear on measuring terminals that is ordinarily done by adjusting an anvil screw. This is a decided improvement, as it allows of using a solid and substantial anvil, also provides a very fine adjustment; that is, it takes a considerable movement of nut *C* to make a small change in the adjustment. On the face of the nut *C* and nut *D* there are 56 V-shaped teeth milled, forming a clutch. In the recess between these two nuts there is a light coiled spring *E*. When these two nuts are clutched together, and spindle screwed through, it is impossible to separate them. This arrangement allows of two forms of adjustment for taking up wear in threads of screw. First, the rigid adjustment, which is done by advancing the small nut one or more teeth, and second, a flexible adjustment produced by spring *E*. After fitting these two nuts together, a line is cut outside, marking point where they are fitted. This construction also allows of making cheap repairs, in case of accident or extreme wear. By putting in new bushing *H* and main nut *C* the original alignment is restored.

Caution: To make adjustment, a spanner wrench is furnished fitting slot *e* in main nut *C*. In turning this nut the wrench should be held down firmly, so as not to slip and tear out slot, as these nuts start rather hard. To know exactly how much to turn the main nut, first measure an accurate standard and find the exact fraction of a thousandth that is needed for adjustment. For illustration: Suppose it is found that spindle needs adjusting down  $.000\frac{1}{4}$ . As turning adjusting nut *C* one whole revolution advances spindle  $.006\frac{1}{4}$ , then adjusting down  $.000\frac{1}{4}$  would mean turning nut  $1/25$  revolution, or the amount of one division of thimble. To do this turn thimble back until its end matches inside of slot on main Nut *C* and one line corresponds with the left side of slot, when holding tool with thimble pointed away from the eye. Now draw lead pencil mark on sleeve *B* to correspond with next line on thimble, after which turn thimble back sufficient to allow for using wrench and turn nut to the right so that edge of slot corresponds with lead pencil mark. This is moving nut the amount of one division of thimble. For  $.000\frac{1}{2}$  adjustment, turn the amount of two divisions, or for  $.001$  adjustment, turn the amount of four divisions. By this method it is easy to adjust these micrometers to an accuracy of  $.0001$  without making a second attempt. Sometimes, for inspection, a person who is not familiar with the construction will get the small nut detached, and lose it up inside of thimble. There is absolutely no occasion for this, as these nuts cannot be separated, except by running spindle back about  $\frac{1}{2}$  inch beyond last graduation, a thing that is never necessary to do except for inspection or repair. When this is done it is a very easy matter to match nuts according to line cut on outside and hold them together closely, until screw is entered in main nut, when they cannot be separated.

Arrangement of nuts insuring long bearing in spite of wear.

Short nut—D to compensate for wear in threads.

No split in sleeve to admit dust and dirt and cause rapid wear.

Nut—C  $\frac{5}{8}$ " long, twice as long as bearing in other micrometers. Can be replaced when worn.

.270" diameter screw and anvil. This gives  $16\frac{1}{2}\%$  more wearing surface at this point than .250" diam.

Solid inserted anvil—G.

I section frame—B drop forged from bar steel.

Decimal equivalents stamped on thimble.

F—Thimble.

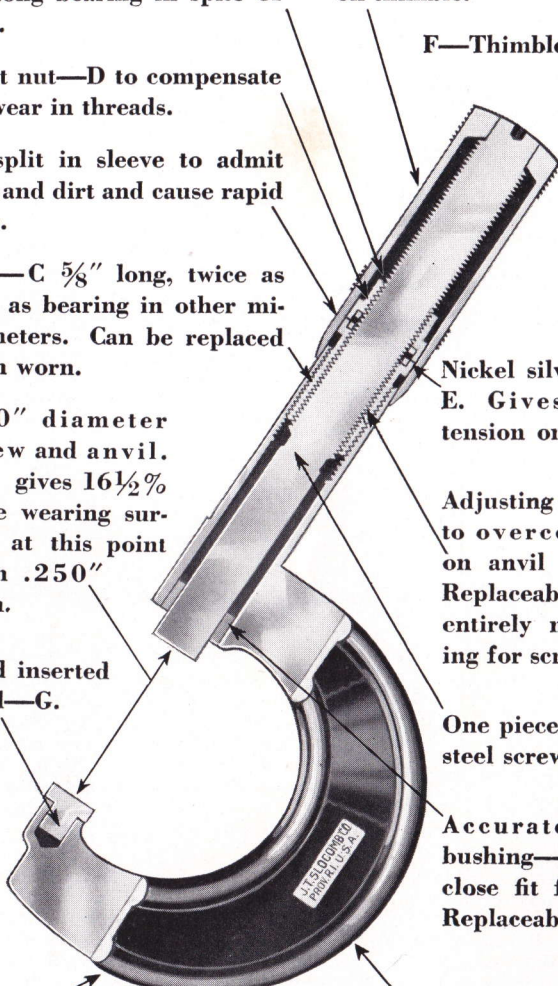
Nickel silver spring E. Gives uniform tension on screw.

Adjusting nut—C to overcome wear on anvil or screw. Replaceable, giving entirely new bearing for screw.

One piece hard tool steel screw—A.

Accurately fitting bushing—H insures close fit for screw. Replaceable.

Black enameled or polished frame.

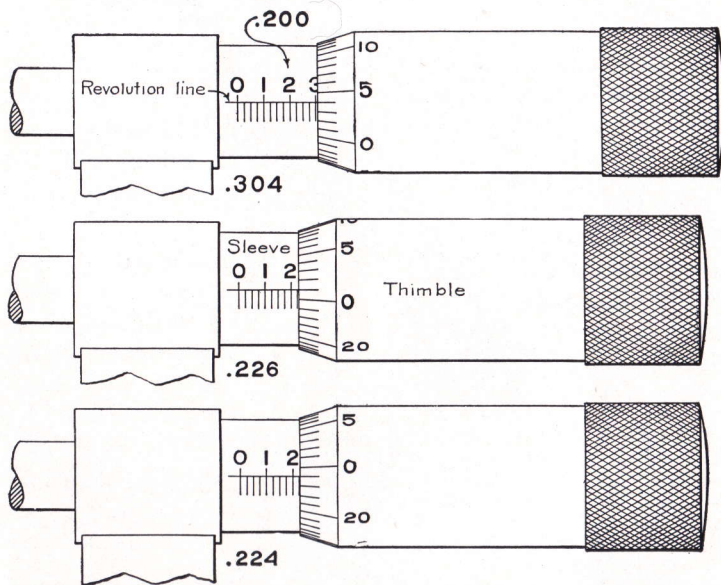


## How to Read a Micrometer

A micrometer is very easily read, but of course, like many other things, rapid work is obtained only after some practice.

Many machinists read the micrometer almost at a glance.

The micrometer divides the inch in 1,000 parts. As usually made it has a 40 pitch screw which advances through its nut .025 inch per revolution. It is evident that, if measurements are to be made of .025 inch or less, all the graduating can be on the end of revolving thimble only, and all that would be necessary besides this would be an indicating line on stationary part.



To measure a greater range it is necessary to have some means of counting and adding together the additional revolutions of screw. This is done in an ingenious and very simple manner by the graduation and numbering used, and is plainly illustrated by cut, which is made about twice actual size.

The cross lines on sleeve are spaced .025 inch apart to equal the pitch of screw. A revolution line is cut lengthwise of the sleeve which in connection with the zero line on thimble counts whole revolutions of screw. When end of thimble matches any of the cross lines, and the zero line matches with the revolution line, the number of spaces exposed denote the number of revolutions made. Every fourth cross line is numbered from 0 to 10.



In the first illustration the reading is .304 showing .300 on the sleeve and .004 on the thimble. In the second illustration the reading is .226 showing .225 on the sleeve and .001 on the thimble. In the third illustration the reading is .224 showing .200 on the sleeve and .024 on the thimble.

The figures should be taken off the sleeve as hundreds, that is, 100, 200, 300, etc. The thimble is shown purposely close to the lines in the cut as these are the points where a mistake would be most likely.

In the .226 reading while the end of the thimble may appear to match the cross line, it is evident that it does not for the reason that the zero lines on thimble and sleeve do not coincide but are one space advanced which, of course, we add to the .225 making the reading .226. The same is true in the .224 reading, but the zero line has gone by one space making the reading .224.

A very good way to begin in teaching a man who has never used a micrometer is to let him take a one inch size, run it down to zero or against the anvil, then have him turn the screw back, counting the graduations on thimble for four turns counting these graduations to 100. He then readily sees the use of the cross graduating and how it helps him to count.

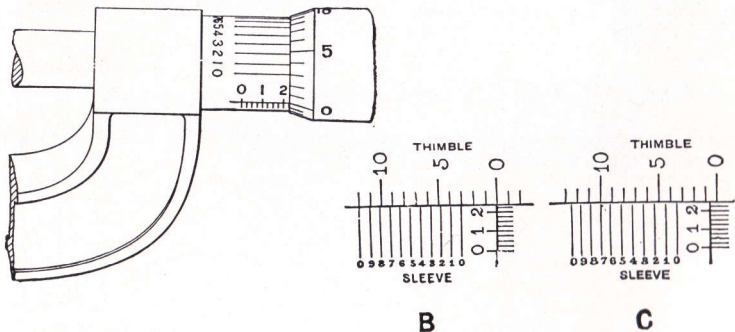
While the thousandths part of an inch is the most convenient unit, and is fine enough for the general run of machine work, still there are times when this must be further divided. With an ordinary micrometer one-half and one-quarter thousandths are easily estimated. Where finer measurements than these are required, we have micrometers graduated with a vernier arranged so that they will read direct on the thimble in ten thousandths.

Micrometer Verniers are described and illustrated below.

Finer measurements even than these are made with measuring machines, see pages 46, 94 to 96, but, of course, every degree of refinement adds greatly to the cost.

### Micrometers Graduated to Ten Thousandths

There are eleven parallel lines on the sleeve occupying the same space as ten lines on the thimble; these lines are numbered 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0. The difference between the width of one of the ten spaces on the sleeve and



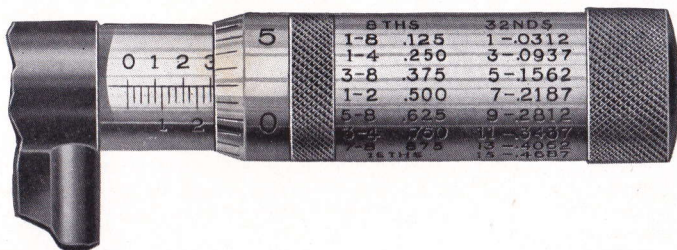
one of the nine spaces on the thimble is one-tenth of a space on the thimble or one ten thousandth of an inch in the reading of micrometer.

In Fig. B the third line from 0 on thimble coincides with the first line on the sleeve. The next two lines do not coincide by one-tenth of a space on the thimble, the next two marked 5 and 2 are two-tenths apart, and so on. When the micrometer is opened the thimble is turned to the left and each space on the thimble represents a thousandth of an inch. Therefore, when the thimble is turned so that the lines 5 and 2 coincide the micrometer is opened two-tenths of one thousandth or two ten thousandths. If the thimble be turned down further, so that the line 10 coincides with the line 7 on the sleeve as Fig. C the micrometer has been opened seven ten thousandths.

### To Read the Micrometer

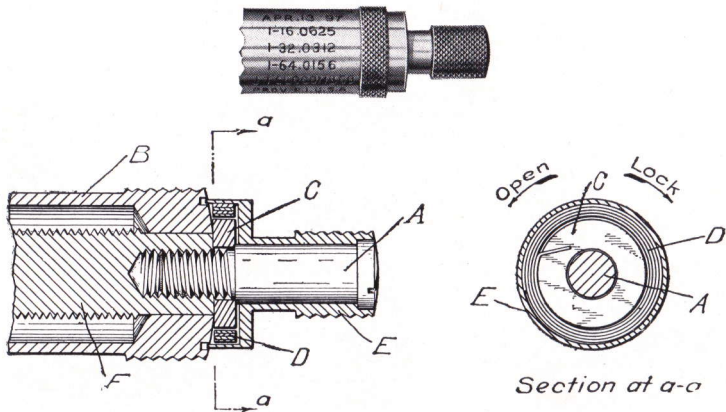
Note the thousandths as usual, then observe the number of divisions on the Vernier until a line is reached which coincides with a line on the thimble. If it is the second line marked 1, add one ten thousandth; if the third marked 2, add two ten thousandths, etc.

It is not advisable to use micrometers graduated to ten thousandths where fine measurements are not required, as wear although it be of comparatively slight consequence in a micrometer that reads only to thousandths, is perceptible and important when making these fine measurements.



**Table of Decimal Equivalents Rolled on Micrometer Thimble**

This table consists of decimal equivalents of 8ths, 16ths, and 32ds rolled almost completely around thimble.

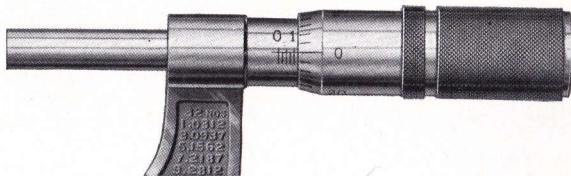


**Friction Stop**

This device consists chiefly of a coiled flat spring *D* of nickel silver. The inner end of this spring is attached to washer *C*, which is clamped to end of thimble by shoulder on central screw *A*. The outer end slides around inside of large bore in outer revolving part; so arranged that in turning to the right the device slides over the spring, but in turning to the left the friction uncoils the spring, causing it to drive positively in this direction. This device has no parts that are liable to get out of order, and allows of a large and substantial screw for attaching; also allows of reducing the knurled part to small diameter, so as to provide a speeder as well.

The nickel silver spring does not require lubrication, and as there is so much of it, it will not wear so as to lose its tension.

Another advantage is in the absence of click, which makes such a device rough in its action, and does not stop so positively as this friction device.



**Friction Thimble**

The construction is practically the same as the friction stop on end of thimble.



## Regarding Reliable Measurements

A thoroughly reliable Standard Measuring Machine should not depend for its setting on steel plugs or end measures that are liable to wear. For reference in measuring large sizes J. T. Slocomb Co. uses a 36 inch Pratt & Whitney Measuring Machine. In this machine the locating of head for even inches is done by setting to lines on a graduated bar by the help of a powerful microscope. The lines on this bar are about 1/10000 inch wide, and are too fine to be seen by the naked eye. By this arrangement there can be no wear on the standard, consequently the greatest reliability. The following is taken from a catalog issued by the Pratt & Whitney Co., Hartford, Conn., by their consent.

"The illustration on following page shows the latest model of the Pratt & Whitney Standard Measuring Machine. In redesigning this machine, every point brought out by experience with previous models has been carefully considered, and if practical to do so has been incorporated in this model, making it the most complete machine of its kind on the market.

"An important improvement in the machine is the raising of the standard bar at the rear of the machine to a position nearly level with the surface of the bed. This reduces to the lowest degree any error that may arise from reading with the microscope. The bed is nearly twice the weight of previous models and is of massive construction, resting on three neutral points and cannot easily be affected by temperature or flexure. The sliding head which includes the screw and index is carefully fitted, insuring parallelism of the measuring faces at any position along the bed up to the capacity of the machine.

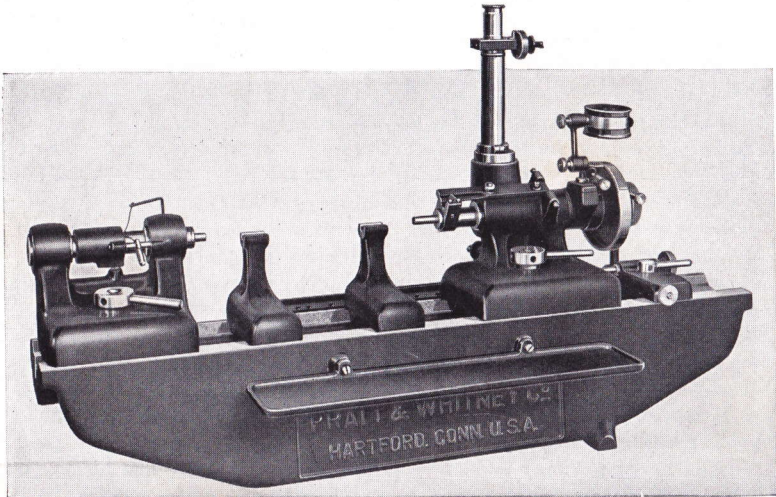
"The screw is standard 25 threads per inch, or one millimeter pitch for Metric System, and has adjustment for wear in both nut and shoulders. Particular attention is called to the calipering attachment, which is simple in the extreme, and solves completely the problem of end measurements within the limits of accuracy attainable in line reading by means of the microscope and micrometer eyepiece. The standard bar to which the end measurements are referred is not touched during the operation, and each measurement is derived from the same zero, so that error from end wear does not enter into the problem.

"A strong feature in the operation of this machine is the comparing of all measurements with a carefully divided and investigated standard bar, the divisions of which are marked upon hardened and polished steel plugs set into a soft steel bar. This bar is never handled, is covered when not in use, and can in no way be injured when calipering except by accident. Delicacy of contact between the measuring faces is obtained by the use of auxiliary jaws holding a small cylindrical drop plug by the pressure of a light helical spring, which also operates the sliding spindle, to which one of the auxiliary jaws is attached. The instant the calipering surfaces are brought into perfect contact, either directly or through the work, the tension on the spring is so adjusted that the plug which is held in a horizontal position by friction will swing toward a vertical position, any excess pressure causing the plug to drop out. An adjusting device for the index line provides for any slight variation of the position of the calipering faces at zero.

"The British Imperial Yard, which is carefully preserved at the Royal Observatory at Greenwich, consists of a bronze bar 38 inches long, with

two gold plugs inserted at a distance of 36 inches apart. Upon the polished surfaces of each is a very fine line, the distance between which, at a temperature of 62° Fahrenheit, represents the standard yard from which all English measurements are derived.

"The Standard Meter established by law consists of a bar of platinum and iridium, 90 parts of the former to 10 parts of the latter. This is an end measure and derives its length from the report of a commission appointed by the French Government, and which recommended a measure derived from a quadrant of the earth's meridian divided into ten million equal parts, the meter being a subdivision and is equal to 39.370788 inches English measure.



"This bar is standard only at 0° Centigrade and is kept in the International Bureau at Breteuil, between Paris and Versailles, where we have recently had plugs verified.

"Upon these two standards Pratt & Whitney Measuring Machines are based. The English Graduated Machines are standard only at 62° Fahr., and the Metric Machines at 0° Centigrade.

"It is understood, however, that it is not necessary to use the machines at the initial temperature, as once standardized any variation of temperature will affect both the work and the machine alike, and give readings that will be correct for light materials, not only at the initial temperature, but at any temperature for which the readings may be taken.

"Machines for English measurements have 400 graduations on the index circle, reading to 1/10000 inch, and for metric measurements have 500 graduations, reading 1/500 millimeter (1/12500 inch nearly). These divisions can easily be subdivided into quarters or even less by estimation."

## **Johansson Gauges**

### **Used by J. T. Slocomb Co.**

In order to keep micrometer calipers to the very closest limits of accuracy, accurate and reliable gauges are a necessity. In making gauges to an accuracy of one ten thousandth, it is evident that the master gauges must be very much closer than this. It is claimed that Johansson Gauges can be made to an accuracy of one millionth inch. One set of these gauges consists of 81 blocks so proportioned that any measurement can be obtained by ten thousandths of an inch by piling them together. The surfaces are so accurate that when they are perfectly clean, these blocks will wring together excluding the air so as to hold together with remarkable firmness. With this set of gauges we are able to test our micrometers at any point of their graduations; also we are able to correct our master screw to the highest degree of accuracy. By locking together three of these blocks so that the outside ones overlap, forming an external gauge held together by air pressure only, it is possible to insert another standard of exactly the same dimension, pushing it through while removing the first center plug, making the second one take its place without breaking the joint. This seems to disprove the common idea that a plug must be smaller than a hole in order to enter. It is possible that the air pressure allows these blocks to separate to some extent, but it must be an almost inconceivable amount.



## Making Proper Allowances for Various Classes of Fits

The question often occurs how much allowance to make for a certain kind of a fit. If the fit must be a tight one, forced or shrunk together, the shaft must be larger than the bore. If the hub is of soft and tough metal, such as soft steel or bronze, and is thin, it is evident that some allowance must be made for the stretching of metal in hub. If the surfaces are rough, rough turning and rough boring, some allowances must be made for the flattening down of these rough surfaces. Then again, the bore and shaft are often out of round and not axially true. A shaft that is out of round is often larger than it measures, also a bore that is not axially straight appears smaller than it is, in a running fit. Cored holes bored by various kinds of reamers only, are liable to be crooked on account of tools springing, and so following, to some extent, direction of core. For this reason, as a rule, a long bearing, in a running fit, requires more allowance than a short one. Where surfaces are hard and perfectly true and smooth, as in Standard Plug and Ring Gauges, very small allowances suffice.

The following table of allowances will be found useful for good average machine work.

FORCE FITS (for Shafts)	DRIVING FITS (for Shafts)
Up to ½ in. + .0005 to .001	+ .0004 to .0006
½ in. to 1 in. + .001 to .003	+ .0004 to .001
1 in. to 2 in. + .002 to .004	+ .00075 to .002
2 in. to 3 in. + .003 to .006	+ .0015 to .003
3 in. to 4 in. + .005 to .008	+ .002 to .004
4 in. to 5 in. + .006 to .010	+ .002 to .0045
5 in. to 6 in. + .008 to .012	+ .003 to .005
PUSH FITS	RUNNING FITS
Up to ½ in. — .00025 to .00075	— .00075 to .0015
½ in. to 1 in. — .0005 to .001	— .001 to .002
1 in. to 2 in. — .0005 to .0015	— .0015 to .0025
2 in. to 3 in. — .0005 to .0015	— .0015 to .003
3 in. to 4 in. — .00075 to .002	— .002 to .0035
4 in. to 5 in. — .00075 to .002	— .0025 to .004
5 in. to 6 in. — .00075 to .002	— .0025 to .0045

## Table of Decimal Equivalents

Inch	Inch
$\frac{1}{64}$ ..... <b>.0156</b>	$\frac{33}{64}$ ..... <b>.5156</b>
$\frac{1}{32}$ ..... <b>.0313</b>	$\frac{17}{32}$ ..... <b>.5313</b>
$\frac{3}{64}$ ..... <b>.0469</b>	$\frac{35}{64}$ ..... <b>.5469</b>
$\frac{1}{16}$ ..... <b>.0625</b>	$\frac{9}{16}$ ..... <b>.5625</b>
$\frac{5}{64}$ ..... <b>.0781</b>	$\frac{37}{64}$ ..... <b>.5781</b>
$\frac{3}{32}$ ..... <b>.0938</b>	$\frac{19}{32}$ ..... <b>.5938</b>
$\frac{7}{64}$ ..... <b>.1094</b>	$\frac{39}{64}$ ..... <b>.6094</b>
$\frac{1}{8}$ ..... <b>.125</b>	$\frac{5}{8}$ ..... <b>.625</b>
$\frac{9}{64}$ ..... <b>.1406</b>	$\frac{41}{64}$ ..... <b>.6406</b>
$\frac{5}{32}$ ..... <b>.1563</b>	$\frac{21}{32}$ ..... <b>.6563</b>
$\frac{11}{64}$ ..... <b>.1719</b>	$\frac{43}{64}$ ..... <b>.6719</b>
$\frac{3}{16}$ ..... <b>.1875</b>	$\frac{11}{16}$ ..... <b>.6875</b>
$\frac{13}{64}$ ..... <b>.2031</b>	$\frac{45}{64}$ ..... <b>.7031</b>
$\frac{7}{32}$ ..... <b>.2188</b>	$\frac{23}{32}$ ..... <b>.7188</b>
$\frac{15}{64}$ ..... <b>.2344</b>	$\frac{47}{64}$ ..... <b>.7344</b>
$\frac{1}{4}$ ..... <b>.250</b>	$\frac{3}{4}$ ..... <b>.750</b>
$\frac{17}{64}$ ..... <b>.2656</b>	$\frac{49}{64}$ ..... <b>.7656</b>
$\frac{9}{32}$ ..... <b>.2813</b>	$\frac{25}{32}$ ..... <b>.7813</b>
$\frac{19}{64}$ ..... <b>.2969</b>	$\frac{51}{64}$ ..... <b>.7969</b>
$\frac{5}{16}$ ..... <b>.3125</b>	$\frac{13}{16}$ ..... <b>.8125</b>
$\frac{21}{64}$ ..... <b>.3281</b>	$\frac{53}{64}$ ..... <b>.8281</b>
$\frac{11}{32}$ ..... <b>.3438</b>	$\frac{27}{32}$ ..... <b>.8438</b>
$\frac{23}{64}$ ..... <b>.3594</b>	$\frac{55}{64}$ ..... <b>.8594</b>
$\frac{3}{8}$ ..... <b>.375</b>	$\frac{7}{8}$ ..... <b>.875</b>
$\frac{25}{64}$ ..... <b>.3906</b>	$\frac{57}{64}$ ..... <b>.8906</b>
$\frac{13}{32}$ ..... <b>.4063</b>	$\frac{29}{32}$ ..... <b>.9063</b>
$\frac{27}{64}$ ..... <b>.4219</b>	$\frac{59}{64}$ ..... <b>.9219</b>
$\frac{7}{16}$ ..... <b>.4375</b>	$\frac{15}{16}$ ..... <b>.9375</b>
$\frac{29}{64}$ ..... <b>.4531</b>	$\frac{61}{64}$ ..... <b>.9531</b>
$\frac{15}{32}$ ..... <b>.4688</b>	$\frac{31}{32}$ ..... <b>.9688</b>
$\frac{31}{64}$ ..... <b>.4844</b>	$\frac{63}{64}$ ..... <b>.9844</b>
$\frac{1}{2}$ ..... <b>.500</b>	<b>1</b> ..... <b>1.000</b>

**Table of Millimeter Equivalents of Parts of an Inch**

Inch	mm.	Inch	mm.	
	$\frac{1}{64}$ .....	<b>.397</b>	$\frac{33}{64}$ .....	<b>13.097</b>
$\frac{1}{32}$ .....	<b>.794</b>	$\frac{17}{32}$ .....	<b>13.494</b>	
	$\frac{3}{64}$ .....	<b>1.191</b>	$\frac{35}{64}$ .....	<b>13.890</b>
$\frac{1}{16}$ .....	<b>1.587</b>	$\frac{9}{16}$ .....	<b>14.287</b>	
	$\frac{5}{64}$ .....	<b>1.984</b>	$\frac{37}{64}$ .....	<b>14.684</b>
$\frac{3}{32}$ .....	<b>2.381</b>	$\frac{19}{32}$ .....	<b>15.081</b>	
	$\frac{7}{64}$ .....	<b>2.778</b>	$\frac{39}{64}$ .....	<b>15.478</b>
$\frac{1}{8}$ .....	<b>3.175</b>	$\frac{5}{8}$ .....	<b>15.875</b>	
	$\frac{9}{64}$ .....	<b>3.572</b>	$\frac{41}{64}$ .....	<b>16.272</b>
$\frac{5}{32}$ .....	<b>3.969</b>	$\frac{21}{32}$ .....	<b>16.669</b>	
	$\frac{11}{64}$ .....	<b>4.366</b>	$\frac{43}{64}$ .....	<b>17.065</b>
$\frac{3}{16}$ .....	<b>4.762</b>	$\frac{11}{16}$ .....	<b>17.462</b>	
	$\frac{13}{64}$ .....	<b>5.159</b>	$\frac{45}{64}$ .....	<b>17.859</b>
$\frac{7}{32}$ .....	<b>5.556</b>	$\frac{23}{32}$ .....	<b>18.256</b>	
	$\frac{15}{64}$ .....	<b>5.953</b>	$\frac{47}{64}$ .....	<b>18.653</b>
$\frac{1}{4}$ .....	<b>6.350</b>	$\frac{3}{4}$ .....	<b>19.050</b>	
	$\frac{17}{64}$ .....	<b>6.747</b>	$\frac{49}{64}$ .....	<b>19.447</b>
$\frac{9}{32}$ .....	<b>7.144</b>	$\frac{25}{32}$ .....	<b>19.844</b>	
	$\frac{19}{64}$ .....	<b>7.541</b>	$\frac{51}{64}$ .....	<b>20.240</b>
$\frac{5}{16}$ .....	<b>7.937</b>	$\frac{13}{16}$ .....	<b>20.637</b>	
	$\frac{21}{64}$ .....	<b>8.334</b>	$\frac{53}{64}$ .....	<b>21.034</b>
$\frac{11}{32}$ .....	<b>8.731</b>	$\frac{27}{32}$ .....	<b>21.431</b>	
	$\frac{23}{64}$ .....	<b>9.128</b>	$\frac{55}{64}$ .....	<b>21.828</b>
$\frac{3}{8}$ .....	<b>9.525</b>	$\frac{7}{8}$ .....	<b>22.225</b>	
	$\frac{25}{64}$ .....	<b>9.922</b>	$\frac{57}{64}$ .....	<b>22.622</b>
$\frac{13}{32}$ .....	<b>10.319</b>	$\frac{29}{32}$ .....	<b>23.019</b>	
	$\frac{27}{64}$ .....	<b>10.716</b>	$\frac{59}{64}$ .....	<b>23.415</b>
$\frac{7}{16}$ .....	<b>11.113</b>	$\frac{15}{16}$ .....	<b>23.812</b>	
	$\frac{29}{64}$ .....	<b>11.509</b>	$\frac{61}{64}$ .....	<b>24.209</b>
$\frac{15}{32}$ .....	<b>11.906</b>	$\frac{31}{32}$ .....	<b>24.606</b>	
	$\frac{31}{64}$ .....	<b>12.303</b>	$\frac{63}{64}$ .....	<b>25.003</b>
$\frac{1}{2}$ .....	<b>12.700</b>	<b>1</b> .....	<b>25.400</b>	



## Table of Decimal Equivalents of Millimeters and Fractions of Millimeters

$$\frac{1}{100} \text{ mm.} = .0003937 \text{ Inch}$$

mm.	Inch	mm.	Inch	mm.	Inch
$\frac{1}{50}$	.00079	$\frac{26}{50}$	.02047	2	.07847
$\frac{2}{50}$	.00157	$\frac{27}{50}$	.02126	3	.11811
$\frac{3}{50}$	.00236	$\frac{28}{50}$	.02205	4	.15748
$\frac{4}{50}$	.00315	$\frac{29}{50}$	.02283	5	.19685
$\frac{5}{50}$	.00394	$\frac{30}{50}$	.02362	6	.23622
$\frac{6}{50}$	.00472	$\frac{31}{50}$	.02441	7	.27559
$\frac{7}{50}$	.00551	$\frac{32}{50}$	.02520	8	.31496
$\frac{8}{50}$	.00630	$\frac{33}{50}$	.02598	9	.35433
$\frac{9}{50}$	.00709	$\frac{34}{50}$	.02677	10	.39370
$\frac{10}{50}$	.00787	$\frac{35}{50}$	.02756	11	.43307
$\frac{11}{50}$	.00866	$\frac{36}{50}$	.02835	12	.47244
$\frac{12}{50}$	.00945	$\frac{37}{50}$	.02913	13	.51181
$\frac{13}{50}$	.01024	$\frac{38}{50}$	.02992	14	.55118
$\frac{14}{50}$	.01102	$\frac{39}{50}$	.03071	15	.59055
$\frac{15}{50}$	.01181	$\frac{40}{50}$	.03150	16	.62992
$\frac{16}{50}$	.01260	$\frac{41}{50}$	.03228	17	.66929
$\frac{17}{50}$	.01339	$\frac{42}{50}$	.03307	18	.70866
$\frac{18}{50}$	.01417	$\frac{43}{50}$	.03386	19	.74803
$\frac{19}{50}$	.01496	$\frac{44}{50}$	.03465	20	.78740
$\frac{20}{50}$	.01575	$\frac{45}{50}$	.03543	21	.82677
$\frac{21}{50}$	.01654	$\frac{46}{50}$	.03622	22	.86614
$\frac{22}{50}$	.01732	$\frac{47}{50}$	.03701	23	.90551
$\frac{23}{50}$	.01811	$\frac{48}{50}$	.03780	24	.94488
$\frac{24}{50}$	.01890	$\frac{49}{50}$	.03858	25	.98425
$\frac{25}{50}$	.01969	1	.03937	26	1.02362

10 mm. = 1 centimeter = 0.3937 inch.

10 cm. = 1 decimeter = 3.937 inch.

10 dm. = 1 meter = 39.37 inch.

25.4 mm. = 1 English inch.

English Inches Into Millimeters

Inch	0	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{9}{16}$	$\frac{5}{8}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{7}{8}$	$\frac{15}{16}$
0	0.0	1.6	3.2	4.8	6.4	7.9	9.5	11.1	12.7	14.3	15.9	17.5	19.1	20.6	22.2	23.8
1	25.4	27.0	28.6	30.2	31.7	33.3	34.9	36.5	38.1	39.7	41.3	42.9	44.4	46.0	47.6	49.2
2	50.8	52.4	54.0	55.6	57.1	58.7	60.3	61.9	63.5	65.1	66.7	68.3	69.8	71.4	73.0	74.6
3	76.2	77.8	79.4	81.0	82.5	84.1	85.7	87.3	88.9	90.5	92.1	93.7	95.2	96.8	98.4	100.0
4	101.6	103.2	104.8	106.4	108.0	109.5	111.1	112.7	114.3	115.9	117.5	119.1	120.7	122.2	123.8	125.4
5	127.0	128.6	130.2	131.8	133.4	134.9	136.5	138.1	139.7	141.3	142.9	144.5	146.1	147.6	149.2	150.8
6	152.4	154.0	155.6	157.2	158.8	160.3	161.9	163.5	165.1	166.7	168.3	169.9	171.5	173.0	174.6	176.2
7	177.8	179.4	181.0	182.6	184.2	185.7	187.3	188.9	190.5	192.1	193.7	195.3	196.9	198.4	200.0	201.6
8	203.2	204.8	206.4	208.0	209.6	211.1	212.7	214.3	215.9	217.5	219.1	220.7	222.3	223.8	225.4	227.0
9	228.6	230.2	231.8	233.4	235.0	236.5	238.1	239.7	241.3	242.9	244.5	246.1	247.7	249.2	250.8	252.4
10	254.0	255.6	257.2	258.8	260.4	261.9	263.5	265.1	266.7	268.3	269.9	271.5	273.1	274.6	276.2	277.8
11	279.4	281.0	282.6	284.2	285.7	287.3	288.9	290.5	292.1	293.7	295.3	296.9	298.4	300.0	301.6	303.2
12	304.8	306.4	308.0	309.6	311.1	312.7	314.3	315.9	317.5	319.1	320.7	322.3	323.8	325.4	327.0	328.6
13	330.2	331.8	333.4	335.0	336.5	338.1	339.7	341.3	342.9	344.5	346.1	347.7	349.2	350.8	352.4	354.0
14	355.6	357.2	358.8	360.4	361.9	363.5	365.1	366.7	368.3	369.9	371.5	373.1	374.6	376.2	377.8	379.4
15	381.0	382.6	384.2	385.8	387.3	388.9	390.5	392.1	393.7	395.3	396.9	398.5	400.0	401.6	403.2	404.8
16	406.4	408.0	409.6	411.2	412.7	414.3	415.9	417.5	419.1	420.7	422.3	423.9	425.4	427.0	428.6	430.2
17	431.8	433.4	435.0	436.6	438.1	439.7	441.3	442.9	444.5	446.1	447.7	449.3	450.8	452.4	454.0	455.6
18	457.2	458.8	460.4	462.0	463.5	465.1	466.7	468.3	469.9	471.5	473.1	474.7	476.2	477.8	479.4	481.0
19	482.6	484.2	485.8	487.4	488.9	490.5	492.1	493.7	495.3	496.9	498.5	500.1	501.6	503.2	504.8	506.4
20	508.0	509.6	511.2	512.8	514.3	515.9	517.5	519.1	520.7	522.3	523.9	525.5	527.0	528.6	530.2	531.8
21	533.4	535.0	536.6	538.2	539.7	541.3	542.9	544.5	546.1	547.7	549.3	550.9	552.4	554.0	555.6	557.2
22	558.8	560.4	562.0	563.6	565.1	566.7	568.3	569.9	571.5	573.1	574.7	576.3	577.8	579.4	581.0	582.6
23	584.2	585.8	587.4	589.0	590.5	592.1	593.7	595.3	596.9	598.5	600.1	601.7	603.2	604.8	606.4	608.0

39.37 in. = 1 m. = 10dm. = 100cm. = 1000mm. 24.00 in. = 0.6096 m. 1 yd. = 0.9144 m. 1 mile = 1609.3m.

## Tap Drill Sizes

### For Machine Screw Taps

Size of Tap	Outside Diam. of Tap	Decimal Size of Drills	Number Sizes
2 x 56	.0872	.073	49
2 x 64	.0871	.076	48
3 x 48	.1003	.079	46
4 x 56	.1002	.086	44
4 x 36	.1135	.089	43
4 x 40	.1134	.093	42
5 x 36	.1265	.099	39
5 x 40	.1264	.104	37
6 x 32	.1396	.106	36
6 x 36	.1395	.110	35
6 x 40	.1394	.113	33
7 x 30	.1526	.116	32
7 x 32	.1526	.120	31
8 x 30	.1656	.128	30
8 x 32	.1656	.136	29
9 x 24	.1788	.136	29
9 x 28	.1787	.140	28
9 x 30	.1786	.144	27
9 x 32	.1786	.149	25
10 x 24	.1918	.149	25
10 x 30	.1916	.157	22
10 x 32	.1916	.159	21
12 x 28	.2176	.173	17
14 x 20	.2439	.185	13
14 x 24	.2438	.196	9
16 x 20	.2699	.206	5
18 x 18	.2959	.228	1
18 x 20	.2959	.234	A
20 x 18	.3219	.250	E
20 x 20	.3219	.257	F
22 x 16	.3480	.272	I
22 x 18	.3479	.281	K
24 x 16	.3740	.302	N
24 x 18	.3739	.310	N or O
26 x 14	.4001	.316	O
26 x 16	.4000	.323	P
28 x 14	.4261	.339	R
28 x 16	.4260	.348	S
30 x 14	.4521	.368	U
30 x 16	.4520	.377	V



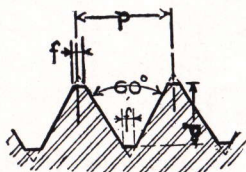
## Tap Drill Sizes For National Form

### Machine Screw Taps

The diameter of drill allows for a practical clearance at the root of the thread so no undue strain is imposed on tap.

Size of Tap	No. of Threads	Size of Drill	Size of Tap	No. of Threads	Size of Drill
0	80	.0465	10	24	.140
1	64	.055	10	30	.152
1	72	.0595	10	32	.154
2	56	.070	12	24	.166
2	64	.070	12	28	.173
3	48	.076	14	20	.182
3	56	.082	14	24	.1935
4	36	.086	16	20	.209
4	40	.089	16	22	.213
4	48	.935	18	18	.228
5	36	.0935	18	20	.234
5	40	.098	20	18	.257
5	44	.0995	20	20	.261
6	32	.1015	22	16	.272
6	36	.1065	22	18	.281
6	40	.110	24	16	.295
7	30	.113	24	18	.302
7	32	.116	26	14	.316
7	36	.120	26	16	.323
8	30	.1285	28	14	.339
8	32	.1285	28	16	.348
8	36	.136	30	14	.368
9	24	.1285	30	16	.377
9	30	.136			
9	32	.1405			

## American National Coarse and Fine Thread Dimensions



### FORMULAS

$$p = \text{pitch} = \frac{1}{\text{No. threads per inch}}$$

$$d = \text{depth} = p \times .6495.$$

$$f = \text{flat} = \frac{p}{8}$$

Diameter of Screw at Top of Thread	Threads per Inch	Diameter at Root of Thread	Width of Flat, Top and Bottom
1/4	20	.185	.0063
5/16	18	.2403	.0069
3/8	16	.2936	.0078
7/16	14	.3447	.0089
1/2	13	.4001	.0096
9/16	12	.4542	.0104
5/8	11	.5069	.0114
3/4	10	.6201	.0125
7/8	9	.7307	.0139
1	8	.8376	.0156
1 1/8	7	.9394	.0179
1 1/4	7	1.0644	.0179
1 3/8	6	1.1585	.0208
1 1/2	6	1.2835	.0208
1 5/8	5 1/2	1.3888	.0227
1 3/4	5	1.4902	.0250
1 7/8	5	1.6152	.0250
2	4 1/2	1.7113	.0278
2 1/4	4 1/2	1.9613	.0278
2 1/2	4	2.1752	.0313
2 3/4	4	2.4252	.0313
3	3 1/2	2.6288	.0357
3 1/4	3 1/2	2.8788	.0357
3 1/2	3 1/4	3.1003	.0385
3 3/4	3	3.3170	.0417
4	3	3.5670	.0417
4 1/4	2 7/8	3.7982	.0435
4 1/2	2 3/4	4.0276	.0455
4 3/4	2 5/8	4.2551	.0476
5	2 1/2	4.4804	.0500
5 1/4	2 1/2	4.7304	.0500
5 1/2	2 3/8	4.9530	.0526
5 3/4	2 3/8	5.2030	.0526
6	2 1/4	5.4226	.0556

Tap drill sizes should be .004 larger than root of thread for 1/4 Tap to .010 for a 2 inch Tap. For some materials more allowance than this should be made.

## Tap Drills For Pipe Taps

Drills to be followed with Pipe Reamer, and threaded with Pipe Tap.

Size Inches	No. Threads to Inch	Diameter Drill Inches	Size Inches	No. Threads to Inch	Diameter Drill Inches
$\frac{1}{8}$	27	$\frac{11}{32}$	$1\frac{1}{2}$	11 $\frac{1}{2}$	$1\frac{3}{4}$
$\frac{1}{4}$	18	$\frac{29}{64}$	2	11 $\frac{1}{2}$	$2\frac{7}{32}$
$\frac{3}{8}$	18	$\frac{37}{64}$	$2\frac{1}{2}$	8	$2\frac{21}{32}$
$\frac{1}{2}$	14	$\frac{23}{32}$	3	8	$3\frac{9}{32}$
$\frac{3}{4}$	14	$\frac{15}{16}$	$3\frac{1}{2}$	8	$3\frac{13}{16}$
1	11 $\frac{1}{2}$	$\frac{111}{64}$	4	8	$4\frac{3}{16}$
$1\frac{1}{4}$	11 $\frac{1}{2}$	$\frac{133}{64}$			

Tap drill sizes for V threads should be .015 larger than theoretical root of thread for  $\frac{1}{4}$  Tap to .062 for a 2-inch Tap.



## Decimal Equivalent of the Numbers of Twist Drill and Steel Wire Gauge

No.	Size of No. in Decimals	No.	Size of No. in Decimals	No.	Size of No. in Decimals	No.	Size of No. in Decimals	No.	Size of No. in Decimals
1	.2280	17	.1730	33	.1130	49	.0730	65	.0350
2	.2210	18	.1695	34	.1110	50	.0700	66	.0330
3	.2130	19	.1660	35	.1100	51	.0670	67	.0320
4	.2090	20	.1610	36	.1065	52	.0635	68	.0310
5	.2055	21	.1590	37	.1040	53	.0595	69	.0292
6	.2040	22	.1570	38	.1015	54	.0550	70	.0280
7	.2010	23	.1540	39	.0995	55	.0520	71	.0260
8	.1990	24	.1520	40	.0980	56	.0465	72	.0250
9	.1960	25	.1495	41	.0960	57	.0430	73	.0240
10	.1935	26	.1470	42	.0935	58	.0420	74	.0225
11	.1910	27	.1440	43	.0890	59	.0410	75	.0210
12	.1890	28	.1405	44	.0860	60	.0400	76	.0200
13	.1850	29	.1360	45	.0820	61	.0390	77	.0180
14	.1820	30	.1285	46	.0810	62	.0380	78	.0160
15	.1800	31	.1200	47	.0785	63	.0370	79	.0145
16	.1770	32	.1160	48	.0760	64	.0360	80	.0135

## Diameters and Centers, Sizes of Center Drills and Speeds Recommended

These sizes are for centers to be left in finished work. Before squaring up, some allowance will have to be made. The speed of drills given is for soft steel or iron. Where there is much turning to be done on a piece of work it is advisable to use larger centers, even if they have to be squared out on finishing the work. For lathe-arbors or other work where considerable wear comes on centers, it is advisable to make them a great deal larger, in fact, as large as the work will allow. Where an arbor press is used the centers can be larger than where arbors are driven with a lead hammer, for the reason that where a

Diam. Work	Diam. Countersink	Use Size
$\frac{3}{16}$ inch	$\frac{3}{32}$ inch	A1
$\frac{1}{4}$ inch	$\frac{7}{64}$ inch	C2
$\frac{5}{16}$ to $\frac{1}{2}$ inch	$\frac{9}{64}$ inch	C2
$\frac{9}{16}$ to $\frac{3}{4}$ inch	$\frac{1}{8}$ inch	D1
$1\frac{3}{16}$ to 1 inch	$\frac{3}{16}$ inch	D1
$1\frac{1}{16}$ to $1\frac{1}{4}$ inches	$\frac{7}{32}$ inch	E1
$1\frac{5}{16}$ to $1\frac{1}{2}$ inches	$\frac{1}{4}$ inch	E1
$1\frac{9}{16}$ to $1\frac{3}{4}$ inches	$\frac{9}{32}$ inch	E2
$1\frac{13}{16}$ to 2 inches	$\frac{5}{16}$ inch	E2
$2\frac{1}{16}$ to $2\frac{1}{2}$ inches	$\frac{3}{8}$ inch	F1
$2\frac{1}{2}$ to 3 inches	$\frac{7}{16}$ inch	F2

hammer is used the flat surface of arbor end should be as large as possible. In lathe arbors it is advisable to round edge of countersink, so that in putting work upon centers the liability of injury to countersink is lessened. For diameters of drill points on our stock size center drills, please see page 65, catalog. In using Combination Center Drills the best result is obtained by running drill at speed suitable for drill point, and feeding the same as you would for a Twist Drill of this small diameter. When the countersink begins to cut it is best to feed rather lighter, giving the chips a chance to work out.

# Speed Recommended for Twist Drills

## Speed of Drills

CARBON STEEL

HIGH SPEED STEEL

Diam. Inches	Revolutions Per Minute			Diam. Inches	Revolutions Per Minute		
	Wrought Iron and Steel	Cast Iron	Brass		Wrought Iron and Steel	Cast Iron	Brass
$\frac{1}{16}$	1833	2320	3667	$\frac{1}{8}$	1832	2440	Periphery Speed 100 to 140 feet per minute
$\frac{1}{8}$	917	1160	1833	$\frac{3}{16}$	1221	1627	
$\frac{3}{16}$	611	773	1222	$\frac{1}{4}$	916	1220	
$\frac{1}{4}$	458	580	917	$\frac{5}{16}$	733	976	
$\frac{5}{16}$	342	465	733	$\frac{3}{8}$	611	813	
$\frac{3}{8}$	285	386	611	$\frac{7}{16}$	523	697	
$\frac{7}{16}$	244	331	524	$\frac{1}{2}$	458	610	
$\frac{1}{2}$	214	290	458	$\frac{9}{16}$	407	510	
$\frac{9}{16}$	176	238	407	$\frac{5}{8}$	366	459	
$\frac{5}{8}$	159	214	367	$\frac{11}{16}$	333	417	
$\frac{11}{16}$	144	194	333	$\frac{3}{4}$	305	383	
$\frac{3}{4}$	132	178	306	$\frac{13}{16}$	282	353	
$\frac{13}{16}$	112	165	282	$\frac{7}{8}$	262	328	
$\frac{15}{16}$	105	153	262	$\frac{15}{16}$	244	306	
1	98	143	244	1	229	287	
$1\frac{1}{16}$	90	134	229	$1\frac{1}{16}$	215	270	
$1\frac{1}{8}$	80	126	216	$1\frac{1}{8}$	204	255	
$1\frac{3}{16}$	75	119	204	$1\frac{3}{16}$	193	242	
$1\frac{1}{4}$	71	113	193	$1\frac{1}{4}$	183	229	
$1\frac{5}{16}$	67	107	183	$1\frac{5}{16}$	174	219	
$1\frac{3}{8}$	64	102	175	$1\frac{3}{8}$	166	209	
$1\frac{7}{8}$	61	97	167	$1\frac{1}{2}$	153	191	
$1\frac{1}{2}$	56	89	153	$1\frac{5}{8}$	138	176	
$1\frac{5}{8}$	52	82	141	$1\frac{3}{4}$	127	164	
$1\frac{3}{4}$	48	76	131	$1\frac{7}{8}$	112	153	
$1\frac{7}{8}$	45	71	122	2	104	143	
2	42	67	115	$2\frac{1}{8}$	95	126	
$2\frac{1}{8}$	40	63	108	$2\frac{1}{4}$	89	118	
$2\frac{1}{4}$	38	59	102	$2\frac{3}{8}$	80	112	
$2\frac{3}{8}$	36	56	96	$2\frac{1}{2}$	76	106	
$2\frac{1}{2}$	34	53	92				
$2\frac{5}{8}$	32	51	87				
$2\frac{3}{4}$	30	49	83				
$2\frac{7}{8}$	28	47	80				
3	26	45	76				



## Speed Recommended for Twist Drills

### FEED PER REVOLUTION

CARBON STEEL DRILLS		HIGH SPEED STEEL DRILLS
.005"	$\frac{1}{4}$ "	.006"
.009"	$\frac{5}{8}$ "	.010"
.012"	1	.015"
.015"	2	.020"

The Speeds and Feeds are approximate for average conditions. They can be greatly exceeded under some conditions, but under others both would have to be reduced.

These speeds should seldom be exceeded, except for Oil Drills and Drills made of high speed steel. Feed per revolution for  $\frac{1}{4}$  inch Drill, about .005 inch; for  $\frac{1}{2}$  inch Drill, about .007 inch; for  $\frac{3}{4}$  inch Drill .010 inch.

Combination Center Drills for centering lathe work should be run at a suitable speed for the drill point, regardless of countersink. We find it is often the case that these drills are run at a suitable speed for drills, size of large diameter or countersink, which is altogether too slow. The E2 Drill with  $\frac{1}{8}$  inch point should be run about 850 per minute, the C2 Drill with  $\frac{1}{16}$  inch point at about 1700. Feed should not exceed that for a small drill of this diameter.

## Index to Catalog

---

	PAGE
Building .....	4
Cases	
Morocco Leather .....	47, 48, 49, 51, 68
Oak .....	50, 52
Center Drills, Combination .....	64, 65, 66, 67
Center Drill Sets .....	67
Combination Micrometer Gauges .....	60, 61, 62
Depth Gauges .....	60, 61, 62
End Measures .....	63
Extension for Micrometer Gauges .....	57
Features of a Slocomb Micrometer .....	10
Guarantee .....	6
Height Gauge .....	62
Introductory .....	7
Micrometers	
Bench (6 inch) .....	46
Direct Reading .....	27, 42, 45
Extension (Inside) .....	57
Fly Tool .....	44
Heads .....	58
Inside .....	57, 59
Outside .....	12-46, 48
Paper .....	14, 45
Pointed Screw Thread .....	33
Polished Frame .....	21-27
Quantity Production .....	20, 21
Quick Acting .....	45
Rolling Mill .....	38, 39, 40
Sets .....	42, 43, 47-56
Snap Gauge .....	41
Thread (Standard) .....	34, 35
Tube .....	36, 37
Racks for Micrometer Sets .....	53-56
Sectional View—Micrometer Caliper .....	11
Standard End Measure Rods .....	63
Suggestions for Ordering .....	8

## Index to Measuring Book

---

	PAGE
Using a Common Rule.....	70
Graduated Adjusting Dials for Machine Tools.....	70-75
Old-Fashioned Inside and Outside Calipers.....	75
Suggestions as to How Micrometers May Be Used for Various Kinds of Measuring.....	76-81
Tube Micrometers .....	82
Screw Thread Micrometers.....	83-85
Table of Constants for use with Screw Thread Micrometers.....	86
Special Features of the Slocomb Micrometer.....	87
Sectional Cut of Slocomb Micrometers.....	88, 89
How to Read a Micrometer.....	90, 91
How to Read Micrometers Graduated to Ten Thousandths.....	91, 92
Friction Stops .....	93
Friction Thimble .....	93
Regarding Reliable Measurements.....	94, 95
Pratt & Whitney Measuring Machine.....	95
Master Standards, How Derived and Where Kept.....	95
Johansson Gauges .....	96
Table of Allowances for Various Classes of Fits.....	97
Table of Decimal Equivalents.....	98
Table of Millimeter Equivalents of Parts of an Inch.....	99
Table of Decimal Equivalents of Millimeters and Fractions of Millimeters .....	100
Table of English Inches into Millimeters.....	101
Table of Tap Drill Sizes for Machine Screw Taps.....	102
Table of Tap Drill Sizes for Machine Screw Taps National Form .....	103
Table of National Standard Screw Threads.....	104
Table of Tap Drills for Pipe Taps .....	105
Table of Decimal Equivalents of the Numbers of Twist Drill and Steel Wire Gauges.....	106
Diameters of Centers, Sizes of Center Drills and Speeds Recommended .....	107
Table of Speeds Recommended for Twist Drills.....	108, 109



J. T. SLOCOMB COMPANY











