Starrett

PRECISION TOOLS, STEEL TAPES,
DIAL INDICATORS, HACK SAWS

The L. S. Starrett Company, Athol, Mass., U.S.A.

Starrett

CATALOG
NO. 26

TRADE MARK

Starrett

REG. U. S. PAT. OFF.

For Latest List Prices of Tools Shown in This Catalog and Tools Now Being Manufactured, Refer to Separate List Price Booklet No. 103-V

Buy Through Your Distributor

Starrett Tools are sold only through authorized distributors located in all principal cities of the world.

FINE MECHANICAL TOOLS

FROM THE WORLD'S GREATEST TOOLMAKERS

TRADE MARK
REG. U. S. PAT. OFF.
STARRETT

TRADE MARKS REGISTERED IN FOREIGN COUNTRIES

Catalog 26

Manufactured by

THE L. S. STARRETT COMPANY

Athol, Massachusetts, U. S. A.

Cable Address, Starrett, Athol

CODES

Acme. Lieber's, New Business
Bentley's Complete Phrase Code, Improved

NEW YORK
53 Park Place (Corner West Broadway)

CHICAGO
17 N. Jefferson St.

LONDON
35, 36, 37, Upper Thames St., E.C. 4

Printed in U. S. A.

10 to 11 SETS OF TOOLS APPRENTICES
12 to 13 GROUND FLAT STOCK
14 to 25 STEEL RULES
33 to 43 STEEL TAPES
45 to 47 TRANSITS and LEVELING INSTRUMEN
48 to 62 COMBINATION SQUARES and SET
87 to 95 VERNIER CALIPERS HEIGHT GAGES
97 to 139 MICROMETER CALIPERS
143 to 146 INDICATORS "LAST WORD"
147 to 157 INDICATORS DIAL AND TEST
159 SETS OF TOOLS AUTOMOTIVE
162 to 175 GAGES SCREW PITCH—THICKNE
194 to 206 CALIPERS—DIVIDERS
226 to 233 GAGES DRILL AND WIRE
234 to 239 LEVELS
241 to 254 HACK SAW FRAMES—BLADES
255 to 281 REFERENCE TABLES INDEX

Our Pledge

TO INDUSTRY

TO the trade without whose loyal co-operation we should never have attained our present ability to render useful service on a large scale—

To the thousands of men who use STARRETT TOOLS to earn their daily bread, whose skill and integrity alone have made possible the tremendous industrial expansion of the world—

To all who know and love fine tools—

We pledge ourselves to protect and carry on the high standards set by our founder to the end that The L. S. Starrett Company shall continue to merit the distinction of the "world's greatest toolmakers" and that Starrett Tools shall continue to be known and accepted as standard the world over.

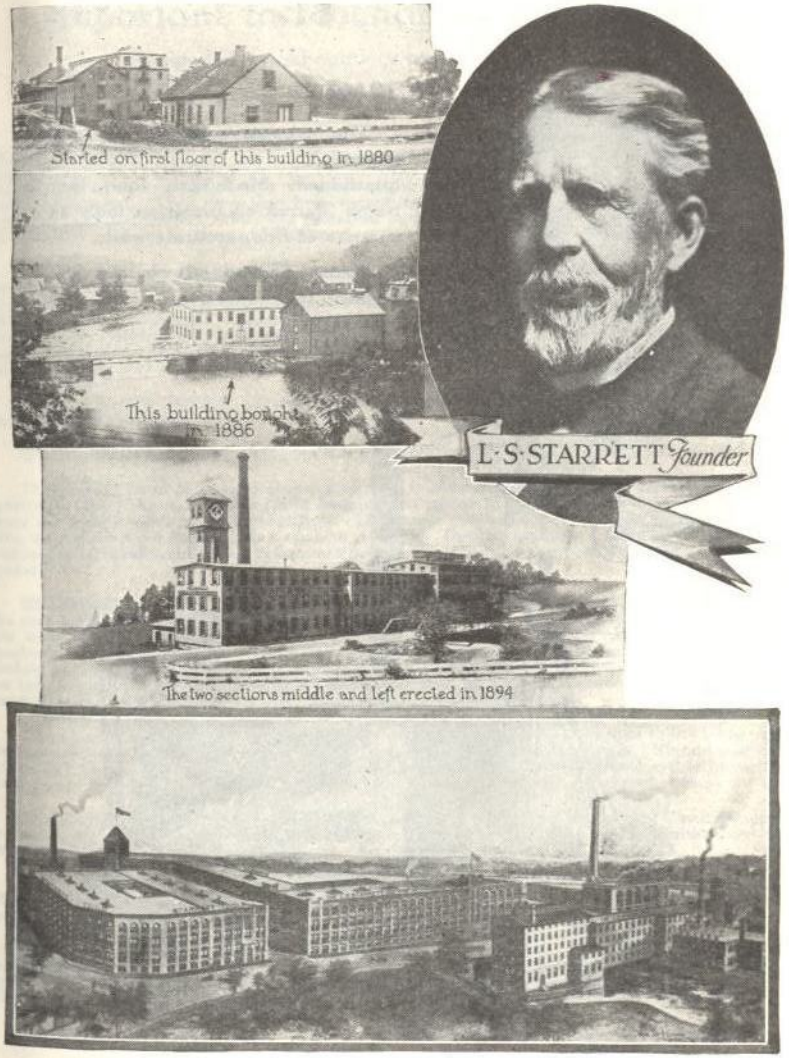
L. S. STARRETT
1880 to 1909

THE L. S. STARRETT CO.
1909 to 1938

WORLD'S GREATEST TOOLMAKERS

Manufacturers of

PRECISION TOOLS—Standard for Accuracy
DIAL INDICATORS—For Every Requirement
STEEL TAPES—Accurate and Reliable
HACK SAWS—Cut Quicker—Last Longer

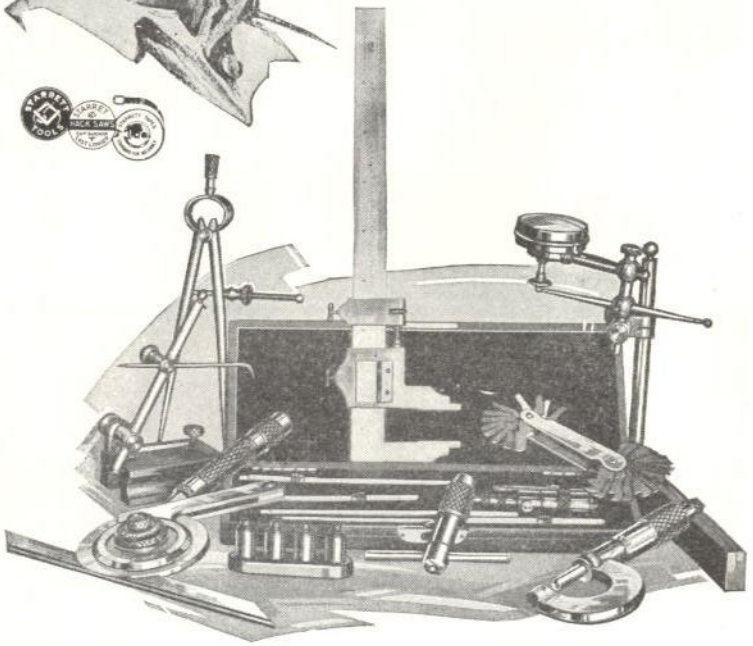


The Largest Plant in the World

Devoted Exclusively to the Manufacture of Precision Tools, Hack Saw Blades, Steel Tapes and Dial Indicators

The accuracy, utility and lasting dependability of Starrett Tools is unquestioned. Machinists look for the name Starrett on precision tools as assurance of fine, accurate work.

Made since 1880 by the world's greatest toolmakers.



Starrett

Important to Mechanics and Dealers

Please destroy old catalogs and order only from this

CATALOG No. 26

STARRETT TOOLS are made by skilled mechanics, in modern factories, clean, well lighted, well ventilated; equipped with up-to-date machinery and appliances for the production of the highest grade of tools and instruments of precision. The parts of tools are carefully tested at every stage of their manufacture, and each completed tool is rigidly inspected before shipment. They have long been recognized as the standard for accuracy, workmanship, design and finish. They are preferred by skilled mechanics with whom accuracy is a matter of pride as well as of livelihood.

EVERY TOOL IS WARRANTED accurate and satisfactory. In the immense number of tools we are constantly sending out it is unavoidable, in spite of our safeguards and precautions, that one will occasionally be found which is not of Starrett quality. We shall esteem it a favor if our customers will notify us of any such case, and any tool proving defective in material or workmanship will be gladly replaced. Our tools are not warranted, however, against breaking or against the results of improper usage. No tool on which a name has been stamped will be replaced or exchanged.

PURCHASING TOOLS. Starrett Tools are sold only through authorized distributors located in all principal cities.

IN ORDERING do not fail to give the tool number and size of each article wanted.

TO DEALERS we sell at a discount sufficient to insure a fair profit after deducting cost of carriage, handling, advertising and keeping the goods in stock. Discount sheets will be sent to regular dealers on application. Discounts are subject to change without notice. We do not pay carriage in any case to dealers. Dealers without adequate commercial ratings must send satisfactory references before goods will be shipped, except for cash with order.

SHIPPING INSTRUCTIONS must be given with each order. Whether the goods are to be sent by freight, express or mail must be distinctly stated. When goods are ordered sent by mail, parcel post, insured will be assumed to be meant. In the absence of shipping instructions we will ship by what we consider the best way, cheapness, quickness, and safety being considered, and cannot be held responsible for transportation charges, delay, or loss in transit; if by express, no allowance will be made for difference between express and freight charges.

The goods are sold and our responsibility ceases when delivery is made to the transportation company or post office, and we will replace no goods lost in transit. Should miscarriage or loss occur, however, we will do our best, in the interest of the purchaser, to have the lost goods found or proper restitution made by the transportation company at fault.

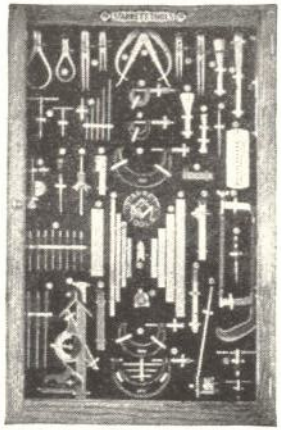
CLAIMS FOR LOST SHIPMENTS, sent to places in the United States and Canada, must be made within sixty days from date of invoice; in foreign shipments such claims must be made within 120 days from date of invoice.

CLAIMS FOR ERRORS or shortages must be reported immediately on receipt of goods. Actual errors or shortages will be rectified as promptly and cheerfully after a bill has been paid as before.

WHEN GOODS ARE RETURNED for repairs or for other reason, the name of the sender must be plainly marked on the package, and the transportation charges prepaid. A letter giving full information as to what is wanted should be mailed at the time goods are sent. Tools to be repaired should be sent to the factory at Athol, not to any of our branches.

All business communications should be addressed to the Company, not to individuals.

COME TO SEE US. A cordial invitation is given to our dealers to stop at Athol when convenient and get personally acquainted with us and see our works.



Display Cases for Distributors

To assist our Trade in promoting additional sales for Starrett Tools, we are pleased to furnish Display Cases or Panels on which our tools are mounted.

These cases not only make an attractive Display of Starrett Tools, but also keep the tools in perfect condition, free from unnecessary handling, thus providing a very valuable store fixture for any dealer.

We are equipped to and will gladly mount our tools on display panels sent in by any of our dealers, charging only for the tools at our regular prices.

Full particulars, with prices, quoted upon application.

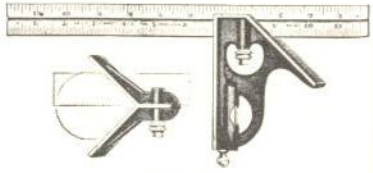
Electrotypes

We are glad to furnish electrotypes of the tools we make to any dealer who will use them. We can supply them in the large size (approximately 3 inches), or reduced to 1½ inches the longer way, as in the following examples:

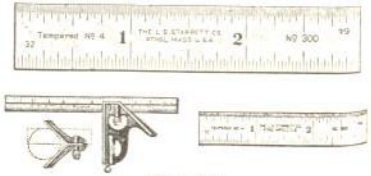
We send out only new electrotypes, and will furnish either size, as may be preferred by the dealer, without charge.

We are constantly using large space in the best mechanical papers to acquaint mechanics with the merits of our goods. Dealers can turn this publicity to their own account, and focus on their own stores the benefit of the sales promotion we do by advertising locally in newspapers, street cars, by circulars, catalogs, etc., that they sell Starrett Tools.

When calling for electrotypes kindly state whether large or small size, as explained above, are required.



Large Size



Small Size

The Starrett Books

Handy volumes, 7 x 4⅝ inches, printed in clear type, on good paper and strongly bound in serviceable Athol imitation leather.

Volume I

For Machinists' Apprentices

184 pages of material that shows "how to do it." Essential to the beginner, valuable to the experienced machinist. It deals with the layout and precise measurement of work. Also shows use of tools. Helpful to the apprentice and handy for the foreman.

Price .....

Volume II

Data Book for Machinists

180 pages of important technical data, tables that relate to machine speeds, power transmission, drilling, turning and milling, materials, etc. This book is of exceptional value to the practical machinist, foreman, and superintendent.

Price .....

Volume III

For Motor Machinists and Auto Repairmen

206 pages of information which motor machinists and auto repairmen will appreciate. With many reference tables it covers, in an easily understandable manner, the methods and general practice in automobile and engine repair work. A particularly valuable book for the beginner. Useful to the most experienced. Should be in every garage.

Price .....

Special Work

Our many years of manufacturing experience, combined with our excellent equipment, enable us to manufacture special tools and gages in large or small quantities at the lowest possible cost. In addition to special inquiries for odd sizes and graduations of steel rules, straight edges, etc., we will gladly estimate on any specifications sent us, if they are such as we are in a position to handle.

Practical Advertising Specialties

Steel Rules—Steel Tapes—and many other numbers from our line have proven most effective items for direct specialty advertising.

Such high-grade articles with their accuracy and durability are not only attractive but useful.

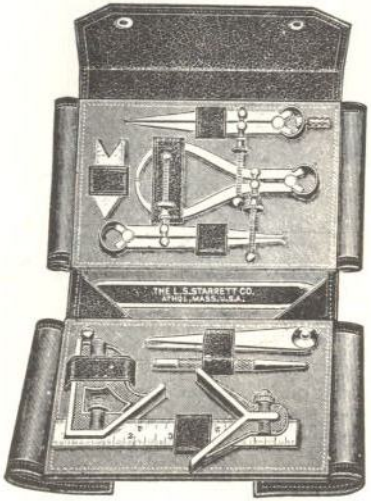
Special markings to meet individual requirements increase the Advertising and Good Will value.

We solicit such work and welcome the opportunity to submit sketches and quote on large or small quantities.

Sets of Tools

For Students and Apprentices

These sets of tools will be found indispensable to the Student or Apprentice Mechanic. Compact and convenient to carry.



No. 900

Set complete in folding case, about 1¼ x 4¾ x 7 inches. Contains the following tools, as shown in cut:

No. 11 6-inch Combination Square, complete.
No. 320 6-inch Flexible Steel Rule.
No. 117 B Center Punch.
No. 390 Center Gage.
No. 241 4-inch Caliper.
No. 79 4-inch Outside Caliper with solid nut.
No. 73 4-inch Inside Caliper with solid nut.
No. 83 4-inch Divider with solid nut.

PRICE

No. 900 Set of Tools, with case .....

No. 901

In substantial and nicely finished wood case, about 1½ x 7 x 12 inches. Set complete, as shown in cut, contains:

No. 11 6-inch Combination Square, complete.
No. 320 6-inch Flexible Steel Rule.
No. 117 B Center Punch.
No. 390 Center Gage.
No. 77 5-inch Divider with spring nut.
No. 79 6-inch Outside Caliper with solid nut.
No. 73 6-inch Inside Caliper with solid nut.

The Starrett Book for Machinists' Apprentices. Volume I.

No. 901 Complete Set, with case .....Price,

Starrett

No. 902

Recommended where a more complete set of tools is desired by the apprentice. Similar in style to the set No. 900, only that it contains tools of different patterns, with a 1-inch micrometer included.

In folding case, about 1½ x 5½ x 8 inches.

Set complete, as shown in cut, contains:

No. 436 x 1-inch Micrometer, without ratchet stop and without lock nut.
No. 11 x 9-inch Combination Square with center head.
No. 391 Center Gage.
No. 117-D Center Punch.
No. 323 6-inch Flexible Rule.
No. 277 4-inch Divider.
No. 275 4-inch Caliper.
No. 274 4-inch Caliper.
No. 243 4-inch Caliper.

No. 902 Complete Set, with case .....Price,

Starrett Educational Sets

Large Size Charts for the Instructor and School Use

14 Charts to the Set

Small Size Charts to fit the Student Standard Notebook for Students and Apprentices

STARRETT TOOLS are standard equipment in Manual Training and Vocational Education classes, just as they are in Industrial Tool Rooms—and for the same reasons. The special features that make them efficient for skilled workmen make them easy for beginners to use.

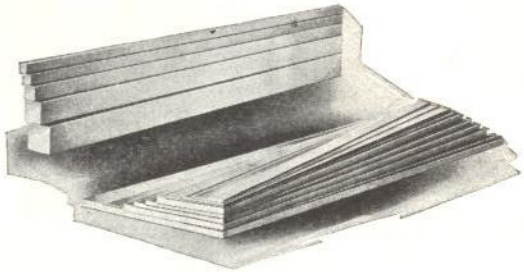
[The Set of Fourteen Blueprinted Student Notebook Pages, each showing a different tool and how to use it, punched and trimmed to fit the standard 8 x 10½ inch notebook size, furnished at per set.]

Ground Flat Stock
No. 495

Made of first quality tool steel ground to .001 inch in thickness. Ranging in thickness from 1/64 inch to 1 inch or larger, it is nicely annealed so that it is easily machinable. Indispensable for making templates, gages, test and cutting tools, parallels, machine parts, etc. Many shops, as individuals, do not have the facilities to grind to close limits; consequently this stock provides worth-while economy.

Our Ground Flat Stock is made to our own specifications and each piece is packed in a properly labeled envelope showing the dimensions. A most convenient way of handling. Buy it through your Mill Supply Dealer.

For hardening, we recommend as follows: Heat between 1400 degrees and 1500 degrees F., depending on size and shape to be hardened. Quench in water, brine or oil, depending on hardness required. At a slightly increased heat, stock within certain thickness limits will harden satisfactorily in oil with less danger of cracking. After quenching, to obtain medium temper, draw in oil at a temperature of 600 degrees F. for approximately fifteen minutes or heat until stock shows a very dark blue. To obtain more hardness, draw in oil at 350 degrees F. for the same duration or heat until stock shows a light straw color.



Size, Inches	Price, Per Piece	Size, Inches	Price, Per Piece	Size, Inches	Price, Per Piece	Size, Inches	Price, Per Piece
1-64		**1-16**		**5-32**		**1-4**	
1 x 18 x 1/64		2 1/2 x 18 x 1/16		1 1/2 x 18 x 5/32		4 x 18 x 1/4	
1 1/2 x 18 x 1/64		3 x 18 x 1/16		2 x 18 x 5/32		5 x 18 x 1/4	
2 x 18 x 1/64		3 1/2 x 18 x 1/16		2 1/2 x 18 x 5/32		6 x 18 x 1/4	
2 1/2 x 18 x 1/64		4 x 18 x 1/16		3 x 18 x 5/32		**5-16**	
3 x 18 x 1/64		5 x 18 x 1/16		4 x 18 x 5/32		5/16 x 18 x 5/16	
4 x 18 x 1/64		6 x 18 x 1/16		**3-16**		1/2 x 18 x 5/16	
1-32		**3-32**		1/2 x 18 x 3/16		1 x 18 x 5/16	
3/4 x 18 x 1/32		1/2 x 18 x 3/32		3/4 x 18 x 3/16		1 1/2 x 18 x 5/16	
1 x 18 x 1/32		3/4 x 18 x 3/32		1 x 18 x 3/16		2 x 18 x 5/16	
1 1/2 x 18 x 1/32		1 x 18 x 3/32		1 1/4 x 18 x 3/16		2 1/2 x 18 x 5/16	
2 x 18 x 1/32		1 1/2 x 18 x 3/32		1 1/2 x 18 x 3/16		3 x 18 x 5/16	
2 1/2 x 18 x 1/32		2 x 18 x 3/32		2 x 18 x 3/16		4 x 18 x 5/16	
3 x 18 x 1/32		2 1/2 x 18 x 3/32		2 1/2 x 18 x 3/16		**3-8**	
3 1/2 x 18 x 1/32		3 x 18 x 3/32		3 x 18 x 3/16		3/8 x 18 x 3/8	
4 x 18 x 1/32		3 1/2 x 18 x 3/32		3 1/2 x 18 x 3/16		1/2 x 18 x 3/8	
5 x 18 x 1/32		4 x 18 x 3/32		4 x 18 x 3/16		3/4 x 18 x 3/8	
6 x 18 x 1/32		5 x 18 x 3/32		5 x 18 x 3/16		1 x 18 x 3/8	
3-64		6 x 18 x 3/32		6 x 18 x 3/16		1 1/2 x 18 x 3/8	
1 x 18 x 3/64		**1-8**		**7-32**		2 x 18 x 3/8	
1 1/2 x 18 x 3/64		1/2 x 18 x 1/8		1 x 18 x 7/32		2 1/2 x 18 x 3/8	
2 x 18 x 3/64		3/4 x 18 x 1/8		1 1/2 x 18 x 7/32		3 x 18 x 3/8	
2 1/2 x 18 x 3/64		1 x 18 x 1/8		2 x 18 x 7/32		4 x 18 x 3/8	
3 x 18 x 3/64		1 1/4 x 18 x 1/8		2 1/2 x 18 x 7/32		**1-2**	
4 x 18 x 3/64		1 1/2 x 18 x 1/8		3 x 18 x 7/32		1/2 x 18 x 1/2	
5 x 18 x 3/64		2 x 18 x 1/8		4 x 18 x 7/32		3/4 x 18 x 1/2	
6 x 18 x 3/64		2 1/2 x 18 x 1/8		**1-4**		1 x 18 x 1/2	
1-16		3 x 18 x 1/8		1/4 x 18 x 1/4		2 x 18 x 1/2	
1/2 x 18 x 1/16		3 1/2 x 18 x 1/8		1/2 x 18 x 1/4		3 x 18 x 1/2	
3/4 x 18 x 1/16		4 x 18 x 1/8		1 x 18 x 1/4		4 x 18 x 1/2	
1 x 18 x 1/16		5 x 18 x 1/8		1 1/2 x 18 x 1/4		**3-4**	
1 1/2 x 18 x 1/16		6 x 18 x 1/8		2 x 18 x 1/4		3/4 x 18 x 3/4	
1 1/2 x 18 x 1/16		**5-32**		2 1/2 x 18 x 1/4		**1**	
2 x 18 x 1/16		3/4 x 18 x 5/32		3 x 18 x 1/4		1 x 18 x 1	
		1 x 18 x 5/32		3 1/2 x 18 x 1/4			

Other sizes furnished to order. Prices upon application.

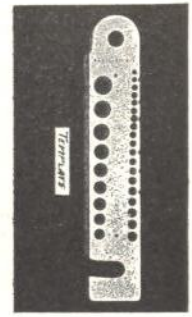
Use Starrett Ground Flat Stock

Made of High Grade Annealed Tool Steel
Easily Machined

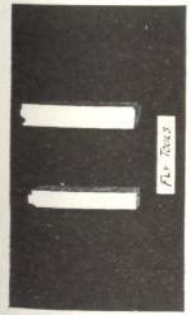
Some of the jobs on which Starrett Ground Flat Stock will save time and money

Templates

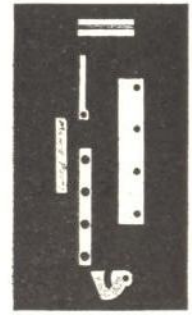
TEST TOOLS
DIE WORK
JIGS
FIXTURES
PARALLELS
MACHINE PARTS
SHIMS
PUNCH DIES
FLAT GAGES
TEST GAGES
SNAP GAGES
STAMPS and CUTTERS
TEMPLATES



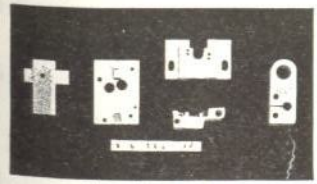
Template



Fly Tools



Machine Parts



Jig and Fixture Parts

Gages

Starrett

Steel Rules

Machine Divided—Distinctive Graduations

The many advantages of light, thin, spring-tempered steel rules over ordinary thick, soft rules are so apparent that they are at once adopted by mechanics. The popularity of our spring-tempered rules is shown not only by the increasing demand for them among mechanics and draftsmen but also by the fact that other manufacturers have been forced to imitate them and to adopt as near as they are able our improved methods of making them.

Attention is invited to the variety of rules that we make: Spring-Tempered, both light and heavy, Flexible, Semi-Flexible, Narrow and Desk; Spring-Tempered and Flexible Rules graduated in the Metric System as well as combining both the Metric and the English measures, also our latest achievement—Stainless Steel Rules.

In 1882, the late Mr. L. S. Starrett began the manufacture of spring-tempered steel rules. At once they became the favorite among mechanics and are still the leaders in this class of fine tools. Our many years' experience in making tempered rules has naturally led to a continually improved product, and our present methods have been made possible by new graduating machines from Mr. Starrett's own designs. Our new departments, equipped with every perfected appliance needed in the manufacture of accurate scales, are meeting every requirement.

Our rules are made to agree with the accurate standards furnished by the United States Government. From time to time we forward our standards to the Bureau of Standards at Washington where they are compared with the government standards.

In this manner our standards are not only strictly accurate, but are kept so. The most minute error due to wear of the standards we use for comparison is provided for.

English Measure

Graduations

These Rules are divided into parts of inches as follows:

No. 1 Graduation

1st corner	10, 20, 50, 100
2d corner	12, 24, 48
3d corner	16, 32, 64
4th corner	14, 28

No. 2 Graduation

1st corner	10, 20, 50, 100
2d corner	12, 24, 48
3d corner	16, 32, 64
4th corner	8

No. 4 Graduation

1st corner	64
2d corner	32
3d corner	16
4th corner	8

No. 7 Graduation

1st corner	64
2d corner	32
3d corner	16
4th corner	100

No. 10 Graduation

1st corner	32
2d corner	64

No. 11 Graduation

1st corner	64
2d corner	100

No. 12 Graduation

1st corner	50
2d corner	100

No. 16 Graduation

1st corner	32
2d corner	64
3d corner	50
4th corner	100

Starrett

Spring-Tempered Steel Rules

Machine Divided—Distinctive Graduations

Approximate Thickness, inches	3/64 or No.18 gage										
Approximate Width, inches	1/2	1/2	9/16	5/8	3/4	7/8	1	1 1/8	1 1/4	1 1/4	1 1/4
Length, inches	1	2	3	4	6	9	12	18	24	36	48
Price, each											

No. 300 has No. 4 graduation. Made in lengths 1 inch to 48 inches inclusive.
No. 301 has No. 1 graduation. Made in 6-inch and 12-inch lengths only.
The No. 301 Rule is commonly used on gear cutting work.
No. 302 has No. 2 graduation. Made in 6-inch and 12-inch lengths only.
***No. 307** has No. 7 graduation. Made in lengths 1 inch to 48 inches inclusive.
No. 309 has No. 16 graduation. Made in 6-inch and 12-inch lengths only.
Prices same as corresponding lengths of No. 300 Rules, as shown above.

***No. 307** Rules, 36-inch and 48-inch, are made 1½ inch wide and 1/10 inch thick.

Packed 1 to 12 inch, inclusive, 6 in a box; 18 inch and up, inclusive, 1 in a package.

No. 303

Quick Reading with Graduated End

No. 303 has No. 4 graduation and is graduated in 32nds of an inch on opposite sides of one end; the 64ths and 32nds with quick reading.

These rules are of the same widths and thicknesses as corresponding lengths of No. 300 Rules. Made in 2-inch to 12-inch lengths only, inclusive.

Prices: The same as for No. 300 Rules, listed above. Packed 6 in a box.

Nos. 600 and 603

No. 600 Front With Quick Reading Figures

Special attention is called to the fact that these rules are figured so as to assist the user to quickly read the 64ths and 32nds, as shown by the cut.

No. 600 has No. 4 graduation, which consists of 8ths and 16ths on one side, and 32nds and 64ths on the other. Made in 1-inch to 24-inch lengths, inclusive.

Longer lengths have two rows of figures.

Showing No. 603 Reverse Side with End Graduations

No. 603 has No. 4 graduation, with the 64ths and 32nds figured, like No. 600, and is graduated in 32nds of an inch on both ends of one side, as shown by the cut. Made in 2-inch to 12-inch lengths, inclusive.

Approximate Thickness, inches	3/64 or No.18 gage										
Approximate Width, inches	1/2	1/2	9/16	5/8	3/4	7/8	1	1 1/8	1 1/4		
Length, inches	1	2	3	4	6	9	12	18	24		
Price, each											

Spring-Tempered Steel Rules No. 607

Machine Divided—Distinctive Graduations—Quick Reading

No. 607 has No.7 graduation, which consists of 16ths and 32nds on one side, and 64ths and 100ths on the other. Special attention is called to the fact that these rules are figured so as to assist the user to quickly read the 32nds, 64ths and 100ths, as shown by cut. No.607 made only in 4, 6, 12, 18 and 24 inch lengths.

Same widths and thicknesses as No.600 and No.603, listed on page 15.

Length, inches	4	6	12	18	24
Price, each					

Packed 1 to 12 inch, 6 in a box; 18 and 24 inch, 1 in a package.

Nos. 400 and 407

Machine Divided—Distinctive Graduations

With One Beveled Edge

No. 400 has No.4 graduation, with 64ths on the beveled edge.

Approximate Thickness, inches	3/64 or No. 18 gage							
Approximate Width, inches	1/2	1/2	5/16	5/8	3/4	7/8	1	1 1/8	1 1/4
Length, inches	1	2	3	4	6	9	12	18	24
Price, each									

No. 407 has No.7 graduation with 100ths on the beveled edge.

Approximate Thickness, inches	3/64 or No. 18 gage	
Approximate Width, inches	3/4	1
Length, inches	6	12
Price, each		

Packed 1 to 12 inch, 6 in a box; 18 inch and up, 1 in a package.

Heavy Spring-Tempered Steel Rules No. 410

Machine Divided—Distinctive Graduations

No. 410 Heavy, spring-tempered, No.4 graduation.

Thickness, about 1/10 inch.

Width, about, inches	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2
Length, inches	12	18	24	36	48	60	72
Price, each							

Packed 12 inch, 6 in a box; 18 inch and up, 1 in a package.

Semi-Flexible Steel Rules No. 325

Machine Divided—Distinctive Graduations—Quick Reading

No. 325 Semi-Flexible. No.4 graduation, and graduated in 32nds of an inch on both ends of one side. Made in 6 and 12 inch lengths only.

These rules are about 1/50 inch thick, slightly heavier than the Flexible Rules and lighter than the Spring-Tempered Rules. They are of the same widths as the corresponding lengths of Spring-Tempered Rules. Packed 6 in a box.

Length, inches	6	12
Price, each		

Starrett

Spring-Tempered Steel Rules No. 305

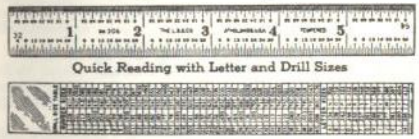
Machine Divided—Distinctive Graduations

As the cut shows, this rule has the 32nds and 64ths graduations, with quick reading set up on one side, and the very legible table of fractions and decimal equivalents on the other. Approximate thickness, 3/64 inch. Width, 3/4 inch.

Quick Reading with Decimal Equivalents

No. 305 6-in. only, Price,

Spring-Tempered Steel Rules No. 306



Quick Reading with Letter and Drill Sizes

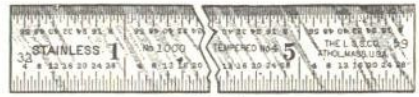
Another good practical shop rule. One side graduated 64ths and 32nds with quick reading figures. The other side shows letter sizes of drills from A to Z and the diameters in thousandths, also number sizes from 1 to 80 with diameters in thousandths.

No. 306 6-inch only....Price, each,

Stainless Steel Rules No. 1000

Machine Divided—Distinctive Graduations

HARDENED AND TEMPERED. Will not Rust or Stain. Made of the highest grade of STAINLESS STEEL specially heat-treated. Graduated on both edges of both sides. Quick reading graduations (the 64ths being numbered every 8th division, the 32nds every 4th division). Made in 6 and 12 inch lengths only.



Quick Reading

No. 1000 6-inch; approx. 3/4 inch wide. Price,

12-inch; approx. 1 inch wide. Price,

Flexible Stainless Rules No. 1020

No. 1020 Similar to No.327, listed on page 19, except that they are made of stainless steel. Graduated in 16ths, 32nds and 64ths, and on both sides of rule, from one end. Made in 6-inch length only. Quick reading.

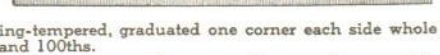
No. 1020 6-inch....Price, each,

Narrow Steel Rules Nos. 330 and 331

Machine Divided—Distinctive Graduations

No. 330 Narrow, No.10 graduation (32nds and 64ths).

No. 331 Narrow, No.11 graduation (64ths and 100ths).



About 3/16 inch wide, 1/25 inch thick, spring-tempered, graduated one corner each side whole length, either in 32nds and 64ths or 64ths and 100ths.

Length, inches	4	6	9	12
Price, each				

Above numbers packed 6 in a box.

Starrett

Flexible Steel Rules
Nos. 320, 321 and 322

Machine Divided—Distinctive Graduations

These are very thin, spring-tempered rules, nicely graduated on one side only. Those from 1 inch to 12 inches are ½ inch wide, and will easily conform to a 2-inch circle. Those from 18 inches to 48 inches are ¾ inch wide, and are made from a trifle heavier stock.

Length, inches	1	2	3	4	6	9	12	18	24	36	48
Price, each											

No. 320 No.10 graduation. (32nds and 64ths)
No. 321 No.11 graduation. (64ths and 100ths) 6 and 12 inch only.
No. 322 No.12 graduation. (50ths and 100ths) 6 and 12 inch only.

Packed 1 to 12 inch, 6 in a box; 18 inch and up, 1 in a package.

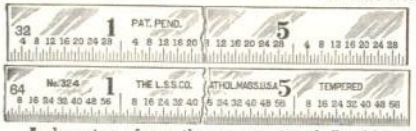
No. 323

Machine Divided—Distinctive Graduations
With Quick Reading Figures

Has the usual 64ths and 32nds graduations. Every 4th graduation of 32nds and 8th graduation of 64ths, numbered. Gives mechanics another choice of flexible rule with quick readings.

No. 323 6-inch ..... Price, each,

Packed 6 in a box.



No. 324 Patented

Machine Divided—Distinctive Graduations
Graduated Both Sides Quick Reading

A departure from the conventional flexible steel rule as both sides are graduated, as shown by the above cuts. Graduated 64ths on one side and 32nds on the other, with the addition of our quick reading figures.

As illustrated, it is graduated on opposite sides and opposite edges and from one end.

Close working mechanics, more and more, lean to the 6-inch flexible rule as the one rule they carry and as this rule is graduated so it is always in the natural position to use, it is becoming very popular. (No turning end for end nor measuring with figures upside down.) Made only in 6-inch length.

No. 324 6-inch ..... Price, each,

Packed 6 in a box.

With Pocket Clip

No. 320 K Patented

Machine Divided—Distinctive Graduations

Designed specially for shopmen who use a rule many times a day. Mechanics have seen and devised numerous methods for fastening rules to their clothes but here is a combination which we believe superior to all others.

Simple—just a Clip permanently attached to a 6-inch flexible rule.

The Clip is positioned at the 4-inch mark, garment pocket depths being considered. Rule cannot be released without slight downward pressure on the pawl.

The No.320 K comprises our No. 320—6-inch Rule with Clip. Rule is graduated on one side only—one edge in 32nds and the other edge in 64ths of an inch.

No. 320 K 6-inch..... Price, each,

Packed 6 in a box.

Note: Cases with Clips, for Flexible Rules, will be supplied at a price of each, list.

Starrett

Flexible Steel Rules
Nos. 338 and 339

Machine Divided—Distinctive Graduations

Figured Graduations in 10ths—50ths—32nds—64ths

Facilitates measurements where dimensions are in decimals, eliminating necessity of converting decimals into fractions. One side graduated in 10ths and 50ths of an inch. Each 10th of an inch in the 50th graduations is figured—a great help for quick and easy reading in decimals. Hundredths of an inch are estimated readily.

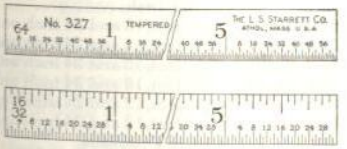
Opposite side of rule graduated in 32nds and 64ths, the 64th graduations being figured every 8th of an inch. The combination of 10ths and 50ths on one side, with 32nds and 64ths on the other, together with the handiness of the figured graduations, make this rule especially useful and desirable for up-to-date shop work.

No. 338 6-inch Flexible ..... Price, each,
No. 339 12-inch Semi-Flexible..... Price, each,

No. 327

Machine Divided—Distinctive Graduations

With Simplified Quick Reading



An improved flexible steel rule—graduated in 16ths, 32nds and 64ths, and on both sides of the rule, from one end. No turning end for end nor measuring with figures upside down. Graduations that are used mostly, 32nds and 64ths, are on the lower edges, with quick reading features. The 16ths, regular graduation, is on the upper edge of the 32nds side. Made from finest quality spring-tempered steel. This thin rule being graduated on both sides, **caution** is recommended against bending too sharply.

No. 327 6-inch only.....Price, each,
Packed 6 in a box.

No. 328

Machine Divided—Distinctive Graduations

With Tapered End

One side has plain 64th divisions, other, 32nd divisions. Figures and divisions always in natural position, as our No.324 Rule. The gradual taper from the 2-inch line to an approximate end width of ⅛ inch gives it a greater range than the ordinary rules, as it permits measuring in holes, slots, from shoulders, etc. Same width and thickness as our No.320 Flexible Rule.

No. 328 6-inch only.....Price, each,
Packed 6 in a box.

Note: Cases with Clips, for Flexible Rules, will be supplied at a price of each, list.

Shrinkage Rules

Machine Divided—Distinctive Graduations

For all ordinary measurements a STANDARD RULE is used, but for laying out or for working patterns, or any part of a pattern or core box, a SHRINKAGE RULE should be used. The reasons are that when a mould made from the wooden pattern in the sand is filled with molten metal, its temperature is very high, and as it cools and solidifies it contracts. Accordingly, to compensate for this, the patternmaker must add to the size of the pattern. In order that this may be done and exact relations be maintained for all dimensions a SHRINKAGE RULE is used. This rule is graduated like an ordinary rule, but if the two are compared the SHRINKAGE RULE will be found to be longer. EXAMPLE: Cast iron will shrink about 1/8 inch to the foot, so the rule in reality would be 12 1/8 inches long, the additional length gradually being gained in the length of the rule. The contraction of different metals in the moulds varies greatly, that for cast iron being about 1/8 inch to each foot, 3/16 inch to the foot for brass, while for many of the softer metals it is as great as 1/4 inch to the foot. The usual allowance for each foot in length is as follows:

Shrinkage of Castings

In large cylinders ..... 3/32 in.	In cast iron pipe ..... 1/8 in.	In copper ..... 3/16 in.
In small cylinders ..... 1/16 in.	In steel ..... 1/4 in.	In bismuth ..... 5/32 in.
In beams and girders .. 1/10 in.	In zinc ..... 5/16 in.	In malleable iron ..... 1/8 in.
In thick brass ..... 5/32 in.	In lead ..... 5/16 in.	In aluminum ..... 3/16 in.
In thin brass ..... 3/16 in.	In tin ..... 1/4 in.	

See page 191 for Rule Holder particularly adapted to the use of Patternmakers.

Steel Shrink Rules

Machine Divided—Distinctive Graduations

These rules are spring-tempered and are of the same width and thickness as Spring-Tempered Standard Rules, listed on page 15. Made with No.4 graduation, 8ths, 16ths, 32nds and 64ths.

Prices: 6 inch..... 12 inch..... 24 inch.....

No. 370 Shrink, 1/8 to foot
No. 372 Shrink, 1/8 to foot, 6-inch only, flexible
***No. 373** Shrink and Standard, 1/8 to foot
No. 375 Brass Shrink, 3/16 to foot
No. 376 Shrink, 7/32 to foot, 12-inch only
****No. 377** Double Shrink, 1/4 to foot
No. 378 Shrink, 9/32 to foot, 12-inch only
No. 374 Shrink, 1/10 to foot, 12 and 24 inch only
No. 368 Shrink, 5/16 to foot, 12 and 24 inch only
No. 369 Shrink, 3/8 to foot, 12 and 24 inch only
No. 388 Shrink, 1/12 to foot, 12 and 24 inch only
No. 389 Shrink, 5/32 to foot, 12 and 24 inch only
No. 393 Shrink, 7/16 to foot, 12 and 24 inch only

6-inch and 12-inch, packed 6 in a box; 24-inch, packed 1 in a package.

***No. 373** 12-inch, is graduated 2 edges on one side in 64ths and 32nds, 12 1/8 inches long, or with 1/8 inch shrink, and on the other side 2 edges in 64ths and 32nds, 12 inches long, or the standard foot for comparison.

****Double shrink** is used when 2 shrinks are necessary, as in a master pattern. Take cast iron, which shrinks 1/8 inch to foot, for example: a master pattern is made to make a gate pattern, the result being 1/8 inch shrink, then the production piece from pattern is another 1/8 inch, consequently 1/4 inch shrink is used to make the master pattern.

Metric Steel Shrink Rules

Machine Divided—Distinctive Graduations

These rules are spring-tempered, and of the same width and thickness as the 12-inch Shrink Rules listed above. Packed 1 in a package.

Graduated three edges in millimeters, one edge in 1/2 millimeters. Made in 30 cm. lengths only.

Price, each .....

No. 468 Metric Shrink, 1 mm. to 100 mm. **No. 469** Metric Shrink, 2 mm. to 100 mm.

Starrett

Steel Rules

Metric

Machine Divided—Distinctive Graduations

Spring Tempered

No. 340 Graduated three corners in millimeters, one corner in 1/2 mm. The same width and thickness as our No. 300 Spring-Tempered Rules of English measure, listed on page 15. Lengths and prices given below.

Lengths	Prices	Lengths	Prices
5 cm. = 1.9685 inches		20 cm. = 7.8740 inches	
10 cm. = 3.9370 inches		30 cm. = 11.8110 inches	
15 cm. = 5.9055 inches		50 cm. = 19.6850 inches	

1 m. = 39.3700 inches .....

Flexible

No. 345 Graduated on one side only, one corner in millimeters, the other in 1/2 mm. The same width and thickness as Flexible Rules of English measure, listed on page 18.

Made in the following lengths: 10, 15, 20, 30 cm. and 1 meter.

Prices the same as for corresponding lengths listed above.

Narrow

No. 347 About 3/16 inch wide, and about 3/64 inch thick. Graduated one side in millimeters, the other in 1/2 mm. Made in the following lengths: 10 and 15 cm.

Prices the same as for corresponding lengths listed above.

5 cm. to 30 cm., packed 6 in a box; 50 cm. and up, packed 1 in a package.

Metric and English

Machine Divided—Distinctive Graduations

Spring Tempered

No. 350 Graduated one corner each in millimeters, 1/2 mm., 32nds and 64ths of an inch, all lengths.

Lengths	Prices	Lengths	Prices
5 cm. = 1.9685 inches		20 cm. = 7.8740 inches	
10 cm. = 3.9370 inches		30 cm. = 11.8110 inches	
15 cm. = 5.9055 inches		50 cm. = 19.6850 inches	

1 m. = 39.3700 inches .....

No. 351 Made in the following lengths: 15 and 30 cm. only. The 15 cm. length graduated as follows: first corner in 1/2 mm., second corner in 1 mm., third corner in 64ths, fourth corner in 100ths of an inch. The 30 cm. length graduated as follows: two inches of third corner in 64ths, the rest of that corner in 16ths of an inch. Two inches of fourth corner in 100ths, the rest of that corner in 50ths of an inch.

Flexible

No. 355 Graduated one edge in millimeters, the other in 64ths.

Made in the following lengths: 10, 15, 20 and 30 cm. Prices the same as for corresponding lengths listed above. Graduated on one side only.

Narrow

No. 357 Graduated one edge in millimeters, the other in 64ths.

Made in 10 and 15 cm. lengths only. Prices the same as for corresponding lengths listed above. Graduated on one edge of each side only, about 3/16 inch wide and about 3/64 inch thick.

English and Metric with One Beveled Edge

No. 352 Graduated on beveled edge in 64ths inch, the other edge of same side in millimeters. Reverse side, one edge in 8ths, the other in 16ths of an inch. These rules are of the same width and thickness as No. 400, listed on page 16.

Lengths, inches 6 12 18 24

Price, each .....

5 cm. to 30 cm., or 12 inch, 6 in a box; 50 cm., or 18 inch and up, 1 in a package.

Adjustable Hook Rules No. 418

Machine Divided—Distinctive Graduations

Patent Applied For

Has an improved feature whereby the hook can be adjusted to be short or long in connection with any one of the four graduations on the rule. Its construction also enables one to set calipers to any of the graduations. These features are readily recognized from the cut, as compared to our other hook rules shown on this page. The hooks are hardened and may be entirely removed or adjusted by a slight turn of the eccentric stud. Rule graduations, 64ths, 32nds, 16ths and 8ths. Made only in 6, 9, 12, 18 and 24 inch lengths. Prices same as for No. 419 listed below.

Hook Rules No. 419

Machine Divided—Distinctive Graduations

Very convenient in taking measurements from points where one cannot see if rule is even with measuring edge, from round corners, through hubs of pulleys, setting inside calipers, etc. The hook may be quickly removed by turning the eccentric stud one half turn. "End Graduation" means both sides of one end graduated to 32nds.

Nos. 418 and 419

6-inch	Price,	Our No. 303 Direct Reading with End Graduation Rule, with hook.
9-inch	Price,	Our No. 303 Direct Reading with End Graduation Rule, with hook.
12-inch	Price,	Our No. 303 Direct Reading with End Graduation Rule, with hook.
18-inch	Price,	Our No. 600 Direct Reading Rule, with hook.
24-inch	Price,	Our No. 600 Direct Reading Rule, with hook.
36-inch No. 419 Type Hook only..	Price,	Our No. 410 Rule, with hook.
48-inch No. 419 Type Hook only..	Price,	Our No. 410 Rule, with hook.
60-inch No. 419 Type Hook only..	Price,	Our No. 410 Rule, with hook.
72-inch No. 419 Type Hook only..	Price,	Our No. 410 Rule, with hook.

Narrow Hook Rules No. 422

Machine Divided—Distinctive Graduations

These rules, while very similar to our No. 419 line, are designed for taking measurements through small holes. Measurements through holes as small as $11/32$ inch approximately, can be obtained. Graduated on one side in 32nds and the other in 64ths of an inch. Our No. 330 Rule, with hook.

Length, inches	4	6	9	12
Price, each				

Above Numbers: 4 to 12 inch, inclusive, 3 in a box; 18 inch and up, 1 in a package.

Steel Slide Caliper Rules No. 296

Machine Divided—Distinctive Graduations

The rules are 4 inches long, $5/8$ inch wide and $1/16$ inch thick, with jaws $1/2$ inch deep. With No. 4 Graduation, furnished with either 32nds or 64ths graduation on the lower edge of front side as may be desired, and 8ths and 16ths graduations on the reverse side. The thumb piece slides in a groove on the reverse side.

Where quick measurements are to be taken on small rods, tubing, sheet stock, etc., it is convenient to have an instrument which measures the object between two contacts. This slide caliper is highly satisfactory to any mechanic, but of extreme value in stock rooms and stores.

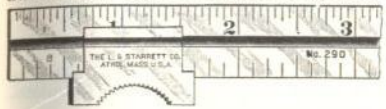
No. 296.....Price, each,

No. 296M The above rule is furnished with graduations in millimeters and half millimeters at the same price. Packed 3 in a box.

Steel Rules with Thumb Slide No. 290

Machine Divided—Distinctive Graduations—Hardened Rule

The rules are 6 inches long, about $5/16$ inch wide and $1/16$ inch thick. These are fitted with a thumb slide. Useful in measuring against a shoulder, the width of flanges, collars, etc. The slide may be used on either edge of the rule, or removed and the rule used alone. Made in 6-inch length. No. 4 graduation.



Price, each .....

Packed 3 in a box.

Brass Hook and Handle Rule No. 465

To enable blacksmiths to more conveniently measure hot pieces, and for convenience in measuring through holes, or from the inside when held against a corner, etc., the blacksmiths' hook and handle rule has been devised. This is an ordinary rule with a hook at zero, so that by placing the hook against the work the reading may be readily made from the scale at the edge. A handle on the opposite end from the hook permits using the rule without getting the hand near the work.

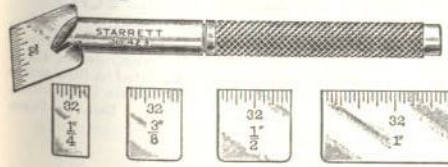
These rules are made from hard rolled sheet brass $1/10$ of an inch thick, $1\,1/16$ inches wide, with heavy graduations and figures, graduated from the end in $1/16$ inch on one side, and from the inside of the hook in 16ths of an inch on the other, adapting them for taking measurements either from the hook or from the outside edge. They are graduated 12 inches, have flat handles and measure overall $16\,3/4$ inches.

No. 465 A Without sliding head.....Price,

No. 465 B With sliding head.....Price,

No. 465 B sent unless otherwise ordered. Packed 1 in a package.

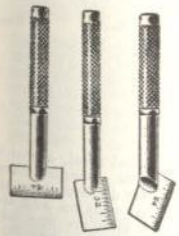
Tempered Steel Rules with Holder No. 423



Patented

Machine Divided

Distinctive Graduations



It is hardly necessary to describe the utility of these little rules as the average mechanic has many times seen places where just such rules were needed. They will be found useful where it is inconvenient to use an ordinary rule as in lathe work where there are grooves and short shoulders to be turned, measuring a recess or keyway as well as the general class of tool and die work. The holder is designed to retain the rules on a 30° angle. A slight turn of the knurled handle against a spring plunger locks the rule. The rules are graduated to read 32nds of an inch on one side and 64ths on the other. The 1-inch and $1/2$-inch lengths can also be furnished graduated to 50ths of an inch on one side and 100ths on the other at the prices listed below. A few of the many positions of this tool are shown above.

No. 423—English Set of rules and holder, comprising $1/4$, $3/8$, $1/2$, $3/4$ and 1 inch in length, with 32nds and 64ths graduations.....Price,

Rules only, all lengths..Price, each, Holder only..Price,

No. 423 M—Metric Set of rules and holder, comprising 5, 10, 15, 20, 25 mm. in length, with millimeters on one side and half millimeter graduations on other side Price,

Rules only, all lengths.....Price, each, Holder only.....Price,

Packed 1 set in a box.

Folding Steel Rules No. 460

Made of best quality spring-tempered steel, ¾ inch wide. Graduated the first two inches in 32nds, remainder in 16ths, on one side, and 8ths of an inch on the other. Cut shows full width. Lock joints. Black finish, with large, raised bright figures and graduations.

Length	Each	Per Dozen
2-ft., 2 fold, 12-inch joints	Price	
3-ft., 3 fold, 12-inch joints	Price	

Folding Steel Rules No. 460 M and E

Metric and English

The same as No. 460, except that one side is graduated in Metric measure (centimeters and millimeters), reverse side 16ths of an inch.

Length	Each	Per Dozen
2-ft., 60 cm., 2 fold, 12-inch joints	Price	

Packed 6 in a box.

Folding Brass Rules No. 462

With Stop Joint

Made of hard brass. Two feet long, ¾ inch wide, 12-inch joints, 2 fold. Graduated in 8ths of an inch on one side and 16ths on the other.

Length	Each	Per Dozen
2-ft., 2 fold, 12-inch joints	Price	

Packed 6 in a box.

Folding Steel Pocket Rules No. 450

No. 450 Made of best quality spring-tempered steel, ⅜ inch wide. Graduated the first two inches in 32nds of an inch, remainder in 16ths on one side, reverse side graduated in 8ths entire length. Raised figures and double lock-joints.

Length	Each	Per Dozen
1-ft., 3 fold, 4-inch joints		
2-ft., 4 fold, 6-inch joints		

Metal Bound Cases—1-ft., ; 2-ft., each.

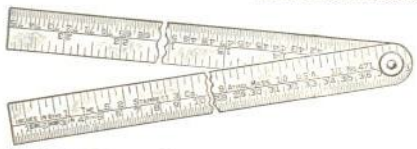
No. 450 M and E The same as No. 450, except that they are graduated in Metric measure (centimeters and millimeters) on one side, and 16ths of an inch on the other.

Length	Each	Per Dozen
1-ft., 30 cm., 3 fold, 4-inch joints	Price	
2-ft., 60 cm., 4 fold, 6-inch joints	Price	

1-ft. packed 12 in a box; 2-ft. packed 6 in a box.

Steel Rules No. 471

With Circumference Measurement

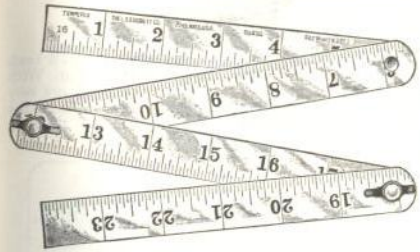


Made of spring-tempered steel, about ⅛ inch thick and ¾ inch wide. Length, 2 feet, 12-inch joints, 2 fold. Has distinct lines and figures and stop joint. One edge on one side graduated 16ths, reverse side on one edge 8ths and circumference inches by 8ths. Shows direct reading circumference measure up to 75 inches opposite the respective diameter. Packed 6 in a box.

No. 471 Price, each .....

Folding Steel Rules No. 451

Machine Divided—Distinctive Graduations



Made of best quality spring-tempered steel, ¾ inch wide in 6-inch sections, with double lock joints, a feature patented by us. Accurately graduated, the same as our regular machinists' rules, in 8ths of an inch on one side and 16ths on the other, with large figures for easy reading.

Length	Price
2-foot, 4-fold, each	
3-foot, 6-fold, each	
4-foot, 8-fold, each	
6-foot, 12-fold, each	

2, 3 and 4 foot packed 6 in a box; 6 foot packed 3 in a box.

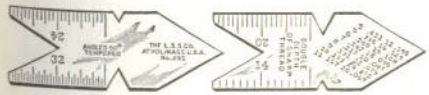
29° Screw Thread Gage No. 284

Acme Standard

This gage is a standard for grinding and setting tools when cutting Acme threads. Acme threads have the same depth as square threads but the sides of the thread are at an inclination of 14½° (29° included angle). This form of thread is used extensively at the present time and has in many instances replaced the square thread in machine construction. The advantages of the Acme thread are its strength and the ease with which it can be cut compared with the square threads. The angles and edges of this gage are hardened, ground and carefully tested.

No. 284 Price .....

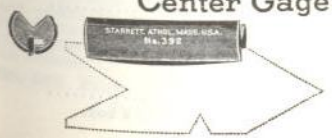
Center Gages



For use in grinding and setting screw cutting tools. Graduated in 14ths, 20ths, 24ths and 32nds of an inch, except Nos. 397 and 398, which are graduated in millimeters and ½ mm. These graduations are useful in finding the number of threads to the inch. Packed 6 in a box.

		Price
No. 390	U. S. Standard, 60°, not tempered	
No. 391	U. S. Standard, 60°, spring tempered	
No. 395	Whitworth Standard, 55°, not tempered	
No. 396	Whitworth Standard, 55°, spring tempered	
No. 397	Metric, 60°, not tempered	
No. 398	Metric, 60°, spring tempered	
No. 399	Heavy Center Gage, ⅛ in. thick. U. S. Standard, 60°, tempered, not graduated	

Center Gage Attachment No. 392

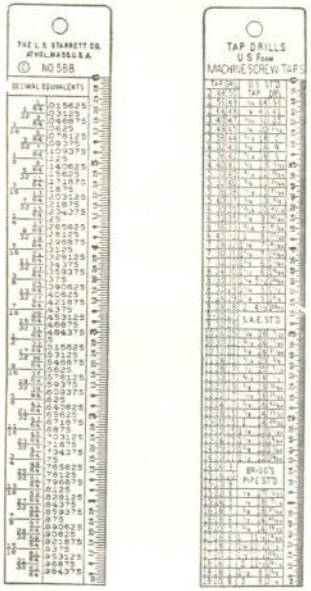


V Block with a slot above the V, for holding center gage against a lathe spindle or face plate. For both external and internal work.

No. 392 Price .....

Packed 3 in a box.

Ready Reference Table with Rule



No. 588

Copyrighted

Spring Steel—Quick Reading

Has decimals, fractions and 6-inch rule with 32nds divisions on one side, and tap and drill data and 6-inch rule with 64ths divisions on the other, as illustrated. Handy for toolmakers and machinists. Markings distinct and easy to read.

Note the 32nds divisions marked every 4, 8, 12, etc., lines; the 64ths divisions marked every 8, 16, 24, etc., lines—our quick reading feature on both sides.

Note also the way the rule is incorporated—no turning end for end—32nds or 64ths always in the natural position.

Size, about $^{2}/_{100}$ inch thick, 1¼ inches wide, and 6¾ inches long.

Price, each .....

Packed 12 in a box.

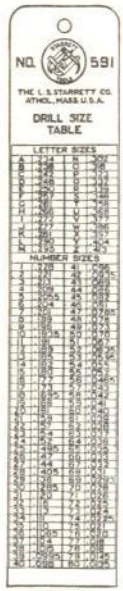
Handy Equivalent Tables

Made from Spring Steel

These Ready Reference Tables are but .012 inch thick, 1¼ inches wide, and about 6 inches long. With the black markings and polished surface they are very distinct. Carried in the pocket or used around the bench they are invaluable to machinists, tool makers, steel workers, etc.

No. 589

No. 590



No. 591

No. 589

Decimal Equivalents

Price, each .....

No. 590

Tap Drills—For Machine Screws

Price, each .....

No. 591

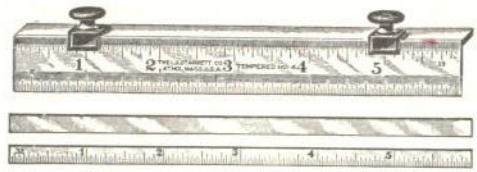
Drill Size Tables

Price, each .....

Above numbers packed 12 in a box.

Starrett

Key-Seat Rules No. 105



It is manifestly impossible to hold an ordinary rule on the cylindrical surface of a shaft and keep it parallel with the axis, while laying off measurements or drawing lines. The round surface of the work makes it difficult to hold the rule in place and it is liable to form a slight angle with the axis causing a measurement to be shorter than the true length, which should be made as it will be machined. This is an important matter when measuring lengths for splining keyways on shafting. To overcome this difficulty there have been designed rules with flanges, called key-seat rules.

The Starrett Key-Seat Rule is an improvement over the ordinary type in that the machinist's scale is used as part of the key-seat rule. This is made possible by a device which holds two straight edges together in the form of a box square. One of these rules is a plain, straight edge and the other the rule with which the machinist ordinarily works. The two edges forming the box square when applied to the surface of the cylindrical piece keep the graduated edge of the rule in a line parallel with the axis, permitting a line or series of lines to be so drawn.

The steel auxiliary straight edge is either plain or graduated in 32nds and 64ths as desired, and sent when ordered. Unless otherwise ordered the key-seat rule is sent without auxiliary straight edges.

PRICES

No. 105 A	Without auxiliary straight edge, 6-inch	**No. 105 D**	9-inch
No. 105 B	With auxiliary straight edge, plain, 6-inch	**No. 105 E**	9-inch
No. 105 C	With auxiliary straight edge, graduated, 6-inch...	**No. 105 F**	9-inch

No. 105 A sent unless otherwise ordered.

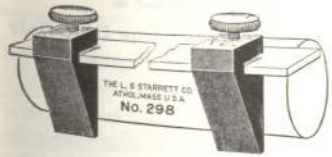
No. 105 M—Metric One side of scale graduated both edges in millimeters, the other side graduated one edge in millimeters and the other in ½ millimeters. The auxiliary straight edge graduated in millimeters and ½ millimeters.

PRICES

No. 105 M-A	Without auxiliary straight edge, 15 cm.....	**No. 105 M-D**	20 cm.
No. 105 M-B	With auxiliary straight edge, plain, 15 cm. ..	**No. 105 M-E**	20 cm.
No. 105 M-C	With auxiliary straight edge, graduated, 15 cm.	**No. 105 M-F**	20 cm.

Above numbers packed 1 in a box.

Key-Seat Clamps No. 298



Designed to transform any common steel scale into a key-seat rule; and a valuable addition to any machinist's kit. They are made of steel, case-hardened and accurately ground. A pair weighs but an ounce. They may be put on or taken off almost instantly and are a complete substitute for a more costly tool. They may be used with our Combination Square Blades or with any straight rule with accurate results.

No. 298 Per pair.....Price,

Packed 1 pair in a box, 6 boxes in a carton.

Rule Clamp No. 299

This little tool is used to clamp two steel rules together, end to end, making one long rule. The rules may be of the same or different widths up to 1¼ inch. This clamp will be of special value to mechanics, whose tool chests will usually not hold rules longer than 12 inches.

No. 299 Price .....

Packed 4 in a box.

Hardened Steel Straight Edges No. 382

These straight edges are accurately ground and hardened.

Packed 1 in a package.

Length Inches	Approximate Width, Inches	Approximate Thickness, Inches	Price
3¾	⅞	3/16	
5½	1 1/16	5/64	
7⅛	1 5/16	5/64	
10½	1 13/16	5/64	
13⅝	2	5/64	
17	2 ¼	7/64	
20⅜	2 ⅞	7/64	
26⅝	3 1/16	7/64	

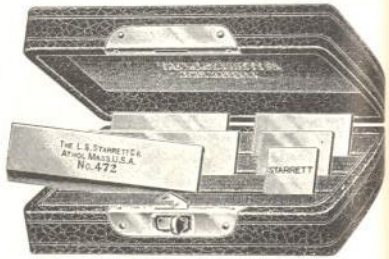
Straight Edge Set No. 472

Narrow Edge

Small, short length straight edges have an equally important place in tool equipment, where true alignment and accuracy play a part, as those of larger proportions. With this in mind we list this set with beveled narrow edges in leather case.

Made of tempered steel, 3/32 inch thick and 19/32 inch wide. Six lengths as follows: ½, ¾, 1, 1¼, 1½ and 2 inches.

No. 472 Set Complete, with Case Price,



Tempered Steel Rules with Beveled Edges Nos. 484 and 484 A

The edges are beveled on opposite sides, so that while one of the edges is always close to the paper the other stands up from it. Pressure on one edge will raise the other so that the rule can be picked up instantly. The raised edge is right to draw a pen against for inking without blotting the paper. Nickel plated, dull finish.

		Price, Each	
No. 484	Graduated in 10ths, 40ths, 50ths, and 100ths.	6-inch....	12-inch....
No. 484 A	Graduated in 8ths, 16ths, 32nds, and 64ths.	6-inch....	12-inch....

Packed 6 in a box.

Draftsmen's Scales No. 405

Quick Reading

This scale has tilting studs, so placed that any one of the four edges, with different graduations, will come in contact with the paper by its own weight when resting on the studs, with the back edge raised at an angle of about 30°. The scales are graduated in parts of inches as follows:

		Price, Each	
No. 405	Graduated in 10ths, 40ths, 50ths, and 100ths.	6-inch....	12-inch....
No. 405 A	Graduated in 8ths, 16ths, 32nds, and 64ths.	6-inch....	12-inch....

Packed 1 in a box.

No. 405 M

Graduated in the Metric System, one edge of each side in millimeters, the other in ½ millimeters

15 cm. .....Price, each, 30 cm. .....Price, each.

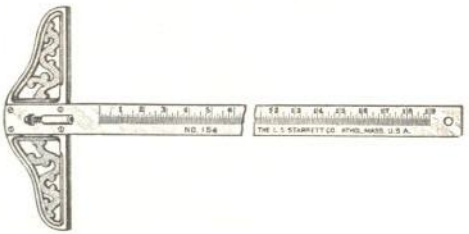
Prices for above rules of graduations, different than listed, quoted on application.

Packed 1 in a box.

Improved T-Squares No. 164

Graduated

A nickel-plated T-square, with spring-tempered steel blade and aluminum head, weighing only about five ounces, which has an automatic clasping device to hold it by spring pressure against a metal straight edge attached to the end, or end and side, of a drafting board or table (see description of Metal Edge, No. 168), or by a slight turn of knurled nut locked firm. The top side of the graduated blade provides a scale to set dividers. Graduated 32nds of an inch. Edges of blade are beveled on underside.



PRICES

Blade	Head	Blade	Head
22 x 1¼ inch,	10-inch, graduated	36 x 1¾ inch,	13-inch, graduated ....
26 x 1¼ inch,	10-inch, graduated	42 x 1¾ inch,	13-inch, graduated .....
32 x 1¼ inch,	10-inch, graduated	48 x 1¾ inch,	13-inch, graduated .....

Packed 1 in a package.

Adjustable Metal Edges No. 168

Designed to be attached to end, or end and side, of drafting board or table, insuring a more accurate guide for the T-square.

The cam device at the end permits fine adjustments in forming a perfect right angle when two of the metal edges or T-rails are used together. By loosening the knurled binding nut the screw can be adjusted.

The face of the metal edge is ground straight and all parts are nickel plated. An especially desirable combination when used with our No. 164 T-Square.

23-inch	Price, each,	36-inch	Price, each,
24-inch	Price, each,	40-inch	Price, each,
30-inch	Price, each,	48-inch	Price, each,
32-inch	Price, each,		

Packed 1 in a package.

Draftsmen's T-Squares No. 163

Nickel Plated — Not Graduated

The heads are made of aluminum, 10 inches long, weighing only from 4 to 6 ounces, and the blades of spring-tempered steel all nicely finished and warranted accurate. Edges of blade are beveled on underside.

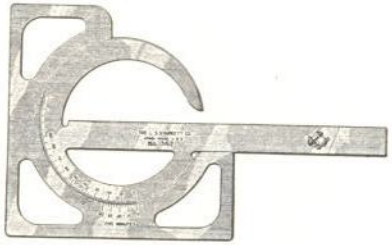
PRICES

20-in. blade, 1¼ in. wide, 3/64 in. thick.	36-in. blade, 1¼ in. wide, 3/64 in. thick.
24-in. blade, 1¼ in. wide, 3/64 in. thick.	42-in. blade, 1¼ in. wide, 3/64 in. thick.
30-in. blade, 1¼ in. wide, 3/64 in. thick.	48-in. blade, 1¼ in. wide, 3/64 in. thick.

Packed 1 in a package.

Starrett

Draftsmen's Protractors
No. 362



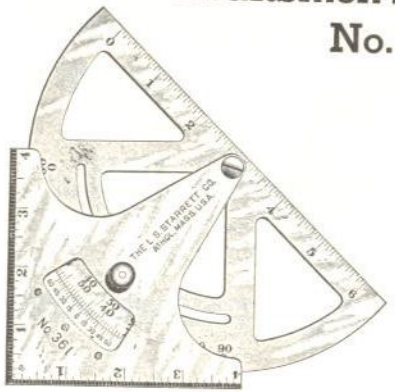
This is a protractor for draftsmen, which can be quickly set to any angle, used either side up and on either of the outside edges of the frame. Very advantageous in dividing a circle, transferring angles or laying off any given angle, without resetting, on either side of a line.

This protractor forms an extension for a T-square and very often takes the place of 45° and 60° triangles. Graduations are clear and sharp. With the vernier it reads to $^1/_{12}$ of a degree or 5 minutes. Blade is 8½ inches long, frame approximately 6 inches square. Furnished nickel plated.

No. 362 A .....Price, each,
No. 362 B With case.....Price, each,
Case only.....Price, each,

No. 362 B sent unless otherwise ordered.
Packed 1 in a box.

Draftsmen's Protractors
No. 361



This protractor is made of sheet steel, nickel plated, graduated in degrees and figured to read from either right or left—with vernier to read in five minutes. The three straight edges of the protractor are graduated in inches and 16ths, the longer part 6 inches. The tool will lie flat on the paper. The knurled locking nut is convenient for picking up the instrument. To obtain the complement of an angle without resetting, place the opposite straight part of the stock against the T-square or straight edge of a drawing board, and the reverse angle can be obtained by placing the straight part of the arc against the T-square or straight edge. By loosening the binding nut, friction is taken off, making it easy to adjust to degrees, when the tool may be again firmly locked.

This is a high grade protractor and one greatly appreciated by draftsmen.

No. 361 A .....Price, each,
No. 361 B With case.....Price, each,

No. 361 B sent unless otherwise ordered.

Starrett

STANDARD
FOR
ACCURACY

Starrett Steel Tapes are made in the following types:

POCKET TAPES
BUILDERS' TAPES
MILLMEN'S TAPES
STAINLESS STEEL TAPES
MEASURING TAPES
REEL TAPES
ENGINEERS' TAPES
SURVEYORS' CHAIN TAPES
OIL GAGING TAPES

In lengths and graduations to suit every requirement.

STARRETT STEEL TAPES

Steel Measuring Tapes

Where anything approaching correct measures of long lengths is required nothing gives such close results as a steel tape. All woven tapes will stretch or shrink, and cannot be depended upon. Where accurate measurements are necessary one of our steel tapes should be used. They can be positively relied upon for quality of material, workmanship and accuracy. Each tape is carefully inspected and tested before leaving our factory.

Accuracy and Tension

Temperature standard is 68° Fahrenheit. Co-efficient of expansion of steel tapes as determined by U. S. Bureau of Standards is 0.000/006/45 per degree Fahrenheit, amounting on a 100-foot tape to 0.007/74 inch per degree. Our standard tension for tapes of ordinary lengths when supported throughout is 10 pounds. (For metric tapes, 5 kilograms.)

Quick Reading

An important feature used in our steel tapes consists in placing the foot figures before each inch mark, as shown in cut below. This feature eliminates the possible chance of error in reading, and also saves time.

The dissimilarity of figures materially lessens (in fact ought to entirely obviate) the liability to erroneous readings that frequently occur through the uniformity of all figures in steel tapes of other makers.

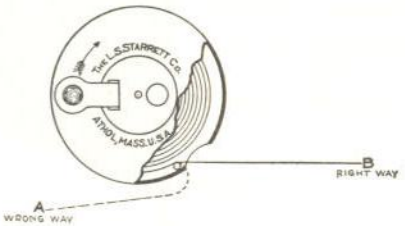
Special attention is called to our push button handle opener, as shown in the following pages. A slight pressure on the push button, on the side opposite the handle, will instantly open it. This can be done with a thick glove on as well as with the bare hand.

Black Finish

By this we designate the superior finish we put on all our steel tape lines. It produces an even black background with bright steel figures and graduations. This finish wears well.

Starrett Steel Tapes are acknowledged as standard for accuracy and convenience in reading.

Important Instructions Regarding the Use of Steel Tapes



1. In drawing the tape from the case at the opening, do not pull backward as at A (see cut) as this is liable to injure the tape.
2. In pulling the tape out, hold the case in a position that will avoid its being pulled against the edges of the opening. Many tapes are broken by holding the case in an awkward position, thereby preventing them running freely.
3. Occasionally tapes will pull hard and sometimes stick, which is due to their springy nature, and which prevents their being drawn back in the case in perfect alignment. This is more prevalent in large tapes. To overcome this difficulty rap the side of the case smartly against any flat surface and the tape will invariably free itself.
4. A spring wind pocket tape should not be allowed to be drawn back into the case unchecked, as it is thereby liable to become twisted or broken. It should be guided with the hand and kept straight as at B (see cut).

Starrett

Repairing Tapes

We will attend to any repairs of broken steel tapes, promptly, in a workmanlike manner, and at a reasonable charge. Such tapes should be sent to **our factory at Athol, Mass.**—not to any of our branches—prepaid, with name of sender plainly marked on the package for identification.

Special Graduations of Tapes

Made to Order

Tapes, ⅜ inch wide, graduated in 16ths, numbered in consecutive inches up to 1200 inches (100 feet), in addition to No.510, listed on page 38, prices quoted on application.

M The tapes listed on pages 37, 38, 39 and 41, excepting Nos.530, 520 and 521, can be furnished at the regular prices, graduated one side only in Metric measure as follows: the first 10 centimeters in millimeters, and balance of tape in centimeters and meters. When this style, quick reading, is desired add the letter M to tape number.

C The tapes listed on pages 37, 38, 39 and 41, excepting Nos.530, 520 and 521, can be furnished graduated in feet and 12ths of a foot on one side; feet, 10ths and 100ths of a foot on the other. For price add 2 cents per foot to list price. When this style is desired add letter C to tape number.

D The tapes listed on pages 37, 38, 39 and 41, excepting Nos.530, 520 and 521, can be furnished graduated in feet on one side as listed, Metric measure on the other side as follows: the first 10 centimeters in millimeters; balance of tape in centimeters and meters. For price add 2 cents per foot to list price. When this style is desired add letter D to tape number.

F The tapes listed on pages 38, 39 and 41 can be furnished graduated on one side only in feet, inches and 16ths of an inch in place of graduation shown. For price add 5 per cent to list. When this style is desired add letter F to tape number.

L The tapes listed on pages 37, 38 and 41 can be furnished graduated in feet on one side as listed; links and poles (pole equals 16½ feet or one rod) on the other side. For price add 2 cents per foot to list price. When this style is desired add the letter L to tape number.

J The tapes listed on pages 37, 38, 39 and 41, excepting Nos.530, 520 and 521, can be furnished up to 50 feet graduated in feet on one side as listed, diameter measurements on the other side, so that by measuring the circumference one is enabled to arrive at the exact diameter as fine as 64ths of an inch. For price add 2 cents per foot to list price. When this style is desired add letter J to tape number.

Tapes only, without Cases

Light, ¼ inch wide.

	PRICES				
Length, feet	25	33	50	66	75
Length, meters	8	10	15	20	23
Graduated one side					
Graduated two sides					

Heavy, ¼ inch wide, with two No.534A one-inch rings (shown on page 41).

Length, feet	25	33	50	66	75	82	100
Length, meters	8	10	15	20	23	25	30
Graduated one side							
Graduated two sides							

These tapes are used in our No.535 and No.536 (shown on page 41).

Heavy, ⅜ inch wide.

Length, feet	25	33	50	66	75	82	100
Length, meters	8	10	15	20	23	25	30
Graduated one side							
Graduated two sides							

Heavy, ½ inch wide, with snap.

Length, feet	33	50
Graduated one side		

These tapes are used in our No.507 (shown on page 42).

Pocket Steel Tapes No. 500

No. 500 These tapes are ¼ inch wide, in well finished nickel-plated cases, with rounded edges. Spring wind with center stop. Graduated in inches and sixteenths of an inch

36-inch	Price, each,
60-inch	Price, each,
72-inch	Price, each,
96-inch	Price, each,
120-inch	Price, each,

No. 500 F The same as No. 500, except that they are graduated in feet, inches and sixteenths, quick reading.

3 feet	Price, each,
5 feet	Price, each,
6 feet	Price, each,
8 feet	Price, each,
10 feet	Price, each,

No. 500 A—Metric Same as No. 500, except that it is graduated on one side only in millimeters.

1 meter	Price, each,
1½ meters	Price, each,
2 meters	Price, each,
2½ meters	Price, each,
3 meters	Price, each,

No. 548 Architects' Tape—60 inches. Graduated one side full length consecutive inches and sixteenths; other side containing ⅛, 3/16, ¼, ½ and ¾ inch architects' scale.
Price, each .....

No. 540 Builders' Tape—62½ inches. Graduated with ⅛-inch scale from 1 to 500 on one side, and with ¼-inch scale from 1 to 250 on the other side. Specially recommended for builders contractors and architects, as each full tape will be either a quarter or a half of a thousand feet depending on the scale of the plans, making it very simple to figure out the total length.
Price, each .....

Above numbers packed 1 in a box; 6 boxes in a carton.

No. 501 M and E

Metric and English

No. 501 Same style as our No. 500 A, but graduated in inches and sixteenths of an inch on one side, millimeters on the other side.

Length, Inches	Length, Meters	Price, Each
36	1	
60	1½	
72	2	
96	2½	
120	3	

Above numbers packed 1 in a box; 6 boxes in a carton.

Millmen's Steel Tapes No. 504

With Hook

This style of tape with markings starting from the inner side of the hook and marked consecutive inches from 1 to 144, in 16th divisions, enables workmen in steel mills, warehouses, etc., to readily measure metal sheets without assistance.

Standard ⅜ inch wide ribbon. Steel case, nickel plated. Folding flush handle and push button. Diameter of case about 2⅜ inches.

Note: Same tape marked feet, inches and 16ths furnished on request at regular list prices below.

No. 504 Length, 144 inches (12 feet).....
No. 504 Length, 240 inches (20 feet).....
Packed 1 in a box.

Steel Measuring Tapes No. 530

The Popular Priced Tape—Quick Reading

A moderate priced tape without sacrificing durability.

The case consists of two metal sections, covered with Athol black artificial leather, which is drawn and held in position by a concavo-convex ring. The opening in the case has a metal re-enforcement with roller, thereby preventing damage to either the case or the tape. All metal parts have bright nickel finish.

Has ⅜ inch wide, quick reading tape, push button and folding handle. Graduated in feet, inches and eighths of an inch.

Length, feet	25	50	75	100
Price, each				

Above sizes and listing for Domestic Trade.

For Export Trade we furnish these tapes in the above and some additional sizes, graduated Metric, Metric and English, also inches and links.

Information regarding Export list and sizes sent on request.

Note: See page 40 describing Tape Hooks.

Patented

No. 502

In Steel Cases—With Push Button—Quick Reading

The tapes are ¼ inch wide, in strong and well finished nickel-plated steel cases, with flush handle and push button on opposite side, a slight pressure of which will instantly release the handle.

No. 502 Graduated in feet, inches and sixteenths of an inch.

Length, feet	25	50
Price, each		

No. 502 A Graduated in Metric measure (centimeters and millimeters) the entire length.

Length, meters	10	15
Price, each		

No. 502 B Graduated Metric on one side, English on the other side.

Length, feet	33	50
Length, meters	10	15
Price, each		

For special graduations which may be supplied, see page 35.
For price of tapes only, see page 35.

No. 512

In Leather Cases—With Push Button—Quick Reading

These tapes are ¼ inch wide, in hard leather cases, with flush handle and push button on the opposite side, a slight pressure of which will instantly release the handle. Trimmings nickel plated.

No. 512 Graduated in feet, inches and sixteenths of an inch.

Length, feet	25	50
Price, each		

No. 512 A Graduated in Metric measure (centimeters and millimeters) the entire length.

Length, meters	10	15
Price, each		

No. 512 B Graduated Metric on one side, English on the other side.

Length, feet	33	50
Length, meters	10	15
Price, each		

For special graduations which may be furnished, see page 35.
For price of tapes only, see page 35.

Above numbers packed 1 in a box.

Steel Measuring Tapes
Nos. 505 and 506

In Steel Cases with Push Button — Quick Reading

These tapes are ⅛ inch wide, in strong and well-finished nickel-plated steel cases, with flush handle and push button on opposite side, a slight pressure of which will instantly release the handle.

No. 505 Graduated in feet, inches and 8ths of an inch.
No. 506 Graduated in feet, 10ths and 100ths of a foot.

Length, feet	25	33	50	66	75	100
Price, each						

No. 505 A Graduated in Metric measure (centimeters and millimeters) the entire length.

Length, meters	10	15	20	25	30
Price, each					

No. 505 B Graduated Metric on one side, English on the other side.

Length, feet	25	33	50	66	75	82	100
Length, meters	8	10	15	20	23	25	30
Price, each							

For special graduations which may be supplied, see page 35. For price of tapes only, see page 35.

Packed 1 in a box.

Nos. 510 and 511

In Leather Cases with Push Button — Quick Reading

These tapes are ⅜ inch wide, in hard leather cases, with flush handle and push button on opposite side, a slight pressure of which will instantly release the handle. Trimmings nickel plated.

No. 510 Graduated in feet, inches and 8ths of an inch.
No. 511 Graduated in feet, 10ths and 100ths of a foot.

Length, feet	25	33	50	66	75	100
Price, each						

No. 510 A Graduated in Metric measure (centimeters and millimeters) the entire length.

Length, meters	10	15	20	25	30
Price, each					

No. 510 B Graduated Metric on one side, English on the other side.

Length, feet	25	33	50	66	75	82	100
Length, meters	8	10	15	20	23	25	30
Price, each							

For above tapes graduated in links and poles on reverse side, also for special graduations, see page 35. For price of tapes only, see page 35.

Packed 1 in a box.

No. 510 Steel Tapes in Consecutive Inches
For work requiring long measurements expressed in inches

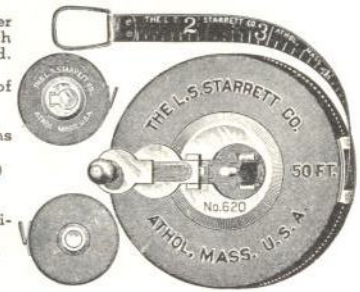
Our No. 510 Tape supplied graduated on one side only in 16ths, with inches numbered consecutively.

No. 510 Graduated 300 inches (25 feet).....Price, each,
No. 510 Graduated 600 inches (50 feet).....Price, each,

Prices for longer lengths quoted on application.

Steel Measuring Tapes
Nos. 620 and 621

In Leather Cases—with Patent Push Button Handle—Quick Reading



These tapes are ⅜ inch wide, in metal-lined leather cases, with new extension push button handle which is flush with the case when closed. Trimmings nickeled.

No. 620 Graduated in feet, inches and eighths of an inch.

No. 621 Graduated in feet, tenths and hundredths of a foot.

Length, feet	25	33	50	66	75	100
Price, each						

No. 620 A Graduated in Metric measure (centimeters and millimeters) the entire length.

Length, meters	10	15	20	25	30
Price, each					

No. 620 B and **No. 621 B** Graduated in Metric on one side, English on the other side.

Length, feet	25	33	50	66	75	82	100
Length, meters	8	10	15	20	23	25	30
Price, each							

No. 620 H Graduated feet, inches and eighths of an inch on one side, links and poles on the other. For price add per foot to list of No. 620.

No. 621 H Graduated feet, tenths and hundredths of feet on one side, links and poles on the other. For price add per foot to list of No. 621.

Packed 1 in a box.

Stainless Steel Measuring Tapes
Nos. 520 and 521

With Tape ⅜ Inch Wide, Leather Case, and Push Button

Quick Reading—Constant Legibility—Resistant to Corrosion under All Ordinary Conditions

Users of tapes whose work is largely in the open, where rust and corrosion play havoc, recognize in these STAINLESS STEEL TAPES a real service in maintenance and added accuracy and a timesaver in reading and cleaning.

In wet tunnel work, around salt water, and in damp and dirty locations such as often prevail, the usual frequent cleanings which wear down the markings of non-stainless tapes are greatly reduced, thus prolonging the life of the tape.

On account of the properties of **stainless** tape-steel we recommend that ordinary care be used against tape being bent too sharply.

No. 520 Graduated in feet, inches and eighths of an inch.

No. 521 Graduated in feet, tenths and hundredths of a foot.

50 feet .....Price,
100 feet .....Price,

Packed 1 in a box.

Tape Hooks

Patented

Can be Furnished on Any of Our ⅜-inch Wide Steel Tapes

Showing Tape Hook attached to our No. 530 Tape

Showing Hook not in use

Showing Hook in flat surface

Showing Hook over an edge

A most satisfactory hook; inbuilt with end link. Folds neatly out of the way when not in use. A tape with this hook attached might well be termed—the "one man" tape.

In ordering tapes with Tape Hook—specify "with hook" after catalog number.

Tape Hook supplied on any of our ⅜-inch wide Steel Tapes.

For No. 530 Tape without hook, see page 37.

Price extra per Tape.....

Hooks for Steel Tapes
No. 514

These hooks are made from brass castings and are nickel plated. They are easily attached to our ¼-inch, except pocket tapes, and ⅜-inch tapes and are designed to take measurements from the inside of the hook.

No. 514 A For ⅜-inch Tapes.....Price, each.
No. 514 B For ¼-inch Tapes.....Price, each.

Above numbers packed 1 in a box.

Reel Measuring Tapes Nos. 537 and 538

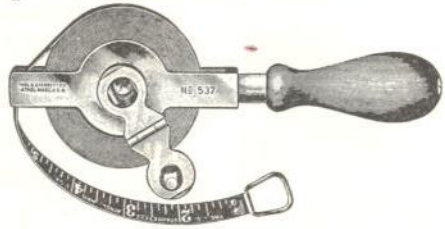
With ⅜-inch tape. Frame nickeled with rosewood handle. Folding winding handle. Packed 1 in a box.

No. 537 Graduated in feet, inches and eighths of an inch.

No. 538 Graduated in feet, tenths and hundredths of a foot.

Length, feet....	50	75	100
Price, each.....			

No. 537 A Graduated Metric measure (centimeters and millimeters) the entire length.



Length, meters	15	25	30
Price, each			

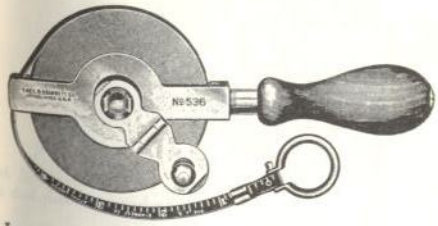
No. 537 B and **No. 538 B** Graduated Metric on one side, English on the other side.

Length, feet	50	82	100
Length, meters	15	25	30
Price, each			

For special graduations which may be supplied, see page 35.
For price of tapes only, see page 35.

Engineers' Reel Measuring Tapes
Nos. 535 and 536

With ¼-inch heavy tape. Frame nickeled with rosewood handle. Folding winding handle. The tape can be readily detached from the reel. Two rings (one No. 534 A) furnished with each tape, one ring for each end. Packed 1 in a box.



No. 535 Graduated in feet, inches and eighths of an inch.

No. 536 Graduated in feet, tenths and hundredths of a foot.

Length, feet	50	100
Price, each		

No. 535 A Graduated in Metric measure (centimeters and millimeters) the entire length.

Length, meters	15	30
Price, each		

No. 535 B and **No. 536 B** Graduated Metric on one side, English on the other side.

Length, feet.....	50	100
Length, meters.....	15	30
Price, each.....		

For special graduations which may be supplied, see page 35.
For price of tapes only, see page 35.

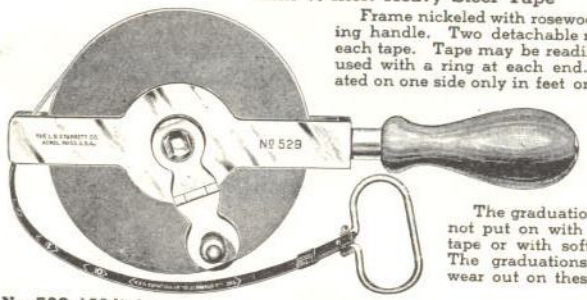
Detachable Rings for Engineers' and Surveyors' Chain Tapes
No. 534

Rings do not interfere with reading of graduations.

No. 534 A 1-inch round Price, per pair,
No. 534 B 3-inch oval Price, per pair,

Surveyor's Chain Tapes Nos. 528 and 529

With ¼-inch Heavy Steel Tape



Frame nickeled with rosewood handle. Folding winding handle. Two detachable rings (No. 534 B) sent with each tape. Tape may be readily detached from reel and used with a ring at each end. These tapes are graduated on one side only in feet or links and poles. Tapes graduated in feet have first foot graduated in tenths or twelfths.

Unless otherwise ordered, those in tenths will be sent.

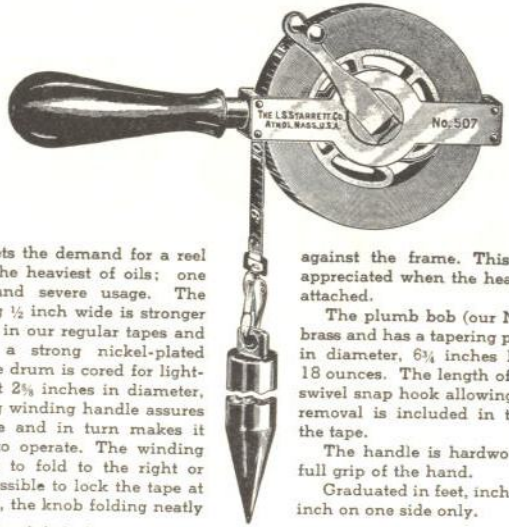
The graduations are etched on the tape, not put on with rivets which weaken the tape or with soft metal which wears off. The graduations and figures will never wear out on these tapes.

No. 528 150 links.....Price, each,
No. 529 100 feet.....Price, each,
Tape only, with rings.....

Packed 1 in a box.

Oil Gaging Steel Tapes No. 507

½-inch Tape—Quick Reading—With Lock Handle



This tape meets the demand for a reel tape for gaging the heaviest of oils; one that will withstand severe usage. The tape ribbon being ½ inch wide is stronger and heavier than in our regular tapes and is mounted in a strong nickel-plated metal frame. The drum is cored for lightness and is about 2⅛ inches in diameter, and with the long winding handle assures increased leverage and in turn makes it quick and easy to operate. The winding handle is hinged to fold to the right or left, making it possible to lock the tape at the desired length, the knob folding neatly against the frame. This feature will be appreciated when the heavy plumb bob is attached.

The plumb bob (our No. 515 C) is solid brass and has a tapering point. It is 1 inch in diameter, 6¾ inches long and weighs 18 ounces. The length of the bob and the swivel snap hook allowing the bob's quick removal is included in the markings on the tape.

The handle is hardwood and affords a full grip of the hand.

Graduated in feet, inches and 8ths of an inch on one side only.

No. 507 With plumb bob, length 33 feet.....Price, each,
No. 507 With plumb bob, length 50 feet.....Price, each,

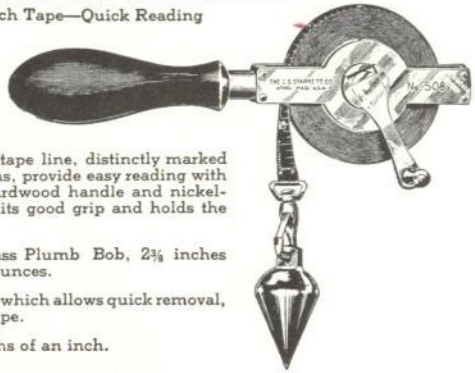
Packed 1 in a box.

Oil Gaging Steel Tape No. 508

With Lock Handle and Brass Plumb Bob

⅜-Inch Tape—Quick Reading

WHEN SOUNDING FOR THE BOTTOM OF THE TANK THE LOCK HANDLE IS MOST CONVENIENT AND IS PREFERRED BY MANY GAGERS



Our black finish, standard weight tape line, distinctly marked with bright steel figures and graduations, provide easy reading with accurate measurements. Polished hardwood handle and nickel-plated frame. The lock handle permits good grip and holds the tape at any point.

Fitted with our No. 515 B Solid Brass Plumb Bob, 2⅜ inches long, 1¼ inches diameter; weight, 6 ounces.

Length of bob and swivel snap hook, which allows quick removal, is included in the markings on the tape.

Graduated in feet, inches and eighths of an inch.

PRICES

No. 508 With No. 515 B Bob—25 feet, each .....
No. 508 With No. 515 B Bob—33 feet, each .....
No. 508 With No. 515 B Bob—50 feet, each .....

We can also furnish the tapes listed above with Stainless Steel lines at an additional cost. Prices quoted upon application.

Oil Gaging Steel Tape No. 509

With Folding Handle and Brass Plumb Bob

⅜-Inch Tape—Quick Reading

WHEN GAGING LIGHT CRUDE OILS, GASOLINE, ETC., THIS TAPE IS VERY POPULAR

Our black finish, standard weight tape line distinctly marked with bright steel figures and graduations provide easy reading with accurate measurements. Polished hardwood handle and nickel-plated frame.

Fitted with our No. 515 B Solid Brass Plumb Bob, 2⅜ inches long, 1¼ inches diameter; weight, 6 ounces.

Length of bob and swivel snap hook, which allows quick removal, is included in the markings on the tape.

Graduated in feet, inches and eighths of an inch.

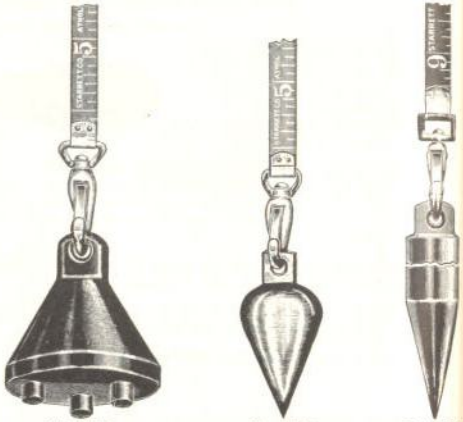
No. 509 With No. 515 B Bob—25 feet .....Price, each,
No. 509 With No. 515 B Bob—33 feet .....Price, each,
No. 509 With No. 515 B Bob—50 feet .....Price, each,

We can also furnish the tapes listed above with Stainless Steel lines at an additional cost. Prices quoted on application.

No. 509 may be supplied with tape line going between rolls in end of frame (as shown in cut), or inside of frame.

Plumb Bobs for Steel Tapes No. 515

These plumb bobs are used on oil burning boats and in oil fields for gaging the oil in tanks. The attachment, as shown in the cut, is included in the measurement of the tapes. The plumb bobs may be detached from the nickel-plated swivel snaps when not in use. The No. 515 A is made of cast iron with an enameled finish; the No. 515 B and No. 515 C are made of solid brass. We can attach these plumb bobs to any of our steel tapes at the prices listed below.



No. 515 A No. 515 B No. 515C

No. 515 A Plumb Bob only, with Swivel Snap, approx. weight, 13 ounces....Price, each,
No. 515 B Plumb Bob only, with Swivel Snap, approx. weight, 6 ounces....Price, each,
No. 515 C Plumb Bob only, with Swivel Snap, approx. weight, 18 ounces....Price, each,

Improved Mercury Plumb Bobs No. 87

Patented

The improvement consists in our patented device for fastening the string without a knot to tie or untie, simply by drawing it into the peculiarly slotted neck at the top, after unwinding the required length, when the bob will hang perfectly true.

These plumb bobs are made from solid steel, bored and filled with mercury. Noteworthy features are their great weight in proportion to size, low center of gravity, small diameter, hardened and ground points, knurling on the body and the simple and effective device at top for fastening end of line after winding up. Nickel plated. Each is provided with a braided silk line.

4 inches long, ½ inch diameter, 3½ ounces..Price, each,
5 inches long, ⅝ inch diameter, 6 ounces..Price, each,
5½ inches long, ⅞ inch diameter, 12 ounces..Price, each,
6 inches long, 1 inch diameter, 16 ounces..Price, each,

Steel Plumb Bobs No. 177

The same in design as No. 87, but made from solid steel, the mercury being omitted.

4 inches long, ½ inch diameter, 2¾ ounces..Price, each,
5 inches long, ⅝ inch diameter, 5 ounces..Price, each,
5½ inches long, ⅞ inch diameter, 8½ ounces..Price, each,
6 inches long, 1 inch diameter, 14½ ounces..Price, each,

Above numbers packed 1 in a box.

Starrett Levels and Transits are designed with the needs and training of farmers, contractors, carpenters, millwrights, masons and similar craftsmen in mind. They are practical, accurate instruments, yet they can be used without the knowledge of higher mathematics or engineering principles . . . . .

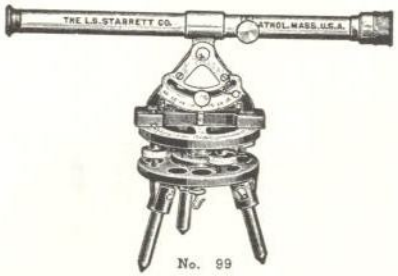
STARRETT

LEVELING INSTRUMENTS AND TRANSITS

Transit No. 99

Inexpensive—Does not Require a Trained Engineer to Use It

To meet the demands of contractors, builders, carpenters, farmers and others for a transit and level, low in price, yet sufficiently accurate for their needs, we have developed the Starrett Transit and Level. These instruments are very simple; they do not have the expensive attachments found on engineers' instruments. The builder and contractor find them indispensable in laying out building lots, locating batter boards, leveling foundation walls, and in pouring concrete floors. Farmers and ranchers use them in laying out modern tile drainage systems, irrigation ditches and new roads. Millwrights and machinists may use the Starrett Level to advantage in leveling and aligning shafting in mill or factory. In general it may be said that the Starrett Transit or Level can be used for the same purpose as any engineer's transit and level. Free from complications and confusing adjustments, any man may use these instruments without the knowledge of higher mathematics and engineering principles necessary for using the much higher priced engineers' transits.

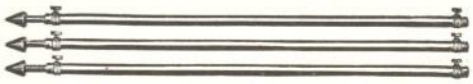


No. 99

A comprehensive booklet explaining in detail the uses and illustrating practical problems accompanies each instrument. One of these booklets will be mailed on request to anyone interested.

The instrument is composed of iron and brass, and consists of a tripod, to the head of which is connected, by a ball-and-socket joint, an upper plate which can be leveled by the leveling screws.

This plate is recessed to contain a graduated arc for taking horizontal angles. This arc is ½ of a circumference, reading 90° each side of 0, and being independent of level and sight tube can be turned and used at any point of a complete circle. On this plate rests a triangular frame to which are attached a level, a graduated arc for taking vertical angles, graduated 45° each side of 0, and a sight tube or telescope.



The PLAIN SIGHT TUBE has no lenses, is brass, twelve inches long; in one end is a small eye aperture, in the other the usual cross wires.

The TELESCOPE has cross lines, is adjustable to distances, and is same size and length as plain sight tube. The lens is well protected from dirt and breakage by a friction cap, and a shutter for the eye aperture.

With short legs, as shown in the cut, the instrument is eight inches high. With long extension legs, which fasten on over the short legs, the height can be adjusted from two feet eight inches to four feet eight inches. The sight tube, level case, and graduated arcs are nickel plated, the other parts are japanned.

The advantages of this transit are as follows: The head is held to the tripod with a bolt and knurled nut, so as to make it stationary at any given point; the graduated arc can be clamped to the base-plate by throwing a small cam arrangement, and a spring indexing finger to mesh in the arc graduations. The transit with short legs is housed in a substantial wood box about 4¼ x 9½ x 13¾ inches; with a leather strap running completely over the box cover, weighing approximately 8 pounds, making it easily carried about. The extension legs are not packed in the box. They weigh about 6 pounds, so when used with the short legs the transit weighs about 11 pounds.

Directions for setting up and using are inclosed with each transit.

Furnished in wood carrying case.

Weight, packed in box for shipment, approximately 20 pounds. Packed 1 in a box.

No. 99 B With plain sight tube, long legs and plain level vial.....Price, each,
No. 99 F With telescope, long legs, and ground level vial.....Price, each,
Iron target, without pole .....Price, each,

No. 99 F sent unless otherwise ordered.

Send for free copy of Starrett Transit and Level Booklet.

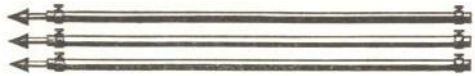
Leveling Instrument No. 101

Low Priced—Yet Dependable for Accurate Work

It should be borne in mind that our leveling instruments do all that a transit will do except measure vertical angles. These instruments attain angles in a horizontal plane only, and are designed for the use of farmers, contractors, carpenters, millwrights, masons, surveyors, etc.


No. 101C

Its lightness, simple construction, and moderate price, combined with the wide range of work to which it can be applied, make it very desirable for all who have occasion to use such an instrument. The upper plate is connected to the tripod head by a ball and socket joint, and is leveled by the leveling screws. This plate is recessed to contain a graduated arc for taking angles, and on the plate is the frame with level and sight tube for taking horizontal angles only. The nickel-plated SIGHT TUBE on the No. 101 A is PLAIN, with no lenses, 12 inches long, with small eye aperture and the usual cross wires. The TELESCOPE on the No. 101 C is the same as that used on the No. 99 F Transit. It has cross lines, is adjustable to distances, and is the same size and length as plain sight tube. Other features are precisely the same as the transit described and shown on the following page.



Directions for setting up and using are inclosed with each leveling instrument.

Furnished in wood carrying case.

Weight, packed in box for shipment, approximately 20 pounds.

PRICES

No. 101 A With plain sight tube, long legs and plain level vial.....
No. 101 C With telescope, long legs and ground level vial.....
Iron target, without pole.....

Wood Leveling Rod and Target No. 999

Made of seasoned stock. These rods have two 4-foot sections which are easily and quickly aligned by a positive locking arrangement, giving a total height of 8 feet. The bottom of the rods are steel capped.

No. 999 A is divided into feet, inches and quarter inches with heavy lines and figures, the foot figures red and the inch figures black.

No. 999 B is divided into feet and tenths of a foot, the foot figures red and the tenth figures black.

Approximate weight, 1¼ pounds. Packed 1 in a package.

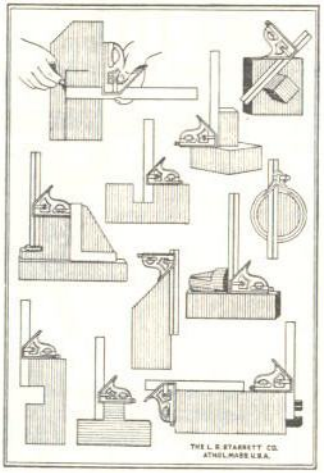
PRICES

No. 999 A Rod and Target, feet, inches and quarter inches.....
No. 999 B Rod and Target, feet and tenths of feet.....

No. 999 A sent unless otherwise ordered.

Send for free copy of Starrett Transit and Level Booklet.

Combination Squares



Showing a few of the many uses of the combination square

The combination square is, as its name indicates, a tool that can be used for the same purposes as an ordinary try-square but it differs from the try-square in that the head can be made to slide along the blade and clamp at any desired place, and combined with the square is a level and a miter. The sliding of the head is accomplished by means of a central groove in which travels a guide in the head of the square. The groove in all blades being concaved eliminates congestion of dirt, giving a free and easy slide. This permits the scale to be pulled out and used simply as a rule. It is frequently desired to vary the length of the blade of a try-square and this is readily accomplished with the combination square. It is also convenient to square a piece with a surface and at the same time tell whether one or the other is level or plumb. The spirit level in the head of the square permits this to be done without the use of a separate level. The head of the square may also be used as a simple level.

Because the blade may be moved in the head, the combination square makes a good marking gage, by setting the blade at the proper position and clamping it there. The whole combination square may then be slid along as with an ordinary gage. As a further convenience, a scriber is held frictionally in the head by a small brass bushing. The scriber head projects from the bottom of the square stock in a convenient place to take out quickly.

In laying out, preliminary to machining, the combination square may be used to scribe lines at miter angles as well as at right angles, for one edge of the square head is at 45°. Where micrometer accuracy is not essential the blade of the combination square may be set at any desired position and the square used as a depth gage to measure in mortises, or the end of the blade may be set flush with the edge of the square, and used as a height gage.

The head may be unclamped and entirely removed from the blade and a center head substituted so that the same tool can quickly be used to find the centers of shafting and other cylindrical pieces. An attachment described on a succeeding page and a second blade or rule can be clamped at any point so that lines may be drawn parallel to the head. When combined with the center head this attachment is convenient for scribing parallel chords on the ends of cylindrical work.

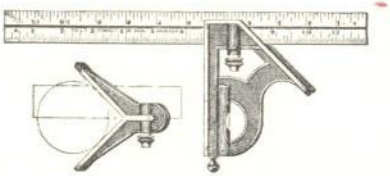
The hardness of the blade of this combination square prevents the corners from wearing round and destroying the graduations, thus keeping the blade at all times accurate.

This combination square combining as it does a rule, square, miter, depth gage, height gage level, and center head permits of more rapid work on the part of the mechanic, saves littering the bench with a number of tools each of which is necessary but which may be used only rarely and tends toward the goal for which all mechanics are striving—greater efficiency

Starrett

Combination Squares No. 11

With Hardened Blade



Every tool warranted accurate. With the adjustable blade this forms one of the most convenient and useful tools ever devised for mechanics' use. It is a complete substitute for a whole set of common try-squares, and is one of the best gages made for transferring exact measurements or laying out work. It is also convenient for a depth gage, or to square in a mortise. For a miter it is perfect, while with the auxiliary center head it forms a centering square, both inside and outside, which for convenience and accuracy has no equal. The blades are hardened and graduated in No.4 and No.7 graduations with heavy figures, reading both ways. See page 48, illustrating the use of the combination square.

4-inch, with center head	Price,	without
6-inch, with center head	Price,	without
9-inch, with center head	Price,	without
12-inch, with center head	Price,	without
18-inch, with center head	Price,	without
24-inch, with center head	Price,	without

The 6, 9, 12, 18 and 24 inch stocks are fitted with levels as shown in the above cut. The 4-inch stock has no level. The 18 and 24 inch have the same stock and center head as the 12-inch. These squares are sent complete unless otherwise ordered.

The blades are graduated in No.4 and No.7 graduations. Those of No.4 graduation being most used, will be sent unless otherwise ordered. Packed 1 in a box.

No. 11 M

Metric — With Hardened Blade

The same as No.11, except that the blade is graduated three edges in millimeters and one edge in ½ millimeters.

10 cm., with center head	Price,	without
15 cm., with center head	Price,	without
20 cm., with center head	Price,	without
30 cm., with center head	Price,	without
50 cm., with center head	Price,	without
60 cm., with center head	Price,	without

No. 11 M and E

Metric and English — With Hardened Blade

The same as No.11, except that the blades are graduated in Metric and English, as follows: one side graduated in ½ millimeters and 32nds of an inch, the reverse side graduated in millimeters and 64ths of an inch.

10 cm., with center head	Price,	without
15 cm., with center head	Price,	without
20 cm., with center head	Price,	without
30 cm., with center head	Price,	without
50 cm., with center head	Price,	without
60 cm., with center head	Price,	without

Sent with center head unless otherwise ordered. Packed 1 in a box.

Combination Squares No. 11S

With Shrink Graduations, for Pattern Makers

These squares are the same as our No. 11, with hardened blade, except that the blades are graduated the same as shrink rules, made in No. 4 graduation only and in 1/8 and 3/16 inch shrinkage to the foot, as listed below.

12-inch, with center head ..... Price, each, without

Sent with center head and with 1/8-inch shrinkage, unless otherwise ordered.

Blades Only

12-inch blade only ..... Price, each,

These blades are made in No. 4 graduation, either 1/8 or 3/16 inch shrinkage, and will fit all our 12-inch combination squares and sets, also our bevel protractors.

When ordering blades state whether 1/8 or 3/16 inch shrinkage is desired.

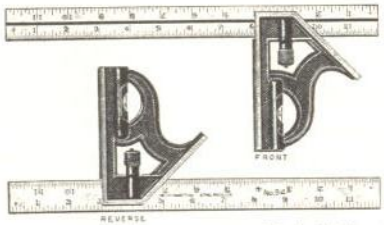
Prices of Separate Parts of Squares No. 11, No. 11M, No. 11M and E

	Blade	Stock	Center Head
4-inch or 10 cm.			
6-inch or 15 cm.			
9-inch or 20 cm.			
12-inch or 30 cm.			
18-inch or 50 cm.			
24-inch or 60 cm.			
Scribers		each	

Note: Blades—12-inch size only—supplied with Readable Graduation in No. 4 Graduations (8ths, 16ths, 32nds and 64ths), also in No. 16 Graduations (32nds, 64ths, 50ths and 100ths). Price, each .....

Combination Squares No. 94

With Level, Miter and Plumb



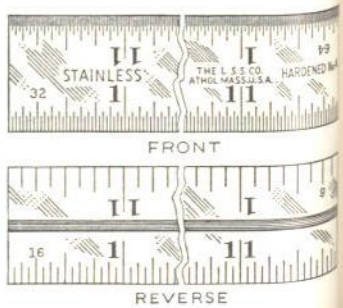
This square will readily appeal to the carpenter and others not requiring a fine graduation of the blade or a scriber. The head may be clamped to any point of the blade. The blade is graduated 8ths and 16ths on both sides, and the lines and figures are very distinct. It is also convenient to square a piece with a surface and at the same time tell whether one or the other is level or plumb. The blade can be used separately as a rule. Combines a marking gage, rule, square, miter, depth gage, height gage, level and plumb.

9-inch ..... Price, each,

12-inch ..... Price, each,

Packed 1 in a box, 100 in a case.

Stainless Steel Square Blades No. 1033



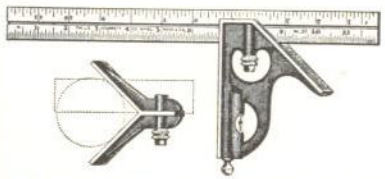
And now the Stainless Steel Square Blade, made to go with our 12-inch Combination Squares and Sets and interchangeable so the machinist and carpenter who have often wanted a blade, resistant to corrosion and rust, can now own one. Made in 12-inch length only, and with 8ths and 16ths graduations on one side and 32nds and 64ths on the other.

12-inch blade..... Price, each

18 and 24 inch sizes quoted on application.

Drop-Forged Steel Combination Squares No. 33

With Hardened Heads and Hardened Blades



Both stock and center head are hardened, as well as the blade, which is graduated with heavy figures reading both ways. All sizes except 4-inch have level.

4-inch, with center head ..... Price, without

6-inch, with center head ..... Price, without

9-inch, with center head ..... Price, without

12-inch, with center head ..... Price, without

18-inch, with center head ..... Price, without

24-inch, with center head ..... Price, without

The blades are graduated in No. 4 and No. 7 graduations. Sent with center head and No. 4 graduation unless otherwise ordered.

No. 33 M Metric

The same as No. 33, except that the blade is graduated three edges in millimeters and one edge in 1/2 millimeters. Sent with center head unless otherwise ordered.

15 cm., with center head ..... Price, without

20 cm., with center head ..... Price, without

30 cm., with center head ..... Price, without

50 cm., with center head ..... Price, without

60 cm., with center head ..... Price, without

No. 33 M and E Metric and English

The same as our No. 33, except that the blade is graduated in Metric and English as follows: one side graduated in 1/2 millimeters and 32nds, the reverse side in millimeters and 64ths.

15 cm., with center head ..... Price, without

20 cm., with center head ..... Price, without

30 cm., with center head ..... Price, without

50 cm., with center head ..... Price, without

60 cm., with center head ..... Price, without

Sent with center head unless otherwise ordered. Above numbers packed 1 in a box.

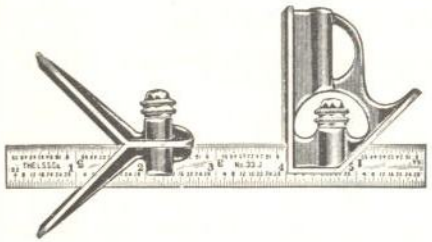
Prices of Separate Parts of Squares No. 33, No. 33M and No. 33M and E Drop-Forged Hardened Heads and Blades

	Blade	Stock	Center Head
4-inch			
6-inch or 15 cm.			
9-inch or 20 cm.			
12-inch or 30 cm.			
18-inch or 50 cm.			
24-inch or 60 cm.			
Scribers		each	

Note: Blades—12-inch size only—supplied with Quick Reading Graduation in No. 4 graduation (8ths, 16ths, 32nds and 64ths), also in No. 16 graduation (32nds, 64ths, 50ths and 100ths). Price, each.....

Drop-Forged Steel Combination Square No. 33 J

Small Size with 6-inch Blade—Quick Reading



Call this added size the "baby" or "junior" of Drop-Forged Steel Combination Squares. Should appeal to tool and die makers. Patterned after our No. 33 line but much reduced in size and weight. The 6-inch hardened blade is also proportionately smaller with the conventional 8ths, 16ths, 32nds and 64ths graduations, the latter having quick reading figures. Weighs about 5 ounces.

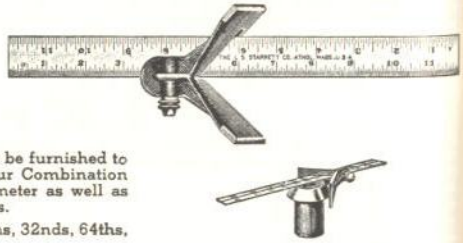
PRICE

With 6-inch blade

With center head.....
Without center head.....

Sent with center head unless otherwise ordered.

Center Squares No. 32



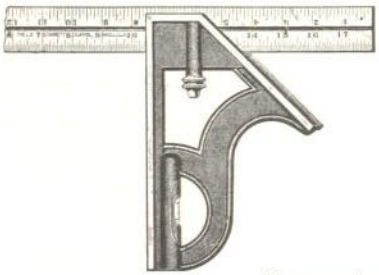
The center head on this tool is made with broader sides than on our other center heads. Its feature, while doing the work of any center head, is in connection with angle and gear work, as the broad sides taper on one side of the head only, enabling one to find centers and scribe lines on angles. The sides are 1 9/16 inches wide at the ends. This center head can be furnished to fit the 12, 18 and 24 inch sizes of our Combination Squares and Sets, and No. 10 Inclinometer as well as the same tools graduated in millimeters.

Sent with No. 4 graduation, 8ths, 16ths, 32nds, 64ths, unless otherwise ordered.

Center head, alone.....Price,
Center head, with 12-inch blade.....Price,
Center head, with 18-inch blade.....Price,
Center head, with 24-inch blade.....Price,

Large Combination Squares No. 8

With Hardened Blade



This square is designed for the use of anyone desiring a heavier and larger adjustable square. Blade graduated in 8ths, 16ths, 32nds and 64ths.

18-inch, blade 1½ inch wide, 1/10 inch thick, 8¼-inch stock, with 5-inch miter.

Without center head.....Price, each,

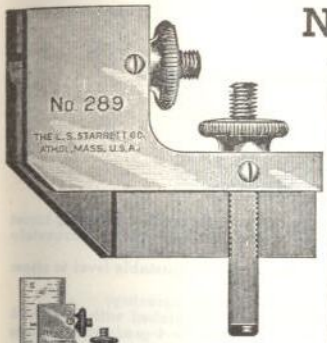
24-inch, blade 1½ inch wide, 1/10 inch thick, 8¼-inch stock, with 5-inch miter.

Without center head.....Price, each,
Center head only, for either size.....

Sent without center head unless otherwise ordered.

Above numbers packed 1 in a box.

Attachments for Combination Squares No. 289

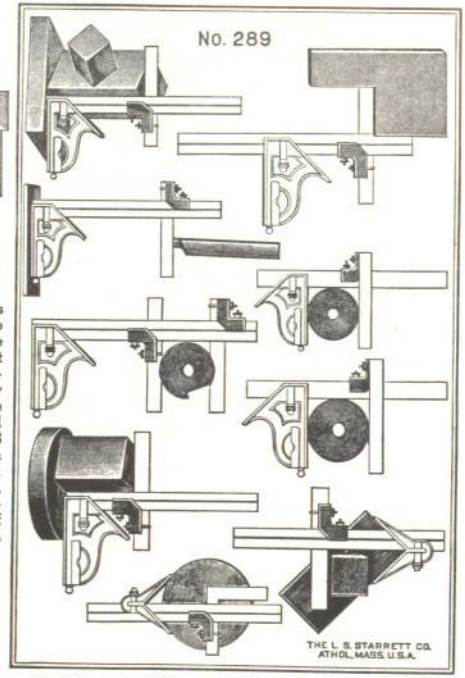


The use of this attachment is so well shown by the illustrations that a further description is hardly necessary. The attachment is made to fit the 12, 18 and 24 inch blades of our Nos. 11 and 33 squares, and can be used in connection with any of our regular rules as wide as 1 inch, or with our flat steel Square No. 21, for laying out key-seats, etc. The illustrations on this page show just a few of the ways in which the attachment can be used.

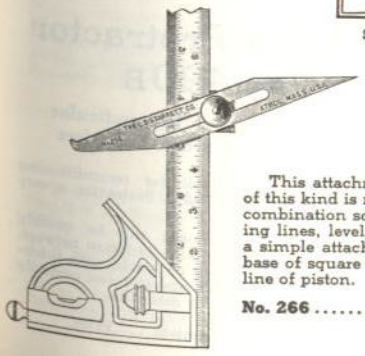
PRICES

No. 289 A 1½ x 1 25/32-inch. Each,
No. 289 B 2⅝ x 2 ¾-inch. Each,

Packed 4 in a box.



Showing our No. 289 as used with our Combination Squares



No. 266

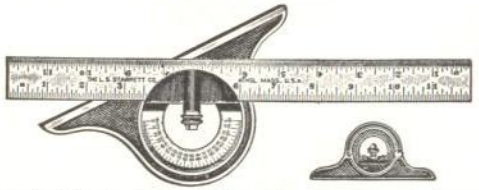
This attachment will adapt itself to many uses where a device of this kind is needed. It clamps to a 12-inch blade of our regular combination square, and can be used as a height gage, for scribing lines, leveling planer work, etc. It was primarily designed as a simple attachment to line up locomotive guides by placing the base of square stock against the guide, and lining with the center line of piston.

No. 266.....Price, each,

Packed 1 in a box.

Bevel Protractors No. 12

With Hardened Blade



An adjustable rule, held firmly at any point by a thumb nut, passes through a revolving turret which is nicely graduated in degrees from 0 to 180, both right and left, and can be accurately adjusted to show any angle.

A valuable feature is the small level attached to the head, forming an adjustable level to show any degree, thus greatly increasing the usefulness of the instrument.

This level is attached to one side of the head as shown in the small engraving.

The blades are the same as those used on our No.11 squares, and furnished with our No.4 or No.7 graduation. These protractors will be sent with 12-inch blades of No.4 graduation unless otherwise ordered. The head is 7 inches long.

9-inch, complete.....Price, 18-inch, complete.....Price,
12-inch, complete.....Price, 24-inch, complete.....Price,
Protractor Head only, with Level.....Price

Note: The Protractor Head for 9-inch blade is not interchangeable with the other sizes.

No. 12 M Metric

The same as No.12, except that the blade is graduated in millimeters and ½ millimeters.

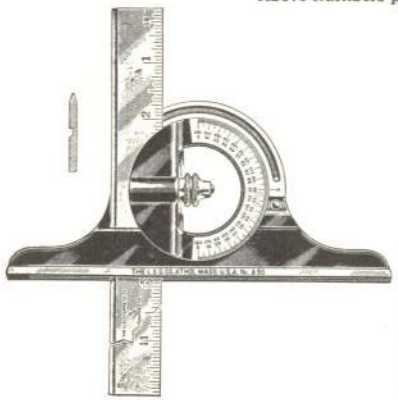
20 cm.....Price, 50 cm.....Price,
30 cm.....Price, 60 cm.....Price,

No. 12 M and E Metric and English

The same as our No.12, except that the blade is graduated in Metric and English, as follows: one side graduated in ½ millimeters and 32nds, the reverse side graduated in millimeters and 64ths.

20 cm.....Price, 50 cm.....Price,
30 cm.....Price, 60 cm.....Price,

Above numbers packed 1 in a box.



V-Edge Protractor No. 490 B

For Checking the Perpendicular Alignment of Motor Cylinders

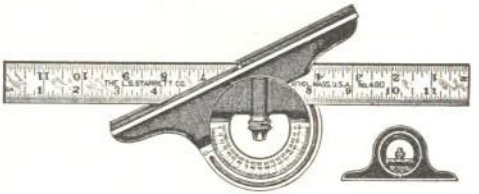
Mechanics doing cylinder reconditioning work will find this V-Edge Protractor a very valuable tool.

Any error in alignment will be quickly detected. By ascertaining the variation between protractor head and face of block, with thickness or feeler leaves, the operator can correctly adjust the reconditioning machine.

No. 490 B 12-inch, complete.....Price.

Bevel Protractors No. 490

With Hardened Blade and Reversible Head



This tool is of the same general design as our No.12 Protractor, with the additional feature of having the head extend both sides of the blade. This greatly increases the usefulness of the tool, as the same angles may be transferred from either side of the frame without resetting. Another improvement is that the turret is graduated to read both ways from 0 to 180 degrees. Mechanics will clearly appreciate this point, as direct readings may be had from the turret, indicating the supplement of the angle, as well as the angle required.

The head of the Protractor is 7 inches long and is supplied with an accurate level attached to one side as shown by small cut. The blades are hardened and graduated with heavy figures reading both ways. The heads are made with fine smooth finish to match the finish of our No.33 Combination Squares. The heads will also fit the blades of our No.11 Combination Square and our Combination Sets. Furnished with No.4 or No.7 graduation. These Protractors will be sent with 12-inch blades of No.4 graduation unless otherwise ordered.

9-inch, complete.....Price, each,
12-inch, complete.....Price, each,
18-inch, complete.....Price, each,
24-inch, complete.....Price, each,
Protractor Head only, with Level.....Price, each,

Note: The Protractor Head for 9-inch blade is not interchangeable with the other sizes.

No. 490 M

Metric

The same as No.490, except that the blade is graduated in millimeters and ½ millimeters.

20 cm., complete.....Price, each,
30 cm., complete.....Price, each,
50 cm., complete.....Price, each,
60 cm., complete.....Price, each,
Protractor Head only, with Level.....Price, each,

No. 490 M and E

Metric and English

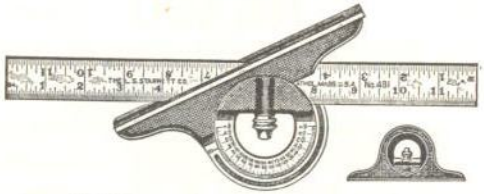
The same as No.490 and No.490 M, except that the blade is graduated in Metric and English. One side graduated in ½ millimeters and 32nds, the reverse side graduated in millimeters and 64ths.

20 cm., complete.....Price, each,
30 cm., complete.....Price, each,
50 cm., complete.....Price, each,
60 cm., complete.....Price, each,
Protractor Head only, with Level.....Price, each,

Above numbers packed 1 in a box.

Bevel Protractors No. 491

With Hardened Blade



This is the same as our No.490, reversible, except that the head is made with checked finish to match the heads of our Combination Squares No.11. Furnished with No.4 and No.7 graduations. No.4 graduation sent unless otherwise ordered.

9-inch, complete.....Price, 18-inch, complete.....Price,
12-inch, complete.....Price, 24-inch, complete.....Price,
Protractor Head only, with Level.....Price,

Note: The Protractor Head for 9-inch blade is not interchangeable with the other sizes.

No. 491 M—Metric The same as No.491, except that the blade is graduated in millimeters and ½ millimeters.

20 cm., complete.....Price, 50 cm., complete.....Price,
30 cm., complete.....Price, 60 cm., complete.....Price,
Protractor Head only, with Level.....Price,

No. 491 M and E—Metric and English The same as Nos.491 and 491 M, except that the blade is graduated in Metric and English. One side graduated in ½ millimeters and 32nds, the reverse side graduated in millimeters and 64ths.

20 cm., complete.....Price, 50 cm., complete.....Price,
30 cm., complete.....Price, 60 cm., complete.....Price,
Protractor Head only, with Level.....Price,

Bevel Protractors No. 492

With Hardened Blade

These are the same as our No.12, except that the heads are made with smooth finish and match the finish of our No.33 Combination Squares. Furnished with No.4 and No.7 graduations. No.4 graduation sent unless otherwise ordered.

The turret is graduated to read both ways from 0 to 180 degrees.

9-inch, complete.....Price, 18-inch, complete.....Price,
12-inch, complete.....Price, 24-inch, complete.....Price,
Protractor Head only, with Level.....Price,

No. 492 M—Metric The same as No.492, except that the blade is graduated in millimeters and ½ millimeters.

20 cm., complete.....Price, 50 cm., complete.....Price,
30 cm., complete.....Price, 60 cm., complete.....Price,
Protractor Head only, with Level.....Price,

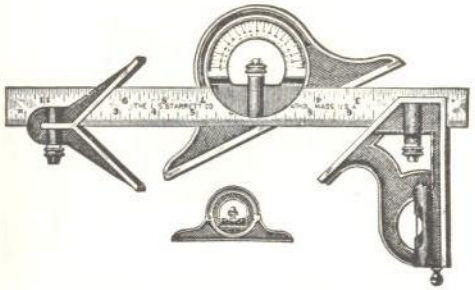
No. 492 M and E—Metric and English The same as our Nos.492 and 492 M, except that the blade is graduated in Metric and English. One side graduated in ½ millimeters and 32nds, the reverse side in millimeters and 64ths.

20 cm., complete.....Price, 50 cm., complete.....Price,
30 cm., complete.....Price, 60 cm., complete.....Price,
Protractor Head only, with Level.....Price,

Above numbers packed 1 in a box.

Combination Sets No. 9

With Hardened Blade



The combination square met with such universal approval from machinists that it was but a step to add to it the protractor head and have a combination set, made up of the rule on which slide the square, center, and protractor heads. This makes possible more varieties of uses in laying out and testing work than are possible with any other instrument used by mechanics.

There are a number of different combinations of the heads with different lengths and styles of rules which are shown on succeeding pages. This cut shows combination square (No.11, page 49) with center head and 7 inch bevel protractor (No.12, page 54), all on the No.11 square blade. Furnished with No.4 and No.7 graduations. No.4 graduation sent unless otherwise ordered.

PRICES

9-inch, set complete.....
12-inch, set complete.....
18-inch, set complete.....
24-inch, set complete.....

No. 9 M

Metric

The same as No.9, except that the blade is graduated three edges in millimeters and one edge in ½ millimeters.

PRICES

20 cm.....
30 cm.....
50 cm.....
60 cm.....

No. 9 M and E

Metric and English

Same as our No.9 and No.9 M, except that the blade is graduated in Metric and English, as follows: one side graduated in ½ millimeters and 32nds, the reverse side graduated in millimeters and 64ths.

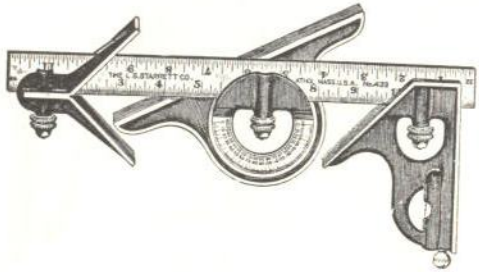
PRICES

20 cm.....
30 cm.....
50 cm.....
60 cm.....

Above numbers packed 1 in a box.

Combination Sets
No. 433

Drop-Forged Stock and Center Head—Hardened Blade



This set consists of our No. 33 Combination Square with hardened drop-forged stock and center head as shown on page 51 and our No. 492 Protractor Head. Furnished with No. 4 and No. 7 graduations. Sent with blades of No. 4 graduation unless otherwise ordered.

PRICES

9-inch, set complete	
12-inch, set complete	
18-inch, set complete	
24-inch, set complete	

No. 433 M

Metric

The same as No. 433, except that the blade is graduated three edges in millimeters and one edge in ½ millimeters.

PRICES

20 cm., set complete	
30 cm., set complete	
50 cm., set complete	
60 cm., set complete	

No. 433 M and E

Metric and English

The same as Nos. 433 and 433M, except that the blade is graduated in Metric and English. One side graduated in ½ millimeters and 32nds, the reverse side graduated in millimeters and 64ths.

PRICES

20 cm., set complete	
30 cm., set complete	
50 cm., set complete	
60 cm., set complete	

Above numbers packed 1 in a box.

Combination Sets
No. 434

Drop-Forged Stock and Center Head—Hardened Blade
Reversible Protractor Head

This set consists of our No. 33 Combination Square with hardened drop-forged stock and center head as shown on page 51 and our Reversible Protractor Head No. 490 as shown in cut. Furnished with No. 4 and No. 7 graduations. Sent with blades of No. 4 graduation unless otherwise ordered.

PRICES

9-inch, set complete	
12-inch, set complete	
18-inch, set complete	
24-inch, set complete	

No. 434 M

Metric

The same as No. 434, except that the blade is graduated three edges in millimeters and one edge in ½ millimeters.

PRICES

20 cm., set complete	
30 cm., set complete	
50 cm., set complete	
60 cm., set complete	

No. 434 M and E

Metric and English

The same as No. 434 and No. 434 M, except that the blade is graduated in Metric and English. One side graduated in ½ millimeters and 32nds, the reverse side graduated in millimeters and 64ths.

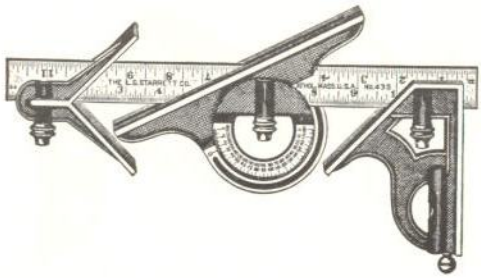
PRICES

20 cm., set complete	
30 cm., set complete	
50 cm., set complete	
60 cm., set complete	

Above numbers packed 1 in a box.

Combination Sets No. 435

Reversible Protractor Head—Hardened Blade



This set consists of our No.11 Combination Square with hardened blade as shown on page 49 and our Reversible Protractor Head No.491 as shown in cut. Furnished with No.4 and No.7 graduations. Sent with blades of No.4 graduation unless otherwise ordered.

PRICES

9-inch, set complete .....
12-inch, set complete .....
18-inch, set complete .....
24-inch, set complete .....

No. 435 M

Metric

The same as No.435, except that the blade is graduated three edges in millimeters and one edge in ½ millimeters.

PRICES

20 cm., set complete .....
30 cm., set complete .....
50 cm., set complete .....
60 cm., set complete .....

No. 435 M and E

Metric and English

The same as No.435 and No.435M, except that the blade is graduated in Metric and English. One side is graduated in ½ millimeters and 32nds, the reverse side graduated in millimeters and 64ths.

PRICES

20 cm., set complete .....
30 cm., set complete .....
50 cm., set complete .....
60 cm., set complete .....

Above numbers packed 1 in a box.

Starrett

Inclinometers No. 10

With Hardened Blade

This cut represents an inclinometer try-square and bevel protractor combined.

It is compact, convenient, and a complete and perfect substitute for several costly tools.

It consists of a stock and disc both slotted to receive the blade, which folds in the stock. The blade attached to the graduated rotary disc may be secured at any angle from 0 to 90 degrees, and by loosening the clamp screw it may be shortened or extended full length, or removed for a straight edge.

The working face of the stock, extending both sides of the blade, admits of its being reversed, so that the same angle may be laid off in opposite directions without changing the angle in the tool, thus requiring but ¼ of a graduated circle to obtain all angles both ways.

At 90 degrees, the blade brings up against a case-hardened screw, accurately adjusted, thus forming a try-square; by holding the blade perpendicular (the level in the stock being at right angles), a plumb; by folding the tool, a level, length of blade.

The blades are graduated in 8ths, 16ths, 32nds and 64ths.

PRICES

With 12-inch blade, without center head
With 18-inch blade, without center head
With 24-inch blade, without center head
Center head, to fit all sizes .....

Sent without center head unless otherwise ordered.

No. 10 M Metric

The same as No.10, except that the blade is graduated three edges in millimeters and one edge in ½ millimeters.

PRICES

With 30 cm. blade, without center head
With 50 cm. blade, without center head
With 60 cm. blade, without center head
Center head, to fit all sizes.....

Sent without center head unless otherwise ordered.

Above numbers packed 1 in a box.

Double Protractor No. 16

This protractor blade closes in the stock either way against a stop, making a square, plumb and level. With a 24-inch blade it weighs but 1¾ pounds. The turret is graduated on both sides, one in degrees, the other to show pitch to the foot, so that the blade may be set by the graduation for laying off angles to any degree or any pitch, and the opposite branch of the stock will be right to lay out, the complementary angle without mental calculation or error, for valley roofs, bridge work, stair gages, etc. The levels are so arranged that work can be leveled up to any degree or pitch underneath or on top of a roof, rafter, stair stringer, etc.

As a square or protractor with the sliding blade it can be used in places where a fixed blade could not and is a substitute for a whole kit of squares from the shortest to the full length of blade, making a depth gage for squaring in mortises and transferring measurements. It may be used in place of the carpenter's old-time steel square with the advantage of being packed in a chest without taking up so much room.

Without the blade the stock may be used in contracted places as a 6-inch level and plumb, while with an 18 or 24 inch blade, a level and plumb of corresponding length is obtained. Altogether this tool makes a combination that will be appreciated by every progressive mechanic.

With 12-inch blade .....Price, each,
With 18-inch blade .....Price, each,
With 24-inch blade.....Price, each,
Stock only .....Price, each,

The 12, 18 and 24 inch blades of our combination squares will fit the protractor stock.

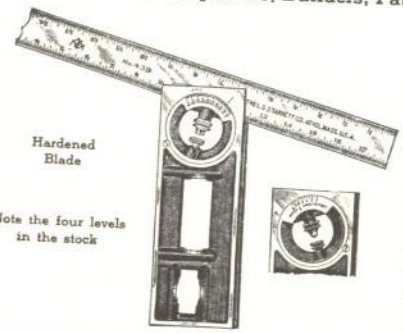
Furnished with No.4 graduation. Protractor with 12-inch blade, No.4 graduation sent unless otherwise ordered. Packed 1 in a box.

Starrett

Combination Tool No. 439

Patented

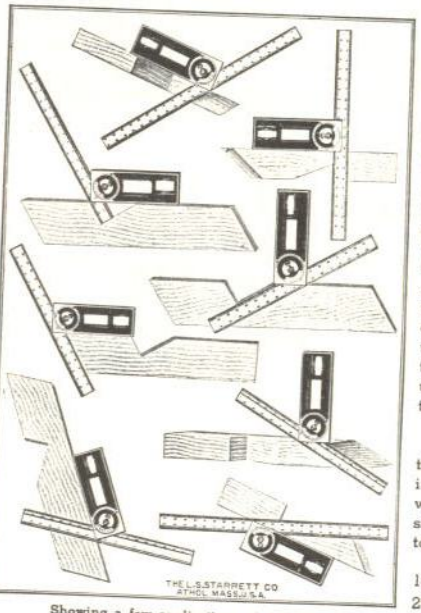
For Carpenters, Builders, Pattern and Cabinet Makers



The success of our combination square and combination set led us to develop a combination tool for carpenters and builders. In this one instrument there are combined seven ordinary tools—rule, square, level, protractor, bevel, pitch-to-foot indicator and plumb. It consists of a stock 9 inches long, with sliding blade, 18 or 24 inches in length and 1½ inches in width, with No. 4 graduation. The blade is adjustable through the revolving turret in the stock, which is graduated on one side in degrees, with two rows of figures reading either right or left, and on the other side, graduated to show pitch-to-foot, the graduations showing ½-inch pitch (see small cut). With levels set in each side of the stock any incline by degrees or pitch-to-foot can be leveled either on top or under the work.

The combination tool is also used for laying out or for cutting valleys or hips of different pitch. The blade is first set to show the pitch desired. Then place the face of the stock against the work and draw a line against the blade; then place the square end of the stock against the work and draw the complementary line, which will give the complementary angle without mental calculation. For a try-square it is far superior to the carpenters' two-foot square, which cannot be folded to put in the chest nor can the blade be shortened when it meets obstructions. Neither can the carpenters' square be used as a level or plumb or depth gage as can this simple tool.

After using this combination tool a short time carpenters will find it very convenient in laying out many kinds of complicated work which otherwise would require considerable calculation. It is a very compact tool, weighing less than three pounds.



Showing a few applications of our No. 439 Builders' Combination Tool

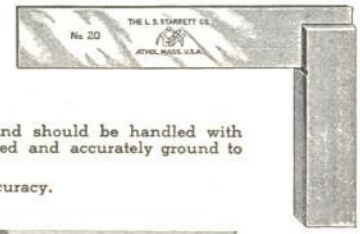
18-inch.....Price, each,
24-inch.....Price, each,

Packed 1 in a box.

Starrett

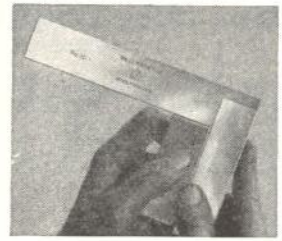
Hardened Steel Squares No. 20

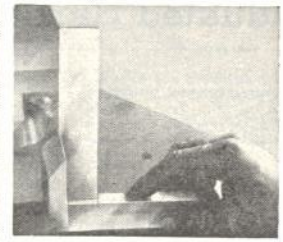
Not Graduated—Recommended as a Standard Square



These squares are fine precision instruments and should be handled with reasonable care. The beams and edges are hardened and accurately ground to insure parallelism and straightness.

Unusual care in manufacturing insures their accuracy.





Showing stock support

Approximate Length of Blade from the inner edge of the beam to the end of Blade	Approximate Length of Beam	Price	Wood Case Extra
1 inch	1 inch		
1½ inches	1 ½ inches		
2 inches	1 7/8 inches		
3 inches	2 3/8 inches		
4½ inches	3 ½ inches		
6 inches	4 5/16 inches		
9 inches	5 5/16 inches		
12 inches	7 inches		
15 inches	8 5/8 inches		
18 inches	10 ½ inches		
24 inches	12 5/16 inches		
*36 inches	20 inches		

The 15, 18 and 24 inch squares have a stock support as shown in cut.
Packed 1 in a box.

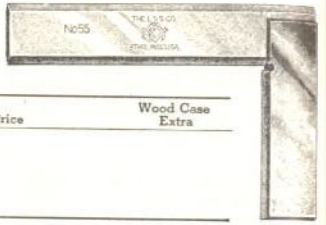
Note: Prices for larger sizes quoted on application.

*For the 36-inch and larger size squares of this type, special screws are used to secure the blade to the beam.

Hardened Bevel Edge Squares No. 55

These squares are similar to our No. 20 Solid Steel Squares shown on page 63, except the two edges of the blade are beveled on both sides, furnishing practically a line contact with the work. They are made only in the sizes listed below.

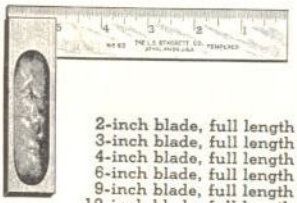
Sectional view of blade



Length of Blade	Length of Beam	Price	Wood Case Extra
1½ inches	1 ½ inches		
2 inches	1 ⅞ inches		
3 inches	2 ⅜ inches		
4½ inches	3 ½ inches		
6 inches	4 5/16 inches		

Packed 1 in a box.

Graduated Hardened Steel Squares No. 63



This cut represents a hardened, solid steel try square. This square has concave depressions in each side of the stock which not only reduce its weight but make it more convenient to hold between the thumb and finger while being used. The stocks are case-hardened, the blades hardened to spring-temper and graduated in 32nds of an inch on one side and 64ths on the other.

2-inch blade, full length of beam 1½ inches .....Price, each,
3-inch blade, full length of beam 2 inches .....Price, each,
4-inch blade, full length of beam 2¾ inches .....Price, each,
6-inch blade, full length of beam 3¾ inches .....Price, each,
9-inch blade, full length of beam 5 inches .....Price, each,
12-inch blade, full length of beam 6½ inches .....Price, each,

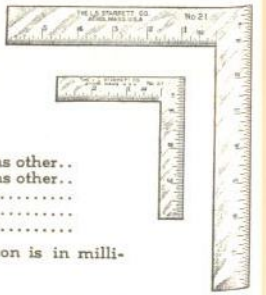
No. 63 M—Metric The same as No. 63, except that the blade is graduated in millimeters on one side and ½ millimeters on the other side.

5 cm. .....Price, each,
10 cm. .....Price, each,
15 cm. .....Price, each,
20 cm. .....Price, each,
30 cm. .....Price, each,

Above numbers packed 1 in a box.

Thin Steel Try-Squares No. 21

For Machinists and Draftsmen



PRICES

2 x 1 inch, 1/20 inch thick, grad. 16ths, 64ths one side; 32nds, 64ths other..
3 x 2 inch, 1/20 inch thick, grad. 16ths, 64ths one side; 32nds, 64ths other..
4 x 3 inch, 1/16 inch thick, grad. 16ths and 32nds both sides .....
6 x 4 inch, 1/16 inch thick, grad. 16ths and 32nds both sides .....
8 x 6 inch, 1/16 inch thick, grad. 16ths and 32nds both sides .....

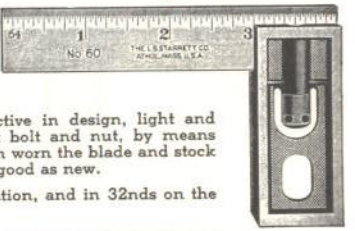
No. 21 M—Metric The same as No. 21, except the graduation is in millimeters and ½ millimeters on both sides.

5 x 3 cm., 1.3 mm. thick..Price, each,
10 x 7 cm., 1.6 mm. thick..Price, each,
15 x 10 cm., 1.6 mm. thick..Price, each,
20 x 15 cm., 1.6 mm. thick..Price, each,

Prices for larger sizes quoted on application. Above numbers packed 1 in a package.

"Reliable" Try-Squares No. 60

With Graduated Blade
Not Hardened



This cut represents a line of Try-Squares, attractive in design, light and convenient. The blade is firmly held by our patent bolt and nut, by means of which the tool can be readily taken apart, and when worn the blade and stock can be reground or lapped, and put together again as good as new.

Graduated one side in 64ths, as shown by illustration, and in 32nds on the other side.

Length of Blade	Length of Beam	Price
4 inches	2 5/16 inches	
6 inches	3 5/8 inches	

Length of Blade	Length of Beam	Price
9 inches	5 1/16 inches	
12 inches	6 inches	

No. 60 M—Metric The same as No. 60, except that the blades are graduated in millimeters on one side and ½ millimeters on the other side.

10 cm. .....Price, each,
15 cm. .....Price, each,
20 cm. .....Price, each,
30 cm. .....Price, each,

Above numbers packed 1 in a box.

"Reliable" Try-Squares No. 61

With Hardened Blade
Not Graduated

The 18 and 24 inch sizes of No. 61 Squares are equipped with the convenient stock support, as illustrated, which projects beyond the side of the stock, or, when not in use, is contained wholly within the stock, and may be clamped firmly in either position.

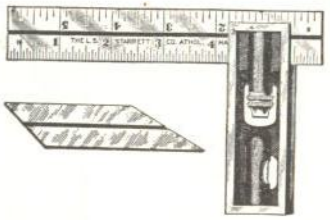
Showing stock support

Length of Blade	Length of Beam	Price
4 inches	2 5/16 inches	
6 inches	3 5/8 inches	
9 inches	5 1/16 inches	
12 inches	6 inches	
18 inches	9 inches	
24 inches	12 inches	

Sizes 4 to 12 inch, inclusive, packed 1 in a box; 18 and 24 inch, 1 in a package.

Double Squares No. 13

With Hardened Blade



This square is conceded to be the most practical one for machinists', tool makers' and pattern makers' use ever offered. The sliding blade, shortened or extended full length, makes it more valuable than a full set of common squares. An extra angle blade with hexagon angle at one end and octagon angle on the other advantageous to pattern makers.

The seat against which the blade is clamped being convex, should corners of the blade get injured, the accuracy of the square is not affected.

4-inch, without bevel blade ..... Price, each,
with both blades ..... Price, each,
6-inch, without bevel blade ..... Price, each,
with both blades ..... Price, each,
9-inch, without bevel blade ..... Price, each,
12-inch, without bevel blade ..... Price, each,

These squares furnished in No. 4 graduation. The 4 and 6 inch sizes can also be supplied in No. 7 graduation.

The 4 and 6 inch sizes sent with both blades unless otherwise ordered.

There is a level in the stocks of the 6, 9 and 12 inch squares.

Angle blades referred to above are made to fit only 4 and 6 inch sizes.

No. 13 M—Metric The same as No. 13, except that the blade is graduated three edges in millimeters and one edge in ½ millimeters. Corresponding metric sizes, same prices as for No. 13.

No. 13 D An auxiliary blade fitting 6 and 9 inch squares only. One end is beveled 59 degrees, the cutting angle of drills, and so graduated to measure perpendicularly to the axis of the drill. The opposite end is beveled 41 degrees, the angle of countersink and flat head machine screws. Graduations are 64ths with quick reading feature. See cut.

No. 13 D

No. 13 D Blade only ..... Price, each,

Above numbers packed 1 in a box.

Double Steel Squares No. 14

With Hardened Head and Blades

This cut represents a double steel square, with a 2½-inch sliding blade, and is especially designed for tool makers. The rule being narrow and instantly adjusted to any length, however short, allows it to be used where it would be impossible to use any square with a fixed blade. The blade is graduated on one side only, in 32nds and 64ths.

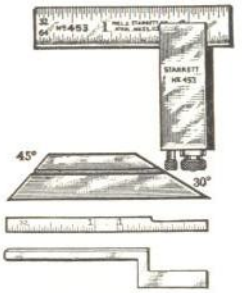
Fitted to go with this stock, we make not only a bevel blade, 45° on one end and 30° on the other, but a very narrow straight one, about ⅛ inch wide, highly appreciated by die makers for squaring small holes, both of which blades will be sent with the square unless otherwise ordered.

No. 14 A Square ..... Price, each,
No. 14 B Square, with either bevel or narrow blade ..... Price, each,
No. 14 C Square complete ..... Price, each,
No. 14 D With larger stock, approximately 2¼ inches long, and 4-inch sliding blade, graduated in 32nds and 64ths on one side and 8ths and 16ths on the other. . . .
A narrow blade is not furnished with this size.
No. 14 E Same as No. 14 D, with bevel blade added .....
Bevel blade will be sent with No. 14 B unless otherwise ordered.

No. 14 M—Metric The same as No. 14, except that the blade is graduated in millimeters and ½ millimeters. Prices the same as for No. 14.

Above numbers packed 1 in a box.

Die Makers' Square No. 453



The purpose in designing this tool was to provide simple means whereby the blade could be adjusted at an angle with the beam. This makes an excellent gage for filing the clearance in dies, etc., as shown by the sectional view.

By releasing the smaller screw (see sectional view) the blade can be clamped firmly to its seat and then used as a regular square. Fitted to take the standard, bevel, narrow graduated and offset blades.

These dimensions may be of interest. STANDARD BLADE—approximately ½ inch wide by 2½ inches long with 64ths and 32nds graduations. BEVEL BLADE—½ inch wide and to determine 30° and 45° angles. NARROW BLADE (graduated)—approximately 5/32 inch wide and 2¼ inches long with 64ths and 32nds graduations. Cut away at one end 5/8 inch back to 3/32 inch width. OFFSET BLADE—protrudes from square about 1½ inches, is ⅛ inch wide and beveled on each edge to give a line contact.

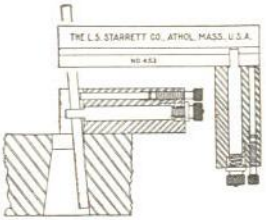
No. 453 A Square, with Standard Blade ..... Price,
No. 453 B Square, with Standard and Bevel Blades ..... Price,
No. 453 C Square, with Standard and Narrow Graduated Blades ..... Price,
No. 453 D Square, with Standard, Bevel and Narrow Graduated Blades ..... Price,
No. 453 E Square, complete, with Standard, Bevel, Narrow Graduated and Offset Blades ..... Price,

No. 453 E complete sent unless otherwise ordered.

No. 453 M

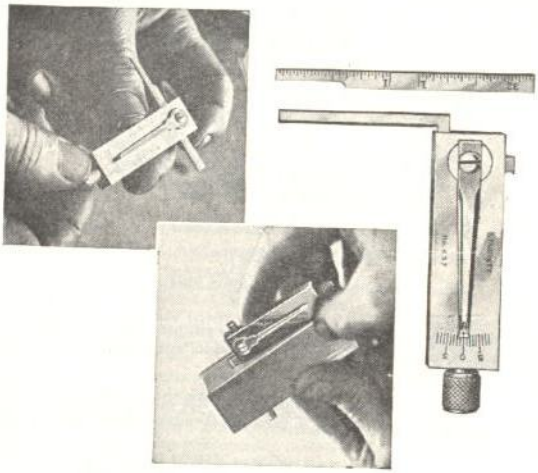
Metric

The same as No. 453, except that the blade is graduated in millimeters and half millimeters. Price same as for No. 453.



Above numbers packed 1 in a box.

Improved Die Makers' Squares No. 457



A tool and die makers' square with degree markings on the stock or beam and an offset blade, so light is unobstructed in small holes. Useful for getting angles and drafts on patterns.

Angle measuring capacity is 16 degrees, 8 degrees either side of 0, the angle of the blade being indicated by the line on the pointer.

The offset blade ⅛ inch wide, beveled on each edge to give a line contact, protrudes from the square about 1½ inches.

The straight and graduated blade is 5/32 inch wide, and 2¼ inches long. Graduated 64ths on one side; 32nds on the other. Attention is called to the narrow end of this blade. For ⅛-inch length it has a width of 3/32 inch.

The beam dimensions of this square are approximately ⅝ inch wide, 11/32 inch thick and 2⅛ inches long.

Beam and blades are hardened and ground.

No. 457 A Square, with straight blade only ..... Price,
No. 457 B Square, with offset blade only ..... Price,
No. 457 C Square, complete with straight and offset blades ..... Price,

No. 457 C complete sent unless otherwise ordered.

No. 457 M

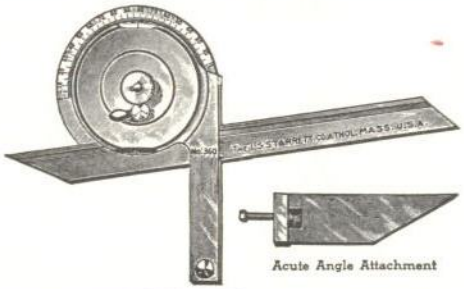
Metric

The straight and graduated blade is 58 mm. long. Graduated in millimeters on one side ½ millimeters on the other. Otherwise this square is similar to No. 457, as shown above.

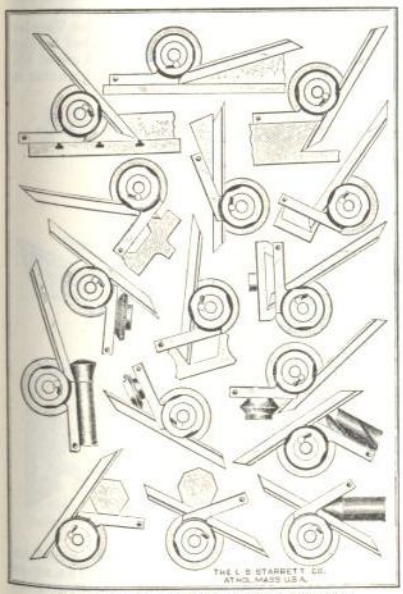
No. 457 M-A Square ..... Price,
No. 457 M-B Square ..... Price,
No. 457 M-C Square ..... Price,

No. 457 M-C sent unless otherwise ordered.
Above numbers packed 1 in a box.

Universal Bevel Protractors No. 360



Acute Angle Attachment



A few uses of the Universal Bevel Protractor

When angles other than 90° and 45° are to be laid off, a protractor must be used because all angles are not obtainable with a square or bevel. The Starrett Universal Bevel Protractor is a graduated disc with a fixed blade and adjustable stock. Any given angle may be laid off or measured by setting the stock at that angle by the graduated disc. This tool has a very wide range of usefulness as shown by the illustrations.

The blade is either 7 or 12 inches by ½ inch and the stock is 4 inches long; both are made from sheet steel nicely finished. The tool weighs 6 ounces. The disc is graduated in degrees from 0 to 90 each way and rotates the entire circle on a center stud. The blade, clamped by an eccentric stud against the end of the disc, may slide back and forth its full length or turn through any angle around the circle and be clamped firmly at any point. It is thus adapted to positions impossible with other protractors and renders unnecessary the use of the common bevel in transferring angles.

One side of the center being flat makes it a convenient tool for laying on paper in drafting and it has double the utility of any similar tool.

The acute angle attachment shown in the small cut but not included with the protractor unless so ordered, at additional price as shown below, will be found convenient in obtaining small angles.

No. 360 A With 7-inch blade ..... Price,
No. 360 B With 7-inch blade in case ..... Price,
No. 360 C With 12-inch blade ..... Price,
No. 360 D With 12-inch blade in case ..... Price,
No. 360 E With both 7 and 12 inch blades ..... Price,
No. 360 F Same as E in case ..... Price,
No. 360 G Acute angle attachment, extra ..... Price,

No. 360 B sent unless otherwise ordered.
Packed 1 in a box.

How to Read Universal Bevel Protractor with Vernier

The disc of the protractor is graduated in degrees from 0 to 90 each way. The Vernier plate is graduated so that 12 divisions on the Vernier occupy the same space as 23 degrees on the disc. The difference between the width of one of the 12 spaces on the Vernier and two of the 23 spaces on the disc is therefore $^1/_{12}$ of a degree.

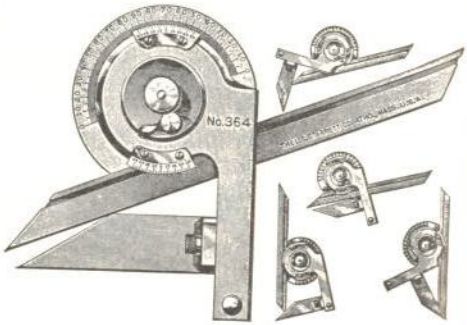
Each space on the Vernier is $^1/_{12}$ of a degree, or five minutes shorter than two spaces on the disc. If a line on the Vernier coincides with a line on the disc and the protractor is rotated until the next line on the Vernier coincides with the next line but one on the disc, the Vernier has been moved through an arc of $^1/_{12}$ of a degree, or 5 minutes.

To read the protractor, note on the disc the number of whole degrees between 0 on the disc and 0 on the Vernier. Then count in the same direction the number of spaces from 0 on the Vernier to a line that coincides with a line on the disc. Multiply this number by 5 and the product will be the number of minutes to be added to the number of whole degrees.

EXAMPLE: In the above cut the number of degrees between 0 on the disc and 0 on the Vernier is 52. The line (45) on the Vernier coincides with the line (70) on the disc, as indicated by the stars, the number of spaces on the Vernier from 0 being 9. Multiply this number by 5 gives 45, the number of minutes to be added to the number of degrees. The reading of the protractor is therefore 52 degrees and 45 minutes (52° 45').

Universal Bevel Protractors No. 364

With Vernier and Acute Angle Attachment



This protractor is the same as our No.360 described on page 69, except that it is made with Verniers reading five minutes or one-twelfth of a degree.

The Verniers are so placed with relation to the graduated half circle as to make the protractor readable by Vernier in any position. The protractor stock is 4 inches long and has either a 7 or a 12 inch blade, ½ inch wide. With the 7-inch blade, the tool weighs but 6 ounces. The disc is graduated in degrees from 0 to 90 each way and rotates the entire circle on a central stud inside the case. The blade, clamped by an eccentric stud against the edge of the disc may be slipped back and forth its full length, or turned at any angle around the circle and firmly clamped at any point. Attention is called to the fact that the figures on the Vernier are placed close to the lines, thus making it easy to read the tool when taking measurements. Attention is also called to the central locking nut on this protractor. By a slight turn of this nut the protractor is firmly held in position. The acute angle attachment which is included with the protractor enables the user to obtain very small angles.

No. 364 A With 7 inch blade ..... Price,
No. 364 B With 7 inch blade in case ..... Price,
No. 364 C With 12 inch blade ..... Price,
No. 364 D With 12 inch blade in case ..... Price,
No. 364 E With both 7 and 12 inch blades ..... Price,
No. 364 F Same as E in case ..... Price,

Above prices include acute angle attachment.

No. 364 G Acute angle attachment, only ..... Price,

No. 364 B sent unless otherwise ordered.

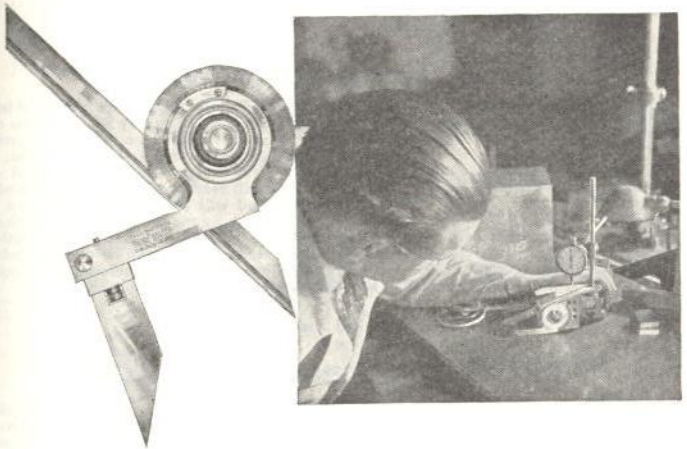
Packed 1 in a box.

Improved Universal Bevel Protractors No. 359

(Patented)

With Vernier and Acute Angle Attachment

Extremely Fine Adjustment Feature



The protractor shown on this page is similar in design to our No.364 except that the dial is graduated to degrees the entire circle and is equipped with a vernier and has encased a positive method for fine adjustments. This method of fine adjustment as well as other adjustments being all controlled from the center on the front side of the tool justifies its being called an Improved Universal Bevel Protractor. The lower nut locks the dial in its rotative path, and the middle nut at a slight downward pressure engages the fine adjusting device while the upper nut locks the blade at any point in its length. The acute angle attachment which is included with the protractor renders it available for obtaining small angles.

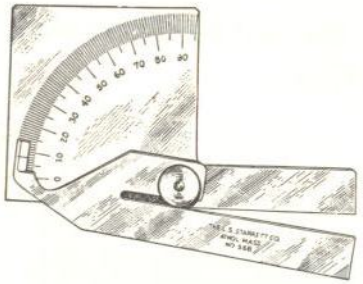
No. 359 A With 7-inch blade ..... Price,
No. 359 B With 7-inch blade in case ..... Price,
No. 359 C With 12-inch blade ..... Price,
No. 359 D With 12-inch blade in case ..... Price,
No. 359 E With both 7 and 12 inch blades ..... Price,
No. 359 F Same as E in case ..... Price,

Above prices include acute angle attachment.

No. 359 G Acute angle attachment, only ..... Price,

No. 359 B sent unless otherwise ordered.

Packed 1 in box.



Protractor No. 568

For Acute Angles

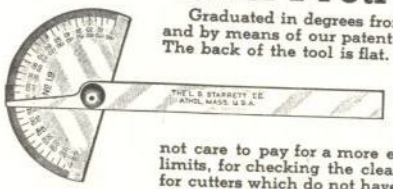
Handy small ACUTE ANGLE protractor, range 0 to 90°. With square shaped end plate, its utility is increased, as aligned with work, lay-out and check can be made from the ends. Primarily designed to facilitate fairly close and quick test of sharp included angles, etc.

Thickness of parts, from about 1/16 to 1/8 inch. Length, about 3½ inches. Height, about 2½ inches.

Price, each.....

Packed 1 in a box.

Steel Protractor No. 19

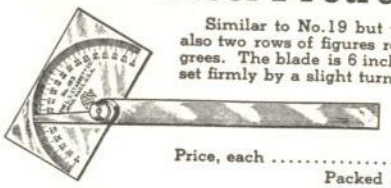


Graduated in degrees from 0 to 180, both ways. The blade is 6 inches long, and by means of our patent lock joint is set firmly by a slight turn of the nut. The back of the tool is flat. This protractor is accurate, and is convenient for setting bevels, for transferring angles, as a small T-square, or for a large number of other uses which will readily occur to a machinist or draftsman, and will be found reliable and very satisfactory by any mechanic, especially those who do not care to pay for a more expensive tool. A very handy tool, within certain limits, for checking the clearance on cutters. Ideal for use on end mills and for cutters which do not have an arbor through the hole when sharpening and when the diameter of the cutter is not more than 6 inches.

Price, each .....

Packed 1 in a box.

Steel Protractor No. 183

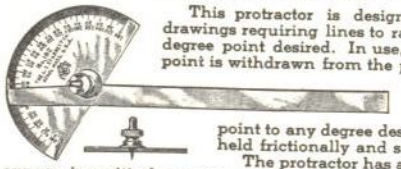


Similar to No.19 but with rectangular head, giving four working faces, also two rows of figures reading both ways to show the complementary degrees. The blade is 6 inches long and by means of our patent lock joint is set firmly by a slight turn of the nut. The back of the tool is flat, the protractor accurate, nicely finished, and convenient for a draftsman or machinist for setting bevels, transferring angles, or for use as a T-square, etc.

Price, each .....

Packed 1 in a box.

Steel Protractor No. 182



This protractor is designed particularly for field engineers, for plotting drawings requiring lines to radiate from the center of a working point to any degree point desired. In use, the fulcrum pin containing the needle or cone point is withdrawn from the protractor hub and bradded into the central point from which lines are to radiate, then the hub of the protractor is slipped on to it, when the working edge of the blade will line through the needle point to any degree desired. When not in use the needle is drawn back, held frictionally and safely carried telescoped in the hub.

The protractor has a 6-inch blade, lies flat on paper, weighs but three ounces, is positively accurate, and by field engineers and draftsmen is much appreciated.

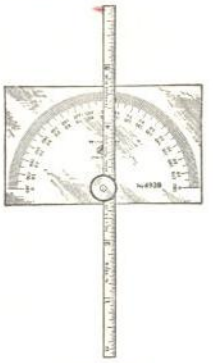
Supplied with one needle and one cone point.

Price, each .....

Packed 1 in a box.

Protractor and Depth Gages No. 493 and 493 B

No. 493



No. 493 B

This tool will readily be appreciated by machinists, draftsmen and shop foremen. Any angle in one-half of a circle (180°) may be obtained and the back is finished to permit its being laid flat upon the paper or work. The blade being adjustable permits its being set at any length within its capacity, permitting its use as a depth gage. The scale, which is clamped by a conveniently knurled nut, is graduated on one side to read by 32nds of an inch, and on the other by 64ths of an inch.

No. 493 ..... Price, each,

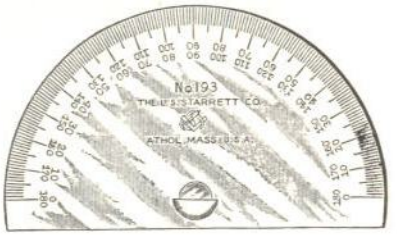
With Rectangular Head

Corresponds to our No.493, except it is made with a rectangular head, like our No.183, shown on page 72, thus providing four working edges or faces.

No. 493 B ..... Price, each,

Packed 1 in a box.

Steel Protractor No. 193



Used for setting bevels No.15, No.47 and No.49, shown on page 74, at any desired angle, thus converting them into Bevel Protractors at slight cost.

No. 193.....Price, each,

Packed 2 in a box.

Universal Bevel
No. 15

The set-off in the blade increases its capacity and usefulness for bevel gear work, etc., so that any angle, however slight, may be obtained.

Another valuable feature is, one edge of the case being solid, a rest is formed directly under the blade, where thin templets may be placed and accurately fitted. It is also useful in working the draft on patterns and in turning angles on the lathe which cannot be reached with an ordinary bevel.

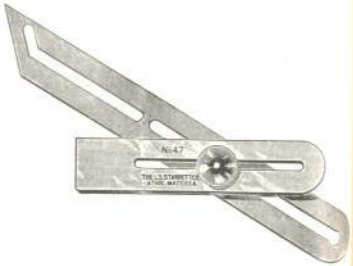
May be used with No.193 Protractor listed on page 73.

No. 15 3-inch .....Price, each,

Improved Bevel
No. 47

The advantages of this bevel over any other tool of this kind made, consist in its having not only the blade slotted but the stock as well, thus admitting adjustments that cannot be obtained with a common bevel. The clamping screw head, which the cut does not show, is let into a rabbet, flush with the surface of the stock allowing it to lie flat on the work.

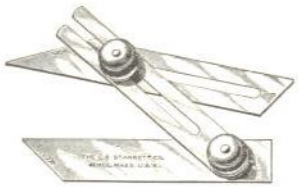
May be used with No.193 as a bevel protractor. (See page 73.)



PRICES

No. 47 6-inch (length of stock, 3½ inches)
No. 47 9-inch (length of stock, 4¼ inches)

Combination Bevel
No. 49

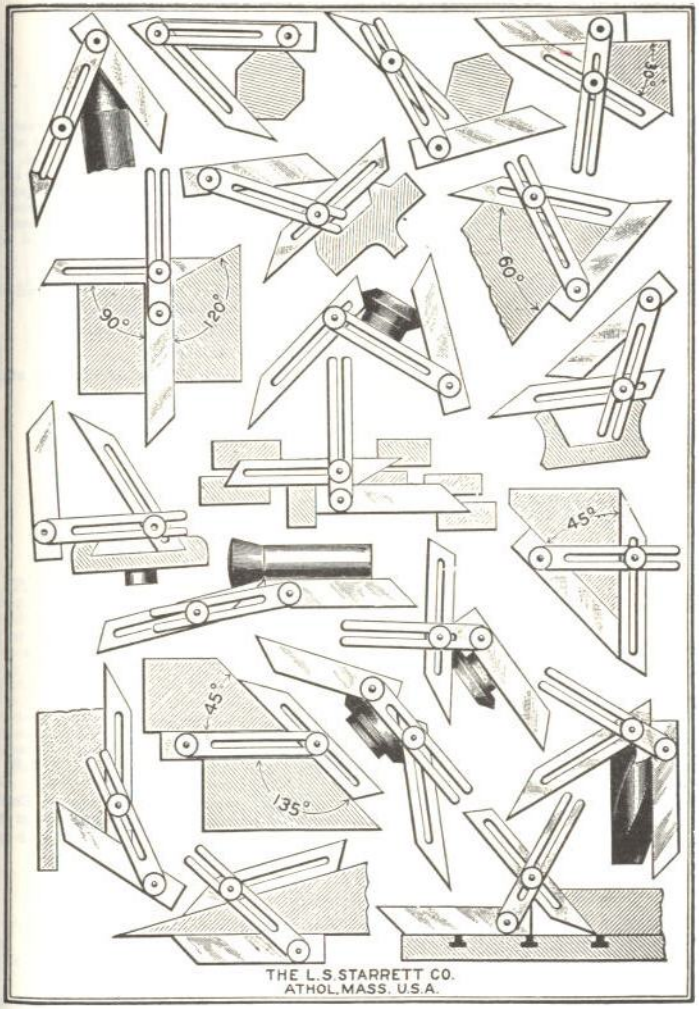


This bevel has a stud riveted in the straight edge stock or head, on which its split blade is hinged, so as to swing over the stock and be clamped at any angle. The slotted auxiliary blade with clamp bolt may be slipped on to the split blade and be clamped at any desired angle and used, in combination with the stock of the other, for laying out work, measuring, or showing any angle desired, and when so combined will lie flat upon its work. The stock is about 4 inches long.

May be used with our No.193 Protractor listed on page 73.

No. 49 .....Price, each,

Above numbers packed 1 in a box.

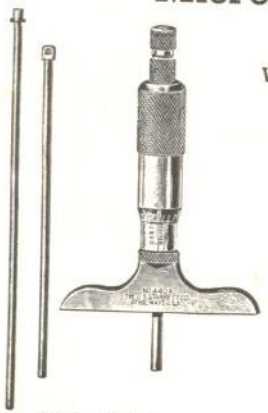


Showing some of the many uses of No.49 Combination Bevel

Micrometer Depth Gages

No. 440

With Three Measuring Rods



This type gage has been added to our line to meet the demand of mechanics who prefer a 1-inch movement of the screw. It provides measurements of the depths of holes, projections, etc., from 0 to 3 inches by thousandths of an inch. Each gage has three measuring rods with hardened and lapped ends with means for adjustment. The rods are inserted through a hole in the screw and brought to a positive seat by a small knurled nut. The base is hardened, ground and lapped.

Note: The end of the rod is flat, but can be furnished very slightly convex, if so ordered, at the same price.

Sent with flat point unless otherwise ordered.

Furnished with or without ratchet stop.

Sent without ratchet stop and without case unless otherwise ordered.

No. 440 A With 2½-inch base, without ratchet stop ..... Price,
No. 440 A With 2½-inch base, with ratchet stop ..... Price,
Case for above ..... Price,

No. 440 B With 4-inch base, without ratchet stop ..... Price,
No. 440 B With 4-inch base, with ratchet stop ..... Price,
Case for above ..... Price,

No. 440 D With 6-inch base, without ratchet stop ..... Price,
No. 440 D With 6-inch base, with ratchet stop ..... Price,
Case for above ..... Price,

Extra Rods for **Nos. 440 A, 440 B** and **440 D**
(Providing Range to 6 inches)

3 to 4 inch rod only ..... Price, each,
4 to 5 inch rod only ..... Price, each,
5 to 6 inch rod only ..... Price, each,

No. 440 M

Metric

For Metric measurements. These gages are of the same proportions as those of English measure, but have 25 mm. movement of the screw, and read by hundredths of a millimeter from 0 to 75 mm.

No. 440 M-A With 2½-inch base, without ratchet stop ..... Price,
No. 440 M-A With 2½-inch base, with ratchet stop ..... Price,
Case for above ..... Price,

No. 440 M-B With 4-inch base, without ratchet stop ..... Price,
No. 440 M-B With 4-inch base, with ratchet stop ..... Price,
Case for above ..... Price,

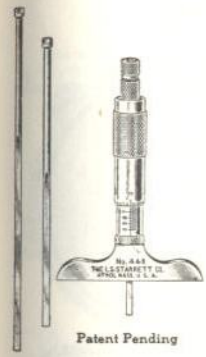
No. 440 M-D With 6-inch base, without ratchet stop ..... Price,
No. 440 M-D With 6-inch base, with ratchet stop ..... Price,
Case for above ..... Price,

Sent without ratchet stop and without case unless otherwise ordered.

Above numbers packed 1 in a box.

Micrometer Depth Gages

No. 449



Patent Pending

Showing something different in depth gages. Now gives a mechanic the bladelike rod instead of the round rod but with micrometer readings instead of the vernier. The blade turns under friction so it can be positioned at any angle relative to the base, but in actual use the same as a micrometer, the blade does not turn, moving perpendicularly only. The experienced mechanic knows what this means in bringing the contact point directly on to a very narrow shoulder.

The blades of the three rods, as shown, and to give a range from 0 to 3 inches, are approximately .045 thick and ⅛ inch in width. The rods are inserted through a hole in the screw and seated by the knurled nut at the top. The base is hardened, ground and lapped.

PRICES

No. 449 A With 2½-inch base, without ratchet stop .....
No. 449 A With 2½-inch base, with ratchet stop .....
Case for above .....

No. 449 B With 4-inch base, without ratchet stop .....
No. 449 B With 4-inch base, with ratchet stop .....
Case for above .....

No. 449 D With 6-inch base, without ratchet stop .....
No. 449 D With 6-inch base, with ratchet stop .....
Case for above .....

Sent without ratchet stop and without case unless otherwise ordered.
Packed 1 in a box.

Micrometer Depth Gages

No. 446

This gage is designed for measuring the depth of grooves, holes or irregular parts. It has ½-inch movement of the screw, reading in thousandths; and with two ½-inch and one 1-inch standard collars to slip off or on the spindle, 2½ inches, reading in thousandths, can be obtained. The split nut is covered and protected by our graduated sleeve which not only protects the nut from dirt, but provides a quick and accurate way of taking up wear and adjusting the micrometer to insure correct reading. The sleeve, being held by a stiff friction, may be rotated by a spanner wrench, accompanying each gage, so that the zero lines will coincide for correct reading. The head is about 4/10 inch thick; this and the point of measuring rod are hardened, ground and lapped.

Note: The end of the rod is very slightly convex, but can be furnished flat, if so ordered, at the same price.

PRICES

No. 446 A With 2¼-inch base ..... With case.....
No. 446 B With 4 -inch base ..... With case.....
Sent without case unless otherwise ordered.

No. 446 M Metric

For Metric measurements. Has 13 mm. movement of screw, reading to one-hundredth mm. Has two collars 12.5 mm. long and one collar 25 mm. long, making the range of the tool 63 mm. The bases are the same as in No. 446 A, approximately 57 mm., and B approximately 101 mm.

PRICES

No. 446 M-A With 2¼-inch base ..... With case.....
No. 446 M-B With 4 -inch base ..... With case.....
Sent without case unless otherwise ordered.
Above numbers packed 1 in a box.

Dial Depth Gage
No. 640

Showing our standard depth gage with dial indicator, 2¼ inches across the face. The base is 4/10 inch thick and 2½ inches long, hardened, ground and lapped. We will gladly quote on countless deviations from the standard specifications, such as other styles of indicators, thicker and longer bases, base beveled to knife edge; the ends of rods tapered, rounded or pointed, etc. This gage can also be had with reverse movement, the rod protruding from the base, so in application, the rod, contacting the work instead of the base, it registers the depth automatically. The reverse movement is sometimes preferred in gaging shallow depths, as in half tones, engravings, etc. Standard specifications follow:

Width of base—4/10 inch
Length of base—2½ inches
Operation—Push Button

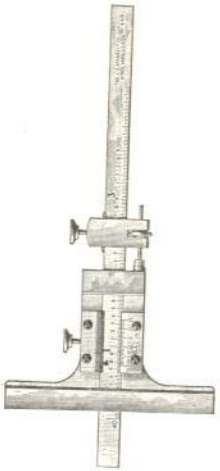
Range—0-.500 inch
Reading—0-50
Graduated—.0005 inch

Jewel Bearings, Side Bezel Clamp and Tell-Tale Hand, which records each revolution of large hand.

Jewel Bearings.....Price, each,
Plain Bearings .....Price, each,

Sent with Jewel Bearings unless otherwise ordered.

Vernier Depth Gage
No. 448



This gage is invaluable where accurate measurements are necessary, and appeals to the class of mechanics whose work requires close limits, such as gaging the depth of holes and recesses in jig, die and fixture work, etc. The head is ¼ inch thick and 2¾ inches long, and is hardened, ground and lapped. The 6-inch blade permits measurements to be made 3½ inches or 88 mm. in depth and for the 12-inch blade 9½ inches or 238 mm. in depth.

Blades graduated on one edge only, which, by means of the vernier, permit reading by thousandths of an inch.

Gage with 6 inch blade .....Price,
Gage with 6 inch blade, with case .....Price,
Gage with 6 and 12 inch blades.....Price,
Gage with 6 and 12 inch blades, with case.....Price,

No. 448 M
Metric

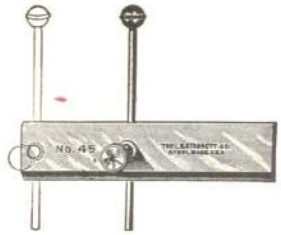
Blades graduated on one edge only to read, by means of the vernier, in 1/50 mm. Prices same as for No. 448.

No. 448 M and E
Metric and English

Graduated to read on one edge by means of the vernier in 1/50 mm. and on the other edge in thousandths of an inch. Price the same as for No. 448.

Above numbers sent without case unless otherwise ordered.
Above numbers packed 1 in a box.

Depth Gages
No. 45

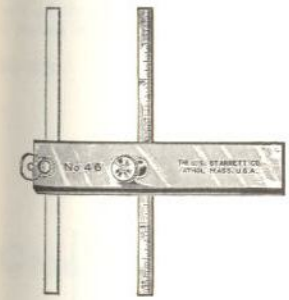


The wire in this gage is held to a groove by a friction spring inside the nut while adjusting, and may be used close to the end, as well as in the center of the straight edge or stock.

By loosening the nut, the gage may be neatly folded.

PRICES

No. 45 A With 3½-inch stock and 3½-inch wire.....
No. 45 B With 6 -inch stock and 6 -inch wire.....
No. 45 C With 10 -inch stock and 6 -inch wire.....



Depth Gages
No. 46

Has in place of the round wire to slide in the groove, as shown with No. 45, a 4-inch or 6-inch scale, 3/16 inch wide, graduated in either 32nds and 64ths, or 64ths and 100ths, indicating exact measurements, and may be used separately from the gage. This tool, like our No. 45, can be used with the scale clamped close to the end, allowing depth measurements to be taken in difficult places.

Sent with 32nds-64ths graduations unless otherwise ordered.

PRICES

No. 46 A With 3½-inch stock and 4-inch scale .....
No. 46 B With 3½-inch stock and 6-inch scale .....
No. 46 C With 6 -inch stock and 4-inch scale .....
No. 46 D With 6 -inch stock and 6-inch scale .....
No. 46 E With 10 -inch stock and 6-inch scale .....

No. 46 M
Metric

The same as No. 46, except that the blades are graduated in millimeters on one side and in ½ millimeters on the other side.

Prices the same as for corresponding sizes of No. 46.

Above numbers packed 1 in a box.

Spring Depth Gages
No. 48

This depth gage is particularly adaptable when taking quick measurements, as the spring in the barrel automatically forces the rod downward. The clamp screw locks the rod in position. Its capacity is 3 inches.

The gage is made with a base about 4/10 inch thick and 2½ inches long. The rod is ⅛-inch diameter. Both the base and contact end of the rod are hardened and ground.

No. 48 .....Price, each,

Depth Gages
No. 237

The head of this gage is steel, nicely finished, and case-hardened, 2 inches wide across the base, ⅛ inch thick.

The blade, which is conveniently held in the groove of the head by a knurled lock nut, is a 6-inch narrow spring-tempered rule, the same as furnished with our No.46 Depth Gage, and can be used separately from the gage. Blades graduated in 32nds and 64ths of an inch will be sent unless otherwise ordered, but we can also supply them graduated in 64ths and 100ths.

No. 237 .....Price, each,

No. 237 M
Metric

The same as No.237, except that the blade is 15 cm. long, graduated on one side in millimeters and on the other in ½ millimeters.

No. 237 M.....Price, each,

Above numbers packed 1 in a box.

Combination Depth and Angle Gage
No. 236

This depth gage, although resembling our popular No.237, is made slightly larger and with degree lines on both sides of the head. Extreme protractor accuracy is not claimed in this construction but for certain classes of work, as a sort of ready reference or for duplicating an angle or chamfer, in combination with a desirable form of depth gage, it is a convenient tool for measuring.

As the cut shows, both sides of the head are marked with 30, 45 and 60 degree lines, so when set to the line on the turret, convenience to the user is doubled. The head of this gage is 2⅝ inches across the base and ⅛ inch thick. Recess in base to facilitate setting to divisions on rule not shown in cut. Spring-tempered rule used is 3/16 inch wide and 6 inches long. Graduated 32nds one side, other side 64ths.

No. 236.....Price, each,

Packed 1 in a box.

Combination Depth Gage and Hook Rule
No. 236 H

So that mechanics may have the combination like the illustration, we have designed a special hook rule, applicable to our Nos.236, 237, 46 and 493 depth gages. Hook adjusts parallel to the base for calipering and the rule can be used independently as a regular hook rule. Reverse hook and use as a depth gage. Rule is graduated 64ths and 32nds. The rod is 5/64 inch diameter and 6 inches long. Used for measuring in small holes where the rule will not enter. Rod feature on No.236 only.

No. 236 H-A	Depth Gage, with Hook Rule	.....Price,
No. 236 H-B	Depth Gage, with Hook Rule and with rod	.....Price,
No. 236 H-C	Hook Rule only for Nos.236, 237, 46 and 493	..Price,
No. 236 H-D	Rod only	.....Price,

No. 236 H-B Complete as shown, sent unless otherwise ordered.

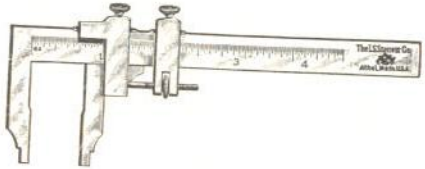
Above numbers packed one in a box.

Measurements between Contacts

The instruments described on preceding pages of this catalogue are such that it is necessary to judge by the eye the position of the edge or point to be measured in relation to a certain graduation on the tool. For some kinds of work this is sufficiently accurate and for others it is the only method possible. But where the distance between two surfaces, either external or internal, is to be measured it is frequently difficult to place the edge of a rule in a position that will allow accurate determination of the distance. To meet the requirements for this kind of measuring, instruments having two points of contact are necessary and are described on the following pages.

With these tools one surface is generally fixed and the other adjustable so that the fixed contact may be placed against one surface and the adjustable contact brought up against the other. Then there is then no possibility of a mistake, for the distance may be read direct from the scale.

Caliper Squares No. 426



This caliper square is designed both for inside and outside measurements. It is made with firm and adjustable jaw. The beam is graduated on one side in 64ths and on the other in 100ths of an inch. With the adjusting screw the sliding head can be more accurately set to the graduations. Width of nibs when closed, .250. Depths of jaws: size A, 1¼ inch; sizes B and C, 1½ inch. Die sinkers find this tool very valuable.

		PRICES	
No. 426 A	3-inch, without case		With case
No. 426 B	4-inch, without case		With case
No. 426 C	6-inch, without case		With case

No. 426 M

Metric

The same as No. 426, except that the beam is graduated on one side in ½ millimeters and on the other in millimeters.

		PRICES	
No. 426 M-B	10 cm., without case		With case
No. 426 M-C	15 cm., without case		With case

No. 426 M and E

Metric and English

The same as No. 426, except that the beam is graduated on one side in ½ millimeters and on the other in 100ths of an inch.

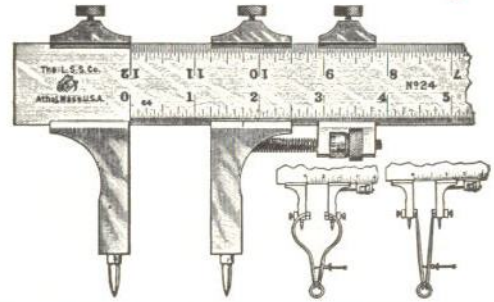
		PRICES	
No. 426 M & E-B	4-inch, without case		With case
No. 426 M & E-C	6-inch, without case		With case

Above numbers sent without case unless otherwise ordered.

Packed 1 in a box.

Micrometer Caliper Gages

No. 24



This gage is specially adapted to the tire industry, in measuring tire molds, and by affording greater scope than any tool of its kind made, and is valuable in many other lines. The beams are 1¼ inches wide, .085 inch thick and are furnished in 12, 18, 24, 36 and 48 inch lengths, and are graduated in 8ths, 16ths, 32nds and 64ths. The head or jaws carry auxiliary tram points and may be removed so that the beam may be used separate as a rule. Attachments are also made to slip on and off the ends of the caliper so they may be used to set inside or outside calipers for making close or drive fits, etc. The inside calipers are set against the inside face of gage and resting on the seat of the attachments keep them in perfect line. The outside calipers are set against an extended seat of the attachment in line with the inside faces of the gage so that both inside and outside calipers may be set to agree with each other. This gage may not only be set by the graduated beam but varied by the micrometer adjusting nut to read in thousandths. The beam and attachments, like the jaws, are hardened and ground insuring long service. The jaws are 1 inch wide when closed and are furnished having 2-inch depth.

12-inch	Price, each,
18-inch	Price, each,
24-inch (For checking flywheel gears)	Price, each,
36-inch	Price, each,
48-inch	Price, each,

No. 24 A

Larger Size

Especially Adapted to the Use of Automobile Tire Manufacturers

The same as No. 24, except that the jaws are 4 inches deep and the beam has a stiffening rod the entire length, which is placed on the 32nds and 64ths graduated side. Made in 48-inch length only.

48-inch	Price, each,

No. 24 M

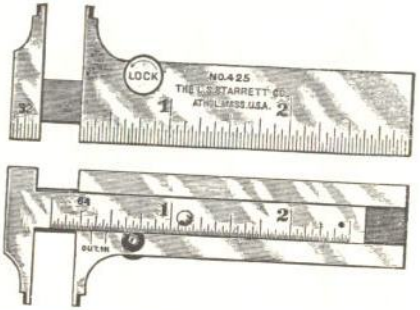
Metric

The same as No. 24, except that the beam is graduated in millimeters and half millimeters and the adjusting nut in hundredths of a millimeter. The jaws when closed are 25 mm. wide.

30 cm.	Price, each,
50 cm.	Price, each,
60 cm.	Price, each,
90 cm.	Price, each,

Above numbers packed 1 in a box.

Pocket Slide Calipers No. 425



Graduated in 32nds on the stock and 64ths on the slide. The improved clamping device, with left hand thread (see cut), is a valuable feature as it may be locked by the thumb of the same hand in which the tool is held. The two lines on the stock as shown in lower cut enable the user to get either inside or outside measurements.

Size	Depth of Jaws	Nibs when Closed	Price
3-inch	11/16 inch	1/8 inch	
5-inch	1 7/16 inch	1/4 inch	

No. 425 A

Same as No. 425, except that it is graduated in 32nds on the stock and 100ths on the slide. Prices and dimensions the same as for No. 425.

No. 425 M

Metric

Same as No. 425, except that the graduations are Metric.
The 7 cm. is graduated in ½ millimeters on slide and millimeters on stock.
The 13 cm. is graduated in millimeters on one edge and ½ millimeters on the other edge of slide, and in millimeters on stock.

Size	Depth of Jaws	Nibs when Closed	Price
7 cm.	11/16 inch	3 mm.	
13 cm.	1 7/16 inch	6 mm.	

No. 425 M and E

Metric and English

Same as No. 425, except that the graduations are in ½ millimeters on one edge and 64ths inch on the other edge of slide, and in 32nds inch on the stock.

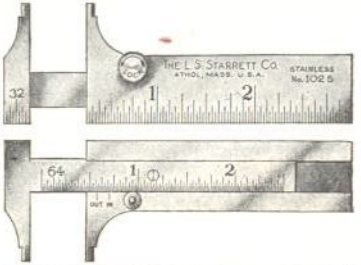
Size	Depth of Jaws	Nibs when Closed	Price
3-inch or 7 cm.	11/16 inch	1/8 inch or 3 mm.	
5-inch or 13 cm.	1 7/16 inch	1/4 inch or 6 mm.	

Above numbers packed 1 in a box.

Cases for above, 3-inch size .....
Cases for above, 5-inch size .....

Pocket Slide Calipers No. 1025

Stainless Steel



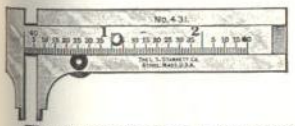
Made of the highest grade of Stainless Steel. The Stainless qualities prevent rust and stain so that a bright finish is retained.

Graduated in 32nds on the stock and 64ths on the slide. The improved clamping device, with left-hand thread (see cut), is a valuable feature as it may be locked by the thumb of the same hand in which the tool is held. The two lines on the stock as shown in lower cut enables the user to get either inside or outside measurements.

	Size	Depth of Jaws	Nibs when Closed	Price
No. 1025	3 inches	11/16 inch	1/8 inch	
No. 1025	5 inches	1 7/16 inch	1/4 inch	

Packed 1 in a box.

Button Gage No. 431



This gage is the same size and similar to our No. 425 Pocket Slide Caliper. The difference is that this gage is graduated on the slide to 40ths of an inch. Stock graduated in 32nds on the front.

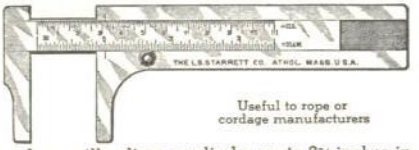
Special attention is called to the fact that every fifth line is figured, so as to assist the user to more quickly read the 40ths, as shown in the cut.

The 3-inch size has a range of 2 inches for both external and internal measurements, while the 5-inch size has a range of 3½ inches.

No. 431 3-inch .....Price, each,
No. 431 5-inch .....Price, each,

Packed 1 in a box.

Slide Rule Caliper and Circumference Scale No. 424



Useful to rope or cordage manufacturers

This gage has a double function—being graduated to read the circumference as well as the diameter of the object measured, the relation of circumference to diameter being shown by the graduations on upper corners of the rule (capacity 3½ inches, about 11 inches circumference). It was originally designed for rope or cordage manufacturers. It makes a first-class slide rule caliper of large scope, opening 3½ inches. The jaws, being 1⅜ inches deep, will caliper a cylinder up to 2¾ inches in diameter. The rule is graduated in 32nds of an inch standard and 16ths of an inch circumference measure. All corners of the tool are rounded smooth to make it fit to carry in the pocket and agreeable to handle. The circumference measure will assist in calculating how many feet a minute the cutting tool in a lathe is doing on any diameter within the scope of the gage and so help determine whether the tools should have a faster or slower speed.

RULE: The circumference being shown by the gage, multiply the same by the speed the lathe runs per minute and the result will show the number of inches or feet the circumference is running and the tool cutting.

No. 424... .....Price, each,

Packed 1 in a box.

Starrett

Starrett Vernier Tools Have Many Features

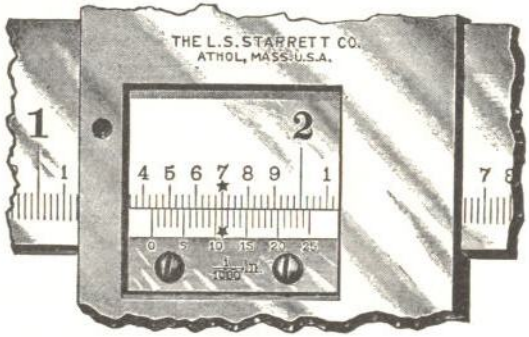
Sharp, clean-cut, machine-divided graduations of uniform width and depth insure accurate readings and settings, and are most essential to correct matching of the graduations on the bar or scale to those on the Vernier plate.

Tightly yet smoothly fitted Vernier slides help to prevent errors at measuring points.

Materials used, workmanship, finish and final inspection provide tools which are reliable and accurate.

Such features make Starrett Verniers outstanding.

How to Read Height Gage or Caliper with Vernier



The bar of the tool is graduated in fortieths or .025 of an inch, every fourth division, representing a tenth of an inch, being numbered. On the Vernier plate is a space divided into twenty-five parts and numbered 0, 5, 10, 15, 20, 25. The twenty-five divisions on the Vernier occupy the same space as twenty-four divisions on the bar.

The difference between the width of one of the twenty-five spaces on the Vernier and one of the twenty-four spaces on the bar is therefore $^1/_{25}$ of $^1/_{40}$ or $^1/_{1000}$ of an inch. If the tool is set so that the 0 line on the Vernier coincides with the 0 line on the bar, the 0 line to the right on the Vernier will differ from the 0 line on the bar by $^1/_{1000}$ of an inch; the second line by $^2/_{1000}$ of an inch and so on. The difference will continue to increase $^1/_{1000}$ of an inch for each division until the line 25 on the Vernier coincides with the line 24 on the bar.

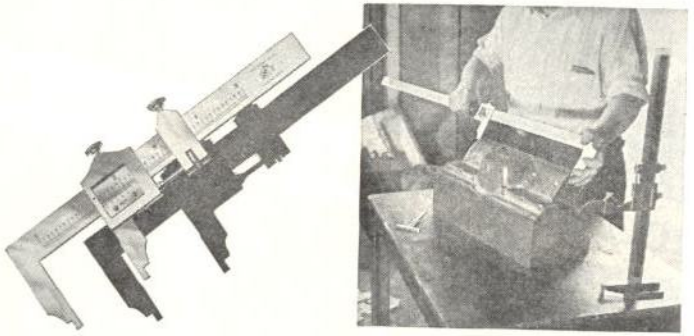
To read the tool, note how many inches, tenths (or .100) and fortieths (or .025) the 0 mark on the Vernier is from the 0 mark on the bar; then note the number of divisions on the Vernier from 0 to a line which exactly coincides with a line on the bar. EXAMPLE: In the above cut the Vernier has been moved to the right one and four-tenths and one-fortieth inches (1.425), as shown on the bar, and the eleventh line on the Vernier coincides with a line, as indicated by the stars, on the bar. Eleven-thousandths of an inch are therefore to be added to the reading on the bar and the total reading is one and four hundred and thirty-six thousandths inches (1.436).

A plentiful supply of Starrett Tools in the tool crib is your best assurance of uniformly accurate work on every operation. . . . . .

STARRETT
SHOP EQUIPMENT
TOOLS

Vernier Calipers No. 122

Hardened Beams



These calipers are graduated either English or Metric measure for outside and inside measurements, also English and Metric or Metric and English for outside measurements direct. Points are placed on the beams and slides of all sizes except 36-inch and 48-inch for setting dividers to transfer distances. Full directions for using the vernier are sent with each caliper.

The jaws are hardened, ground and lapped parallel.

These calipers are sent with finely finished case.

We can furnish a ¼-inch cylindrical plug standard for testing the adjustment of the caliper when desired. Price,

No. 122

English

These calipers are graduated on the front side to read thousandths of an inch for outside measurements and on the back to read direct in thousandths of an inch for inside measurements by means of a vernier on each side.

Size	Approximate Depth of Jaws	Width of Nibs When Closed	Price With Case	Price Without Case
6-inch	1 9/16 inches	.250		
9-inch	2 3/8 inches	.300		
12-inch	2 3/8 inches	.300		
24-inch	2 3/8 inches	.300		
36-inch	3 inches	.500		
48-inch	3 inches	.500		

Sent with case unless otherwise ordered.

Packed 1 in a box.

Prices for larger sizes quoted on application.

Vernier Calipers No. 122 M

Metric

These calipers are graduated on front side to read 50ths of a millimeter for outside measurements and on the back to read direct in 50ths of a millimeter for inside measurements by means of a vernier on each side.

Size	Depth of Jaws	Width of Nibs when Closed	Price, with Case	Price, without Case
150 mm.	39.7 mm.	6 mm.		
200 mm.	60 mm.	8 mm.		
300 mm.	60 mm.	8 mm.		
600 mm.	60 mm.	8 mm.		

Sent with case unless otherwise ordered.

No. 122 M and E

Metric and English

These calipers are graduated on the front side to read 50ths of a millimeter and on the back to read in thousandths of an inch. Both sides read in outside measurements direct by means of a vernier on each side.

Size	Approximate Depth of Jaws mm.	Approximate Depth of Jaws Inches	Approximate Width of Nibs when Closed mm.	Approximate Width of Nibs when Closed Inches	Price With Case	Price Without Case
150 mm. or 6-inch	39	1 9/16	6	.236		
200 mm. or 9-inch	60	2 3/8	8	.315		
300 mm. or 12-inch	60	2 3/8	8	.315		
600 mm. or 24-inch	60	2 3/8	8	.315		

Sent with case unless otherwise ordered.

For inside measurements, it is necessary to add the following thickness of measuring nibs to caliper reading:

Size

150 mm. or 6-inch, add 6 mm. Metric or .236 inch English Measure
200 mm. or 9-inch, add 8 mm. Metric or .315 inch English Measure
300 mm. or 12-inch, add 8 mm. Metric or .315 inch English Measure
600 mm. or 24-inch, add 8 mm. Metric or .315 inch English Measure

No. 122 E and M

English and Metric

These calipers are graduated on the front side to read in thousandths of an inch and on the back to read 50ths of a millimeter. Both sides read in outside measurement direct by means of a vernier on each side.

Size	Approximate Depth of Jaws Inches	Approximate Depth of Jaws mm.	Approximate Width of Nibs when Closed Inches	Approximate Width of Nibs when Closed mm.	Price With Case	Price Without Case
6-inch or 150 mm.	1 9/16	39	.250	6.35		
9-inch or 200 mm.	2 3/8	60	.300	7.62		
12-inch or 300 mm.	2 3/8	60	.300	7.62		
24-inch or 600 mm.	2 3/8	60	.300	7.62		
36-inch or 900 mm.	3	76	.500	12.70		
48-inch or 1200 mm.	3	76	.500	12.70		

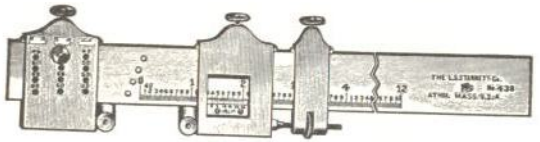
Sent with case unless otherwise ordered.

For inside measurements, it is necessary to add the following thickness of measuring nibs to caliper reading:

Size

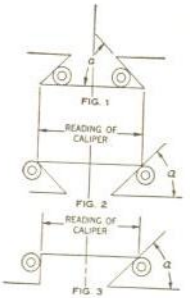
6-inch or 150 mm., add .250 inch English Measure or 6.35 mm. Metric Measure
9-inch or 200 mm., add .300 inch English Measure or 7.62 mm. Metric Measure
12-inch or 300 mm., add .300 inch English Measure or 7.62 mm. Metric Measure
24-inch or 600 mm., add .300 inch English Measure or 7.62 mm. Metric Measure
36-inch or 900 mm., add .500 inch English Measure or 12.70 mm. Metric Measure
48-inch or 1200 mm., add .500 inch English Measure or 12.70 mm. Metric Measure

Dovetail Vernier Caliper
No. 438



This caliper will prove a valuable asset to any manufacturer's tool equipment where dovetail work is involved. With the vernier it measures by thousandths of an inch from 0 to approximately 12 inches.

Heretofore dovetails were commonly gaged by using pieces of round wire or standard plugs keeping them in contact with angle sides and below the upper edges or corners of the dovetail. Then caliper the overall or inside distance of the wires, as the case might be for male or female dovetails, and consult a formula. The result: considerable time and expense which is eliminated by using this caliper.



Position of buttons in relation to reading of caliper

The reading of the caliper is the distance invariably given on drawings from corner to corner of the dovetail, the direct measurement being obtained by the buttons in contact with the sides of the angle. See Figures 1, 2, and 3 which correspond to like figures on the sliding jaw. A taper plug locates this slide in relation to the construction and angle required. The locating pin and buttons are hardened, ground and lapped.

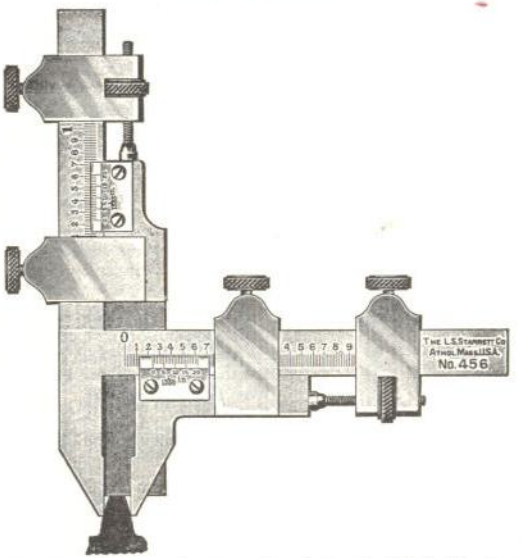
The range of application, 45°, 50°, 55°, and 60° angle, leaves little to be desired in this tool.

With case ..... Price, each,
Without case ..... Price, each,

Sent with case unless otherwise ordered.

Packed 1 in a box.

Gear Tooth Vernier Calipers
No. 456



For work in connection with gear teeth, gear cutters, hobs, etc., this tool is almost indispensable. With it, the thickness at pitch line or chordal thickness of gear teeth and the distance from the top of a tooth to the chord can be measured by thousandths of an inch.

Allowance may be made for variation or error in blank diameter when setting for distance from top to pitch line of tooth.

The thickness of a tooth at pitch line and the addendum are measured by a jaw and tongue respectively, which are adjustable on the graduated arms. (See cut.)

A substantially constructed and well-balanced tool with distinct graduations.

No. 456 A
English

Reads by thousandths of an inch. 20 diametral to 2 diametral pitch.

With case ..... Price, each,
Without case ..... Price, each,

No. 456 B
English

Reads by thousandths of an inch. 10 diametral to 1 diametral pitch.

With case ..... Price, each,
Without case ..... Price, each,

No. 456 M-A
Metric

Reads by fiftieths of a millimeter. 1¼ mm. to 12 mm. module.

With case ..... Price, each,
Without case ..... Price, each,

No. 456 M-B
Metric

Reads by fiftieths of a millimeter. 2½ mm. to 25 mm. module.

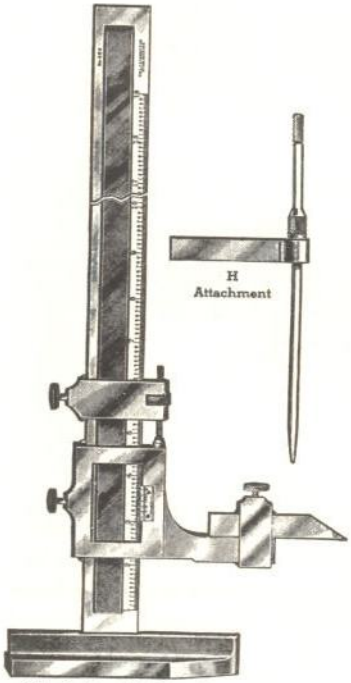
With case ..... Price, each,
Without case ..... Price, each,

Sent with case unless otherwise ordered.

Vernier Height Gages
No. 454

Hardened Bars

English, Metric, and English and Metric Measure

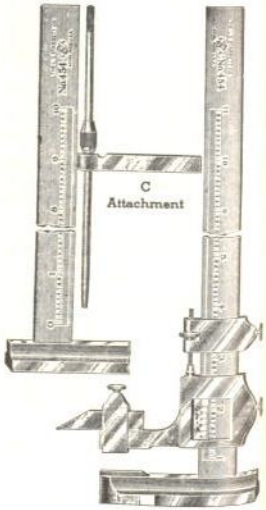


Cut showing 18-inch and larger size Gages

The Vernier Height Gage will be found indispensable when used in connection with any work where a high degree of accuracy is required. Very essential for jig and fixture making. Designed to measure or mark off vertical distances from a plane surface and by the use of toolmakers' buttons (our No.494 shown on page 96), the locating of center distances of jigs, dies, etc., can be accurately obtained.

For measuring or scribing lines on the work, a combination marker and extension is supplied for the movable jaw

The Depth Gage Attachments C (for use with the 10-inch gage) and H (for use with the 18-inch and larger size gages) are used for measurements taken on the inside of the frame of a jig, in deep recesses or over high projections. Measures depths easily and accurately These attachments are easily adjusted, after which accurate measurements can be had with the vernier.



Cut showing 10-inch Gage

10-inch Gages

Base (approximately), 3¼ inches long, 1¼ inches wide, and ⅝ inch high. Graduated to read on both sides.

18-inch Gages

Base (approximately), 5¼ inches long, 2¼ inches wide, and 13/16 inch high. Graduated to read on one side only.

24-inch Gages

Base (approximately), 6⅞ inches long, 3 inches wide, and 1⅛ inches high. Graduated to read on one side only.

Starrett

Vernier Height Gages
No. 454

Instructions when Using 10-Inch Starrett Vernier Height Gages

Measurements by use of the height gage are generally obtained in connection with the Toolmakers' Buttons (our No.494, page 96) in locating the center distance of bushings in jigs, dies, etc., or in ascertaining the height of projections from a plane surface. The bar is graduated to read by means of the Vernier to 1/1000 inch, and is graduated to read from 0 to 9 inches inside of jaws, and from 1 to 10 inches outside of jaws, enabling this gage to be used for either inside or outside measurements.

To explain: On the front side, when the jaws are closed the lines at 0 on both bar and Vernier plate will coincide, and the tool is designed for outside measurements only. On the reverse side, draw the movable jaw back to point where lines at 0 of both Vernier plate and bar coincide, the distance from the bottom of the base to the top of the movable jaw now equals 1 inch, and the tool is designed for inside measurements only. The hardened base is recessed in the bottom and ground and lapped square with the bar, allowing the gage to stand upright. An extension or scriber, as shown in cut (page 92) on the movable jaw, is also furnished which allows reverse measurements to be taken from the top or bottom side of the jaw. This extension permits measurements over projections and is hardened, ground, and lapped to a point so that a line or series of lines may be drawn and spaced as required in laying out of dies, etc.

A valuable feature in connection with this gage is the attachment by which measurements may be taken inside the frame of a jig or in ascertaining the depth of recesses, etc., which could not readily be accomplished in the ordinary way. All measurements outside only.

The rod shown with this attachment is 6 inches long, and is held by a spring bushing and nut similar to a chuck. It can be readily adjusted to approximate measurements, after which accurate measurements can be had with the Vernier.

See pages 94 and 95 for prices.

The 18 and 24 inch Starrett Vernier Height Gages are designed for use as height gages only, measurements being taken only on the outside of the jaws. They differ from our 10-inch gage in range and proportion.

Offset Scriber

The Offset Scriber will also be found valuable. It makes measurements from the base possible, although held like the straight scriber. Adjust to plane with base and take reading for working point.

PRICES

No. 454D For 10-inch height gage .....
No. 454K For 18-inch and larger height gages .....

Vernier Height Gages No. 454

No. 454—English Measure 10-Inch Gage

The bar approximately ¾-inch wide and ⅛-inch thick, is graduated to read by means of the vernier to 1/1000 inch. The base is hardened, ground and lapped on top and bottom and is approximately 3¼ inches long, 1¼ inches wide and ⅝ inch high. Measurements may be taken on both inside and outside of jaw enabling this gage to be used for either inside or outside measurement.

One side of the bar is graduated (for use as a height gage) to read from 1 to 10 inches in thousandths of an inch; the other side (for use as an outside caliper), measuring between jaws, to read from 0 to 9 inches by thousandths of an inch.

		Price With Case	Price Without Case
No. 454 A	10-inch Vernier Height Gage, with Attachment C		
No. 454 B	10-inch Vernier Height Gage, without Attachment C		
No. 454 C	Attachment only		Price.

No. 454 A Gage with Attachment sent unless otherwise ordered.

Height Gages sent with case unless otherwise ordered.

No. 454 M—Metric Measure 10-Inch Gage

One side of bar is graduated Metric measure to read from 25 mm. to 26 cm. by 50ths of a millimeter (for use as a height gage); the other side (for use as an outside caliper), measuring between jaws, to read from 0 to 23 cm. by 50ths of a millimeter.

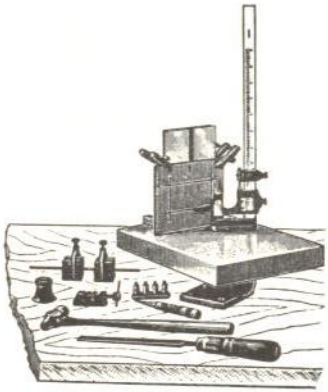
Prices same as for **No. 454**—10-inch.

No. 454 E and M—English and Metric Measure 10-Inch Gage

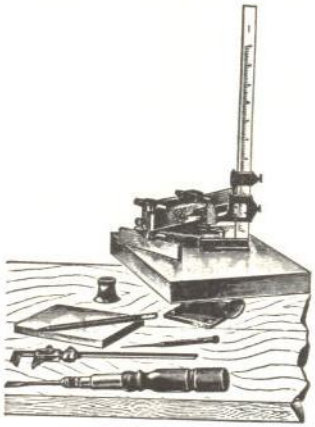
One side of bar is graduated English measure to read from 1 to 10 inches in thousandths of an inch (for use as a height gage). The other side is graduated Metric measure to read from 38 mm. to 26 cm. by 50ths of a millimeter (for use as a height gage).

Using this gage as an outside caliper, measurements between the jaws are determined by deducting from the reading on the bar the thickness of the jaw and base, obtained by bringing the jaw and base into closed position and recording the tool reading at that point.

Prices same as for **No. 454**—10-inch.



The Scriber in Use



Checking Drill Jig Bushing

Showing some uses of our No. 454 Vernier Height Gage

Starrett

Vernier Height Gages No. 454

No. 454—English Measure 18-Inch Gage

Designed for use as a height gage only, measurements being taken only on the outside of the jaws. The bar is approximately 1¼ inches wide and ¼ inch thick, is graduated on one side only to read from 1½ to 18 inches by thousandths of an inch. The base, hardened, ground and lapped on the bottom, is approximately 5¼ inches long, 2¼ inches wide and 13/16 inch high.

		Price With Case	Price Without Case
No. 454 F	18-inch Vernier Height Gage, with Attachment H		
No. 454 G	18-inch Vernier Height Gage, without Attachment H		
No. 454 H	Attachment only		Price.

No. 454 F Gage with Attachment sent unless otherwise ordered.

Height Gages sent with case unless otherwise ordered.

No. 454 M—Metric Measure 18-Inch Gage

Graduated on one side only Metric measure to read from 40 mm. to 46 cm. by 50ths of a millimeter. Prices same as for **No. 454**—18-inch.

No. 454 E and M—English and Metric Measure 18-Inch Gage

Graduated on one side English measure to read from 1½ to 18 inches by thousandths of an inch, and on the other side Metric measure to read from 40 mm. to 46 cm. by 50ths of a millimeter. Prices same as for **No. 454**—18-inch.

No. 454—English Measure 24-Inch Gage

Designed for use as a height gage only, measurements being taken only on the outside of the jaws. The bar, approximately 1¼ inches wide and ¼ inch thick, is graduated on one side only to read from 1½ to 24 inches by thousandths of an inch. The base, hardened, ground and lapped on the bottom, is approximately 6⅞ inches long, 3 inches wide and 1⅛ inches high.

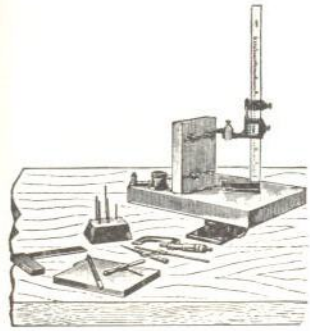
		Price With Case	Price Without Case
No. 454	24-inch Vernier Height Gage, with Attachment H		
No. 454	24-inch Vernier Height Gage, without Attachment H		
No. 454 H	Attachment only		Price.

No. 454 Gage with Attachment sent unless otherwise ordered.

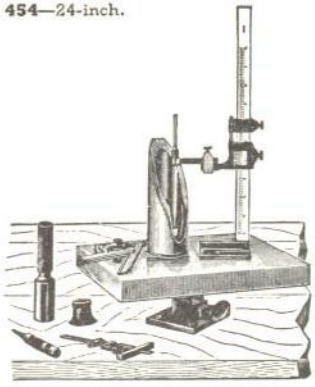
Height Gages sent with case unless otherwise ordered.

No. 454—English and Metric Measure 24-Inch Gage

Graduated on one side English measure to read from 1½ to 24 inches by thousandths of an inch, and on the other side Metric measure to read from 40 mm. to 60 cm. by 50ths of a millimeter. Prices same as for **No. 454**—24-inch.



Used with No. 494 Buttons



Use of Attachment

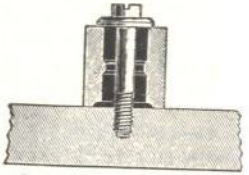
Showing some uses of our No. 454 Vernier Height Gage

Starrett

Toolmakers' Buttons
No. 494

Patented

For Jig and Die Work



Sectional view of button applied

These buttons are hardened, ground and lapped square with the end to diameter sizes of .300, .400, .500 and 1 inch to allow the mechanic easy figuring in laying out work. Each set contains four buttons of the same diameter. In A, B and C sets, three buttons are ½ inch long and one button ⅝ inch long. In set D, three buttons are 1 inch long and one button 1⅛ inches long. The reason for the one longer button is to facilitate truing up when two buttons are positioned very close together. Any hole or series of holes where positive accuracy must be had in relation to each other, or from given points as in drill jigs, die and fixture work, toolmakers' buttons should be used. These buttons are nearly always used with a vernier height gage, although in many cases micrometers and size blocks may be used. In using these buttons the work to which they are clamped should be true, for if not the buttons will slant parallel with the base and cause error in measurements. Once the work has been ground or planed true any hole or series of holes to be bored should be laid out with scriber, scale and dividers, which can be done within approximately .010 inch, prick punch lines intersecting at points to be bored, drill and tap sufficient depth, so that the .125-40 pitch screw shall enable the button to be clamped tight. File the burr caused by tapping and screw the buttons to work just hard enough so that they may be tapped to position while locating. (See sectional view of button showing ample space around screw for adjustment.) The work should now be placed on a surface plate or machine platen for final adjustment of buttons with the height gage. When in position for accurate boring tighten clamping screws so that they will not move while being trued up and bored. Next clamp to face plate and tap the work to bring buttons to run true with their axis by using a test indicator. See that the work is fast to face plate, being careful that the buttons have not moved while clamping in position, then remove buttons, drill and bore. These buttons are furnished in sets of four and are screwed to the base plate or holder by the same screws and washers used in clamping to working points, permitting them to be placed compactly in the tool chest.

Set of four buttons with screws and washers.

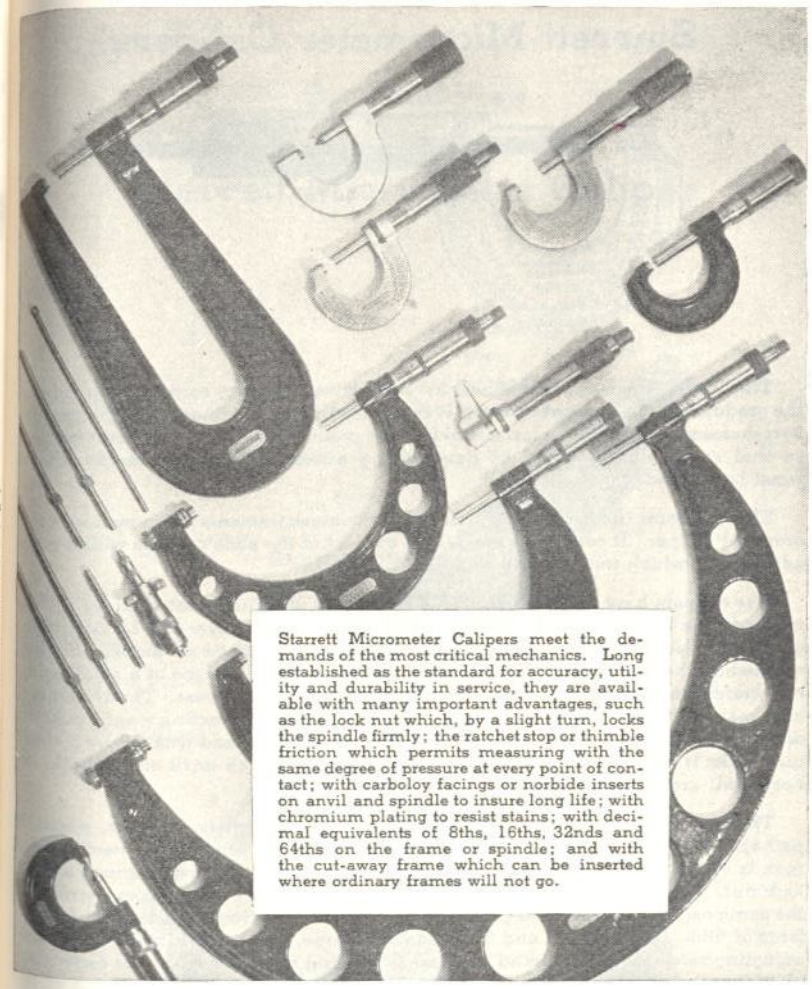
No. 494A Set .300 x ½ inch ..... Price,
No. 494B Set .400 x ½ inch ..... Price,
No. 494C Set .500 x ½ inch ..... Price,
No. 494D Set 1.000 x 1 inch ..... Price,
Taps (.125–40) to use with A, B, and C sets ..... Price,
Taps (.250–24) to use with D set ..... Price, each,
..... Price, each,

A, B and C sizes packed 1 set in a box; 3 boxes in a carton.

D size packed 1 set in a box.

STARRETT MICROMETERS

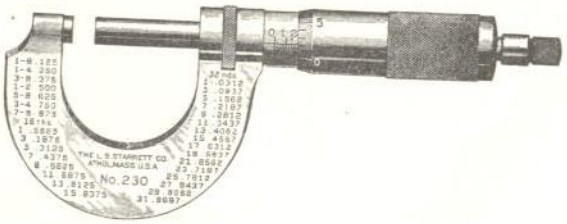
All furnished with hardened and ground threads



Starrett Micrometer Calipers meet the demands of the most critical mechanics. Long established as the standard for accuracy, utility and durability in service, they are available with many important advantages, such as the lock nut which, by a slight turn, locks the spindle firmly; the ratchet stop or thimble friction which permits measuring with the same degree of pressure at every point of contact; with carboloy facings or norbide inserts on anvil and spindle to insure long life; with chromium plating to resist stains; with decimal equivalents of 8ths, 16ths, 32nds and 64ths on the frame or spindle; and with the cut-away frame which can be inserted where ordinary frames will not go.

STARRETT MICROMETER CALIPERS

Starrett Micrometer Calipers



The limit of accuracy obtained by measuring between contacts depends on the graduations on the instrument. It is evident that as the fineness of the graduation increases, the chances for mistaking one graduation for another also increase, so that some other method of determining extremely accurate measurements must be devised.

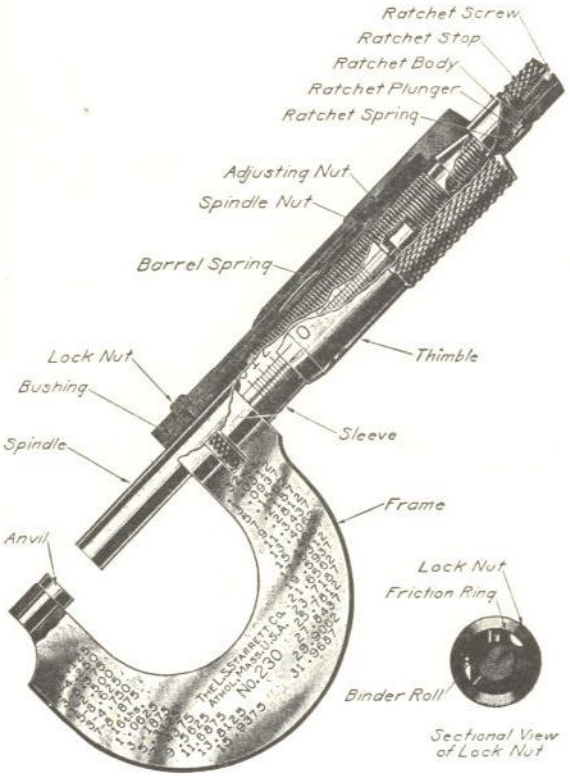
The common instrument for making such measurements is known as a micrometer caliper. It combines the double contact of the slide calipers with a screw adjustment which may be read with great accuracy.

Our calipers have a more exact and easier way of adjustment than by the old method of a movable anvil. This is obtained by placing over the barrel a thin, graduated sleeve which carries the base or zero line, instead of having this line marked on the barrel itself. This sleeve may be turned by means of a small spanner wrench to bring the zero line correct to compensate for wear. The thin sleeve also keeps dirt from the screw. A knurled locking nut contracting a split bushing around the spindle tightens and keeps the spindle central and true, or by a slight turn locks it firm, making a solid gage when desired. The anvil and spindle are hardened, ground and lapped.

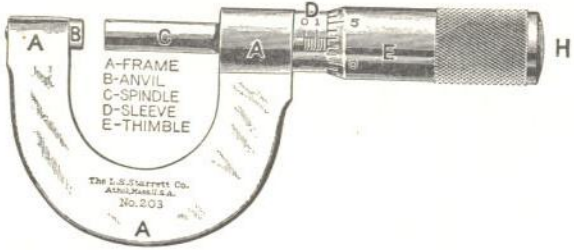
Through years of experience in manufacturing micrometer calipers, which is perhaps the most discussed of all mechanical tools, we are able to meet the demands of the most critical mechanics. Among the many Starrett features are the lock nut, which by a slight turn locks the spindle firmly; the ratchet, permitting the same degree of pressure at points of contact in measuring; the decimal equivalents of 8ths, 16ths, 32nds and 64ths, on the frame, or on the thimble; the quick adjusting micrometer, reducing the time in reading from 1 inch to 0 or forty complete turns of the screw to an instant; the concave cut in the frame back of the anvil for insertion where the ordinary style will not go; anvils and spindles with Carboloy or Norbide facings; thimble friction mechanism; the attachment for our 2-inch micrometers permitting measurements from 0 to 2 inches; and many others meeting all possible demands of a micrometer. Cuts and descriptions of our line will be found on the following pages.

Starrett

Sectional View
of
Starrett Micrometer Caliper



How to Read a Micrometer Caliper



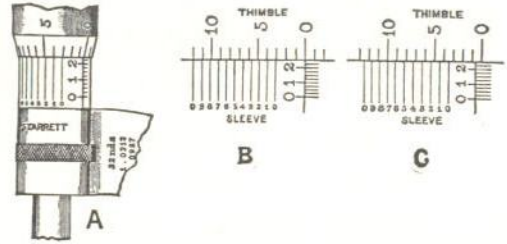
The spindle C is attached to the thimble E, on the inside, at the point H. The part of the spindle which is concealed within the sleeve and thimble is threaded to fit a nut in the frame A. The frame being held stationary, the thimble E is revolved by the thumb and finger, and the spindle C being attached to the thimble revolves with it, and moves through the nut in the frame, approaching or receding from the anvil B. The article to be measured is placed between the anvil B and the spindle C. The measurement of the opening between the anvil and the spindle is shown by the lines and figures on the sleeve D and the thimble E.

The pitch of the screw threads on the concealed part of the spindle is 40 to an inch. One complete revolution of the spindle therefore moves it longitudinally one-fortieth (or twenty-five thousandths) of an inch. The sleeve D is marked with 40 lines to the inch, corresponding to the number of threads on the spindle. When the caliper is closed, the beveled edge of the thimble coincides with the line marked 0 on the sleeve, and the 0 line on the thimble agrees with the horizontal line on the sleeve. Open the caliper by revolving the thimble one full revolution, or until the 0 line on the thimble again coincides with the horizontal line on the sleeve; the distance between the anvil B and the spindle C is then $^1/_{40}$ (or .025) of an inch, and the beveled edge of the thimble will coincide with the second vertical line on the sleeve. Each vertical line on the sleeve indicates a distance of $^1/_{40}$ of an inch. Every fourth line is made longer than the others, and is numbered 0, 1, 2, 3, etc. Each numbered line indicates a distance of four times $^1/_{40}$ of an inch, or one-tenth.

The beveled edge of the thimble is marked in twenty-five divisions, and every fifth line is numbered from 0 to 25. Rotating the thimble from one of these marks to the next moves the spindle longitudinally $^1/_{25}$ of twenty-five thousandths or one-thousandth of an inch. Rotating it two divisions indicates two thousandths, etc. Twenty-five divisions will indicate a complete revolution, .025 or $^1/_{40}$ of an inch.

To read the caliper, therefore, multiply the number of vertical divisions visible on the sleeve by 25, and add the number of divisions on the bevel of the thimble, from 0 to the line which coincides with the horizontal line on the sleeve. For example, as the tool is represented in the engraving, there are seven divisions visible on the sleeve. Multiply this number by 25, and add the number of divisions shown on the bevel of the thimble, 3. The micrometer is open one hundred and seventy-eight thousandths. ($7 \times 25 = 175 + 3 = 178$.)

How to Read a Ten-Thousandths Micrometer Caliper



Readings in ten-thousandths of an inch are obtained by the use of a vernier, so named from Pierre Vernier, who invented the device in 1631. As applied to a caliper this consists of ten divisions on the adjustable sleeve, which occupy the same space as nine divisions on the thimble. The difference between the width of one of the ten spaces on the sleeve and one of the nine spaces on the thimble is therefore one-tenth of a space on the thimble. In engraving B the third line from 0 on thimble coincides with the first line on the sleeve. The next two lines on thimble and sleeve do not coincide by one-tenth of a space on thimble; the next two, marked 5 and 2, are two-tenths apart, and so on. In opening the tool, by turning the thimble to the left, each space on the thimble represents an opening of one-thousandth of an inch. If, therefore, the thimble be turned so that the lines marked 5 and 2 coincide, the caliper will be opened two-tenths of one-thousandth or two ten-thousandths. Turning the thimble further, until the line 10 coincides with the line 7 on the sleeve, as in engraving C, the caliper has been opened seven ten-thousandths, and the reading of the tool is .2507.

To read a ten-thousandths caliper, first note the thousandths as in the ordinary caliper, then observe the line on the sleeve 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.

Directions for Adjusting

These calipers will read correctly if there is no dirt between the anvil and spindle.

When it becomes necessary to readjust the tool to compensate for the wear of screw and nut, this is done, not by the anvil, but by means of our friction sleeve, as follows: Take up the wear of screw and nut, then remove all dirt from face of the anvil and spindle and bring them together carefully. Insert the small spanner wrench in the small hole and turn until the line on the sleeve coincides with the zero line on the thimble.

Features as Applied to Micrometer Calipers

Ratchet Stop for Micrometer Calipers

In using this device, the ratchet slips by the pawl when more than a certain amount of pressure is applied, and so prevents the spindle from turning further and perhaps springing the instrument.

It is valuable where a number of measurements have to be taken quickly, and especially where measurements are taken by more than one person with the same caliper, as by its use the same amount of pressure is applied in each case to the objects measured.

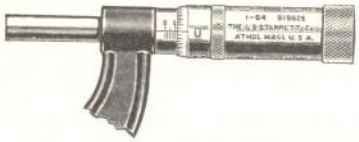
Micrometers

With All Thousandths Divisions Numbered

Some mechanics, also instructors in trade schools, etc., prefer micrometers where the intermediate lines on the thimble denoting thousandths are numbered consecutively. Some think they tend for confusion. To satisfy all, however, we will furnish any micrometer, excluding our Nos. 238 and 239, with this feature without extra charge.

Micrometers

With Half Thousandths Divisions



We desire to call your attention to the half thousandths divisions on the thimble. May be had on any micrometer, excluding our Nos. 238 and 239, without extra charge.

Ball Attachment No. 247

Fits either Anvil or Spindle

Offers a clever little arrangement easily applied to certain micrometers for measuring tubing and other rounding surfaces. Fitting both, anvil and spindle, two of the attachments can be used at once. The ball is hardened and measures ¼ inch or .250 in diameter. It moves freely in the retainer, insuring contact with the anvil or spindle. It must be borne in mind, when using, that the diameter of the ball must be subtracted from the actual micrometer reading.

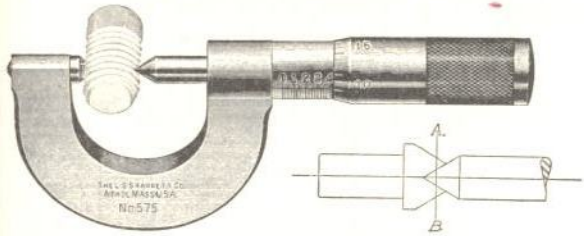
Fits the following micrometers: Nos. 3, 113, 230, 231, 203, 209, 201, 207, 202, 208, 228, 2, 213, 217, 214, 212 attachment, 2A and 263.

No. 247 .....Price, each,

Packed 12 in a box.

Starrett

Screw Thread Micrometer Calipers Nos. 575 and 585



In our line of Screw Thread Micrometer Calipers the movable spindle is pointed, and the end of the anvil is of the same form as the thread to be measured. In measuring screw threads the angle of point and sides of the V come in contact with the cut surface of the thread, so that the reading of the caliper indicates the pitch diameter or the full size of thread less the depth of one thread. In the illustration the spindle is shown closed, and the 0 on the thimble represents a line drawn through the plane A-B, so that readings are taken the same as in a regular micrometer caliper.

Note: Owing to the varied opinion of mechanics, these micrometers are furnished with either fixed or movable anvils. Sent with movable anvil unless otherwise ordered.

Note: For Screw Thread Comparator see our No.210 Micrometer Caliper, page 116.

	Capacity	Range	Form of Thread	Price
No. 575 A	1 inch	8 to 13 threads	*V & U. S. or Whit. Std.	
No. 575 B	1 inch	14 to 20 threads	*V & U. S. or Whit. Std.	
No. 575 C	1 inch	22 to 30 threads	*V & U. S. or Whit. Std.	
No. 575 D	1 inch	32 to 40 threads	*V & U. S. or Whit. Std.	
No. 585 A	2 inches	4½ to 7 threads	*V & U. S. or Whit. Std.	
No. 585 B	2 inches	8 to 13 threads	*V & U. S. or Whit. Std.	
No. 585 C	2 inches	14 to 20 threads	*V & U. S. or Whit. Std.	
No. 585 D	2 inches	22 to 30 threads	*V & U. S. or Whit. Std.	

* "V" and American National or United States Standard.

We can furnish these calipers in corresponding Metric sizes.

We include a 1-inch standard with each 2-inch caliper without extra charge.

Other sizes quoted upon application. Packed 1 in a box.

Table of Pitch Diameters for American National, U. S. and A. S. M. E. Standard Form of Screw Threads

Caliper Reading or Pitch Diameter for above Threads = $D - \frac{.6495}{N}$

No.	Basic and Max. Outside Diameter	Threads Per Inch	Caliper Reading or Max. Pitch Diameter	Single Depth of Thread	No.	Basic and Max. Outside Diameter	Threads Per Inch	Caliper Reading or Max. Pitch Diameter	Single Depth of Thread
	D	N	$D-\frac{.6495}{N}$	$\frac{.6495}{N}$		D	N	$D-\frac{.6495}{N}$	$\frac{.6495}{N}$
0	.060	80	.0519	.0081	12	.216	28	.1928	.0232
1	.073	72	.0640	.0090	14	.242	24	.2149	.0271
2	.086	64	.0759	.0101	16	.268	22	.2385	.0295
3	.099	56	.0874	.0116	18	.294	20	.2615	.0325
4	.112	48	.0985	.0135	20	.320	20	.2875	.0325
5	.125	44	.1102	.0148	22	.346	18	.3099	.0361
6	.138	40	.1218	.0162	24	.372	16	.3314	.0406
7	.151	36	.1330	.0180	26	.398	16	.3574	.0406
8	.164	36	.1460	.0180	28	.424	14	.3776	.0464
9	.177	32	.1567	.0203	30	.450	14	.4036	.0464
10	.190	30	.1684	.0217	.....	.....	.....	.....	.....

Starrett

Screw Thread Micrometer Calipers

Table of Pitch Diameters
For "V" Standard Form of Screw Threads

Caliper Reading or Pitch Diameter for "V" Threads = $D - \frac{.866}{N}$

Diameter Inches	Threads per Inch	Caliper Reading or Pitch Diameter	Single Depth of Thread	Diameter Inches ★	Threads per Inch	Caliper Reading or Pitch Diameter	Single Depth of Thread
D	N	$D - \frac{.866}{N}$	$\frac{.866}{N}$	D	N	$D - \frac{.866}{N}$	$\frac{.866}{N}$
Note:—As there is no standard of diameter for the finer pitches this column is left blank.	64	.....	.0135	1/4	24	.2139	.0361
	62	.....	.0140	1/4	20	.2067	.0433
	60	.....	.0144	5/16	20	.2692	.0433
	58	.....	.0149	5/16	18	.2644	.0481
	56	.....	.0155	3/8	18	.3269	.0481
	54	.....	.0161	3/8	16	.3209	.0541
	52	.....	.0167	7/16	16	.3834	.0541
	50	.....	.0173	7/16	14	.3756	.0619
	48	.....	.0180	1/2	14	.4381	.0619
	46	.....	.0188	1/2	13	.4334	.0666
	44	.....	.0197	1/2	12	.4278	.0722
	42	.....	.0206	9/16	14	.5006	.0619
	40	.....	.0217	9/16	12	.4903	.0722
	38	.....	.0228	5/8	11	.5463	.0787
	36	.....	.0241	5/8	10	.5384	.0866
	34	.....	.0255	11/16	10	.6009	.0866
	32	.....	.0271	3/4	10	.6634	.0866
	30	.....	.0289	7/8	9	.7788	.0962
	28	.....	.0309	1	8	.8918	.1082
	26	.....	.0333	1 1/8	8	1.0168	.1082
	.....	.....	.....	1 1/4	7	1.1263	.1237
	.....	.....	.....	1 1/2	6	1.3557	.1443

★ These figures give the outside diameter for screws with threads cut theoretically sharp. As it is not practical to make these threads sharp, the outside diameter will measure less than the figures given, the pitch diameter remaining the same.

Table of Pitch Diameters
For Whitworth Standard of Screw Threads

Caliper Reading or Pitch Diameter for Whitworth Threads = $D - \frac{.640}{N}$

Diameter Inches	Threads per Inch	Caliper Reading or Pitch Diameter	Single Depth of Thread	Diameter Inches	Threads per Inch	Caliper Reading or Pitch Diameter	Single Depth of Thread
D	N	$D - \frac{.640}{N}$	$\frac{.640}{N}$	D	N	$D - \frac{.640}{N}$	$\frac{.640}{N}$
.....	48	.....	.0133	1/2	12	.4467	.0833
.....	46	.....	.0139	9/16	12	.5092	.0833
.....	44	.....	.0146	5/8	11	.5668	.0582
.....	42	.....	.0152	11/16	11	.6293	.0582
.....	40	.....	.0160	3/4	10	.6860	.0640
.....	38	.....	.0168	13/16	10	.7485	.0640
.....	36	.....	.0178	7/8	9	.8039	.0711
.....	34	.....	.0188	15/16	9	.8664	.0711
.....	32	.....	.0200	1	8	.9200	.0800
.....	30	.....	.0213	1 1/8	7	1.0336	.0914
.....	28	.....	.0229	1 1/4	7	1.1586	.0914
.....	26	.....	.0246	1 3/8	6	1.2684	.1066
.....	24	.....	.0267	1 1/2	6	1.3934	.1066
.....	22	.....	.0291	1 5/8	5	1.4970	.1280
1/4	20	.2180	.0320	1 3/4	5	1.6220	.1280
5/16	18	.2769	.0355	1 7/8	4 1/2	1.7328	.1422
3/8	16	.3350	.0400	2	4 1/2	1.8578	.1422
7/16	14	.3918	.0457	2 1/8	4 1/2	1.9828	.1422

Starrett

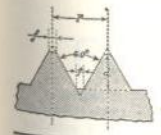
Screw Thread Micrometer Calipers

Table of Pitch Diameters
For American National and U. S. Standard Form of Screw Threads

Caliper Reading or Pitch Diameter for U. S. Threads = $D - \frac{.6495}{N}$

Diameter Inches	Threads per Inch	Caliper Reading or Pitch Diameter	Single Depth of Thread	Diameter Inches	Threads per Inch	Caliper Reading or Pitch Diameter	Single Depth of Thread
D	N	$D - \frac{.6495}{N}$	$\frac{.6495}{N}$	D	N	$D - \frac{.6495}{N}$	$\frac{.6495}{N}$
Note: As there is no standard of diameter for the finer pitches this column is left blank.	64	.....	.0101	1/4	20	.2175	.0325
	62	.....	.0105	5/16	18	.2764	.0361
	60	.....	.0108	3/8	16	.3344	.0406
	58	.....	.0112	7/16	14	.3911	.0464
	56	.....	.0116	1/2	13	.4501	.0499
	54	.....	.0120	9/16	12	.5084	.0541
	52	.....	.0125	5/8	11	.5660	.0590
	50	.....	.0130	3/4	10	.6851	.0649
	48	.....	.0135	7/8	9	.8029	.0721
	46	.....	.0141	1	8	.9188	.0812
	44	.....	.0148	1 1/8	7	1.0322	.0928
	42	.....	.0155	1 1/4	7	1.1572	.0928
	40	.....	.0162	1 3/8	6	1.2668	.1082
	38	.....	.0171	1 1/2	6	1.3918	.1082
	36	.....	.0180	1 5/8	5½	1.5070	.1180
	34	.....	.0191	1 3/4	5	1.6201	.1299
	32	.....	.0203	1 7/8	5	1.7451	.1299
	30	.....	.0217	2	4½	1.8557	.1443
	28	.....	.0232	2 1/2	4	2.3376	.1624
	26	.....	.0250	3	3½	2.8145	.1855
	24	.....	.0271	3 1/2	3¼	3.3002	.1998
	22	.....	.0295	4	3	3.7835	.2165

Table of Pitch Diameters
For Metric Standard Form of Screw Threads

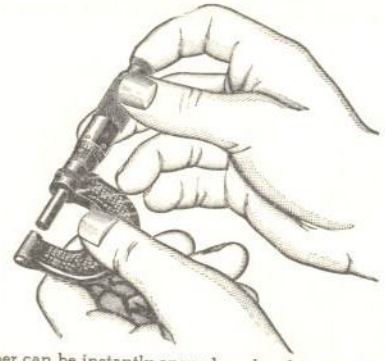


Formula

$p = \text{pitch} = \frac{1}{\text{No. of threads per inch}}$ $\quad d = \text{depth} = \text{pitch} \times .6495$ $\quad f = \text{flat} = \frac{\text{pitch}}{8}$

Size mm.	Pitch		Size mm.	Pitch	
	Intl. Std.	French Std.		Intl. Std.	French Std.
2	.45	.50	20	2.50	2.50
3	.55	.50	22	2.50	2.50
4	.70	.75	24	3.00	3.00
5	.85	.75	26	....	3.00
6	1.00	1.00	27	3.00	....
7	1.00	1.00	28	....	3.00
8	1.25	1.00	30	3.50	3.50
9	1.25	1.00	32	....	3.50
10	1.50	1.50	33	3.50	3.50
11	1.50	....	34	....	3.50
12	1.75	1.50	36	4.00	4.00
14	2.00	2.00	38	....	4.00
16	2.00	2.00	39	4.00	....
18	2.50	2.50	40	....	4.00

Quick Adjusting Micrometer Calipers No. 204



This micrometer caliper can be instantly opened or closed to any point within its capacity. To operate the caliper it is only necessary to press with the finger against the end of the plunger. This immediately releases the nut, disengaging it from the screw, when any adjustment within an inch may be instantly made. Releasing the pressure, the nut instantly engages the screw, when fine adjustments may be made in the usual way.

This caliper also has our adjustable sleeve, as described on a preceding page, as well as the lock nut and ratchet.

It will at once be recognized as a distinct advance in tools of this class; in fact it is in a class by itself.

For measurement by thousandths up to one inch. Has ratchet stop and lock nut.

No. 204 Range 0 to 1 inch ..... Price,
No. 204 C With cut-out frame ..... Price,
With case ..... Price,

No. 204 M Metric

For measurement by hundredths of a millimeter up to twenty-five millimeters. Has ratchet stop and lock nut. Prices same as for No. 204.

Hub Micrometer Calipers No. 228

This caliper is especially useful in the manufacture of cutters and such articles where exact hub lengths are required. The frame will easily pass through a ¾-inch hole.

The caliper is made for measurement by thousandths up to one inch. Has lock nut and ratchet stop.

No. 228 ..... Price,
With case ..... Price,

No. 228 M

The same as No. 228, except that the caliper is for measurement by hundredths of a millimeter up to twenty-five millimeters. Prices same as for No. 228.

Above numbers sent without case unless otherwise ordered.
Packed 1 in a box.

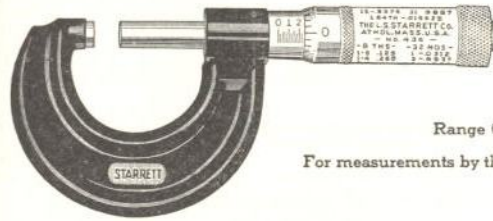
Micrometer Calipers

Chromium Plated

To supply the demand for Chromium-Plated micrometers, which are Stain Resisting and longer wearing, we are now prepared to furnish from stock the following micrometers as listed below. Specify Chromium Plated in addition to catalog number.

No. 436

With Black Enameled Frame. Decimal Equivalents on Thimble



Ratchet Stop

Range 0 to 1 inch

For measurements by thousandths up to one inch.

No. 436 Without lock nut, no ratchet, chromium plated ..... Price,
No. 436 Without lock nut, with ratchet, chromium plated ..... Price,
Case, extra ..... Price,

Sent without lock nut and without ratchet unless otherwise ordered.

Packed 1 in a box.

Nos. 230 and 231

Range 0 to 1 inch

No. 230 For measurements by thousandths up to one inch. Frame is cut out for use in places where the ordinary frame cannot be inserted. Width of anvil end of frame is approximately $1\frac{1}{32}$ inch.

Has lock nut and ratchet stop.

No. 230 Chromium plated ..... Price,
Case, extra ..... Price,

No. 231

Same as No. 230, except graduated for measurements by ten-thousandths up to one inch. Has lock nut and ratchet stop.

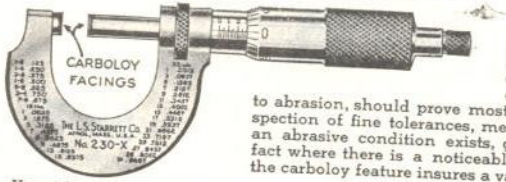
No. 231 Chromium plated ..... Price,
Case, extra ..... Price,

Above numbers sent without case unless otherwise ordered.

Micrometer Calipers
Nos. 230 X and 231 X

Anvil and Spindle with Carboloy (Tungsten Carbide) Facings

Range 0 to 1 inch



Has ratchet stop and lock nut

Carboloy (Tungsten Carbide) faced spindles and anvils on Starrett Micrometers. An alloy of practically diamond-point hardness, and, because of its exceptional resistance to abrasion, should prove most economical. In the constant inspection of fine tolerances, measuring of harder materials, where an abrasive condition exists, grinding with compound, etc., in fact where there is a noticeable wear of spindle and anvil ends, the carboloy feature insures a vastly greater endurance.

No. 230 X For measurements by thousandths up to one inch.....Price,
No. 231 X Same as No.230 X, except graduated for measurements by ten-thousandths up to one inch.....Price,
Case extra, for either of above numbers.....Price,

Above numbers sent without case unless otherwise ordered.

Packed 1 in a box.

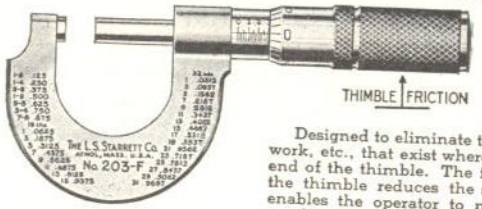
*Norbide. For severe applications of micrometers we will be glad to quote on Norbide inserts in anvils and spindles. Harder than Tungsten Carbide. Approximates diamond hardness. Good under abrasive conditions.

*Trade name of Norton Company for Boron Carbide.

Note: Other Starrett Micrometer Calipers can be supplied with carboloy faced spindles and anvils if desired. Price quoted on application.

Micrometer Calipers

With Thimble Friction



Range 0 to 1 inch

Designed to eliminate the disadvantages in certain inspection work, etc., that exist where the friction stop is positioned at the end of the thimble. The friction stop mechanism embodied in the thimble reduces the span of the thumb and fingers and enables the operator to more easily use the micrometer with one hand.

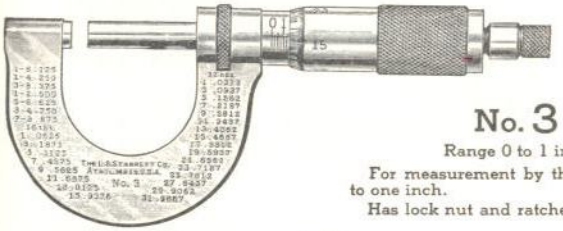
No. 203 F By thousandths.....Price,
No. 230 F By thousandths and with lock nut.....Price,
No. 209 F By ten-thousandths.....Price,
No. 231 F By ten-thousandths and with lock nut.....Price,
Case extra, for any of above numbers.....Price,

Above numbers sent without case unless otherwise ordered.

Packed 1 in a box.

Note: Other Starrett Micrometer Calipers can be furnished with thimble friction feature if desired. Price quoted on application.

Micrometer Calipers



No. 3

Range 0 to 1 inch

For measurement by thousandths up to one inch.

Has lock nut and ratchet stop.

No. 3..... Price, With case.....Price,

Note: This micrometer can be furnished with lock nut at end of frame, when so ordered, at the same price. See cut of No.226 on page 124.

No. 3 M—Metric Range 0 to 25 mm. For measurement by hundredths of a millimeter up to twenty-five millimeters. May be furnished, when so desired, with lock nut on end of frame at regular list price of No.3 M. Has lock nut and ratchet stop.

No. 3 M..... Price, With case.....Price,

No. 113

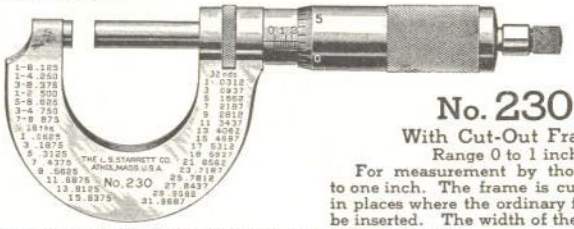
Ten-Thousandths—Range 0 to 1 inch

Same as No.3, except graduated for measurement by ten-thousandths up to one inch. Has lock nut and ratchet stop.

No. 113..... Price, With case..... Price,

Above numbers sent without case unless otherwise ordered. Packed 1 in a box.

For micrometers equivalent to our Nos.3 and 113, only with cut-out frame, see our Nos.230 and 231 shown on this page.



No. 230

With Cut-Out Frame

Range 0 to 1 inch

For measurement by thousandths up to one inch. The frame is cut out for use in places where the ordinary frame cannot be inserted. The width of the anvil end of the frame is approximately $1\frac{1}{32}$ inch. Has lock nut and ratchet stop.

No. 230..... Price, With case..... Price,

No. 230 M—Metric Range 0 to 25 mm. For measurement by hundredths of a millimeter up to twenty-five millimeters. Has lock nut and ratchet stop.

No. 230 M..... Price, With case..... Price,

No. 231

With Cut-Out Frame

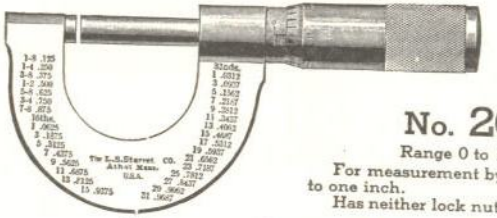
Ten-Thousandths—Range 0 to 1 inch. Same as No.230, except graduated for measurement by ten-thousandths up to one inch. Has lock nut, ratchet stop and cut-out frame.

No. 231..... Price, With case..... Price,

Above numbers sent without case unless otherwise ordered. Packed 1 in a box.

Micrometer Calipers

Showing Cut-out Frame



No. 203

Range 0 to 1 inch

For measurement by thousandths up to one inch.

Has neither lock nut nor ratchet stop.

No. 203.....Price,

Either number in case.....Price,

No. 203 C With cut-out frame...Price,

No. 203 M—Metric Range 0 to 25 mm. For measurement by hundredths of a millimeter up to twenty-five millimeters. Has neither lock nut nor ratchet stop.

No. 203 M.....Price,

With case.....Price,

No. 209

Ten-Thousandths—Range 0 to 1 inch

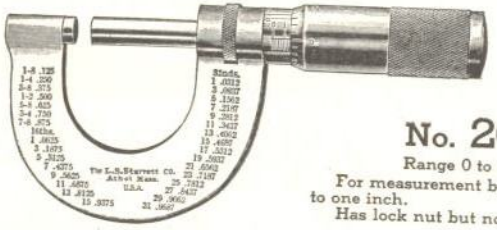
Same as No.203, except graduated for measurement by ten-thousandths up to one inch. Has neither lock nut nor ratchet stop.

No. 209.....Price,

Either number in case.....Price,

No. 209 C With cut-out frame..Price,

Above numbers sent without case unless otherwise ordered. Packed 1 in a box.



No. 201

Range 0 to 1 inch

For measurement by thousandths up to one inch.

Has lock nut but no ratchet stop.

No. 201.....Price,

Either number in case.....Price,

No. 201 C With cut-out frame...Price,

No. 201 M—Metric Range 0 to 25 mm. For measurement by hundredths of a millimeter up to twenty-five millimeters.

Has lock nut but no ratchet stop.

No. 201 M.....Price

With case.....Price,

No. 207

Ten-Thousandths—Range 0 to 1 inch

Same as No.201, except graduated for measurement by ten-thousandths up to one inch. Has lock nut but no ratchet stop.

No. 207.....Price,

Either number in case.....Price,

No. 207 C With cut-out frame..Price,

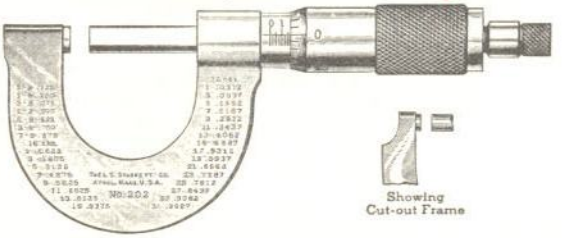
Above numbers sent without case unless otherwise ordered. Packed 1 in a box.

Starrett

Micrometer Calipers

No. 202

Range 0 to 1 inch



Showing Cut-out Frame

For measurement by thousandths up to one inch. Has ratchet stop but no lock nut.

No. 202.....Price,

No. 202 C With cut-out frame.....Price,

Either number in case.....Price,

No. 202 M—Metric. Range 0 to 25 mm. For measurement by hundredths of a millimeter up to twenty-five millimeters. Has ratchet stop, but no lock nut.

No. 202 M.....Price,

With case.....Price,

No. 208

Ten-Thousandths—Range 0 to 1 inch

Same as No.202, except graduated for measurement by ten-thousandths up to one inch. Has ratchet stop but no lock nut.

No. 208.....Price,

No. 208 C With cut-out frame.....Price,

Either number in case.....Price,

Above numbers sent without case unless otherwise ordered.

Packed 1 in a box.

Micrometer Caliper Stand

No. 206

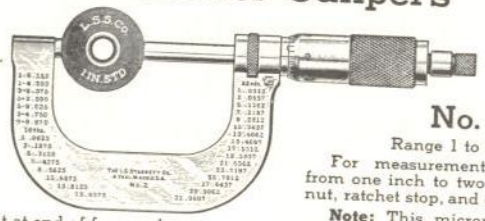
Where frequent reference is to be made to a caliper that is set at a given size, or where a number of pieces must be made of the same size, it is sometimes more convenient to bring the work to the micrometer than to bring the micrometer to the work. The use of a caliper also occupies one hand, while if the mechanic could use both hands he could work faster. To meet such conditions as these we offer the Starrett Improved Micrometer Caliper Stand. This consists of a solid base with a tilting bracket having a clamp which holds the caliper in any convenient position. A turn of the winged nut locks in place both the hinged bracket and the caliper. Both hands are then free for the work. This tool is nickel plated and is specially adapted to our 1 and 2 inch micrometers, excepting our No.226 and No.436 lines.

No. 206.....Price,

Packed 1 in a box.

Micrometer Calipers

Showing Cut-out Frame



No. 2

Range 1 to 2 inches

For measurement by thousandths from one inch to two inches, with lock nut, ratchet stop, and one-inch test gage.

Note: This micrometer caliper furnished with lock nut at end of frame when so ordered. We can also furnish this micrometer caliper with cut-out frame, when so ordered. See cut of No.226 on page 124.

No. 2.....Price,
Either number in case.....Price,

No. 2C With cut-out frame ...Price,
.....Price,

No. 2M—Metric Range 25 to 50 mm. For measurement by hundredths of a millimeter from 25 mm. to 50 mm. Has lock nut and ratchet stop.

No. 2M.....Price,
With case.....Price,

No. 213

Ten-Thousandths—Range 1 to 2 inches

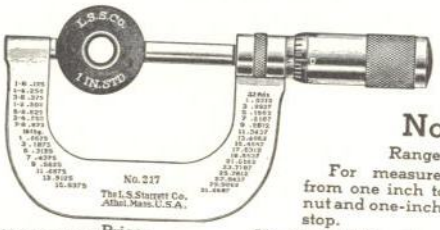
Same as No.2, except graduated for measurement by ten-thousandths from one inch to two inches, with lock nut, ratchet stop, and one-inch test gage.

No. 213.....Price,
Either number in case.....Price,

No. 213C With cut-out frame..Price,
.....Price,

Above numbers sent without case unless otherwise ordered. Packed 1 in a box.

No. 212 attachment (page 113) can be used with No.2 Micrometer.



No. 217

Range 1 to 2 inches

For measurement by thousandths from one inch to two inches. Has lock nut and one-inch test gage, but no ratchet stop.

No. 217.....Price,
Either number in case.....Price,

No. 217C With cut-out frame..Price,
.....Price,

No. 217M—Metric Range 25 to 50 mm. For measurement by hundredths of a millimeter from 25 mm. to 50 mm. Has lock nut, without ratchet stop.

No. 217M.....Price,
With case.....Price,

No. 214

Ten-Thousandths—Range 1 to 2 inches

Same as No.217, except graduated for measurement by ten-thousandths from one inch to two inches. Has lock nut and one-inch test gage, but no ratchet stop.

No. 214.....Price,
Either number in case.....Price,

No. 214C With cut-out frame..Price,
.....Price.

Above numbers sent without case unless otherwise ordered. Packed 1 in a box.

No. 212 attachment can be used with No.217 Micrometer.

Attachment for Two-Inch Micrometer Calipers

No. 212

This attachment, by means of which a two-inch micrometer may be converted into a one-inch size, will be furnished, when ordered, with either our No.2 or No.217 two-inch Micrometers. It will not fit our No.226 or No.436 Micrometers.

No. 212.....Price.

No. 212M

Metric

This attachment, by means of which a 50 mm. micrometer may be converted into a 25 mm. size, will be furnished, when ordered, with either our No.2M or No.217M 50 mm. Micrometers. It will not fit our No.226M or No.436M Micrometers.

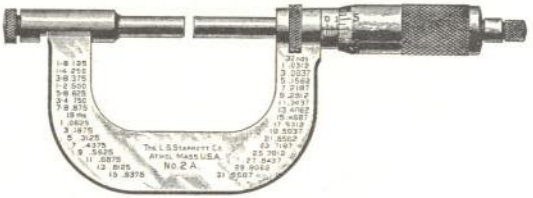
No. 212M.....Price,

Above numbers packed 1 in a box.

Micrometer Calipers with Attachment

No. 2A

Range 0 to 2 inches



This is our No.2 Micrometer, fitted with No.212 attachment and one-inch test gage.

No. 2A.....Price,
With case.....Price,

No. 2M-A

Metric

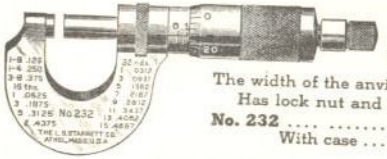
Range 0 to 50 mm.

This is our No.2M Micrometer with No.212M attachment and 25 mm. test gage.

No. 2M-A.....Price,
With case.....Price,

Sent without case unless otherwise ordered.
Packed 1 in a box.

Micrometer Calipers No. 232



Range 0 to ½ inch

For measurement by thousandths up to one-half inch. The frame is cut out for use in places where the ordinary frame cannot be inserted. The width of the anvil end of the frame is approximately 5/32 inch. Has lock nut and ratchet stop.

No. 232 .....Price,
With case .....Price,

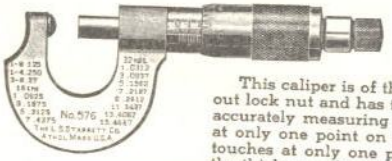
No. 233

Range 0 to ½ inch—Ten-Thousandths

Same as No. 232, except graduated for measurement by ten-thousandths up to one-half inch. Has lock nut, ratchet stop and short anvil.

No. 233 .....Price,
With case .....Price,

No. 576



For Measuring Tubing

Range 0 to ½ inch

This caliper is of the same general design as our No. 232, but without lock nut and has the face of the anvil rounded, which adapts it for accurately measuring the thickness of tubing, etc. The anvil touches at only one point on the inside, while the end of spindle, being flat, touches at only one point on the outside, thus measuring accurately the thickness of tubing. It will enter a 5/16-inch hole freely.

For measurement by thousandths up to one-half inch with decimal equivalents stamped on the frame, with ratchet stop. Without ratchet stop, 50 cents less.

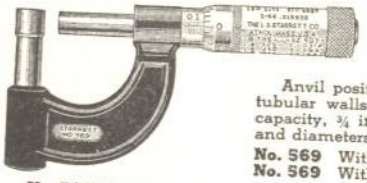
No. 576 .....Price,
With case .....Price,

No. 576 M—Metric Range 0 to 13 mm. The same as our No. 576, except that it is made for measurement by hundredths of a millimeter up to 13 millimeters. Prices same as for No. 576.

Above numbers sent without case unless otherwise ordered. Packed 1 in a box.

Tube Micrometer Caliper No. 569

With Black Enameled Frame. Decimal Equivalents on Thimble



Range 0 to 1 inch

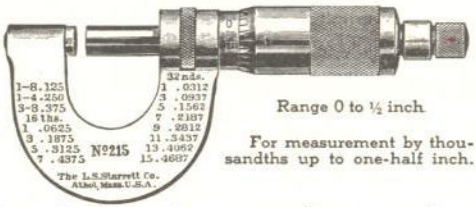
Anvil positioned upright to provide a good tool for measuring tubular walls or the thickness from a hole to an edge. Depth capacity, ¾ inch. Hole capacity, ⅜ inch and up. Special forms and diameters of anvil may be furnished when desired.

No. 569 Without ratchet .....Price,
No. 569 With ratchet .....Price,

No. 569 M—Metric Range 0 to 25 mm. The same as No. 569, except that it is graduated to read to hundredths of a millimeter. Prices same as for No. 569.

Nos. 569 and 569 M sent without ratchet stop unless otherwise ordered. Packed 1 in a wooden box.

Micrometer Calipers No. 215



Range 0 to ½ inch

For measurement by thousandths up to one-half inch.

No. 215 With lock nut and without ratchet stop .....Price, Case, extra...Price,
No. 215 With lock nut and with ratchet stop.....Price, Case, extra...Price,

No. 215 M—Metric Range 0 to 13 mm. For measurement by hundredths of a millimeter up to 13 mm.

No. 215 M With lock nut and without ratchet stop.. ...Price, Case, extra...Price,
No. 215 M With lock nut and with ratchet stop.....Price, Case, extra...Price,

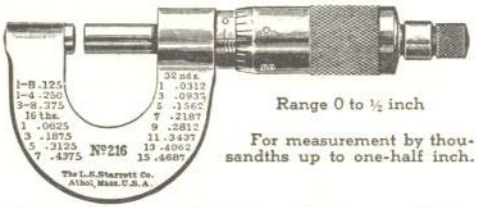
No. 219

Ten-Thousandths—Range 0 to ½ inch

Same as No. 215, except graduated for measurement by ten-thousandths up to one-half inch.

No. 219 With lock nut and without ratchet stop.....Price, Case, extra...Price.
No. 219 With lock nut and with ratchet stop .....Price, Case, extra...Price,

No. 216



Range 0 to ½ inch

For measurement by thousandths up to one-half inch.

No. 216 Without lock nut and without ratchet stop .....Price, Case, extra...Price,
No. 216 Without lock nut and with ratchet stop.....Price, Case, extra...Price,

No. 216 M—Metric Range 0 to 13 mm. For measurement by hundredths of a millimeter up to 13 mm.

No. 216 M Without lock nut and without ratchet stop...Price, Case, extra...Price,
No. 216 M Without lock nut and with ratchet stop.....Price, Case, extra...Price,

No. 218

Ten-Thousandths—Range 0 to ½ inch

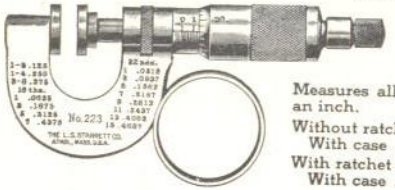
Same as No. 216, except graduated for measurement by ten-thousandths up to one-half inch.

No. 218 Without lock nut and without ratchet stop.. ...Price, Case, extra...Price,
No. 218 Without lock nut and with ratchet stop.....Price, Case, extra...Price,

Above numbers sent with ratchet stop and without case unless otherwise ordered. Packed 1 in a box.

Paper Gage Micrometer Calipers No. 223

With Ring



This caliper is used in measuring the thickness of paper, sheet rubber, cardboard, etc. By means of the floating disc on the anvil it readily adjusts itself to surfaces being measured. Measures all sizes less than $1\frac{1}{32}$ of an inch by thousandths of an inch.

Without ratchet stop and with ring .....Price,
With case .....Price,
With ratchet stop and with ring .....Price,
With case .....Price,

No. 223 M

Metric

The same as above, except that it is graduated to read in hundredths of a millimeter.
Prices same as for No. 223.

No. 225

The same as our No. 223, without the ring attachment.

Without ratchet stop .....Price, With case.....
With ratchet stop .....Price, With case.....

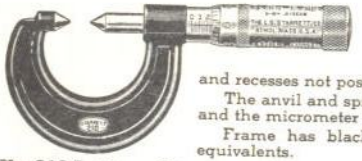
No. 225 M

Metric

The same as our No. 225, except that it is graduated to read in hundredths of a millimeter.
Prices same as for No. 225.
Above numbers sent with ratchet stop and without case unless otherwise ordered.
Packed 1 in a box.

Micrometer Calipers No. 210

Screw Thread Comparator



This micrometer, while it will not measure the actual diameter of a V thread, for the purpose of comparison it has a wide range of use when cutting screw threads and for measuring in small grooves and recesses not possible with regulation micrometers.

The anvil and spindle conical contact points are flattened about $\frac{1}{64}$ inch and the micrometer is adjusted to 0 when flats are in contact.

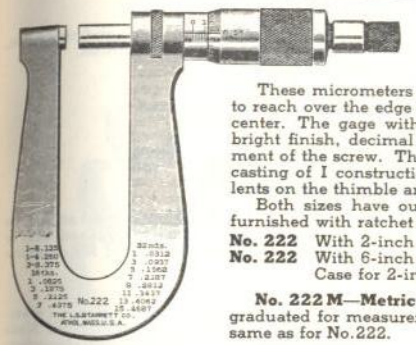
Frame has black finish and thimble bears fractions and decimal equivalents.

No. 210 A Range 0 to $\frac{7}{8}$ inch .....Price.
No. 210 B Range 1 to $1\frac{7}{8}$ inches .....Price.

Note: Larger sizes quoted on application. Metric measure by hundredths of a millimeter furnished in corresponding sizes and prices as above.

Above numbers packed 1 in a box.

Micrometer Calipers No. 222



For Measuring Sheet Metal

These micrometers have 2 and 6 inch depths of U cut in frame to reach over the edge of sheet metal to gage its thickness nearer the center. The gage with 2-inch depth is made from a forging, has bright finish, decimal equivalents on the frame and $\frac{1}{2}$-inch movement of the screw. The gage with 6-inch depth is made from a steel casting of I construction, has black enamel finish, decimal equivalents on the thimble and 1-inch movement of the screw.

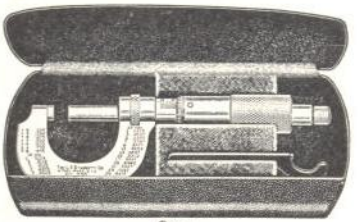
Both sizes have our regular friction sleeve adjustment and are furnished with ratchet stop. The 2-inch only has lock nut.

No. 222 With 2-inch depth in frame .....Price,
No. 222 With 6-inch depth in frame .....Price,
Case for 2-inch depth only .....Price,

No. 222 M—Metric The same as No. 222, except that they are graduated for measurements by hundredths of a millimeter. Prices same as for No. 222.

Pocket Micrometer Case No. 911

Closed



Open

This case is much like the ordinary spectacle case, made of steel with snappy spring cover. It is plush lined and covered with Athol artificial leather.

It is light in weight, compact in size and aside from protection of the micrometer against dirt and grit when carried in the pocket, it is less cumbersome than other types.

For 1-inch micrometers only, regular size, not for heavy duty type, see our No. 238.

No. 911 .....Price,

Packed 1 in a box.

Soft Leather Cases for Micrometer Calipers No. 455

For use in carrying a micrometer in the pocket. Made to hold $\frac{1}{2}$-inch, 1-inch or 2-inch calipers.

$\frac{1}{2}$-inch size.....Price, each,
1-inch size.....Price, each,
2-inch size.....Price, each,

Micrometer Caliper Heads

Starrett Micrometer Heads are easily attached to fixtures, special gages, tools and machine and will be found most useful when fine measurements and adjustments are required.

No. 463

Range 0 to ½ inch

Length of clamping surface is ⅜ inch; diameter, ⅜ inch. When micrometer is set at zero the spindle projects ¾ inch (approximately). Made without lock nut but will be furnished with or without ratchet stop. Sent with ratchet stop unless otherwise ordered. Graduated for measurement by thousandths of an inch up to ½ inch.

Price (with or without ratchet stop) .....

No. 463 M—Metric Range 0 to 13 millimeters. Length of clamping surface is 9.5 mm.; diameter, 9.5 mm. When micrometer is set at zero the spindle projects 19 mm. (approximately). Made without lock nut but will be furnished with or without ratchet stop. Sent with ratchet stop unless otherwise ordered. Graduated for measurement by hundredths of a millimeter up to thirteen millimeters.

Price (with or without ratchet stop) .....

No. 464

Ten-Thousandths—Range 0 to ½ inch

Length of clamping surface is ⅜ inch; diameter, ⅜ inch. When micrometer is set at zero the spindle projects ¾ inch (approximately). Made without lock nut but will be furnished with or without ratchet stop. Sent with ratchet stop unless otherwise ordered. Graduated for measurement by ten-thousandths of an inch up to ½ inch.

Price (with or without ratchet stop) .....

No. 263

Range 0 to 1 inch

Length of clamping surface is ¾ inch; diameter, ½ inch. When micrometer is set at zero the spindle projects 1 1/16 inches (appproximately). Made and sent with ratchet stop and lock nut but will be furnished without ratchet stop or lock nut when so desired. Graduated for measurement by thousandths of an inch up to 1 inch.

Price (with or without ratchet stop or lock nut) .....

No. 263 M—Metric Range 0 to 25 millimeters. Length of clamping surface is 19 mm.; diameter, 12.7 mm. When micrometer is set at zero the spindle projects 27 mm. (approximately). Made and sent with ratchet stop and lock nut but will be furnished without ratchet stop or lock nut when so desired. Graduated for measurement by hundredths of a millimeter up to twenty-five millimeters.

Price (with or without ratchet stop or lock nut) .....

No. 363

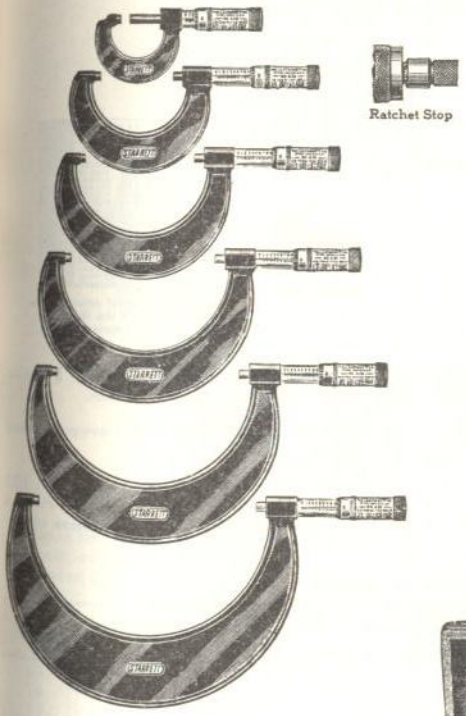
Ten-Thousandths—Range 0 to 1 inch

Length of clamping surface is ¾ inch; diameter, ½ inch. When micrometer is set at zero the spindle projects 1 1/16 inches (approximately). Made and sent with ratchet stop and lock nut but will be furnished without ratchet stop or lock nut when so desired. Graduated for measurement by ten-thousandths of an inch up to 1 inch.

Price (with or without ratchet stop or lock nut) .....

Micrometer Calipers No. 436

With Black Enameled Frame



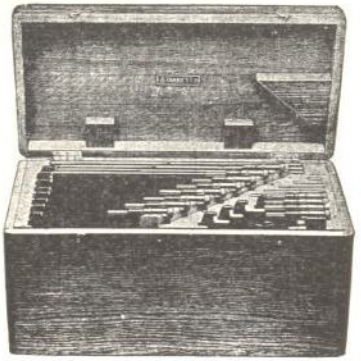
Showing type of wood case in which we furnish our sets of micrometers—No. 436 E-F-G-H.

Solidly built and well-finished.

This line of micrometers will be found most popular with the mechanics, especially to those who are engaged in inspection work.

We also recommend this type micrometer for vocational training students and apprentices.

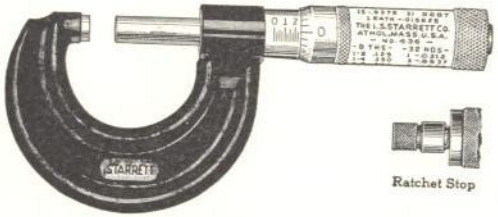
See pages 120, 121, 122 and 123 for further description and prices.



Black Enameled Frame Micrometer Calipers Nos. 436 and 436 M

Range 0 to 1 inch Range 0 to 25 mm.

Furnished with or without Ratchet or Lock Nut



Ratchet Stop

Showing decimal equivalents as marked on the thimble of this micrometer caliper

These micrometer calipers combine strength and rigidity, yet are light in weight. Popular priced, but with the same Starrett dependability. Decimal equivalents on the thimble.

Frames on sizes 1 to 9 inches inclusive are solid type; those 10 inches and larger have perforated type (see page 121) for lightness.

The above cut shows the 1-inch size of our micrometer calipers, No. 436. See pages 121, 122 and 123 for other sizes and prices. This line made in sizes 1 inch to 24 inches inclusive. Packed 1 in wooden box. Sent without ratchet, without lock nut and without standards unless otherwise ordered.

SIZES and PRICES

Size Inches	Size mm.	Range Inches	Range mm.	Without Ratchet no Lock Nut	With Ratchet no Lock Nut	With Lock Nut no Ratchet	With Ratchet with Lock Nut	Standards Extra	Case Extra
1	25	0- 1	0- 25						
2	50	1- 2	25- 50						
3	75	2- 3	50- 75					1″	
4	100	3- 4	75-100					2″	
5	125	4- 5	100-125					3″	
6	150	5- 6	125-150					4″	
7	175	6- 7	150-175					5″	
8	200	7- 8	175-200					6″	These micrometers sizes 7″ to 12″ sent in finished wood case without extra charge
9	225	8- 9	200-225					7″	
10	250	9-10	225-250					8″	
11	275	10-11	250-275					9″	
12	300	11-12	275-300					10″	
								11″	

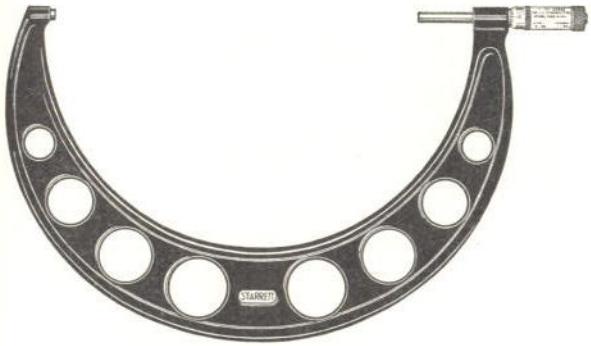
Note: Any of the above micrometers, English measure, can be furnished to read to ten-thousandths of an inch at an additional cost of each to above list prices.

Starrett

Black Enameled Frame Micrometer Calipers Nos. 436 and 436 M

Range 13 to 24 inches Range 300 to 600 mm.

Furnished with or without Ratchet or Lock Nut



Same line of micrometer calipers as those shown on page 120, only additional sizes to 24-inch. Sent without ratchet, without lock nut and without standards unless otherwise ordered. Packed 1 in wooden box.

Size Inches	Size mm.	Range Inches	Range mm.	Without Ratchet no Lock Nut	With Ratchet no Lock Nut	With Lock Nut no Ratchet	With Ratchet with Lock Nut	Standards Extra	
13	325	12-13	300-325					12″	.....
14	350	13-14	325-350					13″	.....
15	375	14-15	350-375					14″	.....
16	400	15-16	375-400					15″	.....
17	425	16-17	400-425					16″	.....
18	450	17-18	425-450					17″	.....
19	475	18-19	450-475					18″	.....
20	500	19-20	475-500					19″	.....
21	525	20-21	500-525					20″	.....
22	550	21-22	525-550					21″	.....
23	575	22-23	550-575					22″	.....
24	600	23-24	575-600					23″	.....

Note: Any of the above micrometers, English measure, can be furnished to read to ten-thousandths of an inch at an additional cost of each to above list prices.

Micrometer Caliper Sets No. 436

With Black Enameled Frame. Decimal Equivalents on the Thimble

		PRICES PER SET Without Lock Nut	With Lock Nut	Case Extra
No. 436 A	Set of three micrometer calipers comprising 1, 2 and 3 inch sizes, all without ratchet stop			
	Set of two standards for above			
No. 436 B	Set of six micrometer calipers comprising 1, 2, 3, 4, 5 and 6 inch sizes, all without ratchet stop			
	Set of five standards for above			
No. 436 C	Set of three micrometer calipers comprising 1, 2 and 3 inch sizes, all with ratchet stop			
	Set of two standards for above			
No. 436 D	Set of six micrometer calipers comprising 1, 2, 3, 4, 5 and 6 inch sizes, all with ratchet stop			
	Set of five standards for above			

Sets A, B, C and D are sent without case and without standards and without lock nut unless otherwise ordered.

No. 436 E	Set of six micrometer calipers, range 6 inches to 12 inches, comprising 7, 8, 9, 10, 11 and 12 inch sizes, all without ratchet stop and without standards, in finished wood case			
	Set of standards for above			
No. 436 F	Same as Set E, except all with ratchet stop			
	Set of standards for above			
No. 436 G	Set of twelve micrometer calipers, range 0 to 12 inches, comprising all sizes from 1 to 12 inch, inclusive, all without ratchet stop, and without standards, in finished wood case			
	Set of standards for above			
No. 436 H	Same as Set G, except all with ratchet stop..			
	Set of standards for above			

Sets E, F, G and H sent without standards and without lock nut unless otherwise ordered.

Sets E, F, G and H are all furnished in finished wood cases at prices shown above.

Starrett

Micrometer Caliper Sets No. 436 M

With Black Enameled Frame. Metric Measure

		PRICES PER SET Without Lock Nut	With Lock Nut	Case Extra
No. 436 M-A	Set of three micrometer calipers comprising 25, 50 and 75 mm. sizes, all without ratchet stop			
	Set of two standards for above			
No. 436 M-B	Set of six micrometer calipers comprising 25, 50, 75, 100, 125 and 150 mm. sizes, all without ratchet stop			
	Set of five standards for above			
No. 436 M-C	Set of three micrometer calipers comprising 25, 50 and 75 mm. sizes, all with ratchet stop			
	Set of two standards for above			
No. 436 M-D	Set of six micrometer calipers comprising 25, 50, 75, 100, 125 and 150 mm. sizes, all with ratchet stop			
	Set of five standards for above			

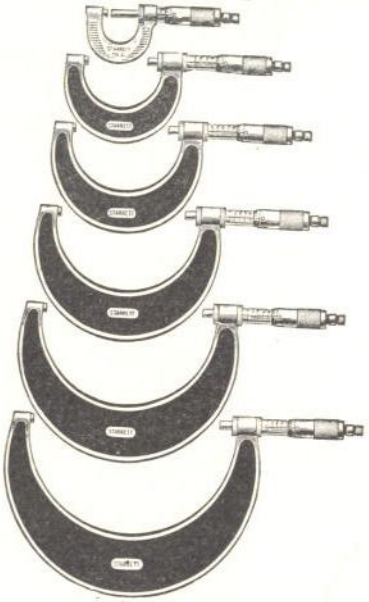
Sets M-A, M-B, M-C and M-D are sent without case and without standards and without lock nut unless otherwise ordered.

No. 436 M-E	Set of six micrometer calipers, range 150 mm. to 300 mm., comprising 175, 200, 225, 250, 275 and 300 mm. sizes, all without ratchet stop and without standards, in finished wood case			
	Set of standards for above			
No. 436 M-F	Same as Set M-E, except all with ratchet stop			
	Set of standards for above			
No. 436 M-G	Set of twelve micrometer calipers, range 0 to 300 mm., comprising all sizes from 25 mm. to 300 mm., inclusive, all without ratchet stop, and without standards, in finished wood case			
	Set of standards for above			
No. 436 M-H	Same as Set M-G, except all with ratchet stop			
	Set of standards for above			

Sets M-E, M-F, M-G and M-H sent without standards and without lock nut unless otherwise ordered.

Sets M-E, M-F, M-G and M-H are all furnished in finished wood cases at prices shown above.

Micrometer Calipers No. 226

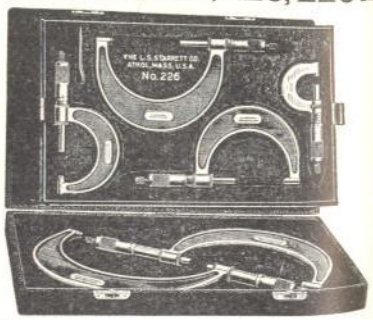


Cases for Micrometer Calipers Nos. 436, 436 M, 226, 226 M

The cases for these calipers are well made and nicely finished. They are covered with leather and lined with velvet.

Case only, for set of three micrometers ..

Case only, for set of four micrometers ..



Case only, for set of six micrometers

Note: All cases are made to hold the standards.

For description and prices covering No. 226 Micrometers, see pages 125 and 126.

Micrometer Calipers No. 226

These calipers meet the demand for accurate gages at a low price. They are better adapted for general use than the vernier or bar micrometer, as they can be set quickly for the different measurements and are more easily read.

Each caliper is graduated to read by thousandths of an inch, is furnished with lock nut, and is sent with or without ratchet stop as desired.

The frames are drop-forged from bar steel and are nicely finished.

The 1-inch has the decimal equivalents stamped on the frame. The other sizes are marked to show their capacity.

Standards for use in adjusting these calipers will be furnished when desired at prices given below.

Calipers will be supplied singly or in sets as desired; and will be sent with ratchet stop and without case or standard unless otherwise ordered.

Size

1-inch, with decimal equivalents, without ratchet stop (our No. 201) ..... Price,
1-inch, with decimal equivalents, with ratchet stop (our No. 3) ..... Price,
1-inch case only ..... Price,

2-inch, from 1 inch to 2 inches, without ratchet stop ..... Price,
2-inch, from 1 inch to 2 inches, with ratchet stop ..... Price,
1-inch standard ..... Price,
2-inch case only ..... Price,

3-inch, from 2 inches to 3 inches, without ratchet stop ..... Price,
3-inch, from 2 inches to 3 inches, with ratchet stop ..... Price,
2-inch standard ..... Price,
3-inch case only ..... Price,

4-inch, from 3 inches to 4 inches, without ratchet stop ..... Price,
4-inch, from 3 inches to 4 inches, with ratchet stop ..... Price,
3-inch standard ..... Price,
4-inch case only ..... Price,

5-inch, from 4 inches to 5 inches, without ratchet stop ..... Price,
5-inch, from 4 inches to 5 inches, with ratchet stop ..... Price,
4-inch standard ..... Price,
5-inch case only ..... Price,

6-inch, from 5 inches to 6 inches, without ratchet stop ..... Price,
6-inch, from 5 inches to 6 inches, with ratchet stop ..... Price,
5-inch standard ..... Price,
6-inch case only ..... Price,

Packed 1 in a box.

Note: The 1, 2, 3, 4, 5 and 6 inch sizes can be furnished to read to ten-thousandths of an inch, at an additional cost of each to above list prices.

No. 226 M

Metric

The same as No. 226, except that they are graduated for measurement by hundredths of a millimeter. Furnished in corresponding sizes and prices as above.

Micrometer Caliper Sets
No. 226

PRICES PER SET

		Without Case	With Case
No. 226 C	Set of three micrometer calipers comprising our No. 201 1-inch, No.226 2-inch and 3-inch, all without ratchet stop		
	Set of two standards for above		
No. 226 D	Set of three micrometer calipers comprising our No. 3 1-inch, No.226 2-inch and 3-inch, all with ratchet stop		
	Set of two standards for above		
No. 226 G	Set of six micrometer calipers comprising our No. 201 1-inch, No.226 2-inch, 3-inch, 4-inch, 5-inch, and 6-inch, all without ratchet stop		
	Set of five standards for above		
No. 226 H	Set of six micrometer calipers comprising our No. 3 1-inch, No.226 2-inch, 3-inch, 4-inch, 5-inch, and 6-inch, all with ratchet stop		
	Set of five standards for above		
No. 226 K	Set of four micrometer calipers reading to ten-thousandths, comprising our No.207 1-inch, with decimal equivalents, No.226 2-inch, 3-inch, and 4-inch, all with lock nut and without ratchet stop		
	Set of three standards for above		
No. 226 L	Set of four micrometer calipers reading to ten-thousandths, comprising our No.113 1-inch, with decimal equivalents, No.226 2-inch, 3-inch, and 4-inch, all with lock nut and with ratchet stop		
	Set of three standards for above		

No. 226 M
Metric

PRICES PER SET

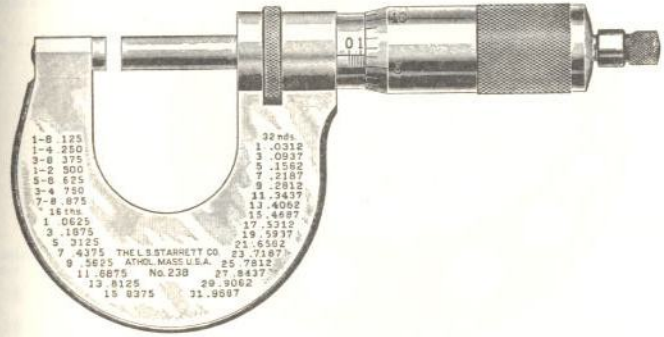
		Without Case	With Case
No. 226 M-C	Set of three micrometer calipers comprising our No. 201 M, 25 mm.; No.226 M, 50 mm. and 75 mm., all without ratchet stop		
	Set of two standards for above		
No. 226 M-D	Set of three micrometer calipers comprising our No.3 M, 25 mm.; No.226 M, 50 mm. and 75 mm., all with ratchet stop		
	Set of two standards for above		
No. 226 M-G	Set of six micrometer calipers comprising our No.201 M, 25 mm.; No.226 M, 50 mm., 75 mm., 100 mm., 125 mm., and 150 mm., all without ratchet stop		
	Set of five standards for above		
No. 226 M-H	Set of six micrometer calipers comprising our No.3 M, 25 mm.; No.226 M, 50 mm., 75 mm., 100 mm., 125 mm., and 150 mm., all with ratchet stop		
	Set of five standards for above		

The above sets are sent without case, and without standards, unless otherwise ordered.

See page 124 for illustrations of cases.

Micrometer Calipers
Heavy Duty Type
No. 238

Range 0 to 1 inch



These calipers are made with the frame and the other parts much heavier than the regular one-inch micrometers and will last longer under hard usage, on account of their stiffness and because of larger bearing surface for the threads. They are especially useful on grinding work and wherever it is necessary to take measurements after the lock nut is set. Many mechanics prefer this micrometer for lathe and milling machine work where constant measurements are required under trying conditions and in the grinding room where dirt and moisture are found.

To prevent wear the measuring surfaces and bearing parts are hardened. These calipers have the decimal equivalents stamped on the frame and are packed in a strong wooden box.

For measurement by thousandths up to one inch. Has ratchet stop and lock nut.

Note: Can be furnished to read to ten-thousandths of an inch at an additional cost of each to list price.

PRICES

No. 238 .....

With case .....

No. 238 M
Metric—Range 0 to 25 mm.

The same as above except that they are made for measurement by hundredths of a millimeter up to twenty-five millimeters.

PRICES

No. 238 M .....

With case .....

No.238 and No.238M sent without case unless otherwise ordered.

Packed 1 in a box.

Heavy Micrometer Calipers No. 239

These calipers were designed to meet the exacting demands of heavy and severe usage. The spindle and screw portion is of larger area than in the regular micrometer, thus insuring longer wear and greater rigidity; those from 2 inches to 6 inches, inclusive, are made from drop-forgings and the larger sizes, from 7 inches to 12 inches, from steel castings with holes in frame as shown by larger cut. The bearing parts and measuring surfaces are hardened to prevent wear, and the same means provided for adjustment as in our other micrometers. Made with lock nut and ratchet stop. Sizes are stamped on these tools to show their capacity.

1 inch to 2 inches	Price,	With standard,
Case extra		Price,
2 inches to 3 inches	Price,	With standard,
Case extra		Price,
3 inches to 4 inches	Price,	With standard,
Case extra		Price,
4 inches to 5 inches	Price,	With standard,
Case extra		Price,
5 inches to 6 inches	Price,	With standard,
Case extra		Price,
6 inches to 7 inches	Price,	With standard,
7 inches to 8 inches	Price,	With standard,
8 inches to 9 inches	Price,	With standard,
9 inches to 10 inches	Price,	With standard,
10 inches to 11 inches	Price,	With standard,
11 inches to 12 inches	Price,	With standard,

Cases not supplied for sizes above 6-inch. Micrometers sent without case, and with standard unless otherwise ordered. Sizes 2-inch to 6-inch sent in strong wood boxes. Larger sizes sent in finished wood cases.

Note: Any of the above micrometers can be furnished to read to ten-thousandths of an inch at an additional cost of each to list prices.

Sets of Heavy Micrometer Calipers

Set No. 239 A Consisting of our No.238, one-inch, as shown on page 127, with decimal equivalents on frame, and our No.239, sizes 2 to 6 inch.

Sent in strong wood boxes.

Price, set ..... With standards,

Sent with standards unless otherwise ordered.

Set No. 239 B Consisting of our No.238, one-inch, as shown on page 127, with decimal equivalents on frame, and our No.239, sizes 2 to 12 inch.

Sent in strong wood boxes.

Price, set ..... With standards,

Sent with standards unless otherwise ordered.

Heavy Micrometer Calipers No. 239 M

Metric

The same as our No.239, except that they are graduated for measurement by hundredths of a millimeter.

25 to 50 mm.	Price,	With standard,
Case extra		Price,
50 to 75 mm.	Price,	With standard,
Case extra		Price,
75 to 100 mm.	Price,	With standard,
Case extra		Price,
100 to 125 mm.	Price,	With standard,
Case extra		Price,
125 to 150 mm.	Price,	With standard,
Case extra		Price,
150 to 175 mm.	Price,	With standard,
175 to 200 mm.	Price,	With standard,
200 to 225 mm.	Price,	With standard,
225 to 250 mm.	Price,	With standard,
250 to 275 mm.	Price,	With standard,
275 to 300 mm.	Price,	With standard,

Cases not supplied for sizes above 150 mm. Micrometers sent without case, and with standards unless otherwise ordered. Sizes 50 mm. to 150 mm. sent in strong wood boxes. Larger sizes sent in finished wood cases.

Sets of Heavy Micrometer Calipers

Metric

Set No. 239 M-A Consisting of our No.238 M, as shown on page 127, 0 to 25 mm., and our No.239 M, sizes 25 to 150 mm.

Sent in strong wood boxes.

Price, set ..... With standards,

Sent with standards unless otherwise ordered.

Set No. 239 M-B Consisting of our No.238 M, as shown on page 127, 0 to 25 mm., and our No.239 M, sizes 25 to 300 mm.

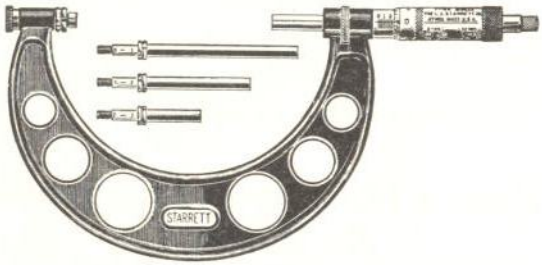
Sent in strong wood boxes.

Price, set ..... With standards,

Sent with standards unless otherwise ordered.

Micrometer Caliper Sets No. 224

For Automobile and Aviation Service Shops



No. 224 AA

Range 0 to 4 inches

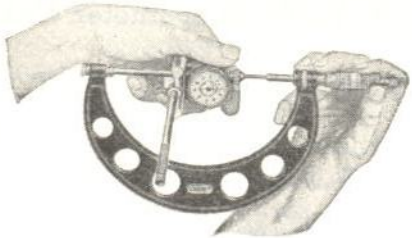
No. 224 A

Range 2 to 6 inches

One micrometer for all intermediate measurements from 0 to 4 inches or 2 to 6 inches by thousandths. Furnished with accurately positioned and readily interchangeable anvils. Measures pistons, crank shafts, cam shafts, and wrist pins.

The frames are made from forgings and have black enamel finish. Decimal equivalents are stamped on the thimbles and the micrometers are provided with lock nuts.

See page 131 for prices.



Showing a few applications of our No. 224

Starrett

Micrometer Caliper Sets No. 224

	No. 224 AA English Range 0 to 4 inches	No. 224 M-AA Metric Range 0 to 100 mm.
Without ratchet stop and without standards		
With ratchet stop and without standards		
Without ratchet stop and with standards		
With ratchet stop and with standards		

	No. 224 A English Range 2 to 6 inches	No. 224 M-A Metric Range 50 to 150 mm.
Without ratchet stop and without standards		
With ratchet stop and without standards		
Without ratchet stop and with standards		
With ratchet stop and with standards		

Note: Sent with Ratchet Stop and Standards unless otherwise ordered. Both sizes furnished without extra charge in finished wood case.

LARGER SIZES

No. 224 B 6-inch to 9-inch range
With lock nut, ratchet stop and three standards in substantial wood case.....

No. 224 C 9-inch to 12-inch range
With lock nut, ratchet stop and three standards in substantial wood case.....

No. 224 D 12-inch to 16-inch range
With lock nut, ratchet stop and four standards in substantial wood case.....

No. 224 E 16-inch to 20-inch range
With lock nut, ratchet stop and four standards in substantial wood case.....

No. 224 F 20-inch to 24-inch range
With lock nut, ratchet stop and four standards in substantial wood case.....

No. 224 K Set Complete. Range 2 inches to 24 inches, with standards, lock nuts and ratchet stops, in substantial wood cases.....

No. 224 L Set Complete. Range 0 to 24 inches, with standards. Same as No. 224 K Set with the addition of our No. 436 Micrometers with ratchet stops, sizes 1 and 2 inch, as listed on pages 120 to 123 inclusive, in substantial wood cases.....

No. 224 R Set Complete. Range 0 to 24 inches, with standards. Consisting of our No. 436 Micrometers with ratchet stops, sizes 1, 2, 3, 4, 5 and 6 inch, as listed on pages 120 to 123 inclusive, and our No. 224 B, C, D, E and F, in substantial wood cases.....

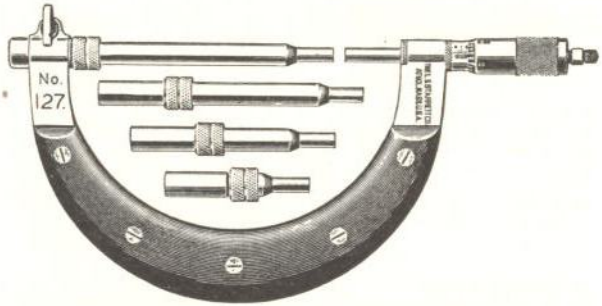
Note: Larger sizes of the following ranges: 24 to 28 inches, 28 to 32 inches, and 32 to 36 inches can be furnished when desired. Prices quoted upon application.

No. 224 M

Metric

The same as No. 224, except that they are graduated for measurement by hundredths of a millimeter and the thimbles are plain, not marked with decimal equivalents. Furnished in corresponding sizes and prices as above.

United States Government Micrometer Caliper Gages
No. 127



These gages were designed and made to meet the requirements of the Government in making big guns and other work in the Ordnance Department of Government shops, where they are now used. The frames are cut from steel plates, nicely finished. The sides are covered with hard rubber, put on with brass screws, preventing inaccuracy through expansion caused by change in temperature when held in the hands. The micrometer screw adjusts one inch, reading $^{1}/_{1000}$ of an inch, and is provided with lock nut. The different length tail spindles, forming anvils, are interchangeable and have positive stops to set against their socketed seats. The adjusting collars on these anvils have notches to facilitate the removal of dirt, which would prevent them from setting accurately against the seat. The contact ends of spindles are slightly convex. Furnished with ratchet stop.

No. 127
English

No. 127 A	0 to 4 inches.....	**No. 127 D**	12 to 16 inches .....
No. 127 B	4 to 8 inches.....	**No. 127 E**	16 to 20 inches .....
No. 127 C	8 to 12 inches.....	**No. 127 F**	20 to 24 inches .....

No. 127 M
Metric

The same as No.127, except that it is graduated for measurement by hundredths of a millimeter.

No. 127 M-A	0 to 100 mm.....	**No. 127 M-D**	300 to 400 mm.....
No. 127 M-B	100 to 200 mm.....	**No. 127 M-E**	400 to 500 mm.....
No. 127 M-C	200 to 300 mm.....	**No. 127 M-F**	500 to 600 mm.....

Furnished in case without extra charge.
Sent without standards unless otherwise ordered.

Packed 1 in a box.

For prices of standards to use with these micrometers, see page 133.
Larger sizes can be made to order when so desired. Prices quoted on application.

Starrett

Standard End Measuring Rods
Nos. 234 and 234 M
With Spherical Ends

These rods are made of steel, hardened and lapped spherical on the ends with a radius of one-half the length of the rod. The handles are of rubber, two-thirds the length of the rod, and guard against any expansion due to change in temperature when held in the hands, thereby maintaining their accuracy under adverse conditions.

1-inch to 6-inch are ¼-inch diameter with handles $^{7}/_{16}$-inch diameter.
7-inch to 12-inch are ⅜-inch diameter with handles $^{5}/_{8}$-inch diameter.

1-inch or 25 mm. rod	.....Price,	7-inch or 175 mm. rod	.....Price,
2-inch or 50 mm. rod	.....Price,	8-inch or 200 mm. rod	.....Price,
3-inch or 75 mm. rod	.....Price,	9-inch or 225 mm. rod	.....Price,
4-inch or 100 mm. rod	.....Price,	10-inch or 250 mm. rod	.....Price,
5-inch or 125 mm. rod	.....Price,	11-inch or 275 mm. rod	.....Price,
6-inch or 150 mm. rod	.....Price,	12-inch or 300 mm. rod	.....Price,

Nos. 137 and 137 M
With Flat Ends

These gages are similar to No.234, except that they are made with flat ends. The 1-inch size is furnished in the form of a disc as shown in the cut.

They are made in both English and Metric sizes. The rods are made of steel, slightly under $^{1}/_{16}$-inch diameter, and the ends are hardened, ground and lapped parallel to each other. The handles are of rubber to guard against any change in their accuracy while held in the hands. Sizes 2 inches to 7 inches have one rubber handle; larger sizes, two rubber handles.

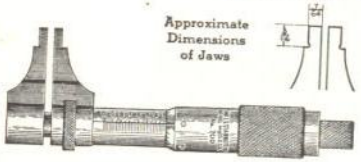
1-inch or 25 mm. disc	.....Price,	13-inch or 325 mm. rod	.....Price,
2-inch or 50 mm. rod	.....Price,	14-inch or 350 mm. rod	.....Price,
3-inch or 75 mm. rod	.....Price,	15-inch or 375 mm. rod	.....Price,
4-inch or 100 mm. rod	.....Price,	16-inch or 400 mm. rod	.....Price,
5-inch or 125 mm. rod	.....Price,	17-inch or 425 mm. rod	.....Price,
6-inch or 150 mm. rod	.....Price,	18-inch or 450 mm. rod	.....Price,
7-inch or 175 mm. rod	.....Price,	19-inch or 475 mm. rod	.....Price,
8-inch or 200 mm. rod	.....Price,	20-inch or 500 mm. rod	.....Price,
9-inch or 225 mm. rod	.....Price,	21-inch or 525 mm. rod	.....Price,
10-inch or 250 mm. rod	.....Price,	22-inch or 550 mm. rod	.....Price,
11-inch or 275 mm. rod	.....Price,	23-inch or 575 mm. rod	.....Price,
12-inch or 300 mm. rod	.....Price,		

Note: These are the measuring rods to be used in connection with our No.127 and No.127M Micrometers, shown on page 132.

Above numbers packed 1 in a package.

Inside Micrometer Calipers No. 700

Range .200″ to 1″ by Thousandths



Designed to provide a tool to read as a micrometer, with vernier caliper styled jaws, for measuring small internal dimensions. Contact surfaces are hardened and ground. Furnished with lock nut.

No. 700 .....Price,
With case .....Price,
Packed 1 in a box.

Micrometer Caliper Gages No. 126

Designed for close internal measurements, indicating thousandths where a definite distance in inches is not essential. The body of the tool is a steel tube, provided at one end with a binding chuck in which are fastened the plain rods, and it can quickly be adjusted to any approximate size. The other end has sleeve and body of barrel marked and graduated same as a micrometer caliper, giving a reading in thousandths, and has ¼ inch movement of screw. Anvil in end of sleeve is hardened, as are the ends of rods.

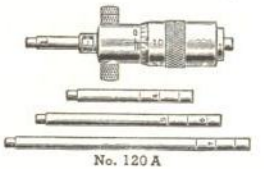
No. 126 Capacity, 2½-inch to 10-inch (with five rods).....Price,
With case .....Price,

No. 126 M

No. 126 M—Metric Capacity, 7 cm. to 25 cm. Price same as for No. 126.
Above numbers sent without case unless otherwise ordered.

Showing use of Inside Micrometer

Inside Micrometer Calipers No. 120



No. 120 A

Both sets have screw and nut the same as an outside micrometer caliper and read in thousandths. Set A measures from 2 inches to 8 inches, has ½-inch movement of screw and requires four extension rods. The rods are provided with a hardened steel adjustable anvil in ends, which permits adjusting for wear. A small binding screw locks rods when set. Rods are marked in ½-inch divisions and set to a similar line on a projection of the barrel.

Set C is similar in all respects with the exception that it measures from 8 inches to 32 inches, with four extension rods, and has a lock for the rods; and has one-inch movement of the screw. This is a very strong and serviceable tool as well as an accurate one. We can furnish rods of extra lengths for these tools when desired.

When so ordered an auxiliary handle similar to the one furnished with No. 124 accompanies Sets A, B and D, which is used by removing the nut opposite the lock nut and screwing the handle in place of same, thereby enabling one to take measurements in holes and other places where the micrometer could not otherwise be used.

Set A With 4 rods, to measure from 2 to 8 inches ....Price, With case.....
Set B With 7 rods, to measure from 2 to 12 inches ....Price, With case.....
Set C With 4 rods, to measure from 8 to 32 inches ....Price, With case.....
Set D Comprising Sets A and C.....Price, With case.....
Handle, extra.....Price,

No. 120 M

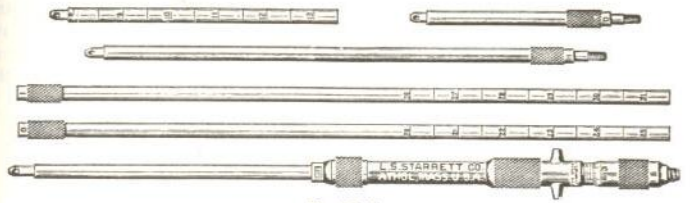
Metric

The same as No. 120, except that it is graduated to read in hundredths of a millimeter.

Set A To measure from 50 mm. to 200 mm. .....Price, With case.....
Set B To measure from 50 mm. to 320 mm. .....Price, With case.....
Set C To measure from 200 mm. to 765 mm. .....Price, With case.....
Set D Comprising Sets A and C.....Price, With case.....
Handle, extra.....Price,

Above numbers sent without case unless otherwise ordered.

Packed 1 in a box.



No. 120 C

Inside Micrometer Calipers No. 124

An Inside Micrometer Caliper is an adjustable end measuring gage. It is designed for internal linear measurements such as cylinders, rings, and also for setting calipers, comparing gages, etc., as well as measuring parallel surfaces. The measurement is taken over its extreme ends which are hardened and ground as contacts. The distance between the contacts is changed by the rotation of the sleeve on the micrometer head up to the extent of screw length. Greater distances are obtained by use of extension rods and suitable collars or gages which are provided with each tool to cover its range.

The rods are marked with the range that the tool will take over the measuring points when that particular rod is used. To illustrate the use of inside micrometers, the 124A set, as illustrated on page 137, shows the micrometer head with the 2 to 3 inch extension rod assembled with the shoulder on the rod in contact with the shoulder of the micrometer head and the micrometer screw rotated to read .125 inch. The measurement over the contacts is 2.125 inch. Since the range of the micrometer screw in the head of the A and B sets is .500 inch, measurements between 2.500 and 3 inches are taken by placing the ½-inch spacing collar or gage on the rod before inserting the rod in the head. The rod length now becomes 2.500, which, added to the reading of the micrometer, gives the distance between the contacts. The same use of the ½-inch collar applies to the other sizes of extension rods. In setting these rods see that the zero marks on the collars and micrometer heads coincide. (Provision is made for adjustment to compensate for wear of screw and contact surfaces.)

The 124C set has a movement of 1 inch in the screw of the micrometer head and is provided with spacing collars or gages that are used in same manner as those in the A set.

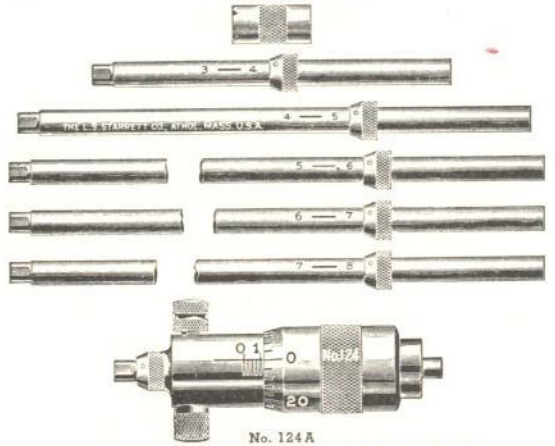
Handle

The auxiliary handle as shown in cut, for use with sets A, B and D, is designed to go on the side opposite the lock screw, which may be distinguished by its small groove. To insert the handle it may be found necessary to use a clamp or pliers on the knurled stud, after which the stud may be easily removed.

See page 137 for additional information and prices.

Starrett

Inside Micrometer Calipers No. 124



No. 124A

Set A has 6 rods and one ½-inch gage, and measures from 2 inches to 8 inches.
Price ..... With case.....
Set B has 10 rods and one ½-inch gage, and measures from 2 inches to 12 inches.
Price ..... With case.....
Set C has 4 rods and one 1-inch and two 2-inch gages, and measures from 8 inches to 32 inches.
Price ..... With case.....
Set D comprises sets A and C, and measures from 2 inches to 32 inches.
Price ..... With case.....
Handle, extra.....

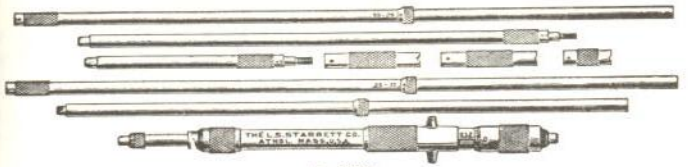
No. 124M

Metric

The same as No. 124, except that it is graduated to read in hundredths of a millimeter.

Set A has 6 rods and one 12 mm. gage, and measures from 50 mm. to 200 mm.
Price ..... With case.....
Set B has 10 rods and one 12 mm. gage, and measures from 50 mm. to 300 mm.
Price ..... With case.....
Set C has 4 rods and one 25 mm. and two 50 mm. gages, and measures from 200 mm. to 800 mm.
Price ..... With case.....
Set D comprises sets A and C, and measures from 50 mm. to 800 mm.
Price ..... With case.....
Handle, extra.....

Above numbers sent without case unless otherwise ordered.
Packed 1 in a box.



No. 124C

Inside Micrometer Calipers No. 121

When linear measurements are beyond the capacity of the ordinary micrometer it is frequently necessary to have a more accurate instrument than the rule or steel tape. The inside calipers shown here were designed for and are now used by the Government in navy yards and arsenals. They consist of steel tubes with telescoping extensions combined with a one-inch screw micrometer movement. The tubes are accurately graduated and figured in inches and set to the inch marks showing the length wanted, and are firmly held by a knurled locking nut. The ends of the rods have hardened steel anvils. Combinations are possible which give a range from 32 to 107 inches and with micrometer accuracy over the whole range. These inside micrometer calipers are nickel plated. A case is furnished with each set.

Set A Stock with one rod, 32 to 57 inches.....Price,
Set B Stock with two rods, 32 to 82 inches.....Price,
Set C Stock with three rods, 32 to 107 inches.....Price,

No. 121 M

Metric

The same as above, except that it is graduated to read in hundredths of a millimeter.

Set A Stock with one rod, 800 mm. to 1440 mm.....Price,
Set B Stock with two rods, 800 mm. to 2070 mm.....Price,
Set C Stock with three rods, 800 mm. to 2700 mm.....Price,

Above numbers packed 1 in a box.

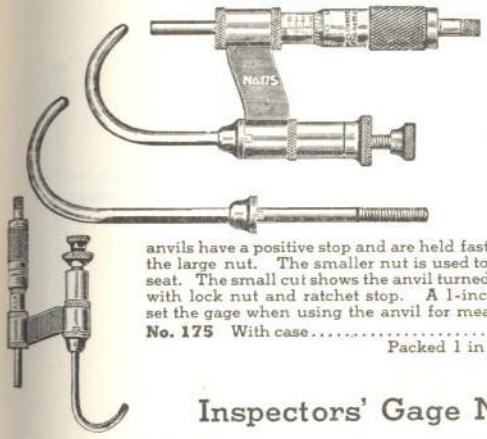
Height Gage Attachment No. 447

This cut shows a steel base for holding our Inside Micrometer No. 124, sets A and B (page 137), for use as a height gage, serving in many cases where the purchase of a more expensive tool would otherwise be required. The anvil end is even with the bottom of the base and the micrometer is held perpendicularly, as shown in cut, making a reliable gage. A slight turn of the knurled screw instantly clamps it to or releases it from the base.

No. 447 Attachment only.....Price,

Inspectors' Micrometer Caliper Gage No. 175

For Testing Boilers, Flues, Tubing, Drawn Die Work, Etc.
Used by U. S. Government Inspectors



This gage was designed particularly for measuring the walls of cylindrical forms through a drilled hole in a flue or pipe where it would not be otherwise possible to secure accurate measurements. This gage is made to read by thousandths of an inch and its peculiar construction makes it possible to obtain as exact readings as upon flat material. It is furnished with two anvils which are interchangeable, whereby measurements may be taken from 0 to 2 inches. The anvils have a positive stop and are held fast to the seat, containing a keyway, by the large nut. The smaller nut is used to turn the anvil when released from its seat. The small cut shows the anvil turned out of position. They are furnished with lock nut and ratchet stop. A 1-inch standard plug is also furnished to set the gage when using the anvil for measurements from 1 to 2 inches.

No. 175 With case.....Price,

Packed 1 in a case.

Inspectors' Gage No. 30

This gage was designed at the suggestion of a government inspector to fill the need of a tool for measuring the thickness of ship plates, boiler plates, etc., where measure has to be taken through a bolt hole or hole drilled for the purpose.

The contact point is carried in beyond any burr formed by drilling, insuring correct measurement.

The slide measuring rod is graduated on two opposite sides, one side reading 32nds, the other 40ths. Reading from the top of the knurled friction slide, which, after the contact ends of the gage are brought together against the object being measured, is slipped down against the top, the graduations above it show the exact measure. Then the measuring rod may be instantly withdrawn, the hook part removed and all taken to the light and the correct measure, indicated above the friction slide, easily read.

The knurled nut over the split hub serves to contract same to fit close on the slide or to lock firm, making a solid gage, convenient for any mechanic.

The gage weighs about 1 ounce and is adapted for the vest pocket. Width, 1 inch. Capacity, 1⅞ inches.

No. 30.....Price,

No. 30 M—Metric Capacity, 47 mm. Rod graduated one side in mm., the other in ½ mm.
No. 30 M.....Price,

Inspectors' Gage No. 31

This gage is similar to our No. 30, except that it is made narrower for use in smaller holes. Width, 7/16 inch. Capacity, 1 13/16 inches. Graduated one side in 32nds, the other in 40ths.

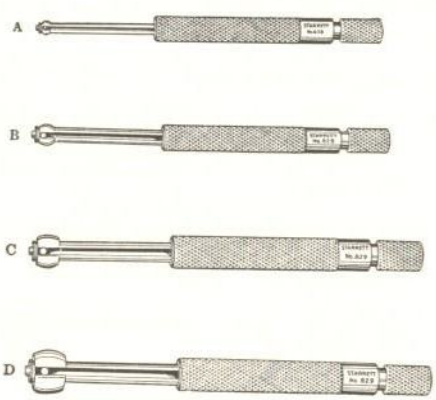
No. 31.....Price,

No. 31 M—Metric Capacity, 47 mm. Graduated in mm. and ½ mm.
No. 31 M.....Price,

Above numbers packed 1 in a box.

Small Hole Gages
No. 829

Patented

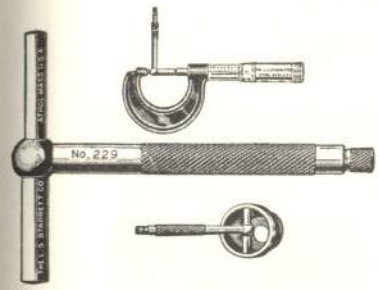


At last, an inexpensive, practical set of small gages that reach into small holes and recesses, and get the measurement from ⅛ inch to ½ inch. A real companion set to our No. 229 Telescoping Gages which have a minimum capacity of ½ inch. (See page 141.)

Balance, sensitivity of contact and adjustment, together with ball radius, hardness and amplitude, make this set of gages of inestimable value. Simply expand to get the "feel" and measure ball end with a micrometer.

No. 829 A	Range ⅛ inch to 2/10 inch	Price, each,
No. 829 B	Range 2/10 inch to 3/10 inch	Price, each,
No. 829 C	Range 3/10 inch to 4/10 inch	Price, each,
No. 829 D	Range 4/10 inch to ½ inch	Price, each,
Set of Four	in red leatherette case	Price, per set,
	Case only	Price, each,

Telescoping Gages
No. 229



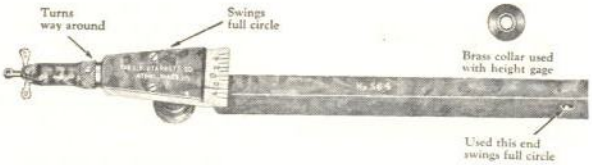
These are instruments from which the exact size of holes or slots can be taken by an outside caliper or micrometer, so that shrink, close or loose fits, varying in thousandths, or less, can be made and measured. The plunger is locked by a slight turn of the knurled screw in the end of the handle. Made in five sizes. The smallest (size A) will enter a ½-inch hole — the largest (size E) will expand to 6 inches.

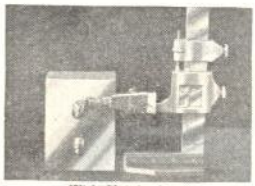
No. 229 A	Range ½ inch to ¾ inch	Price, each,
No. 229 B	Range ¾ inch to 1¼ inches	Price, each,
No. 229 C	Range 1¼ inches to 2⅛ inches	Price, each,
No. 229 D	Range 2⅛ inches to 3½ inches	Price, each,
No. 229 E	Range 3½ inches to 6 inches	Price, each,
Set of 3	One each, sizes A, B, C, packed in special red leatherette case	Price, each,
Set of 5	One each, sizes A, B, C, D, E, packed in special red leatherette case	Price, each,
	Case only for Set of 3	Price, each,
	Case only for Set of 5	Price, each,

Starrett

"Universal Junior" Indicator No. 564

Patented




With Height Gage


In Lathe Tool Post


Hole Application


On Shank Side


On Shank Top

An unusually sensitive and flexible indicator that will hit about every conceivable application. Consider first, the rotating friction sleeve which carries the ball contact point with it. This feature alone always permits the thousandths graduated plate, with a range of .012, to be maintained in the preferred position, thus eliminating physical and eye strain, double graduated scale or mirror. Consider with this rotating sleeve; indicator used on the side of the shank at one end, on the top of the shank at the other end; and the movable, frictionally held, ball contact.

Case-hardened steel and die-cast parts. Shank size, approximately ¼ x ½ x 5 inches. Indicator case thickness about ¼ inch, tapering from $^{11}/_{16}$ to ⅛ inch ball diameter, 2½ inches the length.

Note: Special diameter contacts quoted on application.

No. 564.....Price.
Case, extra .....Price.

Sent without case unless otherwise ordered.

Packed 1 in a box.

Starrett

"Last Word" Indicators

The Popular Line with the Mechanic

Trade-Mark
LAST WORD
Reg. U. S. Pat. Off.

No. 711 F
MODEL "F"
Patented

Reversible Action
Swiveling Tubular Body
Detachable Ratchet Joint
Contact Point
Universal Shank

Price Complete—
Case Included

The various models of "LAST WORD" Indicators, shown on this and the following pages, provide an excellent variety from which the mechanic may choose.

A brief analysis of this cut readily conveys the marvelous flexibility of this complete LAST WORD Dial Indicator. The combination involves No. 711 F with the Universal shank.

On this No. 711 F, instead of sideplate, remove inspection hole screw on left side of body and be sure that reversing switch lever is in its lower position at its outer end. Do not remove dial plate unless you have watchmakers' tools and a watchmaker's touch or you may damage the hairspring.

The No. 711 F has reversible action by means of the switch lever on right side of body underneath the dial.

The switch lever should be at its extreme limit of motion in either direction to get the best action. It also regulates the tension which normally requires ½ to ¾ ounce (15 to 20 grams) pressure on the contact point to set the hand in motion. If the switch is not at its limit of motion the indicator will be more sensitive, and, if left midway between stops, the indicator will not function because the operating spring is then in a neutral position.

The ratchet joint contact point can be moved to any desired position without swiveling the spring clip, which should be swung aside only when changing contact points. The teeth are fine and, if exposed to grit, would be likely to catch dirt and then not come into proper location.

Keep free from oil, dust, acid and moisture.

Note: When some small alteration or unlisted attachment is desired, we will welcome any opportunity to co-operate.

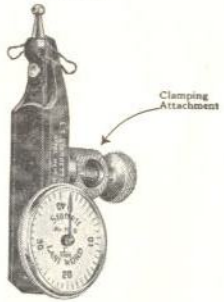
Starrett

"Last Word" Indicators

The Popular Line with the Mechanic

Trade-Mark
LAST WORD
Reg. U. S. Pat. Off.

No. 711 B MODEL "B"
Patented



Friction Joint Contact Point
Range .040 inch Fixed Dial

With Gooseneck Shank.....Price,
With Universal Shank.....Price,
Without shank.....Price,

Sent with Gooseneck Shank and Case unless otherwise ordered.

No. 711 C MODEL "C"
Patented

Friction Joint Contact Point
Range .025 inch Adjustable Dial

With Gooseneck Shank.....Price,
With Universal Shank.....Price,
Without shank.....Price,

Sent with Gooseneck Shank and Case unless otherwise ordered.

No. 711 D MODEL "D"

Fixed Contact Point
Range .025 inch Adjustable Dial

With Gooseneck Shank.....Price,
With Universal Shank.....Price,
Without shank.....Price,

Sent with Gooseneck Shank and Case unless otherwise ordered.

This model can also be furnished in Metric reading $^{1}/_{100}$ mm. at same price.

Starrett

"Last Word" Indicators

The Popular Line with the Mechanic

Trade-Mark
LAST WORD
Reg. U. S. Pat. Off.

No. 711 D-10 MODEL "D-10"

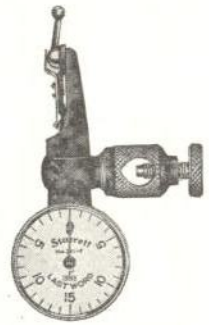
Fixed Contact Point
Range .024 inch Adjustable Dial

With Gooseneck Shank .....Price,
With Universal Shank.....Price,
Without shank .....Price,

Sent with Gooseneck Shank and Case unless otherwise ordered.

This model can also be furnished in Metric reading, $^{1}/_{500}$ mm., at same price.

No. 711 F MODEL "F"
Patented



Ratchet Joint Contact Point
Reversible Action
Range .030 inch Adjustable Dial

With Universal Shank.....Price,
With Gooseneck Shank .....Price,
Without shank .....Price,

Sent with Universal Shank and Case unless otherwise ordered.

This model can also be furnished in Metric reading, $^{1}/_{100}$ mm., at same price.

General Information on "Last Word" Indicators

In places where dealers may not be stocking these indicators they will be sent to any address in the United States prepaid upon receipt of Net List Prices.

Any shortage must be reported immediately to receive consideration. You save time and expense by sending repairs direct to factory by insured parcel post.

We can't undertake to remodel or alter one type into another. All working parts are hardened and every indicator is inspected before shipment. We will not be responsible for damage done, or adjustments disturbed, after the indicator leaves our factory. On all LAST WORD Indicators the bezels are forced on and can be removed by inserting a knife blade between bezel and body of indicator and prying it partly off. Revolve dial a quarter turn and continue to pry until bezel comes off. To replace bezel use a pair of jeweler's end cutting pliers with the cutting edges dulled with an oilstone so they will not injure the bezel. With one jaw resting on the bezel just above the knurled part and the other jaw against the underside of the dial plate, the bezel can be forced on a little at a time until the crystal is tight. If indicator shows backlash, or does not come back to zero with a snappy movement, then remove side plate and with a small pointed wood stick lift lever out of spiral groove, letting spiral assume its own position; then let go of lever and push spiral toward the left until lever snaps into groove, and replace side plate.

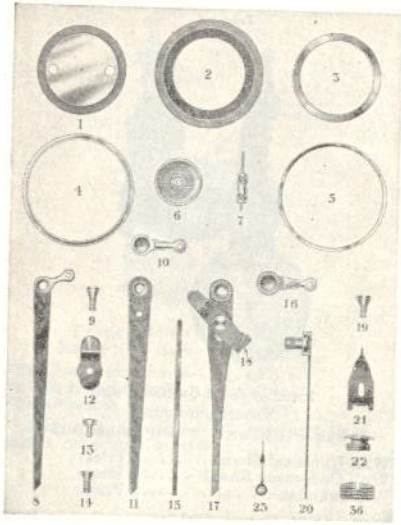
Starrett

"Last Word" Indicators

The Popular Line with the Mechanic

Showing Constructional Detail and Parts Numbers
LAST WORD Indicators

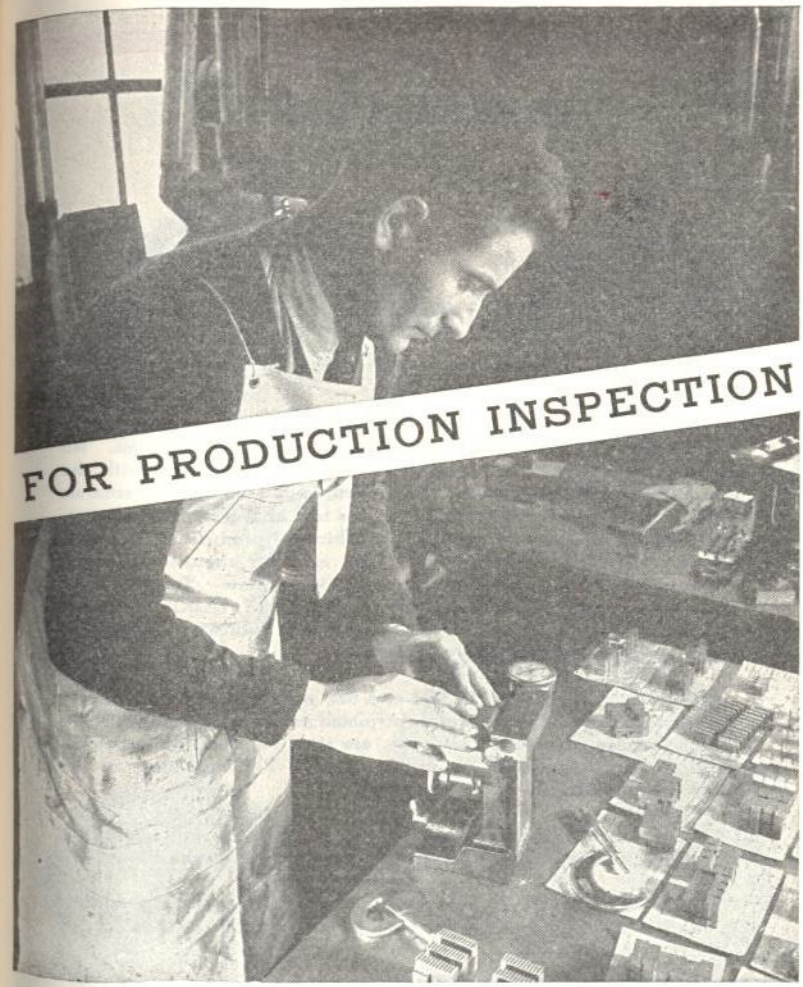
When ordering parts, specify Model with which they are to be used



List of Parts

For No. 711 Indicators

1	Dial plate	Price,
2	Dial plate ring	Price,
	Except Model D-10	Price,
3	Bronze friction washer	Price,
4	Outer bezel	Price,
	Except Model D-10	Price,
5	Inner bezel	Price,
	Except Model D-10	Price,
6	Hairspring with case (state what model)	Price,
	Hairspring without case for Model F	Price,
7	Spiral staff (state what model)	Price,
8	Plain lever for Models D and D-10	Price,
9	Pivot screw for Models B, C, D, D-10	Price,
10	Contact point for friction joint lever	Price,
11	Long arm of friction lever	Price,
12	Spring clip and rivet for friction lever	Price,
13	Rivet only for spring clip	Price,
	Complete friction joint lever	Price,
14	Dial plate screw	Price,
15	Flat spring for all models except F	Price,
16	Contact point for ratchet joint lever	Price,
17	Long arm for ratchet lever	Price,
18	Spring clip and rivet for ratchet lever	Price,
	Complete ratchet joint lever	Price,
19	Pivot screw for ratchet lever	Price,
20	Reversing stud and spring for Model F	Price,
21	Reversing switch lever for Model F	Price,
22	Inspection hole cover screw for Model F	Price,
23	Hand	Price,
	Hand for Model D-10	Price,
24	Side plug for all models except F	Price,
25	Ball cap nut for gooseneck shank	Price,
26	Ball stem	Price,
27	Gooseneck shank complete	Price,
28	Body clamp for Model F	Price,
29	Clamping attachment	Price,
30	Clamping attachment screw	Price,
31	Short arm for universal shank	Price,
32	Screw for universal shank	Price,
33	Long arm for universal shank	Price,
34	Universal shank only	Price,
	Universal shank complete	Price,
35	Vernier height gage attachment	Price,
36	End screw plug for Model F	Price,
	Crystals (glass)	Price,
	Crystals (unbreakable)	Price,
	Crystals for Model D-10	Price,
	Dials for any model except D-10	Price,
	Dials for Model D-10	Price,



STARRETT
DIAL INDICATORS

Dial Indicators

The L. S. Starrett Company wishes to call to your attention its complete line of Indicators; commonly referred to as Dial Gages. No expense or effort has been spared to construct these gages with the durability and accuracy present-day practices and conditions demand. Such Indicators are indispensable in the tool and machine industry, being attachable to tool spindles, machinery, production jigs and fixtures. Essential in inspection work and for mountings where measurements are involved too numerous to estimate. Together with our well-known No. 196 Dial Indicator, the LAST WORD Indicator, and the models illustrated in our complete Dial Indicator Catalog, the buyer is offered an outstanding selection.

Indicator numbers 25, 81, 655 and 656 are rust-proof through the use of stainless steel and chromium-plated parts. All gears, the rack, dowels, screws, stem bushings, etc., are stainless steel, the case and bezel special die castings, chromium-plated. The back cover is also a die casting with black crackle finish.

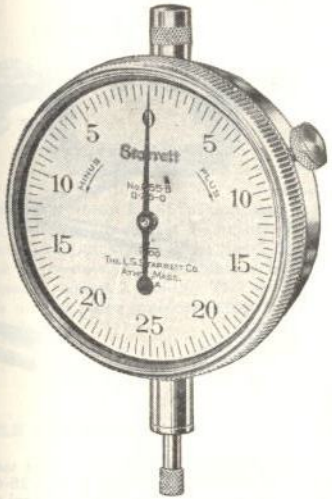
Particular attention has been given to reflection and legibility, sturdiness and accuracy, and interchangeability of parts.

Diamond, Norbide* or Tungsten Carbide Tips, materially adding to the life of the contact points, will be quoted upon request.

*Trade name of Norton Company for Boron Carbide.

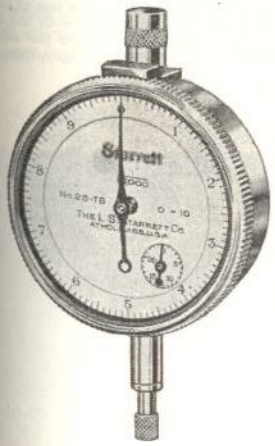
Write for complete Starrett Dial Indicator Catalog and Price List.

Dial Indicators



Dial Diameter—2¾ Inches

Dial Diameter—1 11/16 Inches

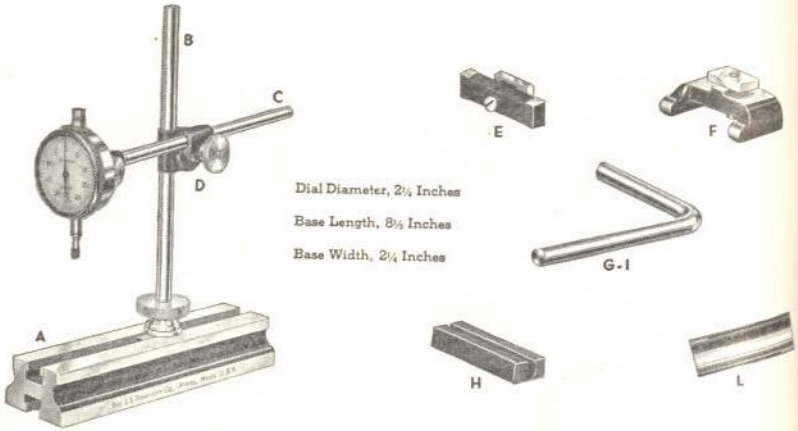


Dial Diameter—2¼ Inches

Dial Diameter—3⅜ Inches

Showing various dial diameters which may be furnished with Starrett Dial Indicators.

Dial Test Indicator No. 665



Dial Diameter, 2¼ Inches

Base Length, 8½ Inches

Base Width, 2¼ Inches

A sturdily built combination for the general work of inspectors, machinists and toolmakers. The indicator has a spindle travel of 3/10 inch and reads in half thousandths from 0-25-0. (Other types of dial indicators for this tool furnished upon request.) By means of the swivel post snug D the horizontal arm C is adjustable to any position or is easily removed for use in the tool post of a lathe. The right angle arm G-1 provides further adjustment. The base stops E and F clamp in the T-slot of the base to provide guides to permit checking from a beveled surface, keyway, T-slot, square edge, work plate, etc. The tool-post holder H is designed to permit the use of other parts such as the horizontal gage holding rod C, offset arm G-1, etc., in connection with the dial indicator, in lathe tool posts and various machine set-ups. The bushing L fits into the swivel post snug D reducing the hole size to ⅜ inch to facilitate clamping to surface gage spindles, etc.

No. 665	Dial Test Indicator, with all attachments, as shown, including finished wood case.....Price,
No. 665 A	Base.....Price,
No. 665 B	Upright Base Post, including clamping mechanism.....Price,
No. 665 C	Horizontal Gage Holding Rod, including clamping mechanism.....Price,
No. 665 D	Swivel Post Snug, complete.....Price,
No. 665 E	Base Stop, Square.....Price,
No. 665 F	Angular Base Stop or Keyway Guide.....Price,
No. 665 G-1	Offset Arm.....Price,
No. 665 H	Tool-Post Holder.....Price,
No. 665 L	Reducing Bushing for Post Snug (⅜-inch hole).....Price,

Packed 1 in a box.

No. 665 M

Metric

Same as above, except the dial indicator reads in hundredths of a millimeter (0-50-0) and the spindle travel is 7 mm.

No. 665 M—Metric Including finished wood case. Prices same as for No. 665.

Packed 1 in a box.

Indicator Attachments

CLAMP No. 665-G

Made to use with our No. 665 Combination Dial Test Indicator. Increases its utility in the inspection of jigs and fixtures, lining up vises, work on centers, machine platens, etc. Clamp capacity, about 3 inches. The swivel brass shoe on the screw prevents injury to a finished surface.

No. 665 G.....Price,

Packed 1 in a box.

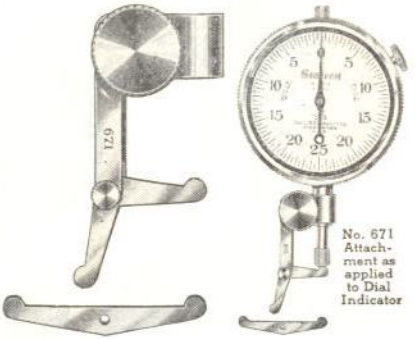
HOLE ATTACHMENT No. 670

Clamps on dial gage stem. Provides added utility around internal and external work.

No. 670.....Price,

Packed 1 in a box.

UNIVERSAL ATTACHMENT No. 671

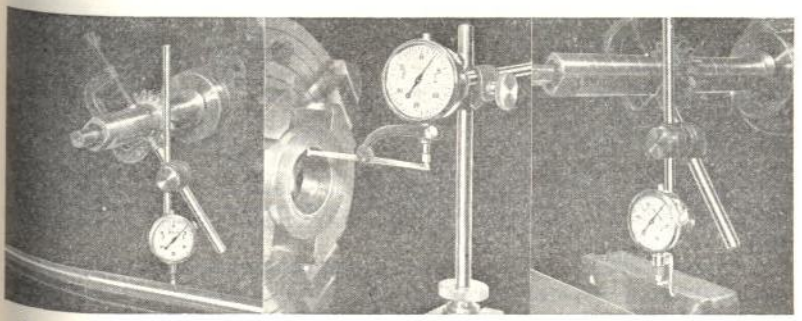


No. 671 Attachment as applied to Dial Indicator

Also clamps on the dial gage stem, the lever working against the spindle. Contacts work that the standard spindle cannot reach. Note the two interchangeable arms by means of tapered stud and held in position by a spring tension.

No. 671.....Price,

Packed 1 in a box.



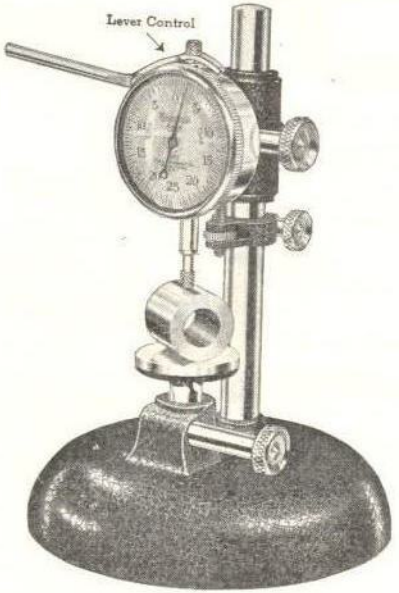
Showing simplicity of clamping indicator in place

Testing internal surface hard to reach with regular dial spindle

Testing the alignment of jaws on milling machine vise

Inspectors' Dial Bench Gage No. 654

With Sliding Head and Table



An excellent gage for measuring rubber, textiles, paper, metal parts, leather, veneer, mica, celluloid, cardboard, fabrics, etc. The dial is graduated to read by thousandths of an inch and reads from 0-25-0. (Will be furnished with other styles of dial gages upon request.) See our Dial Gage Catalog.

Has both lever and top control. The lever is pressed downward to lift the spindle and when released allows the spindle to make contact with the work and under a uniform tension regulated by a spring in the dial gage. The lever is positioned at the left but will be furnished to use at the right if desired.

The dial can be adjusted relative to 0; the range, $^{3}/_{10}$ inch. Bezel clamp not standard but furnished on request. The table ($1\frac{1}{2}$-inch diameter) is adjustable, as is also the dial gage head, and with the lateral and fine adjustment of the latter, the gage readily adapts itself to the job. Range, 0 to 3 inches. Base diameter, $5\frac{1}{2}$ inches. Height, 8 inches. Weight, approximately 6 pounds.

No. 654 In substantial wood case, fitted with our No.25B Dial Gage (as shown)..Price,

No. 654M—Metric Same as above, except dial gage is graduated to read by hundredths of a millimeter. Price same as for No.654.

Note: Special sizes and shapes of contact points and tables can be furnished upon request.

Dial Bench Gage No. 458

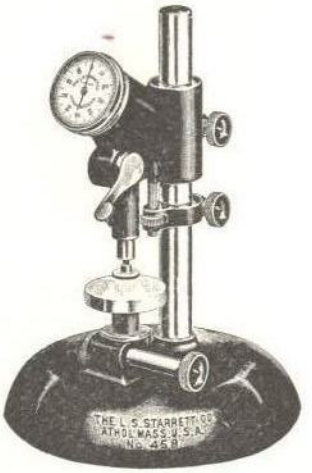
This gage was designed for bench use and has, with its many adjustments, a wide range of usefulness. Widths, thicknesses, etc., of duplicate parts of practically any shaped piece of metal, veneer, celluloid, paper, cardboard and various kinds of fabrics show quickly and directly on the dial. The dial is graduated to read by thousandths of an inch but variations of half thousandths are easily perceptible. With black figures against a white background it is easy to read.

To use: Place the piece to be duplicated or standard gage between the platen and adjustable contact point and turn the dial with the knurled rim so the hand is at 0. The work will, when gaging it, then show the number of thousandths it is over or under size. The platen and contact points are hardened, ground and lapped. The platen has about 1 inch adjustment; the complete head about $2\frac{1}{2}$ inches. There is also a fine adjustment of the head of about $\frac{5}{8}$ inch. With these adjustments and the movement of the dial contact point of easily $^{5}/_{32}$ inch, any reading by thousandths of an inch within its capacity, $2\frac{1}{2}$ inches, can be obtained.

Iron parts have black enamel finish, other parts bright.

The base is $5\frac{1}{2}$ inches diameter. The height of the gage set for maximum capacity is about 9 inches. Weight of gage, 6 pounds.

With 3 contact points. Sent in substantial wood case.



No. 458 Graduated to read by thousandths of an inch ....Price,
No. 458M—Metric Same as No.458, except that it reads in $^{1}/_{100}$ mm.....Price,

Dial Sheet Gage No. 170

Patented

Capacity, 0 to .150 by thousandths. Chrome plated

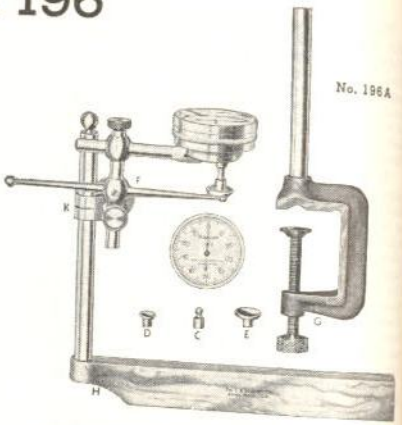
This gage is easily held with one finger through the ring and the thumb on the thumb-pad above. The gage was primarily designed to determine quickly and accurately the thickness of paper, and is also adapted to measure the thicknesses of steel, fibre, cloth, cardboard, celluloid, leather, etc.

Its operation is simple in the extreme. The movable contact point is raised by pressing the thumb down on the thumb-pad and inserting the piece to be measured, remove the thumb and the pressure of the spring holds the piece parallel with the contact points, registering on the dial the thickness in thousandths of an inch. By turning the knurled rim, the dial may be instantly moved to bring the hand to 0. The dial is figured 0, 5, 10, 15, etc., one revolution being 100 thousandths of one inch. The gage is about $1\frac{5}{8}$ inches high, $1\frac{1}{2}$ inches in diameter and 3 inches long. Weight, $4\frac{1}{2}$ ounces.

No. 170 Graduated to read by thousandths of an inch .....Price,
No. 170M—Metric Same as No.170, except that it reads in $^{1}/_{100}$ mm.....Price,
Case for either No.170 or No.170M, extra .....Price,
Sent with case unless otherwise ordered.
Packed 1 in a box.

Universal Dial Test Indicator
No. 196

No. 196B



No. 196A

Simple, reliable, easily read and very sensitive, it may be adjusted to any angle. The slightest pressure upon contact point produces a movement of the hand on the dial. Circumference of the dial divided into 100 equal spaces, each representing a movement of the contact point of one-thousandths of an inch. One revolution of the hand therefore indicates one-tenth of an inch, the capacity of the instrument being approximately two-tenths.

With the contact points D and E any exterior surface may be tested as in cutters, racks, etc., whereas the contact point C with its smaller radius and diameter should be used only on plain surfaces. By bringing the contact point against the work with just enough pressure to give the hand one full turn, then setting it at 0, an opportunity is given for one full revolution of the hand to both right and left at 0, showing a rise or drop in the work and the amount of variation. A most valuable feature is the adjustable dial. By turning the knurled rim the dial may be instantly moved to bring the 0 mark to any point desired in relation to the hand. Each indicator is fitted with three hardened contact points for different classes of work. The special tool-post holder and sleeve are useful in lathe work. For general work the indicator with sleeve K is adapted for use with our 9-inch or 12-inch surface gages. The clamp G permits attaching the indicator to large lathe and planer tools, milling arbors, etc. The attachment F more than doubles the value of the indicator, adapting it for use inside of holes, to reach over blockings on face plates, etc.

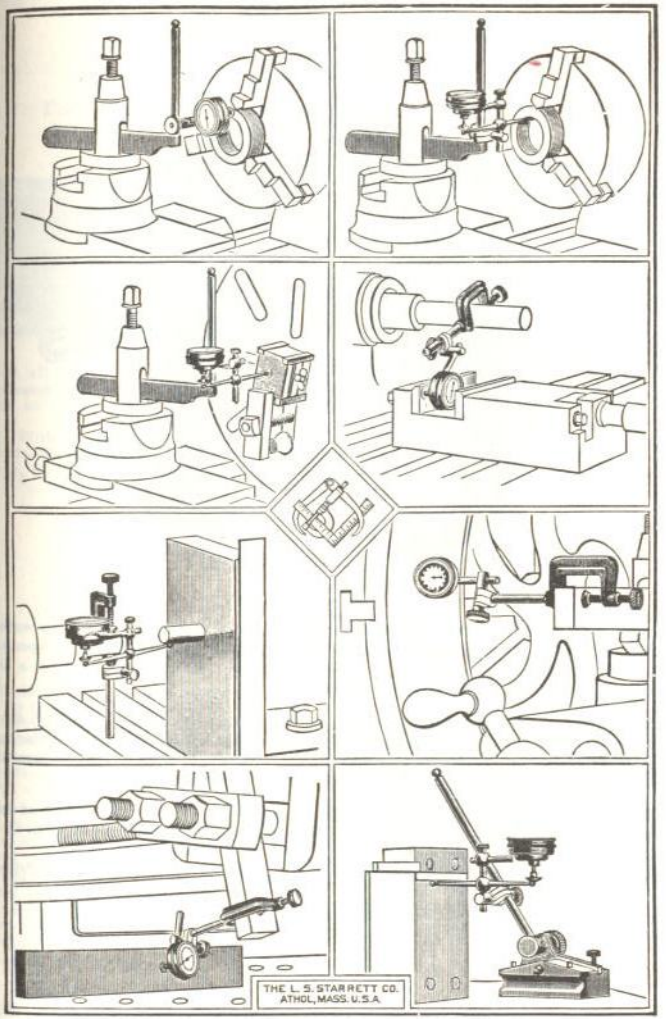
No. 196A Indicator, with all attachments, as shown ....Price,
No. 196B Indicator only, with 3 contact points, C, D and E ....Price,
No. 196F Hole Attachment ....Price,
No. 196G Clamp, $1\frac{5}{16}$-inch capacity, flat or round ....Price,
No. 196H Tool-Post Holder, $\frac{3}{8}$ x $\frac{3}{4}$ x 6 inches, with upright spindle ....Price,
No. 196K Sleeve complete, with $\frac{5}{16}$-inch hole for 9-inch spindle ....Price,
No. 196L Sleeve complete, with $\frac{3}{8}$-inch hole for 12-inch surface gage spindle. Not included with No. 196A ....Price,
Extra contact points, each..... .....Price,

No. 196A Indicator complete, sent unless otherwise ordered.

No. 196 Indicator can be furnished with dial readings 0-20-0 and 0-40 when so specified (at no extra cost).

No. 196M Metric

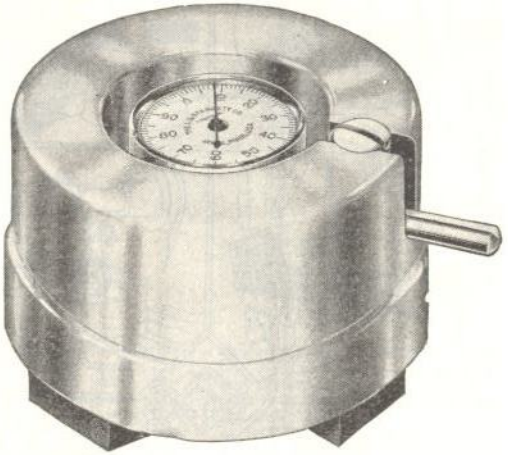
The same as No. 196, except that it reads in $\frac{1}{100}$ mm. Prices same as for No. 196.



A few applications of No. 196 Dial Test Indicator

Vibrometer No. 192

For Testing Amplitude of Vibration



This is a simple instrument for measuring the amplitude of vibration of steam or water turbine units or other similar machinery rotating at high speed and where vibration may hamper efficiency. The amplitude readings obtained at or near the bearings of a rotating machine are a significant indication of the existing dynamic balance of its rotor.

The dial indicator is set in a heavy metal retaining ring on the bottom of which are fastened three soft rubber shoes held in dove-tail grooves and are easily replaced. Such a contact provides a friction so when testing on an incline or contour the position of the vibrometer is retained. All parts are chromium and nickel plated to prevent rust.

The dial gage is removable to permit its use in numerous other ways independent of the mounting. Note also by turning the knurled rim how the hand is positioned in relation to 0.

No. 192 With case.....Price.

Write for complete descriptive circular covering this instrument.

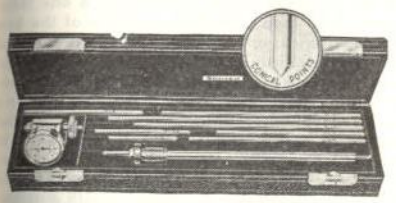
No. 192 M

Metric

No. 192 M—Metric Same as No. 192, except that it reads in $^1/_{100}$ mm. Price same as for No. 192.

Crank Shaft Distortion Dial Gage or Strain Gage No. 696

For Checking the Distortion of Engine Shafts and Frames



Dial registers by thousandths of an inch

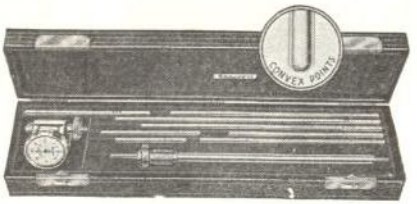
Range from 2¼ inches to 18 inches

An inside measuring gage where the dial registers by thousandths of an inch, which is used for checking the distortion of the webs of crank shafts. This distortion bears a direct relation to any existing misalignment or excessive wear of the bearings. The use of this gage makes it possible to check the bearing alignment or undue deflection of the shaft without having to dismantle the engine. Usable on all Diesel engine shafts as well as the center-crank shafts of any type of engine or compressor. This gage can also be applied as a strain gage on engine frames, while engine is in operation.

No. 696 With sharp points and with leather case.....Price,
No. 696 M—Metric The same as No. 696, except that it reads in $^1/_{100}$ mm.
Range, 58 mm. to 458 mm.....Price,

Inside Dial Gage No. 697

A Practical Gage for Inside Measurements



An inside measuring gage where the dial registers by thousandths of an inch. This is an excellent gage to use between two walls to quickly ascertain parellelism, also very useful in taking comparative measurements of internal diameters. The measuring contacts are made with convex ends.

The movement of the dial indicator is about $^5/_{32}$ inch and with the rods, the 8-inch extension, etc., provides a range from 2¼ to 18 inches.

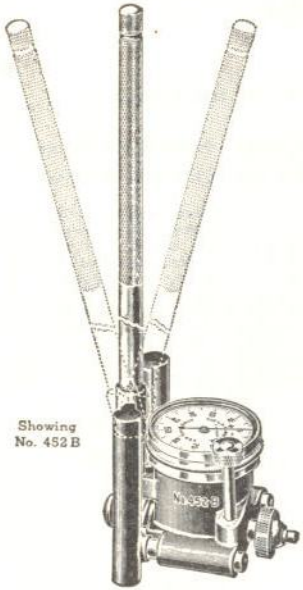
There are ten rods and one extension. The rods are marked to designate the approximate overall length of the gage. Indicator is provided with bezel or ring to adjust dial in relation to the hand and has a non-breakable crystal. The dial is graduated with wide divisions of thousandths of an inch and reads from 0 to .020 to 0, one turn equaling .040.

Rods of different lengths will be furnished upon request.

No. 697 With round points and with leather case.....Price,
No. 697 M—Metric The same as No. 697, except that it reads in $^1/_{100}$ mm.
Range, 58 mm. to 458 mm.....Price,

Write for complete descriptive circular covering these instruments.

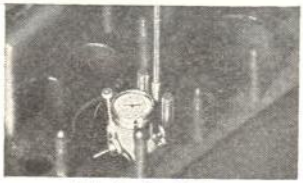
Cylinder Gages No. 452



Showing No. 452 B

Mechanics in motor service, re-grind and re-bore shops pronounce this the ideal gage for determining tapered, out-of-round or scored cylinders. No more difficulty in convincing a car owner the necessity of truing up cylinders. Use the gage before him; it shows him instantly the condition of the cylinders to a one thousandth part of an inch. After the variation of the bore has been determined, note the reading on the dial and transfer to an outside micrometer to find the diameter. This gage is of rugged construction and has a non-breakable crystal over the dial. The dial is mounted on a block which moves at right angles to the sled. The sled has two-line contact points which are at all times in alignment with the walls of the cylinder. Two contact points (hardened) which independently cause the hand to travel over the dial reading in .001 and with a unique double spring action make the gage self-centering and absolutely non-collapsible. Provisions for diameters varying from 1⅞ inches to 6 inches are made by the use of adjustable rods. These may be carried in the hollow handle of the gage. The dial is graduated to show plus or minus, one turn of the hand being .100. By turning the knurled rim the dial may be instantly moved to bring the 0 mark to any point desired in relation to the hand. Nickel plated.

Gage in Use



Using Locking Device

No. 452 A With rigid handle. Capacity, 2½ inches to 6 inches .....Price,

No. 452 M-A—Metric Same as No. 452 A, except that it reads in 1/100 mm. Capacity, 63 mm. to 150 mm. .....Price,

No. 452 B Similar to No. 452 A, with the following new features: Combination of Rigid or Toggle Handle, Locking Mechanism and Hardened and Ground Steel Sled. Capacity, 2½ inches to 6 inches .....Price,

No. 452 M-B—Metric Same as No. 452 B, except that it reads in 1/100 mm. Capacity, 63 mm. to 150 mm. .....Price,

No. 452 E Similar to No. 452 B, but with capacity from 2 1/10 inches to 6 inches, permitting its use in smaller cylinders .....Price,

No. 452 M-E—Metric Same as No. 452 E, except that it reads in 1/100 mm. Capacity, 54 mm. to 153 mm. .....Price,

No. 452 AA Junior size, similar to No. 452 E, but with capacity from 1⅞ inches to 2½ inches .....Price,

No. 452 M-AA—Metric Same as No. 452 AA, except that it reads in 1/100 mm. Capacity, 48 mm. to 63 mm. .....Price,

Write for complete descriptive circular describing these gages.

Handy Automotive Service Sets

In Finished Wood Cases

Set No. 914

Comprises — Price

No. 224 AA Micrometer, with R. S. and Standards
No. 452 B Cylinder Gage, with Locking Mechanism.

Per set, with case .....

Set No. 915

Comprises — Price

No. 224 A Micrometer, with R. S. and Standards
No. 452 B Cylinder Gage, with Locking Mechanism

Per set, with case .....

Set No. 916

Comprises — Price

No. 224 AA Micrometer, with R. S. and Standards
No. 452 B Cylinder Gage, with Locking Mechanism
No. 124 AH Inside Micrometer, with Handle.....
No. 172 B Thickness Gage .....

Per set, with case .....

Set No. 917

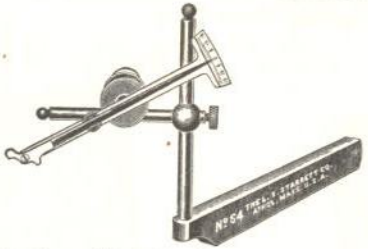
Comprises — Price

No. 224 A Micrometer, with R. S. and Standards
No. 452 B Cylinder Gage, with Locking Mechanism
No. 124 AH Inside Micrometer, with Handle.....
No. 172 B Thickness Gage.....

Per set, with case .....

Dependable Tools for Motor Reconditioning Work.

Universal Test Indicators No. 64

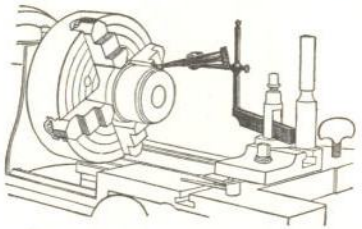


As applied to Surface Gage

This indicator may be used to test inside, outside or surface work. It can be instantly attached to the spindle or the scriber of any surface gage, and used to show the slightest variation in thousandths. It may be clamped to a flat or round support, up to ⅜ inch flat or round. A holder, as shown in cut, is designed to go in the tool-post of a lathe, adapting it for use to show the accuracy of all sorts of lathe work turning, chucking, or locating and centering work on face plate. It is particularly adapted to truing up toolmakers' buttons, as it can be moved with the carriage of a lathe testing the button its full length. The head of the needle has three working points, equally distant from its fulcrum, so that the needle will vibrate, reading in thousandths, when work is in contact with either point—in front, above or below it. When in front, the spring operating the needle needs to be reversed to throw the point of the needle up instead of down as when used above or below the work. This may be instantly done by a slight turn of the knurled disc to which the vibrating spring is attached. The working parts of the head are hardened. In setting the indicator, bring the contact point against the work so that the needle will point to 0, when any variation either way will show. The scale is graduated to read .015 inches on each side of 0.

No. 64 A Indicator, with Tool-Post Holder and Arm complete .....Price,
No. 64 B Indicator only .....Price,
No. 64 C Tool-Post Holder, ⅜ x ¾ x 6 inches, with upright spindle .....Price,
No. 64 D Tool-Post Holder, with upright spindle and with arm .....Price,

No. 64 A sent unless otherwise ordered.

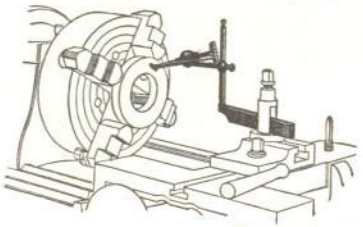


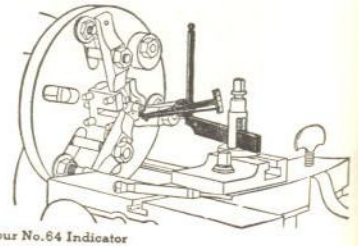
No. 64 M

Metric

The same as above, except that it is graduated to show variations of 1/50 of a millimeter. Prices same as for No. 64.

Above numbers packed 1 in a box.





Showing a few applications of our No. 64 Indicator

Center Tester No. 65

This instrument was designed to use in adjusting and locating centrally any point or hole in a piece of work operated upon in a lathe chuck or on a faceplate; also to test the truth of lathe centers or a shaft between the centers, the instrument being held in the tool posts.

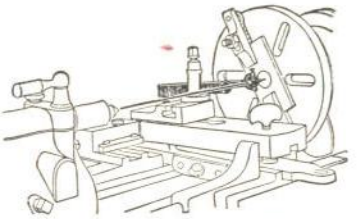
This tester is of improved design and well-finished.

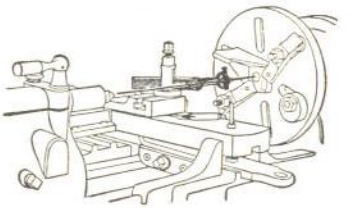
Steel Ball

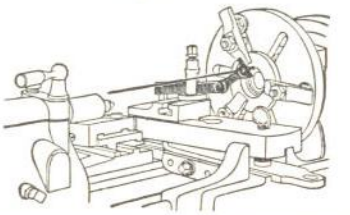
The indicating needle is 12¾ inches long when jointed together, magnifying greatly the slightest movement at the indicating point, and being in two sections it may be carried in the mechanic's kit conveniently. The needle also passes through the ball, having a split stem, forming a chuck for holding it, that it may be adjusted to any desired length. The ball is pivoted to form a universal joint but may be instantly converted into a single joint for vertical motion by merely tightening the knurled nut, adapting it for both inside and outside surface contact. A steel ball about .175 inch in diameter slips over the point of the needle for inside work. The instrument is joined to a tool-post shank by a flexible steel ribbon with sufficient spring to properly hold the needle in contact with the work. The steel ribbon may also be adjusted by loosening the knurled nut holding it to the shank. This is an added feature readily appreciated, as the point to be indicated often is greater than the adjustment attained on the cross rest of a lathe. It is a tool needed in every up-to-date tool room.

No. 65 .....Price,

Packed 1 in a box.

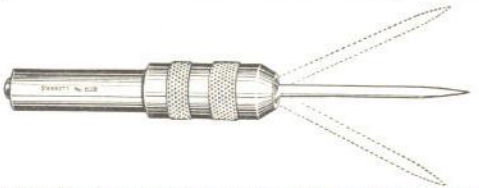






Showing a few applications of our No. 65 Center Tester

"Wiggler" or Center Finder No. 828



For jig and tool work; locating working points in milling and vertical machines, drill presses, etc. Pointer is tensioned against spring so when guided to true concentric, work is brought to perfect alignment with machine spindle. Screw in back of shank varies tension on ball of pointer. Point is protected by telescoping in body when not in use.

Length when closed, 2⅜ inches; when open, 4⅛ inches; shank diameter, ⅜ inch.

No. 828 .....Price, each.

Packed 1 in a box.

Screw Pitch Gages

If not known, the pitch of a thread may be readily determined by comparison with the standards given on our improved screw pitch gages. On the edge of the thin leaves there are teeth corresponding to standard thread sections and by placing leaves successively over the thread, some one leaf will coincide or mesh with the thread, when the pitch can be read from the stamping on the leaf.

The free end of the leaf is made narrow, permitting it to be inserted in a small nut so that either outside or inside threads may be compared.

Our screw pitch gages are stamped on each leaf with decimals to show the double depth of thread, which, of course, equals the depth of threads on the two sides of a tap having the same pitch. This enables the workman to determine what size of drill must be used to leave a full V thread for a tap having the same pitch. To do this, caliper with a micrometer over the threads of the tap and from its size in thousandths shown, deduct those decimals given on the pitch gage leaf which agree with the pitch of the tap. The result will show in thousandths the size of drill needed for a full thread. Allowance is to be made for the amount the thread is to be flattened.

Formulas

For depth of threads for V thread: $d = D - \frac{1.733}{N}$

For U. S. Standard: $d = D - \frac{1.299}{N}$

D = Outside diameter of tap. d = Bottom diameter of tap. N = Number of threads per inch.

No. 40

22 Pitches, 9 to 40, V Thread
With 11½ and 27 Pipe Thread Pitches

The gage has 22 pitches, viz.: 9, 10, 11, 11½, 12, 13, 14, 15, 16, 18, 20, 22, 24, 26, 27, 28, 30, 32, 34, 36, 38, 40.

No. 40 .....Price,

No. 4

24 Pitches, 4 to 30, V Thread

Has the following pitches: 4, 4½, 5, 5½, 6, 7, 8, 9, 10, 11, 11½, 12, 13, 14, 15, 16, 18, 20, 22, 24, 26, 27, 28, 30. The teeth are sharp and clean cut. Like our No. 40, it can be used inside of a nut as well as on the outside of a screw or bolt. It is also a convenient and reliable tool to use as a 60-degree center gage and gage to test the grinding of either an inside or outside threading tool.

No. 4 .....Price,

No. 5

26 Pitches, 32 to 82, V Thread

Of the same form as our No. 40 Screw Pitch Gage, for inside and outside work. Has the following pitches: 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82.

No. 5 .....Price,

Above numbers packed 1 in a box; 6 boxes in a carton.
For Positive Stop Thread Gages, see page 165.

Screw Pitch Gage No. 6

30 Pitches, 4 to 42, V Thread

Of the same form as our No. 4 Screw Pitch Gage. Has the following pitches: 4, 4½, 5, 5½, 6, 7, 8, 9, 10, 11, 11½, 12, 13, 14, 15, 16, 18, 20, 22, 24, 26, 27, 28, 30, 32, 34, 36, 38, 40, 42.

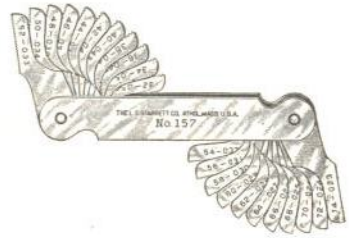
No. 6 .....Price,

Bicycle Screw Pitch Gage No. 157

22 Pitches, 32 to 74, V Thread

Has 22 pitches. Similar in design to No. 40. It is made for the use of bicycle manufacturers, electricians, and others using screws with fine V threads.

It has the following pitches: 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74.



No. 157 .....Price,

Screw Pitch Gage No. 155

For American National, U. S. and S. A. E. Standards

27 Pitches, 2¼ to 28

This gage has 27 pitches, viz.: 2¼, 2⅜, 2½, 2⅝, 2¾, 2⅞, 3, 3¼, 3½, 4, 4½, 5, 5½, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 18, 20, 24, 28.

Also a center gage with coarse and fine notch.

No. 155 .....Price,

Whitworth Screw Pitch Gage No. 7

26 Pitches, 4 to 60

Has the following pitches: 4, 4½, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 18, 19, 20, 22, 24, 25, 26, 28, 30, 32, 40, 48, 60.

No. 7 .....Price,

For Whitworth Standard Thread only.

Above numbers packed 1 in a box; 6 boxes in a carton.
For Positive Stop Thread Gages, see page 165.

Metric Screw Pitch Gage No. 156

28 Pitches, .25 to 2.50

This gage is similar in design to our No.40, with V thread.

The base of this system is one millimeter, and the blades are stamped with the pitch, or the distance from the center of one tooth to the center of the next, expressed in millimeters or fractional parts thereof.

It has the following pitches: .25, .30, .35, .40, .45, .50, .55, .60, .65, .70, .75, .80, .85, .90, 1, 1.10, 1.20, 1.25, 1.30, 1.40, 1.50, 1.60, 1.70, 1.75, 1.80, 1.90, 2, 2.50, that is, from ¼ millimeter up to 2½ millimeters.

No. 156.....Price,

International Standard Screw Pitch Gage No. 158

17 Pitches, 0.5 to 7

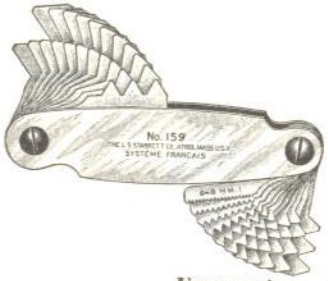
It is made after the French system adopted by the Society for Encouragement of National Industries.

The leaves are stamped to show, on the same leaf, in millimeters, both the pitch and the diameter of bolt.

The gage contains the following pitches: 0.5, 0.75, 1, 1.25, 1.5, 1.75, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5 and 7 millimeters. This gage also contains a center gage with coarse and fine notches, for use in grinding thread tools.

No. 158.....Price,

Metric Screw Pitch Gage No. 159



22 Pitches, 1 to 11.5

This gage is somewhat similar to our No.158. The angle is the same, viz., 60°, but it has more pitches than the No.158. The diameter of screw or bolt is stamped on the leaves as well as the pitch in millimeters.

The gage contains the following pitches: 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9, 9.5, 10, 10.5, 11, 11.5.

No. 159.....Price,

Above numbers packed 1 in a box; 6 boxes in a carton.

For Positive Stop Thread Gages, see page 165.

Positive Stop Screw Pitch Gages No. 473

Patented

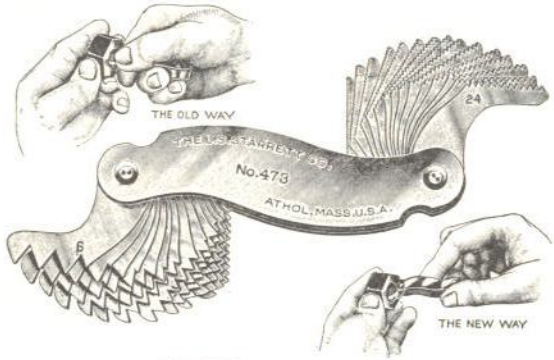
30 Pitches, 6 to 60, V Thread With 11½ and 27 Pipe Thread Pitches

This gage has a positive stop which holds the leaves in a fixed and convenient position for use.

It has 30 pitches from 6 to 60 inclusive, as follows:

6, 7, 8, 9, 10, 11, 11½, 12, 13, 14, 15, 16, 18, 20, 22 in one end of the case; 24, 26, 27, 28, 30, 32, 34, 36, 38, 40, 42, 48, 50, 56, 60 in the other.

The number of the pitch is stamped on the right side of each leaf.



No. 473.....Price,

No. 475

Patented

26 Pitches, V Thread

This gage is similar in design to the No.473 but larger and has coarse pitches containing 26 leaves with pitches as follows:

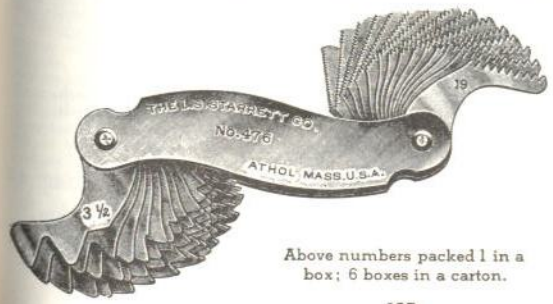
3½, 4, 4½, 5, 5½, 6, 7, 8, 9, 10, 11, 11½, 12 in one end of the case; 13, 14, 15, 16, 18, 20, 22, 24, 26, 27, 28, 30, 32 in the other.

No. 475.....Price,

No. 476

Patented

30 Pitches, 3½ to 60, Whitworth Standard



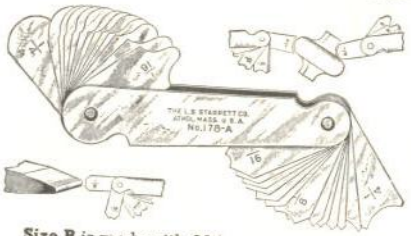
This gage is put up in the same size case as the No.473 and contains 30 leaves with pitches as follows:

3½, 4, 4½, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 18 in one end of the case; 19, 20, 22, 24, 25, 26, 28, 30, 32, 36, 40, 44, 48, 50, 60 in the other.

No. 476.....Price,

Above numbers packed 1 in a box; 6 boxes in a carton.

Fillet or Radius Gage No. 178



This gage may also be described as a concave and convex gage, and is especially adapted for use in laying out special forming tools, dies, etc., as well as for measuring fillets. The illustrations show a few of the ways in which the gage can be used. We recommend it for the use of machinists, toolmakers, and screw machine operators, as well as pattern makers.

Size A has 30 leaves stamped to indicate radii by 64ths, from 1/32 to 1/4 inch (one-half diametric size). Diameters are from 1/16 to 1/2 inch, varying by 32nds.

Size B is made with 32 leaves stamped to indicate radii by 64ths, from 17/64 to 1/2 inch. Diameters are from 17/32 to 1 inch, varying by 32nds. The style of case for size B is the same as that of No.155 Screw Pitch Gage, page 163.

No. 178 A ..... Price, each,
No. 178 B ..... Price, each,

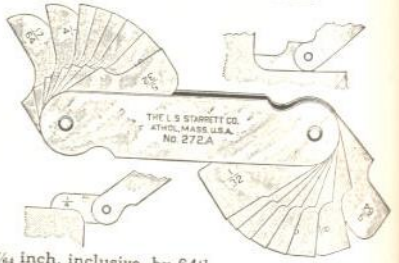
No. 178 M Metric

Metric. Size A has 34 leaves: 1, 1.25, 1.5, 1.75, 2, 2.25, 2.5, 2.75, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7 mm. **Size B** has 32 leaves: 7.5, 8, 8.5, 9, 9.5, 10, 10.5, 11, 11.5, 12, 12.5, 13, 13.5, 14, 14.5, 15 mm.

No. 178 M-A ..... Price, each,
No. 178 M-B ..... Price, each,

Fillet or Radius Gage No. 272

This gage is similar in design to our No.178 and affords means of obtaining the radii of fillets, corners, etc., as shown by the illustrations. Each blade is stamped with the radius in 64ths, the external being on one side and the internal on the other. It can be used in any position or at any angle, the formation allowing it to be used up to a shoulder, and for duplicating sample pieces. The studs holding blades in place are eccentric with the round end of case. This is of advantage as when the gage is opened the edge of case stands well away from the edge of the leaves.



Size A has 16 leaves, with radii from 1/32 to 17/64 inch, inclusive, by 64ths.
Size B has 16 leaves, with radii from 9/32 to 33/64 inch, inclusive, by 64ths.

No. 272 A ..... Price, each,
No. 272 B ..... Price, each,

No. 272 M Metric

Metric. Size A has 18 leaves: .75, 1, 1.25, 1.5, 1.75, 2, 2.25, 2.5, 2.75, 3, 3.25, 3.5, 3.75, 4, 4.25, 4.5, 4.75, 5 mm.
Size B has 16 leaves: 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9, 9.5, 10, 10.5, 11, 11.5, 12, 12.5, 13 mm.

No. 272 M-A ..... Price, each,
No. 272 M-B ..... Price, each,

Above numbers packed 1 in a box; 6 boxes in a carton.

Fillet or Radius Gage No. 279

This cut shows a radius gage similar in design to our No.272, except that it has twenty leaves with radii from .020 to .400 inch inclusive. Nine leaves have concave and convex radii from .020 to .100 inclusive by .010 inch, four leaves with concave and convex radii from .125 to .200 inclusive by .025 inch, one leaf with concave and convex radii of .250 inch, three leaves with concave radii only from .300 to .400 inclusive by .050 inch and three leaves with convex radii only from .300 to .400 by .050 inch.

No. 279 ..... Price,

Packed 1 in a box; 6 boxes in a carton.

Ball or Radius Gage No. 710

Specially for Die Sinkers

A compact gage readily applicable to checking, roughing or finished cutters used by die sinkers. Includes diameters in steps of 32nds from 1/8 inch to 1 inch: this range covering, in the main, a die sinker's requirements. Heretofore mechanics needing a full diameter were compelled to make special gages as they were needed. The gage while not hardened is made of a specially tough steel. Has bright finish with diameter sizes legibly marked. Approximate dimensions, 1/20 inch thick, 1¾ inches wide and 11⅜ inches long.

No. 710 ..... Price,

Packed 1 in a package.

Angle Gage No. 466

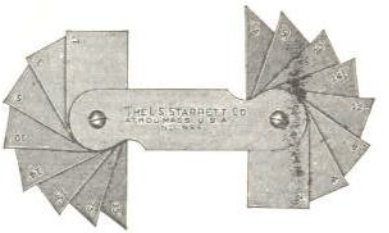
Patented

This gage contains eighteen leaves, the ends being ground on an angle to degrees.

The leaves are of spring tempered steel and their two sides, as well as the angle edge, are ground.

A convenient tool and time saver and, in many instances, takes the place of a protractor. Useful to inspectors, toolmakers and die sinkers, when drop-forged dies are made. Embodies a combination of angles most frequently used, including 14½° or ½ the Acme Standard (29° included angle). The gage is about 9/32 inch thick, 1 1/16 inch wide and 4 3/16 inches long.

Angles are as follows: 1°, 2°, 3°, 4°, 5°, 7°, 8°, 9°, 10°, 12°, 14°, 14½°, 15°, 20°, 25°, 30°, 35°, 45°.



No. 466 ..... Price,

Packed 1 in a box.

Thickness Gage No. 78

The Popular Priced Gage for the Automotive Trade

Has six leaves: .0015, .002, .003, .004, .006 and .015 inch thick. With one leaf or in combination with others the range by thousandths is .0015 to .031. Screw and stud simplifies substitution of new leaf for a damaged one. Case to protect all leaves from bad bends. Eyelet to carry on ring.

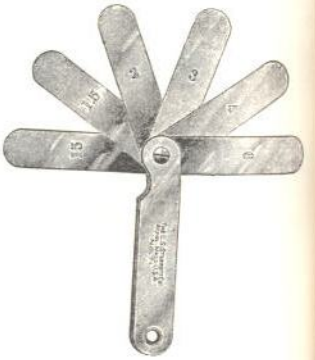
No. 78.....Price, each,

Packed 12 in a box; 6 boxes in a carton.

Also supplied on display card—12 gages on card.

Thickness Gage No. 71

The thickness or feeler gage illustrated contains the following leaves: .0015, .002, .003, .004, .006 and .015 inch. This combination of leaves permits the adjustment of tappets on motors and the gaging of slots from .0015 to .031. The leaves fold neatly in a metal case, thereby protecting the leaves from kinks, and any leaf may be easily replaced by removing the screw stud acting as a pivot. At the opposite end of the case is an eyelet whereby this gage may be carried on a ring or hung from a hook.



No. 71.....Price, each,

Packed 12 in a box.

Ignition Spacing Gage No. 571

For Ignition Spacing and Distributor Work

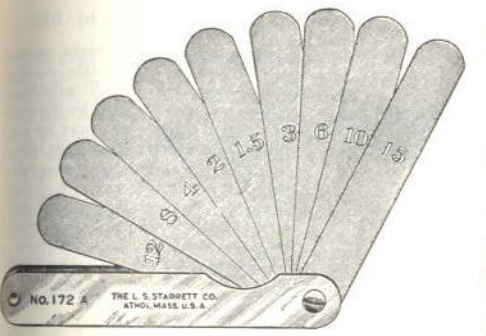
An accurate, properly formed, marked and finished gage for the ignition phase of the automobile field. For auto-electricians, testers and mechanics specializing in engine tune-up and distributor adjusting. Nine tapered leaves of thicknesses to cover the range, whether for spark plugs or breaker points which eliminates the use of two or more leaves, thus lessening the chance of errors in accurate spacings. The thicknesses of the leaves are as follows: .010, .012, .015, .018, .020, .022, .025, .030 and .035 inch. All leaves are suitably hardened. Length, about 2 1/16 inches. Width at large end, 3/8 inch; at small end, 3/16 inch.

The leaves are easily replaced by removing the screw stud from the end.

No. 571.....Price, each,

Packed 1 in an envelope; 6 in a box.

Thickness Gages No. 172



This gage is particularly popular with machinists and toolmakers in gaging narrow slots, as well as with the motor mechanic in adjusting the air gap for the valves on motors.

Size A has nine leaves, viz.: .0015, .002, .003, .004, .006, .008, .010, .012 and .015.

Sizes B and C have eight leaves the same as **A** with the omission of .0015.

The leaves are tempered and have the thickness marked upon them.

Size A is made with either straight leaves as shown here or with tapering leaves as shown in No. 172 M. Sent with straight leaves unless otherwise ordered.

Sizes B and C are made with tapering leaves only, as shown in No. 172 M.

Sizes D and E have eight (straight) leaves, viz.: .002, .003, .004, .005, .006, .008, .010 and .015. As with all our thickness gages, when any leaf becomes impaired it can easily be replaced.

No. 172 A Leaves, 3 1/16 inches long, ½ inch wide.....Price, each,
No. 172 B Leaves, 4½ inches long, ½ inch wide.....Price, each,
No. 172 C Leaves, 6 inches long, ½ inch wide.....Price, each,
No. 172 D Leaves, 9 inches long, ½ inch wide.....Price, each,
No. 172 E Leaves, 12 inches long, ½ inch wide.....Price, each,

Size A will be sent unless otherwise ordered.

Sizes A, B and C—Packed 1 in a box; 6 boxes in a carton.
Size D—Packed 6 in a box. Size E—Packed 3 in a box.

No. 172 M Metric

These gages have nine tapered leaves, tempered, and marked in 100ths of a millimeter as follows: .04, .05, .06, .07, .08, .10, .15, .20 and .30.

No. 172 M-A Case, 8 cm. long x 8 mm. wide; leaves, 7 cm. long x 8 mm. wide..Price, each,
No. 172 M-B Case, 12 cm. long x 8 mm. wide; leaves, 11 cm. long x 8 mm. wide..Price, each,
No. 172 M-C Case, 16 cm. long x 8 mm. wide; leaves, 15 cm. long x 8 mm. wide..Price, each,

No. 172 M-A sent unless otherwise ordered. Packed 1 in a box; 6 boxes in a carton.

Starrett

Thickness Gage No. 72

22 Leaves, .004 to .025

This gage has 22 leaves, varying in thickness by thousandths, running from .004 to .025 inch. The thickness of each leaf is designated by the number upon it. Each leaf may be used singly or in combination with others, and any thickness in thousandths within their limits may be quickly obtained. The leaves are ½ inch wide by 2 5/16 inches long and fold within the case, which is 2¾ inches long, a convenient size to carry in the pocket.

No. 72.....Price,

No. 72 M Metric

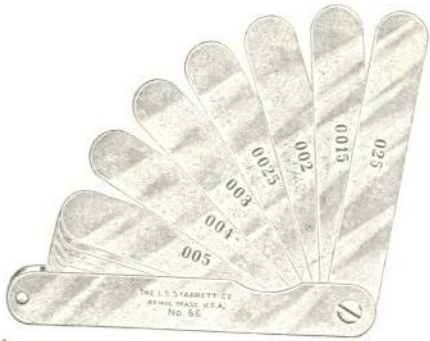
This gage has twelve leaves, varying in thickness by 100ths of a millimeter and running from .04 of a millimeter to 3 millimeters. The thickness of each leaf is designated by the number upon it. Similar to No. 72 above, except that the leaves are 3 inches long.

No. 72 M.....Price,

Above numbers packed 1 in a box; 6 boxes in a carton.

Thickness Gage No. 66

With .0015 and .0025 Leaves



This gage has 26 leaves, ½ inch wide, 3 1/16 inches long, of the following thicknesses: .0015, .002, .0025, .003, .004, .005, .006, .007, .008, .009, .010, .011, .012, .013, .014 .015, .016, .017, .018, .019, .020, .021, .022, .023, .024, .025.

Overall length of gage when open, 6¼ inches.

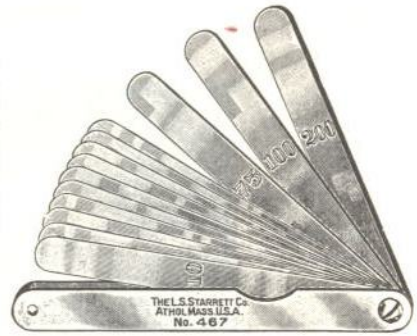
No. 66.....Price,

Packed 1 in a box; 4 boxes in a carton.

Starrett

Thickness Gages No. 467

This gage contains thirteen leaves as follows: .0015, .002, .003, .004, .006, .008, .010, .020, .030, .040, .075, .100 and .200. Each leaf is about 4½ inches long, ½ inch wide, and clearly marked to show thickness. Many combinations by thousandths of an inch are possible. A handy gage for measuring space within its capacity, where standard gages and other types of tools for such work are not available.



No. 467.....Price,

No. 467 M

Metric

Same as No. 467, except that leaves are marked as follows: .04, .05, .06, .07, .08, .10, .15, .20, .30 mm., 1, 2, 3 and 5 mm.

No. 467 M.....Price,

Packed 1 in a box.

Thickness Gage Holders

For Automobile Mechanics

No. 806

Patented

No. 806 D

Patented

Holds single leaves and strips of any thickness from .0015 to .025 inch. A "feeler," defective from use, can be snipped off and withdrawn until entirely used up.

The holder is about 3/32 inch thick, 9/16 inch wide and 5¼ inches long. It has dull nickel finish.

Six-inch leaves, in combination with the holder, give a range for all general purposes on aeroplane, automobile, truck, tractor, motor boat or motorcycle.

No. 806 Holder only. Clamps stock at one end.....Price,
No. 806 D Holder only. Clamps stock at both ends.....Price,

Packed 6 in a box.

Feeler Stock No. 667

12-inch Lengths

Popular Priced

Convenient Lengths

Rounded Ends

No Ragged Edges

No. 667 Display Assortment

Consists of a box (12 pieces) of nine different popular sizes packed in attractive display carton. Twelve pieces of a size in a box, each piece in individual envelope. Extra box for odd pieces. Sizes as follows:

Size	Price per Foot	Size	Price per Foot
.0015		.008	
.002		.010	
.003		.012	
.004		.015	
.006			

Complete Display Assortment of above sizes,

Starrett Feeler Stock has become a necessity in the automotive field. Equally as important to the manufacturer as to the service stations where accurate fit means so much to insure quiet running motors. For setting valve tappets, ignition points, ring groove clearance, gear play, fitting pistons, adjusting spark gap, etc. Starrett Feeler Stock is recognized as the standard for accuracy. Even in the shop it is commonly used in experimental work by toolmakers and machinists.

Made in Popular Thicknesses as follows: *

Thickness	.0015	.002	.003	.004	.005	.006	.007	.008	.009	.010	.012	013	.015
Price, per foot													

Packed: 12 pieces of a size in a box, each piece in individual envelope.

* Many other thicknesses (not shown here) can be supplied if desired. Prices on application.

Furnished in convenient 12-inch pieces, each piece marked with its thickness, both ends nicely rounded with no ragged edges. To prevent stain and rust spots from handling, each piece is contained in an individual envelope. Each envelope is correctly marked to show thickness of the pieces enclosed. The Specially Designed Boxes are particularly convenient for the dealer.

Thickness Gage or Feeler Stock No. 666

25-Foot Rolls in Compact Cases

Recommended for Larger Shops

This roll stock is ½ inch wide and marked every 6 inches with a line STARRETT and thickness in thousandths. This enables accurate cutting, no waste, at the tool crib for the workman, or for sale at the jobber's. Simply snip off the length desired. Compact case about ¾ inch thick and 3½ inches in diameter.

Used for gear play, fitting pistons, ring groove clearance, spark gaps, valve tappet clearance, etc.

No. 666	Price of Complete 25-Foot Roll
25 feet of .0015	
25 feet of .002	
25 feet of .003	
25 feet of .004	
25 feet of .005	
25 feet of .006	
25 feet of .007	
25 feet of .008	
25 feet of .010	
25 feet of .015	

Use our **Nos. 806** and **806 D** with this stock.

Described on page 171.

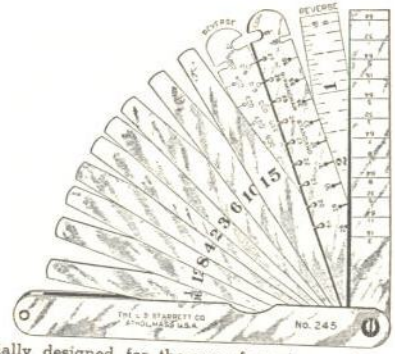
No. 666 M

Metric

Furnished in Metric Thicknesses equivalent to the above thicknesses listed in thousandths. Length of Metric Rolls in case—8 Meters. Prices same as for No. 666. Other Metric Thicknesses quoted on application.

Engineers' Taper, Wire and Thickness Gage No. 245

Patented



This gage is especially designed for the use of marine engineers, machinists and others desiring a set of gages in compact form.

The taper gage shows the thickness in 64ths to 3/16 of an inch on one side, and on the reverse side is graduated as a rule 3 inches of its length, reading in 8ths and 16ths of an inch.

The wire gage, English Standard, shows on one side sizes numbered from 19 to 36, with two extra slots, one 1/16, the other 1/8 of an inch, and on the reverse side shows the decimal equivalents expressed in thousandths. This gage has also 9 thickness or feeler gage leaves, approximately 4½ inches long, of the following thicknesses: .002, .003, .004, 006, .008, .010, .012, .015 and 1/16 of an inch all folded within the case, which is 4¾ inches long, convenient to handle or to carry in pocket.

No. 245 .....Price,

No. 245 M Metric

The same as our No.245, except that it reads in Metric measurement. Prices same as for No.245

Above numbers packed 1 in a box.

Taper Gage No. 270

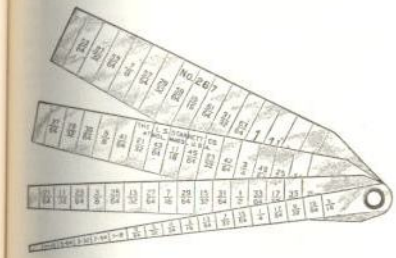
This steel taper gage is primarily valuable on bearing work and gaging slots. It is made of tool steel 7/16 inch wide and 6¼ inches long. One side is graduated to read from .010 inch to .150 inch by thousandths of an inch while the reverse side is graduated to read from 1/10 mm. to 4 mm. by 1/20 mm.

No. 270.....Price,

Packed 1 in a box.

Taper Gages No. 267

Specially Adapted for Tubing Gage



The thin leaves of this gage are tapering, the width varying by 1/64 inch to every ¼ inch of their length. They are graduated in ¼ inches and figured to read in fractions of an inch from 1/16 inch up to 1 1/16 inch. The gage is designed for brass and steel tube manufacturers for inside measurements, and it is also very convenient for mechanics' use to measure the width of slots and size of holes in nuts drilled for tapping. It is also useful for setting calipers to sizes within its capacity.

No. 267 .....Price,

No. 267 M

Metric

The same as our No.267, except that it is graduated in millimeters to read from 1.5 millimeters to 27 millimeters by ½ millimeters. Price same as our No.267.

Taper Gages No. 269

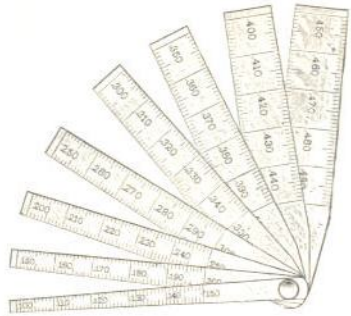
Reading in Thousandths of an Inch

These gages are recommended by mechanics for their wide scope and general utility. They are useful in determining the size of holes in dies, etc. They are made from spring-tempered stock .012 inch thick.

No. 269 A is 2½ inches long, and is graduated to read from 1/10 to ½ inch in thousandths of an inch.

No. 269 B is 2¾ inches long, and is graduated to read from ½ to 1 inch in thousandths of an inch.

No. 269 A With 8 leaves .....Price,
No. 269 B With 10 leaves .....Price,



Above numbers packed 1 in a box.

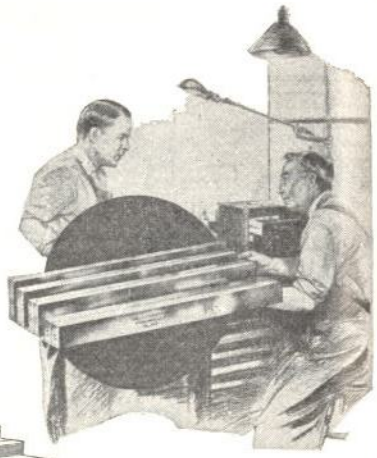
Hardened and Ground Tool Steel Parallels No. 384

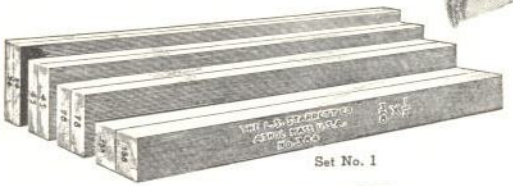
If you are doing much checking or lay-out work you will find that a set of Starrett Parallels will come in mighty handy.

On machine platens and face plate set-ups, for milling, grinding and shaper vises—in fact, for many applications around the shop, they are indispensable.

Ground and finished in pairs of six-inch lengths. They are supplied in individual pairs or in standard sets of four pairs each, which will give you a wide variety of practical working combinations.

For equipment in tool rooms and machine shops or for the individual mechanic, one or more pairs of parallels are of great value.





Set No. 1

Set No. 2

We do not aim to list the many sizes necessary to meet the various opinions among mechanics as to what dimensions are best, but we have standardized eight pairs of parallels, any one of which we believe a good addition to the mechanic's tool box. The sets as listed below make possible many combinations. There are many vises where one set or the other can be used to good advantage.

These parallels are made from a special grade of tool steel hardened and nicely ground on the four sides.

THEY SHOULD BE PURCHASED ONLY IN PAIRS.

As shown by the cuts, they are numbered on the ends in pairs and their relative accuracy is held to extremely close limits. Made in 6-inch lengths only.

THEY ARE NOT MADE TO BE USED AS SQUARES.

Catalog No.	Thickness, Inches	Width, Inches	Price, per Pair	Catalog No.	Thickness, Inches	Width, Inches	Price, per Pair
No. 384 A	1/8	1		**No. 384 E**	1/4	3/4	
No. 384 B	1/8	1 3/16		**No. 384 F**	1/4	1	
No. 384 C	3/16	7/8		**No. 384 G**	3/8	1/2	
No. 384 D	3/16	1 1/8		**No. 384 H**	3/8	3/4	

Set No. 1—4 pairs, consisting of sizes A, C, E and G .....
Set No. 2—4 pairs, consisting of sizes B, D, F and H .....

Packed, each size, 1 pair in a box; also 1 set in a box.

Note: Prices for sizes other than listed quoted on application.

Adjustable Parallels No. 154

These parallels will be found very convenient for use in connection with milling, planer and shaper vises, taking the place of the large number usually required, also for leveling up work on a planer, drill press, etc. They will be found valuable as a support for grinding or milling of square or hexagonal stock on centers, as they may be adjusted and locked to micrometer measurements from 3/8 to 2 1/4 inches.

	Length	Thickness	Capacity	Price, Each
No. 154 A	1 3/4 inches	9/32 inch	From 3/8 inch to 1/2 inch	
No. 154 B	2 1/8 inches	9/32 inch	From 1/2 inch to 11/16 inch	
No. 154 C	2 11/16 inches	9/32 inch	From 11/16 inch to 15/16 inch	
No. 154 D	3 9/16 inches	9/32 inch	From 15/16 inch to 1 5/16 inches	
No. 154 E	4 3/16 inches	9/32 inch	From 1 5/16 inches to 1 3/4 inches	
No. 154 F	5 1/16 inches	9/32 inch	From 1 3/4 inches to 2 1/4 inches	

Packed 1 in a box.

Hold Downs No. 54

Hold downs are used to hold work down flat as on a machine platen or in a vise where a small amount is removed from a surface, etc., and where other methods of clamping are inconvenient. Work can be securely held without distortion. The contact edges are slightly tapered so as to force the base of the work to the bed of the machine. These hold downs are made of tool steel, hardened and ground.

No. 54 A 4 inches long by 23/32 inch wide .....Price, per pair,
No. 54 B 5 inches long by 27/32 inch wide .....Price, per pair,
No. 54 C 6 inches long by 27/32 inch wide .....Price, per pair,

Packed 1 pair in a box.

Toolmakers' Steel Clamps No. 160

These clamps are made from drop-forgings, nicely finished, case-hardened, and have take-up blocks to slip on and off end of screw, and are held to same in a novel manner, allowing slight swivel to the adjustable jaw thereby conforming to shape of the piece to be drilled, holding it secure. They will hold work square and parallel for laying out on surface plates, fitting or drilling. A round piece may be rigidly held in two of the clamps and drilled central and parallel. Put up and sold in pairs. With the small block in use, the capacity of the smaller clamp is a little over one inch, and that of the larger clamp two inches. Has hole in block to insert screw, so that the block may be fastened to the bench, and used as a small vise.

No. 160 1-inch, 2 clamps.....Price, per pair,
No. 160 2-inch, 2 clamps.....Price, per pair,

Packed 1 pair in a box.

Toolmakers' Parallel Clamps No. 161

These clamps are made of steel, case-hardened, and are very useful for holding small work together, in tapping, drilling, etc. When ordering jaws only, state length desired. Specify the jaw with tapped holes as No. 1 jaw, and the plain jaw as No. 2 jaw. When ordering screws only, specify the full threaded screw as "B" screw, and screw with smooth end as "C" screw, as shown in cut. The "loose" jaw is held tightly by a spring attachment, thereby preventing it riding while opening or closing the clamp.

No. 1

No. 2

No. 2—Jaw showing spring clamp attachment

B C

	Length of Jaws	Opening	Price per Pair (2) Clamps	Price Each (1) Clamp
No. 161 AA	1⅝ inches	¾ inch		
No. 161 A	2 inches	1¼ inches		
No. 161 B	2½ inches	1¾ inches		
No. 161 C	3 inches	2¼ inches		
No. 161 D	4 inches	2¾ inches		
No. 161 E	5 inches	3½ inches		

Sent 1 pair (2 clamps) unless otherwise ordered. Packed 1 pair in a box.

Scratch Gage No. 29

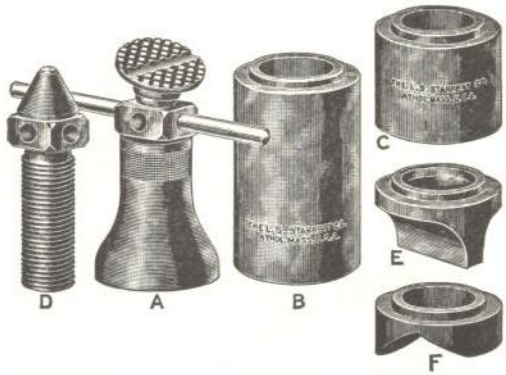
For scribing lines parallel to a given surface the scratch gage is used if the distance is not too great and if the line is to be scribed on a surface nearly at right angles with a given surface. The gage is made of steel with a hardened cast-steel head. A split bushing in the head grips the beam securely when the set screw is tightened. The beam is graduated 64ths of an inch. The marker is a square piece of thin steel properly tempered and firmly held against the edge of the beam presenting four marking points. Fine adjustments may be made by a slight rotating movement of the head on the beam.

		Graduated	Not Graduated
No. 29	5-inch beam, $\frac{15}{64}$-inch diameter	Price,	
No. 29	6-inch beam, $\frac{5}{16}$-inch diameter	Price,	

6 inch—Graduated—sent unless otherwise ordered.

Two extra cutters will be sent with each gage.

Little Giant Jack Screws Nos. 190 and 191



These are designed for tool-room use, for leveling up work on a planer-bed or under an upright drill, setting up machinery, etc. All parts are case-hardened.

No. 190 The Jack (A) is 1¼ inches diameter at the base and has a range from 2¼ to 3⅜ inches. It will raise 1,000 pounds or more. Two extension bases (B and C) are made to fit the base of the main part (A) and are 2 inches and 1 inch high respectively. With these two extensions used singly or together a reach from 2¼ to 6½ inches may be obtained.

An auxiliary pointed screw (D) is supplied to be used in place of the screw with swivel cap in certain places where it may be preferable. Very often at the point where the jack screw must be placed base (B) cannot be used. For use in such instances the base (E) is provided. The extension V base (F) is for use against a cylindrical form and is often used to straighten motorcycle frames.

No. 191 A smaller size is made with the same number of parts but 1 inch diameter. Part A, 1½ inches high; B, 1 inch, and C, ½ inch. With this size, adjustments from 1½ to 3½ inches are obtainable.

For either the No. 190 or No. 191.

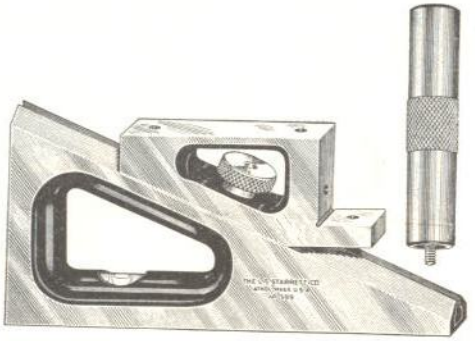
Jack (A)	Price,
Extension Base (B)	Price,
Extension Base (C)	Price,
Extension Base (E)	Price,
Extra Screw (D)	Price,
Extension V Base (F)	Price,
Jack, with all Attachments	Price,

Sent complete unless otherwise ordered.

Planer and Shaper Gage No. 599

Universal Height and Cap Gage

Hardened and Ground



Brought forward to meet the demands of mechanics who recognized the utility of our original patented Planer and Shaper Gage (see page 181), but who wanted a little greater accuracy for gage work. A natural request, as the trend is invariably to attempt accuracy not often recommended with certain machine tools. This gage has the same diversity as our own original No. 246, the level being maintained. Alignment and parallelism of ends, sides and work contacts are held to much closer limits. Lateral play of slide or incline of base is eliminated through the angular ways as illustrated. No projections to interfere as gage might be used on work plate or machine table.

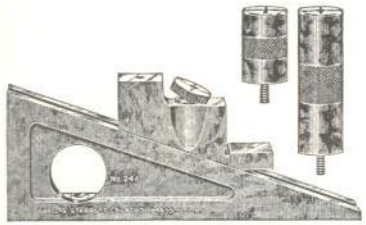
As cut shows, one knurled extension is provided, giving a range of ¼ inch to 9 inches. Without extension, the range is ¼ inch to approximately 6½ inches. Base and slide are made from steel forgings, hardened. Base dimensions, ¾ inch wide, 5¼ inches long. The extension is ⅝-inch diameter, 3 inches long. Weight, approximately 25 ounces.

No. 599 Without case .....Price, each,
No. 599 With wood case .....Price, each,

Sent without case unless otherwise ordered.

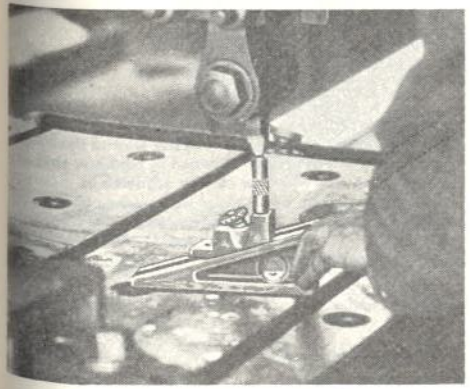
Packed 1 in a box.

Planer and Shaper Gage No. 246



Range of settings from ¼ to 8¼ inches in height

Easily set to a micrometer



Accurate setting to the cutting tool

The time taken by a planer or shaper-hand in adjusting the depth of the first cut, or in setting the tools for any required cut has been found to be so great by ordinary methods that we have designed this special gage, which greatly facilitates these operations. By setting this gage to a micrometer, surface gage, or caliper and bringing the planer tool in contact with it, the first cut may be absolutely relied upon. This reduces to a minimum the cut and try method which is common in shops not having this gage. The level in the base of the gage is an appreciable feature in itself. The base and slide are steel forgings and are heat-treated. All measuring surfaces are nicely ground. With the gage lying flat or in an upright position, all sorts of dimensions are readily set through the combination of parts shown in the illustration.

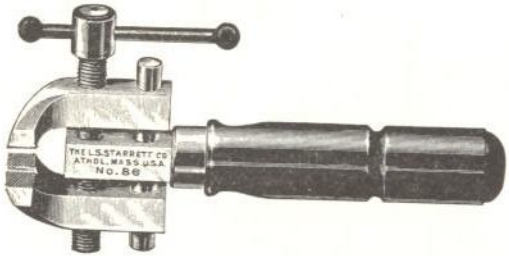
Range, ¼ to 8¼ inches. Base dimensions, ⅝ inch thick, 5 inches long.

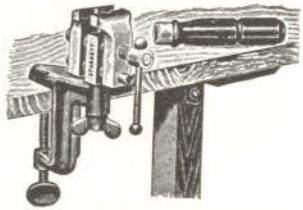
No. 246 .....Price,

Packed 1 in a box.

Combination Hand Vise No. 86

Patented





Applied to Bench

This hand vise furnished with a clamp, permitting its use as a small bench vise, is a tool, the utility of which will readily be recognized by mechanics as well as those working around the home. By removing the handle and substituting the clamp, the tool may be fastened to benches, shelves, etc., having an approximate thickness of ½ to 2⅛ inches. The vise can be adjusted to different positions to meet the convenience of the user. When used as a hand vise the leverage obtainable with the ball-end handle will be appreciated in comparison with a wing nut so commonly employed for this purpose. The jaws are made from forgings and are properly tempered. Width of jaws, 1½ inches. Capacity, about 1½ inches. Length, about 7 inches.

No. 86 A Hand Vise, with clamp as shown.....Price,
No. 86 B Hand Vise only.....Price,

No. 86 A sent unless otherwise ordered.

Packed 1 in a box.

V Blocks and Clamp No. 268

These drill blocks and clamps are of cast-iron material, sufficiently strong to stand any work they may be subjected to. The blocks are 1½ inches square and 2 inches long, and are furnished in pairs.

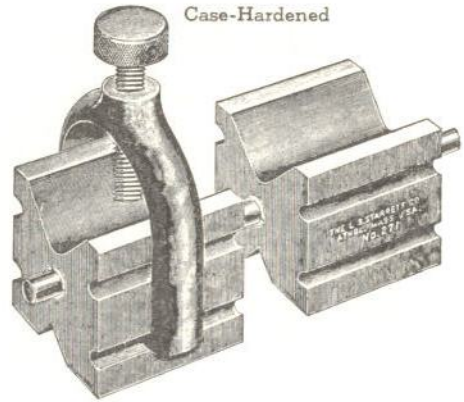
The clamp will hold a round piece up to 1¼-inch diameter firmly in the groove of the blocks, for prick punching, drilling or laying out a series of holes before and while being drilled.

No. 268 A Two Drill Blocks.....Price,
No. 268 B Clamp.....Price,
No. 268 C Set, complete.....Price,

No. 268 C sent unless otherwise ordered.

Steel V Blocks and Clamp No. 271

Case-Hardened



These blocks are designed to be used singly or in pairs in connection with drill presses and for laying out work, prick punching, etc. The blocks may be used close together or separated, and are kept in line by a spindle 6 inches long passing through friction bushings. They will be found convenient when holding pieces with shoulders, which may rest between the blocks. The blocks are 1¼ inches square and will hold round pieces up to 1¼-inch diameter. The two grooves in each side take up the length and hold the clamp for small or large work. The clamp, sometimes called the yoke, is a steel forging finished all over and case-hardened. The V's, as in most V blocks, are 90°, measuring about $13/16$ inch and $13/32$ inch, respectively, across the mouth of the V.

No. 271 A Two Drill Blocks.....Price,
No. 271 B Clamp.....Price,
No. 271 C Set, Complete.....Price,

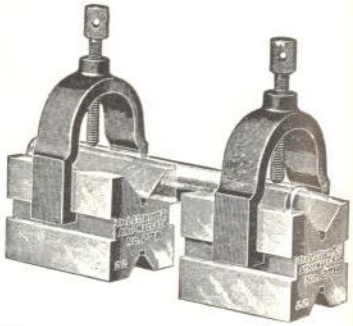
No. 271 C sent unless otherwise ordered.

V Blocks and Clamp No. 278

Hardened and Ground

The drill blocks shown on this page are designed to meet the demands for an accurate set of V blocks to be used in connection with the surface plate, angle iron, etc. Milling or grinding work clamped in the V's of this tool will be held fast and true.

The blocks are made of tool steel and are hardened and ground throughout. The V's are ground central, parallel and square with the ends and sides. The blocks are numbered in pairs so that the V's in each block are always in alignment. Each block is about 1¼ inches square, 1⅝ inches long, and has a clamping capacity of 1 inch in diameter.

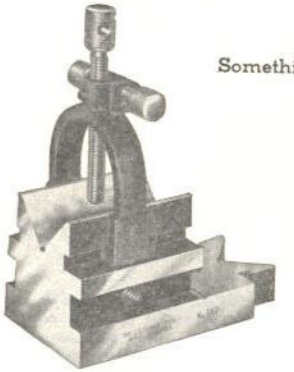


No. 278 Comprising two Drill Blocks and two Clamps .....Price,
Sold only in pairs.
Packed 1 set in a box.

No. 567

Patented

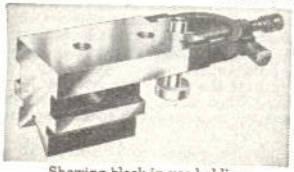
Something Distinctly New in a V Block



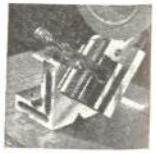
Rests on its side without interference from the clamp, which is a forging, and is provided with an adjustable support to prevent tilting when drilling. Made of steel, it is hardened and ground. The sides are ground parallel; the V grooves being ground central and parallel to the sides and the base. The groove at the stepped end, at a right angle to the base, holds shouldered studs, round pins, etc., for light milling, drilling and grinding. Hole clearance for drilling and removing dowel pins is provided; as also four ⅜ inch x 16 tapped holes, two in the base and one in each side, thereby increasing its utility on face plates and angle irons. The block dimensions are approximately 1⅞ inches square, the base length about 3⅝ inches long. Capacity, about 1 5/16 inches.

No. 567 Complete, one Block with Clamp ....Price,
Packed 1 in a box.

Showing block used on its side



Showing block in use holding shouldered stud at stepped end



Showing block clamped to angle iron

Adjustable Jaw Cut-Nippers No. 1

The majority of wire cutters or nippers once dull or broken are useless. The jaws of these nippers are detachable, so that they can be removed, reground and adjusted when they have become worn. Each jaw can be ground away to the extent of ¼ inch, remaining as good as new for practical use; and when used up, if ever, new jaws can be procured.

A screw through the jaw engages with a spline in the frame and draws the jaw firmly down to the toothed seat, holding it securely.

The adjustable screw and stud inside the handles permit setting the jaws so that the cutting edges will not be forced unnecessarily together. The construction of these cut-nippers furnish an abundant leverage.

Another improved feature in this cut-nipper is a flat spring below the cutting edges and over the joint, forming a yielding seat for the end of the wire to press against while being cut. This obviates the danger of breaking the jaws, as often happens with other styles of cut-nippers, which allow the wire to be inserted against a solid surface, thereby creating a pushing-out strain on the jaws when they are forced.

The head and handles are of drop-forged steel, finely finished. All the parts are case-hardened, except the jaws. These are made from a high grade of steel, nicely tempered. Those warranted to cut music wire have their cutting edges ground to a short, steep bevel, while those for common use have their cutting edges ground more acute, work easier, and are preferable for cutting softer wire or for general use. We particularly recommend this wire cutter to piano men, linemen, telephone men, and aeroplane workers, or in wire mills where constant cutting of wire is demanded. We also make jaws especially shaped for cutting wire in bicycle rims.

The 5½-inch size is made with jaws held in place by one screw, whereas the 7-inch size is fitted with the two screws.

-inch, M (for music wire) .....Price,
-inch, C (for common use) .....Price,
-inch, B (for bicycle use).....Price,
-inch, either M, C, or B .....Price,
tra jaws, either M, C, or B, which should be designated as above, per pair .....Price,
rews for jaws, per dozen .....Price,
lines for jaws, per dozen.....Price,

Cut-Nippers with M jaws sent unless otherwise ordered.

Packed 1 in a box.

Tile Cut-Nippers No. 235


No. 235

For Cutting Tile

These nippers are the same as our No. 1 except that the frames are cut out to allow the jaws to be adjusted for wide opening, as shown in cut, thus fitting them to be used in cutting tile, for which purpose they are highly recommended by many tile workers who are now using them. The jaws can be easily replaced when necessary. These nippers are made in two sizes, 5½ and 7 inches.

No. 235 5½-inch.....Price,
No. 235 7 -inch.....Price,

Packed 1 in a box.

Cut-Nippers No. 437

For Bicycle Spokes, Etc.

No. 437

These nippers combine great power with rigidity. Wire can be cut at extreme end of jaws. Cutting jaws conform to inside of bicycle rim and will cut off spokes as close as required.

In case a jaw breaks it may be replaced.

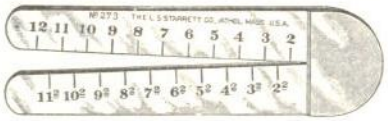
Nippers open 3/32 inch.

Length of nippers overall, 5½ inches.

No. 437 Cut-nippers.....Price,
Jaws, per pair.....Price,

Packed 1 in a box.

Sole Gage No. 273



This gage is especially adapted to the needs of shoe manufacturers. It is made of steel, nicely finished, graduated to show the thickness of soles and taps in 48ths of an inch, and is figured to show "irons" and "half-irons" from 2 to 12 inclusive. It is used to determine the thickness or weight of soles, taps, etc.

No. 273.....Price,

Packed 1 in a box.

Pocket Scribers No. 70

Made from steel tubing, knurled and nickel plated. The scriber is made from the best quality of steel, nicely tempered, and is held by a knurled chuck. The scriber is reversible, telescoping into the stock, and is held by a slight turn of the chuck so that it is always as safe to carry in the pocket as a penknife. The hexagon head prevents rolling off the bench.

Mechanics find this a convenient tool to have in their possession.

No. 70 A Handle, ¼ inch diam.; blade, 2⅜ inch long; weight, 1 oz.....Price, each,
No. 70 B Handle, ⅜ inch diam.; blade, 2⅞ inch long; weight, 1½ oz.....Price, each,

Packed 6 in a box.

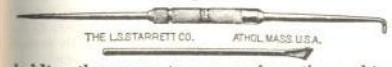
Improved Scriber No. 67

This scriber is made for mechanics who want a better one than of ordinary wire. These points are made of a fine grade of steel, tempered and nicely finished. The knurled stock is of sufficient size to be easily held without cramping or turning in the fingers. The long, bent point will be found a valuable auxiliary for reaching through holes, etc. Length, with short, bent point, 9 inches; with long point, 12 inches. All parts are interchangeable. The knurled sleeve is nickeled.

Complete, as shown in cut.....Price,
Without long point.....Price,
Sent complete unless otherwise ordered.

Extra, Straight Point.....Price,
Extra, Short Bent Point.....Price,
Extra, Long Bent Point.....Price,

Adjustable Sleeve Scriber No. 68



The knurled sleeve has a hole clear through and a clamping device at one end, adapting it for slipping on or off different tools, securely holding them near to or away from the working point. The knurled sleeve is nickeled.

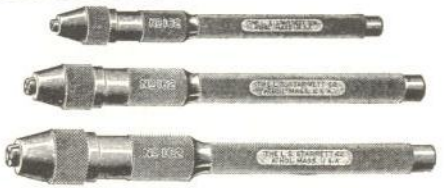
This scriber is made in two lengths, 8 inches and 12 inches. Toolmakers will find the small size more desirable for general use, and the larger one for heavier work. For pattern makers a knife scriber, made of a fine grade of steel, is supplied as an auxiliary.

Either size, without knife point.....Price,
Knife Point, extra.....Price,
Extra Scriber Point.....Price,

The 8-inch, being the more popular size, will be sent (without knife point) unless otherwise ordered.

Above numbers packed 6 in a box.

Pin Vises No. 162



These vises have hardened jaws with chucks so made that they will hold firmly anything inserted in them. The hole extends through full length of the knurled handle. The handle is reduced in size, so that it may be more rapidly rotated between thumb and finger when filing small work. They are convenient handles for holding scribers, small files, taps and extensions for holding small drills. Nickel plated.

No. 162 A Capacity, 0 to .040 inch.....Price,
No. 162 B Capacity, .030 inch to .062 inch.....Price,
No. 162 C Capacity, .050 inch to .125 inch.....Price,
No. 162 D Capacity, .115 inch to .187 inch.....Price,
Set Complete (one of each size).....Price,

Pin Vises No. 166

With Rubber Handle. Octagon Shape

These pin vises are the same as our No. 162, described above, except that they are made with a hard rubber handle which is octagon in shape, thereby making them less apt to roll when laid down.

No. 166 A Capacity, 0 to .040 inch.....Price,
No. 166 B Capacity, .030 inch to .062 inch.....Price,
No. 166 C Capacity, .050 inch to .125 inch.....Price,
No. 166 D Capacity, .115 inch to .187 inch.....Price,
Set Complete (one of each size).....Price,

Each size of Nos. 162 and 166 packed 6 in a box.

Ratchet Wrench No. 443

For Engineers, Machinists and Auto Mechanics

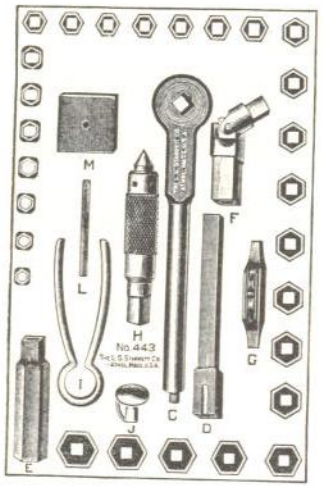
In places difficult of access or in cramped quarters where a swing through a long arc is impossible, the ordinary monkey or S wrench is out of the question. Some other means of turning nuts and bolts is required. To meet these conditions we have invented and perfected the Starrett Ratchet Wrench. It consists of a ratchet with reversible pawl and a long wrench handle. With this wrench we furnish an extension to reach into otherwise inaccessible places; also a universal joint for turning nuts or bolts when it is impossible to get the wrench on at right angles to the ends of the bolt; a spark plug socket for use on automobile and aeroplane engines; a drilling attachment which takes standard square shank drills from ⅛ inch to ½ inch diameter, and a screw driver with reversible end; together with several adjustments to go with the drilling attachment.

This ratchet wrench is of particular value to engineers and mechanics who have to work about machinery crowded into small space or around hot engines. The sockets for the wrench will turn nearly any standard hexagon nut or bolt. With this wrench finished surfaces and corners of nuts need not be marred by taking it off and replacing at every fraction of a turn.

No. 443 A Complete .....Price,

No. 443 B Without drill fixture. Price,

Sent complete unless otherwise ordered.



Parts of Ratchet Wrench

The 27 small engravings around the outside represent the hexagon steel sockets, varying in size by 32nds, from ⅝ to 1 inch, also 1 1/32, 1 3/32, 1 5/32 and 1 7/32 inches. The set also has two square steel sockets, one each 13/32 and 21/32 inch.

C Ratchet wrench, with reversible pawl .....Price,

D Extension to fit part C. The large end takes all standard sockets.....Price,

E Spark plug socket .....Price,

F Universal joint. May be used in connection with wrench and sockets, or with extension, screw driver, etc., thus giving several combinations. Very useful for getting at nuts or screws in otherwise inaccessible places.....Price,

G Screw driver. Used with extension if long blade is required, or in square part of any socket for cramped places. May be used with ratchet, or long socket alone, thus obtaining a good sized handle .....Price,

H Drilling attachment — holds standard square shank drills ⅛ to ½ inch .....Price,

I Holder or friction wrench for drilling attachment .....Price,

J Thrust plug, for use on all sockets and extension, protecting the hand when forcing down on the ends .....Price,

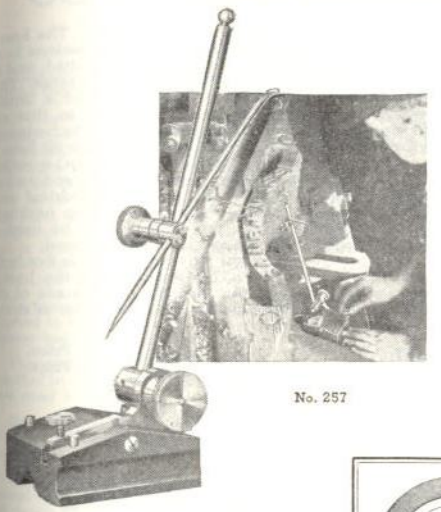
L Drift pin .....Price,

M Thrust plate, for drilling attachment.....Price.

Sockets, all sizes except spark plug. Price, each,

No. 443 K Attachment to be used with bit brace in connection with ratchet wrench sockets, extra .....Price,

Surface Gages

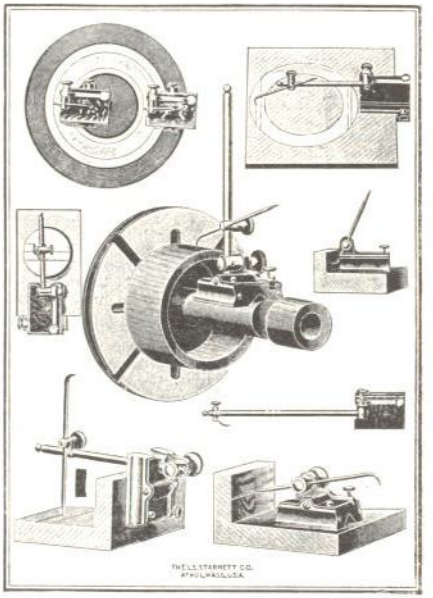


No. 257

The laying out of work often includes the scribing of lines at a given height from some face of the work or the continuation of lines around the several surfaces. To do this work, an instrument called a surface gage has been devised for holding the scriber. This consists of a heavy base and pivoted upright to which is attached a scriber held by a clamp which may be turned through a complete revolution. By resting both the surface gage and the work upon a plane surface, usually a cast-iron surface plate, it is possible to set the point of the scriber at a given height, either by use of a scale or some other standard, and draw lines at this height on all faces of the work or on any number of pieces when duplicate parts are being made. Thus the height of a standard bearing may be transferred to the faces of any number of castings from which duplicate bearings are to be made.

It is necessary in some cases to prepare the surface of the work so that the line made by the scriber will be sufficiently clean cut to enable the workman to distinguish it quickly. This is done in the case of rough castings by chalking the surface and rubbing in with the finger. In the case of a highly finished surface some other method is necessary. The usual way is to use a solution containing copper sulphate and nitric acid in the proportions of one ounce of copper sulphide, four ounces of water, and a teaspoonful of acid. This solution gives a reddish-brown color against which the lines will show. In cases where the temper of the metal is not to be considered, heating it to a blue will give a satisfactory result.

The use of the surface gage is not confined to scribing on vertical surfaces only. It may be used on other surfaces or as a height gage as well where measurements of extreme accuracy are not considered. The bent end on the scriber permits lines to be drawn on horizontal surfaces, while a groove in the base of the gage makes it possible to mark out desired distances from the radius of a circular piece.



Showing a few applications of our Surface Gage.

Toolmakers' Surface Gage No. 56

This gage is admirably adapted for light work. The base is steel, nicely finished and case-hardened, with depressions in the sides for the thumb and finger. The top side is slotted, and the rocking bracket for fine adjustments is pivoted in same. There is a stiff spring under one end of the bracket and a knurled adjusting screw in the other; the spindle jointed to this may be set and rigidly held in any position from vertical to horizontal, and the scriber placed in position to be used below its base for depth gage or (with bent end down) a scribing gage. A V-shaped groove in the end and the base adapts it for use on cylindrical work. There is a small hole in the clamp next to the base in which the scriber may be used for light work, the spindle being removed.

Guide

It weighs but ten ounces, and is five inches high, and when folding the spindle, which is four inches long, horizontally over the base, it may be packed in a 1⅜ x 1½ x 4 inch space in the tool chest. An auxiliary guide made of steel case-hardened, as shown in cut, is furnished to clamp to the base for either a circular or straight edge. See page 189.

No. 56 A With 4-inch spindle and auxiliary guide .....Price,
No. 56 B Without auxiliary guide .....Price,

Sent with guide unless otherwise ordered.

A 7-inch spindle is furnished when ordered at an extra cost of

Packed 1 in a box.

Universal Surface Gage No. 57

This gage has our latest improvements, which make it all that can be desired, possessing the following points of merit:

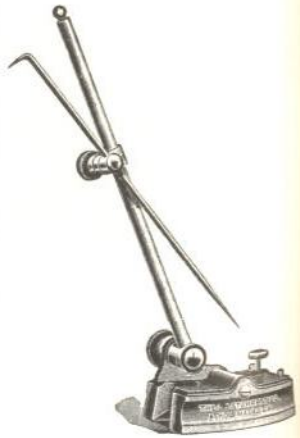
Heavy base, grooved through the bottom and end, adapting it for use on or against circular work as well as flat surfaces.

The spindle passes through a rotating head, jointed to a rocking bracket, pivoted in base. The bracket being adjusted by a knurled screw in one end against a stiff spring in the other, the spindle may be set upright or at any angle, or turned so as to work under the base and be sensitively adjusted to any position. The snug and head carrying the scriber are so made that when the clamp nut is loosened all may be freely moved to any position and, by friction springs, retained in place until a slight turn of the clamp nut holds them firm.

In the rear end of the base are two gage pins frictionally held which may be pushed down to bear against the edge of a surface plate or in the slot of a planer bed for linear work.

For small work the spindle may be removed and the scriber inserted in hole provided where it can be sensitively adjusted and used to advantage on bench work.

Length given for spindle includes height of spindle and base; except the 12-inch spindle with 57B and the 18-inch with 57D, the depth of the base not being included in the length of these two spindles.



No. 57 A Base, approximately 3 inches long, with 9-inch spindle.....Price,
No. 57 B Base, approximately 3 inches long, with 9 and 12 inch spindles.....Price,
No. 57 C Base, approximately 3¾ inches long, with 12-inch spindle.....Price,
No. 57 D Base, approximately 3¾ inches long, with 12 and 18 inch spindles.....Price,

Packed 1 in a box.

Universal Surface Gage No. 257

With Case-Hardened Steel Base

This gage has our latest improvements, which make it all that can be desired, the following being points of special merit:

It has a heavy base, grooved through the bottom and end, adapting it for use on or against circular work as well as flat surfaces. The spindle passes through a rotating head, jointed to a rocking bracket, pivoted in base, the bracket being adjusted by a knurled screw in one end against a stiff spring in the other. The spindle may be set upright or at any angle, or turned so as to work under the base, and can be sensitively adjusted to any position. The snug and head carrying the scriber are so made that when the clamp nut is loosened all may be freely moved to any position, and by friction springs retained in place until a slight turn of the clamp nut holds them firmly.

In the base are four gage pins, frictionally held, which may be pushed to bear against the edge of a surface plate, or in the slot of a planer bed for linear work.

For small work the spindle may be removed and the scriber inserted in a hole provided for it, where it can be sensitively adjusted and used to advantage on bench work.

Special attention is called to the four gage pins in the corners of the base, which adapt it for use as a locomotive guide liner and make it more convenient than other gages for many uses.

Length given for spindle includes height of spindle and base; except the 12-inch spindle with 257 B and the 18-inch with 257 D, the depth of the base not being included in the length of these two spindles.

No. 257 A Base, approximately 3 inches long, with 9-inch spindle .....Price,
No. 257 B Base, approximately 3 inches long, with 9 and 12 inch spindles.....Price,
No. 257 C Base, approximately 3¾ inches long, with 12-inch spindle .....Price,
No. 257 D Base, approximately 3¾ inches long, with 12 and 18 inch spindles.....Price,

Packed 1 in a box.

Rule Holder No. 62

For Pattern Makers and Machinists

See page 20 for Shrink Rules

Designed primarily for the pattern maker and machinist to hold rules in an upright position for use in connection with surface gages, also for use as a depth gage. Its capacity (¾ inch to 1 5/16 inches wide) permits the use of rules in general use, whether shrink, standard or combination square blades. A suitable nut of the right diameter insures firm retention of the rule.

The base is cast iron, proper consideration having been given to the important factor, weight, which is about 1½ pounds. Grooves are cut on two sides for convenience in handling. Has combination of black enamel and bright finish.

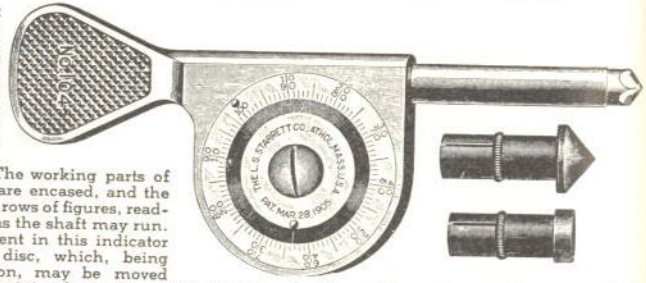
No. 62 .....Price,

Packed 1 in a box.

Speed Indicators

In every factory in which machinery is used, the speed of the shafting and the machines themselves should be accurately determined in order to get from them the maximum service. The knowledge of this speed is also of great assistance in figuring the pulley sizes, etc. Engineers frequently have to compute the horse power which an engine or motor is giving out and this cannot be done without an accurate knowledge of the rotative speed. In order to determine these speeds with the greatest economy, an instrument should be used which will serve equally well for high or low speeds without heating on the high speeds and with perfect accuracy on the low. Our Speed Indicators are made in three different types for general purposes and for registering speeds. Each instrument is provided with three styles of tips, a pointed steel tip hardened and polished, which forms the end of the spindle, and two rubber tips, which may be slipped over the pointed metal tip, so that no matter what the shape of the point of contact, be it pointed, centered or otherwise, the revolutions per minute will be accurately recorded. These rubber tips not only remove the jar and run smoothly but produce a stronger frictional contact.

High Speed Indicator No. 104



May be run at high speed without heating, and this on account of our frictionless bearing against which the inner end of the spindle revolves (a feature patented by us). The working parts of this instrument are encased, and the dial plate has two rows of figures, reading right or left, as the shaft may run.

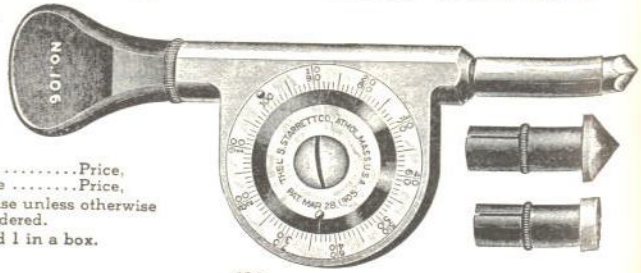
An improvement in this indicator is the rotating disc, which, being carried by friction, may be moved to the starting point where the raised knobs coincide. When the spindle is placed in connection with the revolving shaft, pressing the raised knob with the thumb will prevent the disc from rotating, while the hand of the watch gets to the right position to take the time. By releasing the pressure the disc is liberated for counting the revolutions of the shaft when every 100 may be noted by feeling the knob pass under the thumb lightly pressed against it, thus relieving the eye which has only to look on the watch to note the time. This tool is nickel plated.

No. 104 .....Price, With case.....Price,

Sent without case unless otherwise ordered.

We supply this indicator with a spindle 7½ inches long, in place of regular spindle, for use on Dairy Machines, etc., for extra. Packed 1 in a box.

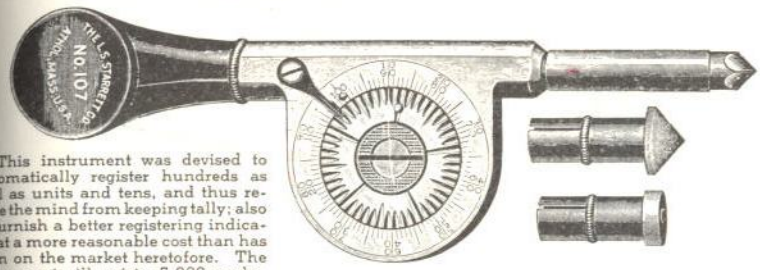
Improved Speed Indicator No. 106



Like our No. 104, this instrument is nickel plated, but has a rubber handle, making a safe insulator when used on electrical machinery.

No. 106 .....Price,
With case .....Price,
Sent without case unless otherwise ordered.
Packed 1 in a box.

Registering Speed Indicator No. 107



This instrument was devised to automatically register hundreds as well as units and tens, and thus relieve the mind from keeping tally; also to furnish a better registering indicator at a more reasonable cost than has been on the market heretofore. The instrument will register 5,000 revolutions. The large dial is graduated into one hundred lines, each one representing a revolution of the spindle. The small dial has fifty lines cut upon its face, each representing one hundred revolutions of the spindle (or one complete turn of the large dial). A spring finger trip attached to the case engages with one of the lines in the small dial and holds it from revolving until the large dial makes one complete turn, when the trip pin passing under the spring trip lifts it, and the dial is frictionally carried along by the large plate one line, thus showing that one hundred revolutions of the spindle have been made. This instrument is nickel plated, has a hard rubber handle, making a safe insulator when used on electrical machinery.

No. 107 .....Price, With case.....Price,

Sent without case unless otherwise ordered. Packed 1 in a box.

Surface Speed Attachment for Speed Indicators No. 109

This attachment applied to any one of our speed indicators is designed to show the number of linear feet per minute the periphery or outside surface of a shaft or pulley is running and thus enable a workman to know if the speed is too fast or too slow to get the most work the tool will stand. For instance, the speed of a cone pulley being turned needs to be changed at every step. Heretofore it has been all guesswork as to the number of feet per minute the periphery of the work is traveling. It may be so fast as to heat and spoil the tool and cause expansion, burning the centers in lathes and milling machine arms, or it may not be nearly fast enough to perform what should be done. The same is true when shifting the tool from the hub to the rim of a pulley. The rubber-banded indicator wheel may be instantly slipped off or on the spindle of any of our speed indicators, and when held against the periphery of a shaft or pulley a half minute or a minute, by dividing the figures showing the revolutions on the dial of the indicator by 2, the number of feet the surface of the object traveling is obtained, as each revolution of the indicator wheel shows six inches; twice around, one foot. A close approach to accuracy is not claimed for this attachment, but it will be found very convenient and adequate for the purposes intended, as suggested above.

No. 109 .....Price,

Packed 1 in a box.

Toolmakers' Calipers and Dividers

With Round Legs

Dividers
No. 277

Outside Calipers
No. 275

Inside Calipers
No. 274

While nearly everyone is acquainted with the use of calipers and dividers, it may be stated briefly that, in general, calipers are used for measuring distances between or over surfaces, or for comparing distances or sizes with standards, such as those on graduated rules. Dividers are for measuring distances between points, for transferring distances taken direct from a scale, and for scribing circles or arcs.

To those who are not familiar with the use of calipers, a word of caution may not be out of place. Calipers should never be used on work while it is revolving in a lathe or in any other machine, because if one contact of the caliper is placed against the work the other is likely to be drawn over the work by the friction of the moving surfaces. Only slight force is necessary to spring the legs of a caliper so that measurements taken from moving pieces are never accurate—frequently they are very misleading.

The cuts on this page represent a line of Calipers and Dividers made from round stock with legs drawn down, making them tough and rigid. The fulcrum stud is hardened, bows extra strong, screw and nut nicely fitted, all highly finished and are the best tools in their line.

Nos. 277, 275 and 274

Made with solid nut only.

2-inch	Price,
3-inch	Price,
4-inch	Price,
5-inch	Price,
6-inch	Price,

Packed 2 in a box.

Duplicate Parts of Toolmakers' Calipers and Dividers

Screw and Ball	Price,
Thumb Attachment (No. 277 only)	Price,
Nut	Price,
Leg (right)	Price,
Spring	Price,
Jam Washer	Price,
Fulcrum Stud	Price,
Leg (left) with screw attached	Price,

Spring Calipers and Dividers

Fay Pattern

Dividers
No. 77

Outside Calipers
No. 75

Inside Calipers
No. 74

The illustrations above represent our Spring Calipers and Dividers with our quick-adjusting automatic closing spring nut, a critical examination of which will at once show its superiority over all others on the market. The thread engages the screw at the slightest pressure when the leg comes in contact with the nut; when pressure is withdrawn it releases itself immediately, sliding freely on the screw. Its use will save much valuable time in opening and closing spring-bow calipers and dividers.

They are also made with solid nut.

Dividers No. 77

	Spring Nut	Solid Nut
2½-inch	Price,	
3 -inch	Price,	
4 -inch	Price,	
5 -inch	Price,	
6 -inch	Price,	
8 -inch	Price,	

Calipers Nos. 75 and 74

	Spring Nut	Solid Nut
2½-inch	Price,	
3 -inch	Price,	
4 -inch	Price,	
5 -inch	Price,	
6 -inch	Price,	
8 -inch	Price,	

Sent with spring nut unless otherwise ordered.

Packed 2 in a box.

Duplicate Parts of Fay Calipers and Dividers

Screw and Ball	Price,
Thumb Attachment (No. 77 only)	Price,
Solid Nut	Price,
Spring Nut	Price,
Leg (right)	Price,
Spring	Price,
Jam Washer	Price,
Fulcrum Stud	Price,
Leg (left) with screw attached	Price,

Spring Calipers and Dividers

Yankee Pattern

Dividers
No. 83

Outside Calipers
No. 79

Inside Calipers
No. 73

The Yankee Calipers and Dividers are similar to the Fay pattern, are not quite so heavy as the Fay, and cost less. They are much liked, and on account of price are preferred by many to the higher cost tools.

All sizes are supplied with either solid or quick adjusting nut.

No. 73 represents our Yankee Inside Transfer Caliper with either spring or solid nut. The bow is stiff, making the caliper reliable. After calipering inside of chambered cavity by springing in the legs they may be withdrawn, and as they spring back will show exact size calipered.

Spring Nut

The Spring Nut grips the screw firmly yet releases easily. Quick adjustments for large and small measurements are thus provided.

Dividers No. 83

	Solid Nut	Spring Nut
2½-inch	Price,	
3 -inch	Price,	
4 -inch	Price,	
5 -inch	Price,	
6 -inch	Price,	
8 -inch	Price,	
10 -inch	Price,	
12 -inch	Price,	

Sent with solid nut unless otherwise ordered.

Packed 3 in a box.

Calipers Nos. 79 and 73

	Solid Nut	Spring Nut
2½-inch	Price,	
3 -inch	Price,	
4 -inch	Price,	
5 -inch	Price,	
6 -inch	Price,	
8 -inch	Price,	
10 -inch	Price,	
12 -inch	Price,	

Duplicate Parts of Yankee Calipers and Dividers

Screw and Ball ..... Price.
Thumb Attachment (No. 83 only) Price,
Solid Nut ..... Price,
Spring Nut ..... Price,
Leg (right) ..... Price,
Spring ..... Price.
Jam Washer ..... Price,
Fulcrum Stud ..... Price,
Stud ..... Price,
Leg (left) with screw attached .. Price,

Thread Calipers Nos. 179 and 184

No. 179

These calipers are designed for inside and outside measurements of threads. Suitably shaped points to work in threads.

PRICES

	Solid Nut	Spring Nut
4-inch	..	
5-inch	.....	
6-inch	.....	

Sent with solid nut unless otherwise ordered.

Packed 3 in a box.

No. 184

Keyhole Calipers No. 82

No. 82

Practical for centering holes, either in flat or round pieces, also for calipering work close to an edge, as in a shaper or planer chuck, where it would be impossible to use a bent leg.

PRICES

	Solid Nut	Spring Nut
4-inch	..	

Sent with solid nut unless otherwise ordered.

Packed 3 in a box.

Yankee Thread Calipers No. 80

No. 80

PRICES

	Solid Nut	Spring Nut
3-inch	....	
4-inch	....	
5-inch	....	

Sent with solid nut unless otherwise ordered.

Packed 3 in a box.

Fay Thread Calipers No. 76

No. 76

PRICES

	Spring Nut	Solid Nut
3-inch	....	
4-inch	....	
5-inch	....	

Sent with spring nut unless otherwise ordered.

Packed 2 in a box.

Improved Firm-Joint Calipers Nos. 26 and 27

No. 26

3-inch .....Price,
4-inch .....Price,
5-inch .....Price,
6-inch .....Price,
8-inch .....Price,
10-inch .....Price,
12-inch .....Price,
14-inch .....Price,
16-inch .....Price,
18-inch .....Price,
20-inch .....Price,
24-inch .....Price,
30-inch, No. 26 only .....Price,
36-inch, No. 26 only .....Price,

The above sizes refer to the length of the calipers.

No. 27

Note: The No. 27 Inside Calipers are not made larger than 24 inches.

Their capacity is about one-third greater than the size given; for example, the 30-inch size will caliper 38 inches, and the 36-inch size will caliper 46 inches diameter.

The improvement in these calipers consists in the construction of the joint, which is so made as to be drawn together by means of a screw. The main stud is squared and fitted to one leg, thus preventing the stud from turning when loosening and tightening, and insuring a smooth and uniform friction of more or less tension to suit the user.

The quality of these calipers is incomparably superior to that of any old style riveted-joint caliper on the market.

Sizes 3 to 12 inches packed 3 in a box.
Sizes 14 to 24 inches packed 2 in a box.
Sizes 30 and 36 inches packed 1 in a package.

Hardened Firm-Joint Calipers Nos. 26 H and 27 H

These calipers are same as our Nos. 26 and 27, except that they are hardened.

3-inch .....Price,
4-inch .....Price,
5-inch .....Price,
6-inch .....Price,
8-inch .....Price,
10-inch .....Price,
12-inch .....Price,

Above numbers packed 3 in a box.

Starrett

Perfected Firm-Joint Screw-Adjusting Calipers Nos. 34 and 35

No. 34

The screw adjustment for fine measurements, the improved joint which may be set to any desired degree of uniform tension, the shape and stiffness of the legs, quickness and wide scope of adjustment,—all go to make this caliper a leader in its line.

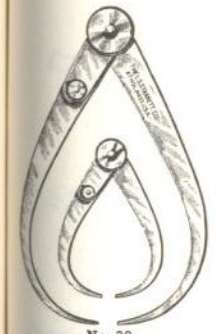
4-inch .....Price,
6-inch .....Price,
8-inch .....Price,
10-inch .....Price,
12-inch .....Price,
14-inch .....Price,
16-inch .....Price,
18-inch .....Price,
20-inch .....Price,
24-inch .....Price,
30-inch, No. 34 only .....Price,
36-inch, No. 34 only .....Price,

No. 35

The No. 35 Inside Calipers are not made larger than 24 inches.

Sizes 4 to 12 inch packed 3 in a box.
Sizes 14 to 24 inch packed 2 in a box.
Sizes 30 and 36 inch packed 1 in a package.

Lock-Joint Calipers Nos. 38 and 39



No. 38

These calipers represent a line of reliable lock-joint calipers of wide scope, for both inside and outside work, that can be instantly adjusted to their full extent, and as quickly locked firm in the joint, and yet provided with a sensitive adjustment. The improvement consists in a socket joint made tapering and locked or released by a partial turn of the knurled disc. A spring washer under the disc maintains an easy friction in the joint when unlocked.

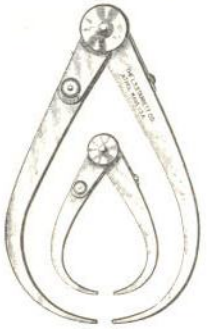
To further describe, in the underside of the short arm is a slot containing a stiff spring. Riveted into the middle leg and projecting through an opening in the arm is a threaded stud on which is a knurled nut having a beveled hub,—this bears against a cone in the arm,—the action of the spring holding them together turns the nut, forces them apart and adjusts the leg when the joint is locked. The spring takes up all backlash, and keeps the legs firm.

Sizes 4 to 12 inch packed 3 in a box.
Sizes 14 to 24 inch packed 2 in a box.

No. 39

4-inch .....Price,
5-inch .....Price,
6-inch .....Price,
8-inch .....Price,
10-inch .....Price,
12-inch .....Price,
14-inch .....Price,
16-inch .....Price,
18-inch .....Price,
20-inch .....Price,
24-inch .....Price,

Lock-Joint Transfer Calipers Nos. 36 and 37



No. 36

These calipers not only have all the excellent features of Nos. 38 and 39, as described on another page, but in addition to common use may be used inside of chambered cavities, over flanges, etc., removed and replaced without losing the size calipered. This is done by loosening the nut binding one arm to the auxiliary leaf and swinging it out or in (while the joint is locked) to clear the obstruction, then moving it back against a stop where it will show the exact size measured.

The sizes given refer to the length of the calipers, but the outside ones will caliper a cylinder 20 per cent greater than their length, and the inside calipers will open nearly twice their length. This applies also to Nos. 26 and 27, page 198; to Nos. 34 and 35, page 199; and to Nos. 38 and 39, page 199.

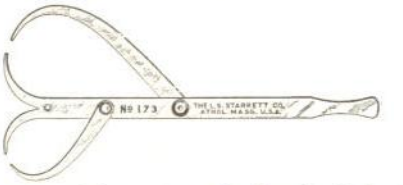
No. 37

Sizes 4 to 12 inch packed 3 in a box.
Sizes 14 to 24 inch packed 2 in a box.

4-inch	Price,	12-inch	Price,
5-inch	Price,	14-inch	Price,
6-inch	Price,	16-inch	Price,
8-inch	Price,	18-inch	Price,
10-inch	Price,	20-inch	Price,
24-inch	Price,		

Illustrations showing our Nos. 36 and 37 Lock-Joint Calipers

Foundry and Forging Caliper No. 173

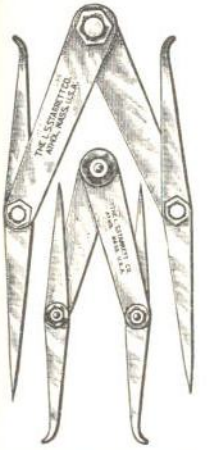


This caliper is well made, with firm joints and a long handle to caliper with comfort hot forgings—the long arm to be used for the greater and the short one for the smaller or finished size. The difference in the length of arms prevents using the wrong caliper when there is but slight variation in the work measured. The caliper is 22 inches in length over all and has a 6-inch caliper on one side and a 12-inch caliper on the other side.

No. 173 ..... Price,

Packed 2 in a box.

Double Calipers No. 44



These instruments, as will be seen from the engraving, combine dividers, inside and outside calipers. They have our improved firm friction joints.

No. 44 6-inch ..... Price,
No. 44 8-inch ..... Price,

Packed 3 in a box.

Calipers No. 444

These calipers may be used for inside or outside work. They have our improved firm friction joints and sensitive screw adjustment.

No. 444 6-inch ..... Price,
No. 444 8-inch ..... Price,

Packed 3 in a box.

Hermaphrodite Calipers

Firm-Joint No. 41

These calipers have our adjustable point, as well as the improved firm-joint, which has made our No.26 Outside and No.27 Inside Calipers deservedly popular among mechanics. This joint, with its smooth and uniform friction, is incomparably superior to the old-style riveted joint.

4-inch.....Price,
6-inch.....Price,
8-inch.....Price,
10-inch.....Price,

Packed 3 in a box.

Lock-Joint No. 42

Reverse Front

With our adjustable point, lock-joint and sensitive adjustment. Reverse cut shows our adjustable point while the front cut shows our lock-joint and sensitive adjustment. The sensitive adjustment is obtained by the smaller knurled nut at lower end of arm.

4-inch Price,
6-inch Price,
8-inch Price,
10-inch Price,

Packed 3 in a box.

Firm-Joint No. 241

The same as No.41 except that both points are solid, neither being adjustable.

3-inch.....Price,
4-inch.....Price,
5-inch.....Price,
6-inch.....Price,
8-inch.....Price,
10-inch.....Price,
12-inch.....Price,

Packed 3 in a box.

Lock-Joint No. 242

The same as No.42 except that both points are solid, neither being adjustable.

4-inch.....Price,
6-inch.....Price,
8-inch.....Price,
10-inch.....Price,

Packed 3 in a box.

Hermaphrodite Calipers

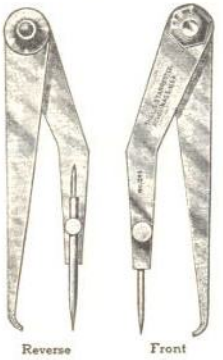
With Adjustable Round Point

Firm-Joint No. 243

These calipers are similar to our No.41 Caliper shown on page 202, except that they are made with an offset leg which retains an adjustable round point. They are made only in the 4 and 6 inch sizes.

4-inch Price,
6-inch Price,

Packed 3 in a box.



Reverse Front

Firm-Joint No. 563

This caliper is similar to our Nos.41and 243, except it is made with a round adjustable point in the straight leg.

For laying off centers and lines from an edge.

4-inch .....Price,
6-inch .....Price,

Packed 3 in a box.

Dividers

Lock-Joint No. 43

With our improved lock-joint attachment and sensitive adjustment. It is light and rigid with large capacity, instantly opened, closed, and locked. The points are nicely tempered.

6-inch .....Price,
8-inch .....Price,
10-inch .....Price,

Packed 3 in a box.

Firm-Joint No. 139

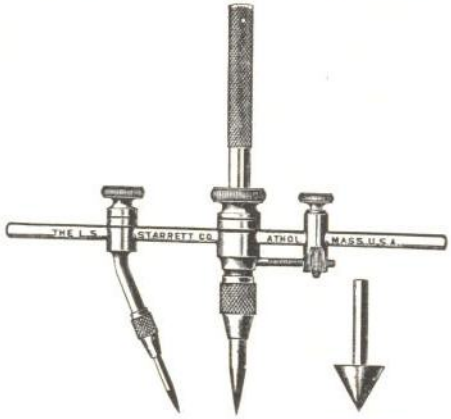
These dividers with our improved firm joint are made in 3, 6, and 12 inch lengths. They are rigid and the points are hardened and nicely finished.

3-inch .....Price,
6-inch .....Price,
12-inch .....Price,

Packed 3 in a box.

Universal Divider and Beam Compass No. 89

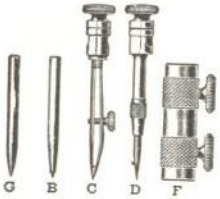
For Engineers, Architects and Draftsmen



Cone Center

The adjustable scriber holder is reversible and carries either a fine tempered steel point or a pencil lead, held in a split socket by a knurled nut. With the holder turned outward it is possible to work close to shoulders, something that cannot be done by a similar tool of any other make; turned inward, points may be brought close together to scribe the smallest circle. With 4-inch beam a 7½-inch circle and under may be scribed. An auxiliary beam 13 inches long is furnished, with which a 25-inch circle may be drawn. The cone center may be substituted for the regular point, adapting the tool for scribing around a drilled hole. We also furnish a pen attachment.

No. 89 A Tool, with 4-inch beam and cone center, as shown above.....Price,
No. 89 S Comprising No. 89 A, without cone center and with 89 D in place of bent arm, also with 89 B in place of G .....Price,



List of Attachments

No. 89 B Needle Points, each .....Price,
No. 89 C Pen Attachment .....Price,
No. 89 D Extra Straight Point and Socket.....Price,
No. 89 E Extra 13-inch Beam to scribe 25-inch circle Price,
No. 89 F Coupling .....Price,
No. 89 G Extra Steel Points, each.....Price,
No. 89 H Tool and all attachments.....Price,
Case for No. 89 A or S, extra .....Price,
Case for No. 89 H, extra .....Price,

No. 89 A, without case, sent unless otherwise ordered. Packed 1 in a box.

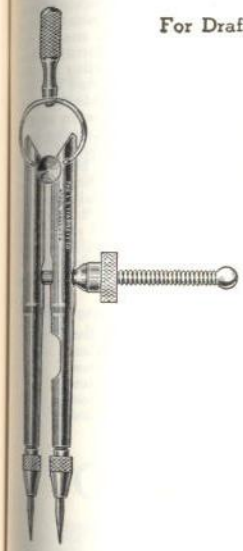
Note: The No. 89 D is supplied regularly with hole diameter .086, but may also be furnished when so desired with hole diameter .076 at the same price.

Note: The following numbers supplied nickel plated at list shown below:

No. 89 A Nickel Plated .....Price
No. 89 S Nickel Plated .....Price,
No. 89 H Nickel Plated .....Price,

Pencil Divider No. 596

For Draftsmen, Toolmakers, Machinists, Students



An excellent tool for lay-out work on metal, and for pencil drawings. It is not designed to do the small work of the bow pencils and bow dividers. Approximate capacity of opening of points 3/16 to 3 inches. It is made with round legs and with two small chucks, .086 hole diameter, for holding the steel points and pencil lead. The leg in which the pencil lead is held is provided with cut-out to readily remove broken or lodged leads.

Finished with a bright nickel plate. Distance from fulcrum to scriber points, about 3¼ inches. No leads are furnished. Extra steel points, 15 cents each.

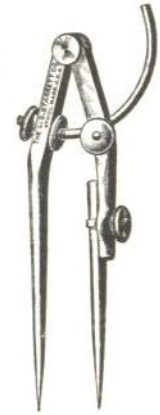
Made in this one size only.

No. 596 .....Price, each,

Packed 2 in a box.

Note: May also be supplied when so desired with hole diameter .076 at the same price.

Divider No. 92



This cut shows a divider with features which make it the best divider in its line yet produced. Both points are crucible forged steel, nicely tempered. The quadrant passes through the leg and the clamp screw frictionally locks it firm. After fine adjustments are made, our style of lock nut, between the arms, locks the spring in the leg firm, overcoming the defect in the old-style dividers of the points dodging out and in with the grain of the wood. The adjustable point may be instantly removed and a common pencil inserted in its place, or the ball points shown below may be used. The dividers are light, yet rigid and easy to handle, and are worth twice the price of the cheap malleable dividers on the market. The adjustable point is eccentric and may be loosened and rotated to make fine adjustments.

No. 92 6-inch .....Price,
No. 92 7-inch .....Price,
No. 92 8-inch .....Price,
No. 92 9-inch .....Price,

Packed 2 in a box.

Improved Extension Divider No. 85

This is a well-finished divider, with auxiliary caliper legs, which, together with a common pencil, form convenient combinations. Our locking nut between the arms, against which a spiral spring acts, is a valuable feature. After the fine adjustment is made, the nut may be turned back, locking spring and arms firmly, thus remedying the weak point which renders the common wing divider only as stiff as the adjusting spring. A full-threaded nut on the stud, through which the quadrant passes, is a more durable fastener than two or three threads tapped in the arm to hold the wing of the old style. The head and arms of this tool are made from the best malleable iron, the rest of steel. The points are hardened. The smallest size is 7 inches long; by adjustment of points it becomes 9 inches and will scribe a 22-inch circle; will caliper 11 inches outside and 13 inches inside. The second size is 9 inches; by adjustment of points it becomes 12 inches, and will scribe a 30-inch circle and caliper 14 inches outside and 16 inches inside. The third size is 12 inches; by adjustment of points it becomes 14 inches, will scribe a 40-inch circle and caliper 17 inches outside and 19 inches inside.

The points are eccentric and may be loosened and rotated to make fine adjustments.

For Ball Points which may be used with this tool, see page 207.

No. 85 A 7-inch, with divider legs only.....Price,
No. 85 B 9-inch, with divider legs only.....Price,
No. 85 C 7-inch, complete.....Price,
No. 85 D 9-inch, complete.....Price,
No. 85 E 12-inch, with divider legs only.....Price,
No. 85 F 12-inch, complete.....Price,

No. 85 C sent unless otherwise ordered.

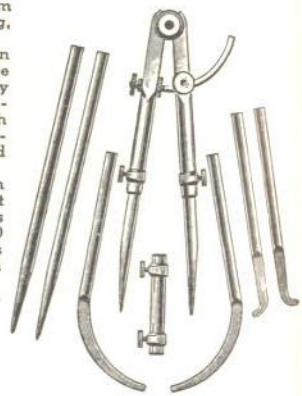
Improved Bronze Divider No. 90

Nickel Plated

The head and socket legs of this tool are made from drawn (not cast) bronze metal, and are hard, tough, strong, finely finished and nickel plated.

The joint is large and firm. Our locking nut between the arms, against which a spiral spring acts, is a valuable feature. After the fine adjustment is made, the nut may be turned back, locking spring and arms firmly, thus remedying the weak point in the common wing divider, which is only as stiff as the adjusting spring. The quadrant is fastened by our improved method. The points are eccentric and may be loosened and rotated to make fine adjustments.

A common pencil fits either socketed leg, while an auxiliary holder fits the reversed end of either short point for an extension. The head, with short point, is eight inches long; may be extended two inches or more; will caliper 10 inches outside and 12½ inches inside. With short points it will scribe a 24-inch circle and with long points a 30-inch circle.



For Ball Points which may be used with this tool, see page 207.

No. 90 A With short points only.....Price,
No. 90 B Set, complete.....Price,

No. 90 B sent unless otherwise ordered.

Extra Parts

Long Points.....Price, per pair,
Outside or Inside Caliper Legs.....Price, per pair,
Auxiliary Pencil Holder.....Price,
Special Long Points (will scribe 44-inch circle) made to order.....Price,

All above packed 1 in a box.

Ball Points No. 88

For Use with No. 85, 90 or 92 Dividers and Nos. 51, 58 and 59 Trammels

When it is necessary to use a hole as center for dividers or trammels it is, of course, impossible to use an ordinary divider point. In such cases the Ball Point placed in the hole and bearing against the edge forms a seat for the divider leg in scribing circles or arcs around the hole. For very accurate work, however, the Ball Point is not recommended for it is impossible to keep it exactly in the center.

This set consists of four balls, 1⅛, 1, ¾ and ½ inch diameter, respectively.

In ordering this set for use with trammels, please give tool number of the trammel so that the proper holder may be sent.

No. 88 Complete, 4 Balls and Holder.....Price,
No. 88 Balls or Holder only.....Price, each,

Packed 1 set in a box.

Improved Trammel Points No. 50

Nickel Plated

A trammel is a tool used to measure the distance between points too great to be reached with ordinary dividers.

These trammels are made of bronze metal, with forged steel points, hardened.

Either point can be removed, and the pencil socket accompanying each pair put in its place.

Adjustable like spring dividers. Light and durable.

The bar, shown in cut, holding pencil socket in center, with frames at each end, is similar to what would be used as a beam in using this tool, but is only long enough to permit easy packing in the tool chest, as well as in shipping.

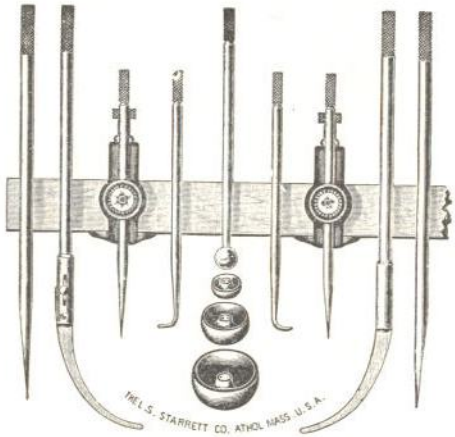
No. 50 A With 3-inch points, adjustable.....Price,
No. 50 B With 3-inch points, not adjustable.....Price,
No. 50 C Extra long points for above, 5-inch.....Price, per set,

No. 50 A sent unless otherwise ordered.

Note: When ordering No. 50C alone state whether they are to be used with No. 50A or No. 50B.

Packed 1 in a box.

Trammels No. 59



No. 59

This cut shows the trammels fastened to a wooden beam, which may be any size from ¾ to 1¼ inches wide, and of any thickness desired (requiring no fitting), giving stiffness according to the length and adapting it for small or large work.

The auxiliaries designed to go with the trammel heads are as shown above, viz., inside and outside caliper legs, an extra pair of long points, a set of four ball points with holder, which enable one to scribe a circle from the center of any hole up to 1½ inches and under. A lead pencil may be used in place of either of the steel points. Points are eccentric for close settings. Our clamping device is adapted to take in either a small or common sized pencil. The trammels are furnished with or without auxiliaries.

Head

The small engraving in the margin gives a more detailed representation of one of the heads. Due to the various lengths of beams required at different times and it being a simple matter for the mechanic to arrange, we do not furnish a beam.

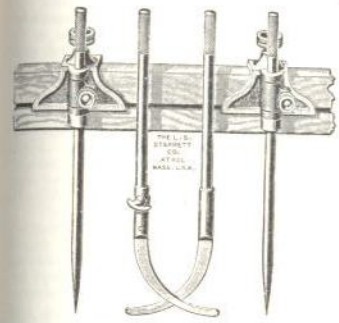
No. 59 A	Trammel Heads (with one pair of points)	Price,
No. 59 B	Balls and Holder	Price, per set,
No. 59 C	Small Caliper Legs	Price, per pair,
No. 59 D	Large Caliper Legs	Price, per pair,
No. 59 E	Large Divider Points	Price, per pair,
No. 59 F	Set complete	Price,

No. 59 A sent unless otherwise ordered.

Packed 1 in a box.

Extension Beam Trammels No. 51

Nickel Plated



This illustration represents a pair of trammel heads, with an opening through the underside to accommodate the extension, giving width and stiffness in proportion to the length required for large work, while it is equally well-adapted to receive a narrow beam for light work.

The points are eccentric, and may be loosened and rotated in their sockets to make fine adjustments. Either point may be removed and a common pencil inserted.

One of the caliper legs is provided with a joint, worked by an eccentric thumb piece for fine adjustments.

This illustration merely shows a section of a beam these trammel heads would be used with. As it is much more convenient for a mechanic to fit the beam, we do not furnish same.

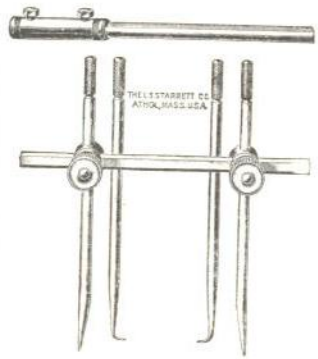
No. 51 A	Complete	Price,
No. 51 B	Without caliper legs	Price,

No. 51 A sent unless otherwise ordered.

For Ball Points which may be used with this tool, see page 207.

Packed 1 in a box.

Extension Steel Beam Trammels No. 58



The beam of this tool is 5/16 inch round, with one side flattened, so constant clamping will not injure the sliding surface as well as keeping the points in alignment. It is made in one, two or three sections, of 14-inch lengths each, and coupled together by means of our improved socket coupling shown in cut, rigidly holding them for long reaches. A special wrench for the coupling screws is furnished with each tool. With one 14-inch section only, it weighs but 8 ounces. The slides carrying the points grip both beam and points by a partial turn of the knurled nut. Fine adjustments are made by a slight rotation of one or the other eccentric points, which by a friction spring retains them when the nut is loosened.

		Plain	Nickel Plated
No. 58 A	With one section, 14-inch	Price,	
No. 58 B	With two sections, 28-inch	Price,	
No. 58 C	With three sections, 42-inch	Price,	
	Extra Sections, with coupling	Price,	
	Caliper Points, as shown in cut	Price, per pair,	
No. 58 D			Price,
No. 58 E			Price,
No. 58 F			Price,
			Price,
			Price,

Sent plain unless otherwise ordered.

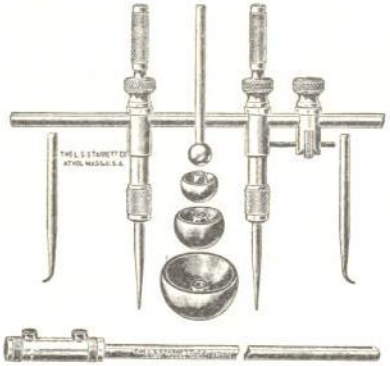
For Ball Points which may be used with this tool, see page 207.

When Ball Points are to be used with **No. 58** the fact should be mentioned in the order.

Packed 1 in a box.

Steel Beam Trammels No. 251

For Draftsmen, Engineers and Metal-Workers



A rigid well-designed trammel for laying out, scribing and measuring. The beam is flattened on the top so when the trams are clamped in position they cannot turn from pressure on the points. The trams are held in place by a spring friction once the nuts are loosened for setting. As will be observed from the cut, one tram has an adjusting screw for fine adjustment of the points.

At the top of each tram the knurled grips are in the form of a roller, the advantage being a swivel handle, which is far better than fixed handles. The points are adjustable in the spring chucks and can be replaced by pencils, caliper legs or ball points. The ball points permit working from holes up to 1½ inches in diameter.

No. 251 A With 10½-inch beam, to scribe circles 18 inches in diameter .....Price,
No. 251 B With 14½-inch beam, to scribe circles 26 inches in diameter .....Price
No. 251 C With 20 -inch beam, to scribe circles 36 inches in diameter .....Price,

Pair Caliper Points included with above sizes.

No. 251 D Coupling, with extra 20-inch beam, to scribe circles 72 inches in diam. Price,
No. 251 E Ball Points and Holder.....Price,
No. 251 F Extra Caliper Points.....Price, per pair,

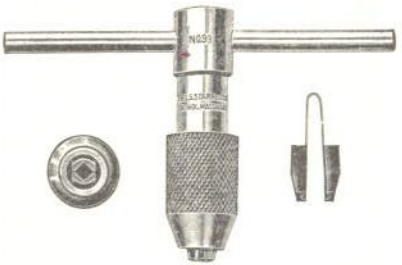
Set A sent unless otherwise ordered.

Additional Attachments for No. 251

Made so that a pen point and chuck (opening .076) to hold pencil leads, etc., may be used with our No. 251 Trammel for draftsmen and engineers. As depicted, the shanks of the attachments are clamped in the larger chucks of the trammel.

No. 251 H Steel Point and Socket (holds leads also) Price, each,
No. 251 J Needle Point .....Price, each,
No. 251 K Pen Attachment .....Price, each,

T-Handle Tap Wrenches No. 93



This cut represents a tool valuable to toolmakers, machinists and motor mechanics. It is used for holding taps to be turned with the hand, and is also useful for holding drills, reamers and other small tools. The body is centered, enabling the workman to use it on lathe centers, or in an upright drilling machine to start the tap straight. Its unique construction permits the jaws to conform to the piece to be held, making it rigid and less apt to become loose. The jaws and the knurled clamping nuts are heat-treated to withstand any ordinary use. No. 93C is made with sliding handle.

The D, E and F listing are identical in construction to A, B and C, except the body from knurled chuck nut to T-handle is proportionately longer. For machine, automobile service and airplane repair shops eliminating the expense of having on hand an endless lot of special long taps to work at depths where space does not permit of turning the handle.

No. 93 A Length, 1 ¾ inches; capacity, 1/16 to 5/32 inch square.....Price,
No. 93 B Length, 2 1/16 inches; capacity, 5/32 to ¼ inch square.....Price,
No. 93 C Length, 3 1/16 inches; capacity, 3/16 to 5/16 inch square.....Price,
No. 93 D Length, 6 inches; capacity, 1/16 to 5/32 inch square.....Price,
No. 93 E Length, 9 ⅜ inches; capacity, 5/32 to ¼ inch square.....Price,
No. 93 F Length, 12 ⅞ inches; capacity, 3/16 to 5/16 inch square.....Price,

Packed 1 in a box.

Tap Wrench No. 174

This wrench of nicely finished steel, with the gripping surfaces tempered, will hold taps, reamers, drills, etc., or any tool ¼ inch in diameter or under. It will grip round, square or oval shanks. It being but 3 inches in length and light in weight makes it particularly valuable in using taps of small diameters.

No. 174 .....Price,

Packed 6 in a box.

Tap Wrenches No. 91

Of new design, with gripping surfaces tempered—strong, neat and efficient. It will hold firmly a tap with square or round shank. Inside the knurled adjusting screw a spring connected with the plunger holds it back and causes instant movement with the screw.

	Length	Holds Taps	Fits Squares	Approximate Weight	Price
No. 91 A	5 ¾ inches	1/16 to ¼ inch	5/64 to 13/64 inch	2½ ounces	
No. 91 B	9 1/16 inches	7/32 to 5/16 inch	11/64 to ¼ inch	8 ounces	
No. 91 C	12 ⅝ inches	¼ to 5/8 inch	3/16 to 23/64 inch	1 pound	
No. 91 D	16 ¼ inches	5/16 to ¾ inch	¼ to 29/64 inch	2 pounds	

No. 91A packed 3 in a box.
Nos. 91 B-C-D packed 1 in a box.

Automatic Adjustable-Stroke Center Punch No. 18

The ordinary hammer and center punch are not sufficiently accurate when laying out fine work. They require the use of both hands and the accuracy of the blow depends upon the skill of the mechanic.

This center punch contains a mechanism which automatically strikes a blow of any required force when the punch is in the exact position desired by the operator. It is provided with a knurled adjustable screw cap, which, working in connection with a spring, regulates the stroke. For work requiring a heavy mark, turn cap down; for work requiring a light mark, turn up. To use it, no hammer is needed. The punch being placed in an upright position over the working line, a downward pressure releases the striking block and makes the impression without danger of slipping, as is liable when a hammer is used. When adjusted for either light or heavy stroke, all indentations are of a uniform size for the starting of the drill, etc., and more accurate and quicker work may be done as required on delicate work in tool making. The working parts are hardened, durable and accessible for such repairs as may ever be needed. The adjustable cap fits the hand, with no stroke adjusting screw through and above it to bother. The point can be removed for regrinding and easily replaced. The AA size is 3¼ inches long when adjusted for medium stroke, ⅜ inch in diameter and weighs 1 ounce. The A size is 5 inches long when adjusted for a medium stroke, ½ inch in diameter and weighs 3 ounces. The B size is 6 inches long when adjusted for a medium stroke, ⅝ inch in diameter and weighs 4 ounces. It differs from the other sizes in being larger and capable of striking a much heavier blow.

No. 18 AA ..... Price,
No. 18 A ..... Price,
No. 18 B ..... Price,
Extra Points ..... Price, each,

No. 18 A sent unless otherwise ordered.
Packed 1 in a box.

Spacing Attachment for Automatic Center Punch No. 18S

For use with automatic center punch No. 18. This attachment is entirely self-contained and can be instantly applied in place of the regular points. It will be found an indispensable tool for the rapid and accurate spacing of any center distances within its range. The locating point is on the principle of a spring plunger, held in its lowest position by a light spiral spring. It is frictionally held and easily replaced.

The attachment is made in two sizes: Size A has a capacity from 1/16 to ¾ inch and fits either Center Punch No. 18 AA or 18 A. Size B has a capacity from ⅛ to 1¾ inches and fits Center Punch No. 18 B.

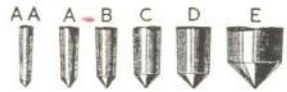
Showing Attachment applied to Center Punch

No. 18 S Size A ..... Price,
No. 18 S Size B ..... Price,
Extra Points ..... Price, each,

Packed 2 in a box.

Center Punches No. 117

Made to supply the demand for a better article than is ordinarily required. Made of fine steel, neatly shaped, knurled for finger grip, hardened and polished, and points nicely ground.



Length of size AA, 3⅛ inches. Length of sizes A, B, C and D, 4 inches. Diameter at top of tapered point: AA, 1/16 inch; A, 5/64 inch; B, 3/32 inch; C, 7/64 inch; D, 5/32 inch.

A larger size, E, is made for heavy work; length, 5 inches; diameter, ¼ inch; diameter of knurled part, ½ inch.

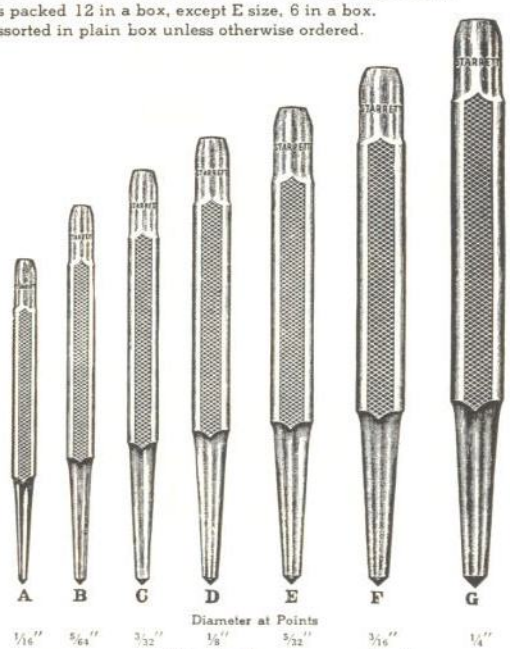
No. 117 Sizes AA, A, B, C and D ..... Price, each, Per dozen,
No. 117 Size E ..... Price, each, Per dozen,
No. 117 Assorted Sizes, A, B, C and D, in plain box ..... Price, per dozen,
No. 117 Assorted Sizes, A, B and C, in round wooden box, as shown on page 216 ..... Price, per dozen,

All sizes packed 12 in a box, except E size, 6 in a box.
Sent assorted in plain box unless otherwise ordered.

Center Punches No. 264

Square
With Knurled Grip
Will Not Roll

This illustration shows our new distinctive line of center punches, square, with knurled grip. They will not roll when laid down. They are made in seven sizes, ranging in length from 2⅞ to 5 inches. The A, B and C sizes are specially adapted to light toolmakers' work. Each punch is tempered its full length.



No. 264 Sizes A, B, C and D ..... Price, each, Per dozen,
No. 264 Sizes E and F ..... Price, each, Per dozen,
No. 264 Size G ..... Price, each, Per dozen,
No. 264 Assorted Sizes, A, B, C and D ..... Per dozen,
Set of Seven (one of each size) in round wooden box, same as shown on page 216 ..... Price,

All sizes packed 12 in a box, except G size, 6 in a box.
Sent assorted unless otherwise ordered

Spacing Center Punch No. 118

No. 118

This Combination Prick Punch and Spacing Tool is just the thing for laying off work quickly and accurately, for drilling, cutting out dies, etc. The prick punch is solid—made from best tool steel, properly tempered. The guide point is set in a socket with a spiral spring to force it down. When the punch is struck, the guide presses back into its socket, permitting the punch to be held straight over its work and insuring accurate results. The screw with pin plunger against spring retainer of adjustable point sets and holds the spacing right in laying out for small or large drill, and has a variation from 5/64 inch to approximately 5/16 inch.

No. 118.....Price,

Packed 3 in a box.

Prick Punches No. 816

Made with a long tapered point. Hardened and polished and the points nicely ground. Length of each size, 4 inches.

No. 816 Sizes A, B, C and D.....Price, each.
No. 816 Sizes A, B, C and D.....Price, per dozen,
No. 816 Assorted Sizes, 3A, 3B, 3C and 3D....Price, per dozen,

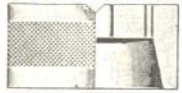
Packed 12 in a box.

Sent assorted unless otherwise ordered.

Bench Block No. 129

Patented

This block, like many other tools, was designed to meet the demand for something better than an ordinary piece of metal with a hole in it to drive pins in round or flat work. It is made from a forging and is hardened and ground. The knurling shown in the cut, while adding to its appearance, makes it easy to handle. The recess in the base, as shown in the semi-sectional view, decreases its weight, but it is strong enough to withstand much hard use. The V in the center is a feature needing no explanation. The holes vary in size from 1/8 to 5/8 inch. The block, being about 1½ inches high and 3 inches in diameter, appeals to mechanics particular in preserving a finished piece of work where the fitting of dowel pins is necessary.



Semi-sectional view

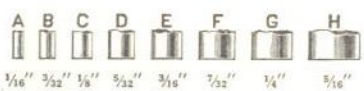
No. 129.....Price,

Packed 1 in a box.

Drive Pin Punches No. 565

Made of good quality steel, neatly shaped, hardened and polished, with knurled centers.

Length of each size, 4 inches. Diameter of points: A, 1/16 inch; B, 3/32 inch; C, 1/8 inch; D, 5/32 inch; E, 3/16 inch; F, 7/32 inch; G, 1/4 inch; and H, 5/16 inch.

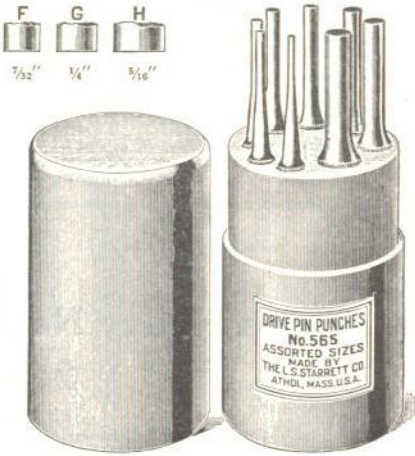


PRICES

Set of Eight (one of each size) in round wooden box, as shown in cut....
Per dozen, in plain box.....
Each .....

Packed 12 of a size, except H, or 12 assorted sizes, in plain box. Size H packed 6 in plain box.

Sent assorted unless otherwise ordered.



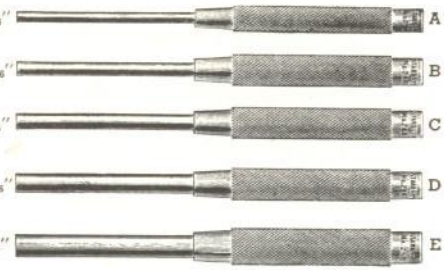
Drive Pin Punches No. 248

Extra Long

For Motor Service and Machine Shop Work

These drive pin punches are 8 inches long and have a knurled grip of 4½ inches. The pin drive part is 3½ inches long, diameters of same being slightly minus; A, 1/8 inch; B, 3/16 inch; C, 1/4 inch; D, 5/16 inch, and E, 3/8 inch. The diameter of the knurled grips is 7/16 inch on the A size, ½ inch on the B, C, and D sizes, and 9/16 inch on the E size.

They are designed to stand much hard use and to provide a more satisfactory punch for motor service and machine shop work. Just the punch to follow long cotter pins and the like into a hole without hindrance. Made of good quality steel and are hardened and polished.



No. 248 Sizes A, B, C, D and E .....Price, each, Per dozen,
No. 248 Assorted Sizes, A, B, C, D and E .....Price, per dozen,
Set of Five in plain box.....Price,

Packed 6 in box; assorted sizes 12 in a box.

Sent assorted unless otherwise ordered.

Nail Sets No. 116

Made of fine grade steel, both ends hardened and polished, centers nicely knurled, tips concaved, tops oval, and the size just right.

Length of each size, 4 inches. Diameter at tip: A, 1/16 inch; B, 3/32 inch; C, 1/8 inch; D, 5/32 inch.

PRICES

No. 116 In plain box.....Per dozen,
No. 116 .....Each,
No. 116 Assorted Sizes, A, B and C, in round wooden box as shown .....Per dozen,

Sent assorted in plain box unless otherwise ordered.

Packed 12 in a box.

Extra Heavy Nail Sets No. 176

PRICES

No. 176 A 5 inches long, 3/8-inch diameter, 3/16 inch at point.....Each, Doz.,
No. 176 B 5 inches long, 7/16-inch diameter, 1/4 inch at point.....Each, Doz.,

Packed 6 in a box.

Square Head Nail Sets No. 800

With Large Square Head and Round Grip

For the carpenter who likes a round grip and large striking surface. The square head prevents rolling and enables the user to readily pick it out from tools, nails, etc., in the pocket.

These nail sets are machined from 3/8-inch square bar stock, cut 4 inches long, have deep knurling and the heads and points are polished. Size of point is stamped on each set.

Made in 5 point sizes: 1/32, 1/16, 3/32, 1/8, and 5/32 inch.

PRICES

No. 800 Sizes A, B, C, D and E .....Each, Per dozen,
No. 800 Assorted Sizes, 2 A, 3 B, 3 C, 3 D and 1 E.....Per dozen,

Sent assorted unless otherwise ordered.

Packed 12 in a box.

Nail Sets No. 265

Square—With Knurled Grip—Will Not Roll

The above cut shows our new distinctive line of nail sets, square with knurled grip. They will not roll when laid down. They are made in seven sizes, the length of the five smaller sizes being 4 inches, the two larger sizes 5 inches. Each set is tempered its full length and the points are nicely cupped and beveled. The A size is specially adapted for a brad set.

No. 265 Sizes A, B, C, D and E .....Price, each, Per dozen,
No. 265 Sizes F and G .....Price, each, Per dozen,
No. 265 Assorted Sizes, A, B, C, D and E .....Per dozen,

Sizes A, B, C, D and E packed 12 in a box.
Sizes F and G packed 6 in a box.
Sent assorted unless otherwise ordered.

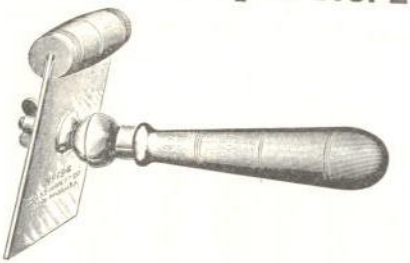
Measuring Bar Clamps No. 69

These clamps are one inch square inside, and are to be used with two wooden bars about 1 by 1/2 inch, of any desired length. (We do not furnish the bars.) The clamps and bars thus combined will be found very convenient by carpenters as adjustable measuring rods, as well as for extension beams for our No. 59 Trammels, as shown on page 208. Nickel plated.

No. 69.....Price, per pair,

Packed 2 pairs in a box.

Universal Scraper No. 194



The edges of the blade are ground square. There are therefore eight sharp cutting edges, and any one of them can almost instantly be brought into use by means of the handle with its ball joint connection. The ball joint has a spring plunger, a feature appreciated in adjusting. The blade is approximately 2 15/16 inches wide, 4 9/16 inches long and .065 inch thick, while the handle is about 7 inches long.

To lock or release the joint, or place the blade at any angle, it is simply necessary to give the handle a slight turn. The wing nut is used when the blade is removed from the handle.

The guard may be instantly slipped on or off either side or end of the blade, and enables one to use the tool with a firm grip, bearing on heavily or lightly as may be desired.

It is the neatest, simplest and best all-around scraper on the market.

No. 194 .....

Blades only, regular size .....Price,
Blades only, 2 inches wide .....Price, each,
Guards for blades.....Price, each,
.....Price, each,

Packed 1 in a box.

Floor, Bench and Cabinet Scraper No. 181

Patented

The head of this scraper is made of sheet steel with ribs struck up to make it rigid and has a bow formed for a rest to bear upon, which is nickel plated to a dull finish. The handle is connected to a universal joint allowing it to be set at an angle, enabling the user to get into corners without bruising the knuckles or bumping the hand against the wall. A turn of the handle locks it firmly. Both ball and handle are hard wood and stained. The blade is square and any of the sharp cutting edges may be quickly placed for action and firmly clamped, seating itself against two studs in the head. The blade is approximately 3 inches square and .065 inch thick, and the handle is about 8¾ inches long. In design, workmanship, material and finish this tool is strictly Starrett quality.

No. 181 .....

Extra Blades .....Price,
Note: For Burnisher to be used with this Scraper, see our No. 810 listed on page 219. .....Price, each,

Packed 1 in a box.

Burnisher No. 810

For Turning Scraper Cutting Edge

Although differing from the set standards for burnishers, many users of scrapers like this oval shape with the knurled steel handle. Gives a better grip and does away with the annoying looseness of a wood handle.

This burnisher is about 7 inches long, the approximate length of the oval section being 4 inches. Possesses proper hardness and smooth polished surface.

No. 810 .....Price, each,

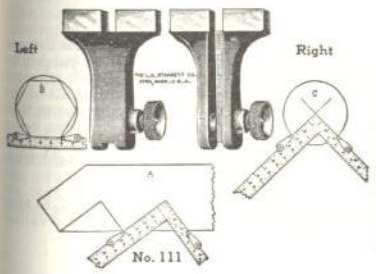
Packed 6 in a box.

Double-Lip Countersink No. 195

This is the only double-lip, self-centering wood countersink that has a keen cutting edge, and the only one made on the true principle for a wood-working tool. It will clear itself of its shavings in any kind of wood and will cut a smooth, round hole with surprising rapidity and ease. It is made from the best of steel, forged, twisted, and tempered. It can be sharpened from the inside with a file, and has a shank so that it may be held in bit braces or wood-working chucks.

No. 195 A ⅝-inch .....Price,
No. 195 B ⅞-inch .....Price,

Packed 6 in a box.



Stair Gage Fixtures No. 111

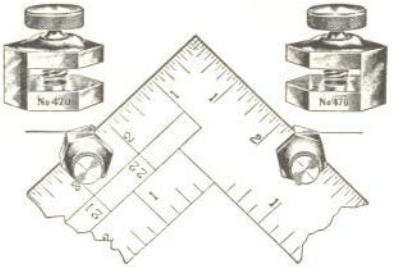
These fixtures can be readily clamped to a carpenter's steel square to form a gage for various uses, as in stairs, valley cuts, hip and rafter work.

Sketch A shows the gage as applied for laying out a stair stringer; sketch B, laying off hexagon angles; sketch C, as used as a center gage or in quartering a circle. Fixtures are light, neat, and efficient.

No. 111 .....Price, per pair,

Packed 3 pairs in a box.

Stair Gage Fixtures No. 470



A small set of ¾-inch hexagonal fixtures for the carpenters' steel square. Can be quickly clamped in place on the blade, to lay out angles for stair stringers, sawing, etc.

The finish is white nickel. Set screws are brass with natural finish.

No. 470.....Price, per pair,

Packed 12 pairs in a box.

Screw Driver No. 570

For Toolmakers and Machinists

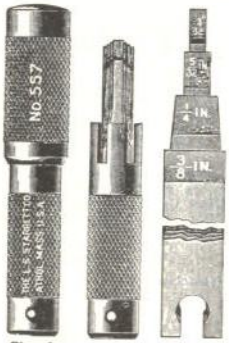
An especially adaptable screw driver for toolmakers and machinists, but appealing to other tradesmen as well, there being three blades which will fit nearly all screw heads. The blade is clamped and is as rigidly held as the solid type by a knurled nut. The cut shows that the nut merely holds the blade in position, the tang being so constructed as to withstand the greatest leverage. The hexagonal hard wood handle makes it the best feeling screw driver on the market. It is a well finished tool throughout and with the blade inserted is about 10 inches in length. Size of bits, approximately 7/32, 1/4 and 3/16 inch.

No. 570 With three blades.....Price, Extra Blades.....Price, each,

Packed 1 in a box.

Magazine Screw Driver No. 557

Patented



Closed 4 in. Long

Blades 2⅝ in. Long

This is the best tool yet offered for a set of pocket screw drivers. It has four blades of different widths, any of which may quickly be taken from the telescope handle and inserted in the end, where it is automatically locked and firmly held for use. Any or all of the blades are carried in the handle, where by a spring pressure they are held from rattling when carried in the pocket, or from being lost when the cap is off. While the cap may be readily pulled off or put on, it is rigidly held from turning and frictionally held from coming off, with no screws to bind or bother.

The smaller blades may be used to make holes in wood, to start screws as well as to drive them home. This tool will be found valuable in every household as well as to the mechanic.

The widths of the blades are 3/32, 5/32, 1/4 and 3/8 inch.

No. 557 Complete. Price, Extra Blades. Price, each,

Packed 1 in a box.

Electricians' Pocket Screw Driver No. 560

Patented

This screw driver is the same as our No. 557, except that the handle is covered with hard rubber for insulation from electrical currents, and is nicely ribbed so as to insure a firm grip when using the tool.

No. 560 Complete.....Price, Extra Blades.....Price, each.

Packed 1 in a box.

Starrett

Jewelers' Screw Drivers No. 555

They are nicely and substantially made from steel tubing, knurled and nickel plated. Six constitute a set, with blades varying from .025 to .100 inch in width. The blades are held from turning in the handle by a solid lock, and from coming out by a slight turn of a neat chuck. The top is finished with a swivel knob, concaved to fit the finger and hexagonal in shape to prevent rolling off the bench. To designate the size at a glance, the chuck end is marked with various grooves, five grooves indicating the finest size AA, four grooves size A, three grooves size B, two grooves size C, one groove size D; the largest size, E, being plain.

No. 555 AA Handle, 1/4-inch diameter; approx. width of blade, .025 inch .....Price,
No. 555 A Handle, 1/4-inch diameter; approx. width of blade, .040 inch .....Price,
No. 555 B Handle, 1/4-inch diameter; approx. width of blade, .055 inch .....Price,
No. 555 C Handle, 1/4-inch diameter; approx. width of blade, .070 inch .....Price,
No. 555 D Handle, 1/4-inch diameter; approx. width of blade, .080 inch .....Price,
No. 555 E Handle, 1/4-inch diameter; approx. width of blade, .100 inch .....Price,
Set of Six .....Price,
Extra Blades .....Price, each,

Each size packed 6 in a box.

Opticians' Screw Driver and Holder No. 552

This screw driver is designed for those using small screws, especially opticians, watch and clock makers. When the screw holder is not needed it may be slipped back on the blade, out of the way.

No. 552 A Screw Driver, complete, with two blades and screw holder .....Price,
No. 552 B Screw Driver, with two blades, without screw holder .....Price,
Screw Holder, only .....Price,
Extra Blades, either size .....Price, each,

No. 552 A sent unless otherwise ordered.

Packed 6 in a box.

Pocket Screw Driver No. 553

This tool is made from steel tubing, knurled and nickel plated. The shank of the blade fits a solid lock in the tube, preventing it from turning, and is held from coming out by a slight turn of the chuck.

To carry in pocket, reverse the blade, inserting it in the handle, giving a slight turn of the chuck to keep it there. It takes no more room in the pocket than a penknife.

The blades are properly tempered.

No. 553 A Handle, ¼-inch diameter; blade, 1⅞ inches long; weight, ½ ounce....Price,
No. 553 B Handle, ⅜-inch diameter; blade, 3 inches long; weight, 1¼ ounces...Price,
Extra Blades.....Price, each,

Pocket Screw Driver No. 559

With Wood Handle

This screw driver is very similar to our No.553 listed above, except that it is made with a good feeling wood handle. There are many small and inexpensive screw drivers on the market but this was designed for those who prefer a little better quality and strength throughout.

Steel parts are nickel plated. Blades reversible, telescoping in handle. Length, with blade: A—4 inches; B—6 inches.

No. 559 A Handle, ¾-inch diameter; blade, 1⅞ inches long; weight, ½ ounce....Price,
No. 559 B Handle, 15/16-inch diameter; blade, 3 inches long; weight, 1¼ ounces...Price,
Extra Blades.....Price, each,

Above numbers, packed 6 in a box.

Eyeglass Screw Driver No. 554

This screw driver is made with a chuck to hold the blade firmly in a split socket when in use. To carry in the pocket, on key-ring or watch chain, the blade may be removed by slightly loosening the chuck, then reversed and telescoped through the socket nearly full length, and held safely by tightening the chuck. Nickel plated.

No. 554.....Price,
Extra Blades.....Price, each,

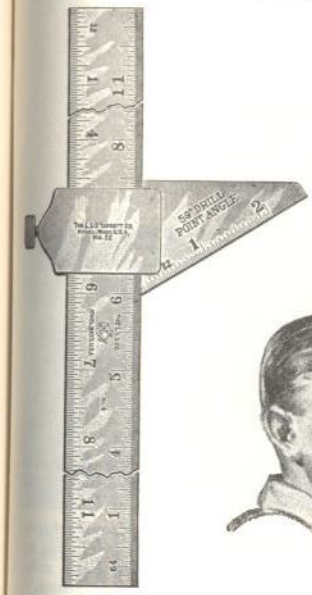
Eyeglass Screw Driver No. 556

Made in two pieces and screwed together, telescoping the blade when not in use. It is neat and safe to carry in the pocket, on key-ring or attached to a watch chain. Nickel plated.

No. 556 ..... Price,

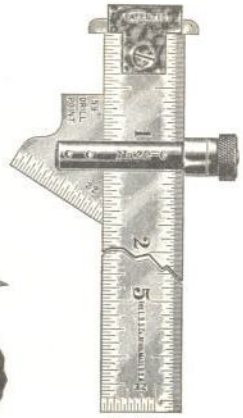
Drill Point Gage No. 22

Patented



No. 22 A
For Large Size Drills

Right on the 59°



No. 22 C
For Small Size Drills

This tool meets the demand for a gage designed for the specific purpose of assisting in grinding drill points accurately. The method followed for sharpening the cutting edges is to do one at a time. For satisfactory results, each lip must not only be the same length, but must also have the same angle in relation to the axis of the drill.

The No.22 C offers a very complete tool which may be used as a Drill Point Gage, Hook Rule, Plain Rule, Depth Gage, Try Square and Slide Caliper. The Head only, No.22 D, will fit our spring-tempered rules of same width and thickness, viz.: our Nos.300, 303, 600 and 603, in the 6-inch lengths.

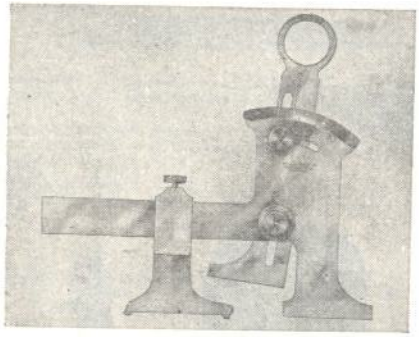
No. 22 A Gage with 12-inch blade (like our combination square blade), complete .Price,
No. 22 B Sliding Graduated Head only for (No.22 A size).....Price,
Recommended for large size drills.
No. 22 C Gage with 6-inch hook rule, complete.....Price,
No. 22 D Sliding Graduated Head only for (No.22 C size).....Price,
Recommended for small size drills.

Above numbers packed 1 in a box.

Blades for both sizes are graduated in 8ths, 16ths, 32nds, and 64ths.

Cutter Clearance Gage No. 459

Patented



PROPER CUTTER CLEARANCE! Is there any phrase heard more in tool and machine shops the world over? There is no more important single factor in the successful operation of a milling cutter than CORRECT CLEARANCE back of the cutting edge.

Correct design, good steel, proper hardening, are factors established by the manufacturer and not subject to alteration after a cutter has been purchased. The one variable factor is CLEARANCE. Cutter clearance generally varies from 2 degrees to 15 degrees, the basic rule being, "Give the cutting edge the maximum backing without letting the heel of the tooth drag."

Previous to the introduction of this new Starrett Cutter Clearance Gage the matter of determining correct clearance has been largely indefinite. The use of a protractor laid on the face of the cutter, or indicating same on cutters with a dial indicator, translating thousandths reading into degrees, etc., has been the slow and expensive way since one method or the other required removal of the cutter from its arbor in the milling machine, or removal from the arbor of the grinding machine. We claim, with this gage, in any department where cutter grinding takes place it will save many dollars by cutting the grinding expense, more work between grinds, less "out time" of machine, less wear on machines and, finally, more and better production. It is the type of gage that grows with one as it is used. The illustrations on the opposite page tell at a glance a few of its many applications. Helps check clearances from ½ to 2 inches in diameter and accurately checks clearance on cutters from 2 to 30 inches or more in diameter on end, side, spiral, helix and inserted teeth milling cutters.

The main sections of the gage are made of tool steel, hardened to withstand wear at contact points. The sliding bar, reversible on the beam, increases its scope. The flat foot of the sliding bar is on the line with the foot of the frame, thus making the measurement of side clearance on large diameter coarse pitch cutters an extremely simple one. Graduated to read by degrees from 0 to 20. The upright blade is both perpendicularly and angularly adjustable and each clamping action thereof is independent of the other.

No. 459.....Price,
With case .....Price,

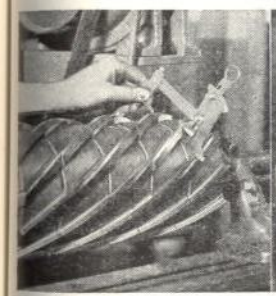
Sent with case unless otherwise ordered.

Packed 1 in a box.

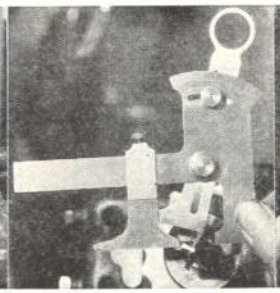
Starrett

Cutter Clearance Gage No. 459

Showing Applications of This Gage



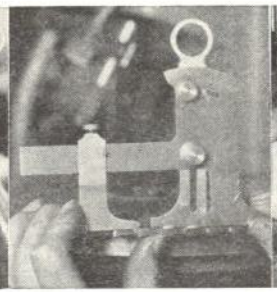
Checking Peripheral Clearance on a 6 x 15 Inch Inserted Cutter at Different Positions



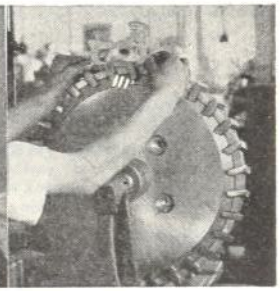
Gage Used on Special Angular Cutter

Check Side Clearance of 4 x ¾ Inch Alternate Tooth Mill

Gage Used on Diameter of 4-Inch Helical Mill



Gage Used on Side Teeth of 12 x 3/16 Inch Saw



Gage Used on Diameter of 20-Inch Diameter Inserted Tooth Mill

Tap and Drill Gage

Tap and Drill Data on This Gage Conforms to the National Coarse and National Fine Thread Series

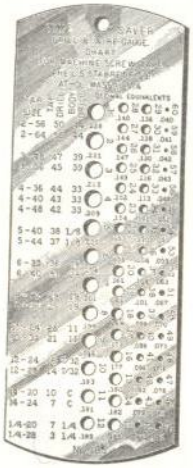
No. 185

Hardened

Trade-Mark

Time Saver

Reg. U.S. Pat. Off.



This gage is approximately 1/64 inch thick, 2 5/16 inches wide, and 6 1/4 inches long. It is hardened, ground and rubbed to a bright finish and is thoroughly tested after hardening.

By the use of this gage one is enabled to select at once the right sized drill to suit machine screw taps most commonly used, leaving just stock enough for the tap to cut as near a full thread as is practicable for one tap without breaking it, thus saving much time and uncertainty of result attending the former crude ways of making a selection.

Explaining the chart, the first row of figures, for an example, read thus, 2-56-50. The number 2 (in the first row of figures) means the number or size of tap; 56, the pitch or size of thread; 50, the size of drill to use which will leave the right stock for proper thread; and the number 44, in last column, is the size of drill to use to let the tap, screw, or bolt through freely.

The figures—1, etc., up to 60—designate the number of drill (size agreeing with the holes). Other figures, 228, 221, etc., designate the size of hole in thousandths of an inch.

No. 185.....Price,

Packed 3 in a box.

Drill and Steel Wire Gage No. 186

Hardened

This gage gives the number of drill to fit each hole, and the size of the hole in thousandths of an inch. This gage is about 5/64 inch thick, 1 1/2 inches wide, and 5 1/2 inches long. It is hardened, ground and rubbed to a bright finish and is thoroughly tested after hardening.

No. 186.....Price,

Packed 3 in a box.

Jobbers' Drill Gage No. 187

Hardened

This gage shows sizes from 1/16 to 1/2 inch, varying by 64ths, and is about 5/64 inch thick, 2 5/16 inches wide and 6 1/4 inches long. It is hardened, ground and rubbed to a bright finish and thoroughly tested after hardening.

No. 187.....Price,

Packed 3 in a box.

Drill and Steel Wire Gage No. 286

Hardened

This gage gives the number and decimal equivalents of standard sizes from 61 to 80 inclusive. It is adapted to gage small twist drills and fine drill rods. Each gage is hardened, ground and rubbed to a bright finish and thoroughly tested after hardening. Size of gage—1/16 inch thick, 3/4 inch wide, and 2 inches long.

No. 286.....Price,

Packed 3 in a box.

English Standard Wire Gages
Nos. 188 and 189

Hardened

Birmingham or Stubs'

Commonly used for gaging iron wire, also for hot and cold rolled steel, and in some instances for gaging sheet iron.

These gages have black finish and the decimal equivalents of each number are stamped on the reverse side. Each gage carefully tested after hardening.

No. 188 Numbers 1 to 36 ..... Price,
No. 189 Numbers 6 to 36 ..... Price,

Sizes and Numbers of English Standard Wire Gage

No. of Wire Gage	Size of Each No. in Decimal Parts of an Inch	No. of Wire Gage	Size of Each No. in Decimal Parts of an Inch	No. of Wire Gage	Size of Each No. in Decimal Parts of an Inch
0000	.454	11	.120	28	.020
000	.425	12	.109	26	.018
00	.380	13	.095	27	.016
0	.340	14	.083	28	.014
1	.300	15	.072	29	.013
2	.284	16	.065	30	.012
3	.259	17	.058	31	.010
4	.238	18	.049	32	.009
5	.220	19	.042	33	.008
6	.203	20	.035	34	.007
7	.180	21	.032	35	.005
8	.165	22	.028	36	.004
9	.148	23	.025		
10	.134	24	.022		

Packed 2 in a box.

See page 255 for comparison of wire gage standards.

United States Standard Gage
No. 283

Hardened

The gage numbers are United States Standard, adopted by Congress March 3, 1893. The recognized commercial standard in the United States for uncoated sheet and plate iron and steel, and is based on weights in ounces per square foot. Gage is black finished with decimal equivalents of each number stamped on reverse side. Carefully tested after hardening.

No. 283 Numbers 0 to 36 ..... Price,

Packed 2 in a box.

See page 255 for comparison of wire gage standards.

Starrett

American Standard Wire Gages

The Generally Accepted Standard for Non-Ferrous Metals
Adopted by the Brass Manufacturers, January, 1858

No. 281

Hardened

No. 282

Hardened

These gages are particularly useful for gaging sheets, plates and wire of non-ferrous metal such as copper, brass, aluminum, etc., also for electricians' use. Each gage has black finish, and is carefully tested after hardening. The decimal equivalents (approx.) are stamped on the reverse side.

No. 281 Numbers 0 to 36 ..... Price,
No. 282 Numbers 5 to 36 ..... Price,

Packed 2 in a box.

See page 255 for comparison of wire gage standards.

Wire Gage No. 287

Hardened

Washburn & Moen Standard

"U. S. Steel Wire Gage"

For gaging steel wire and drill rod.

This gage takes in sizes from 0 to 36. The gage numbers are those of the Washburn & Moen Standard. Decimal equivalents on the back.

Each gage has the black finish and is carefully tested after hardening.

No. 287 Numbers 0 to 36.....Price,

Sizes and Numbers of Washburn & Moen Standard Wire Gage

No. of Wire Gage	Size of Each No. in Decimal Parts of an Inch	No. of Wire Gage	Size of Each No. in Decimal Parts of an Inch	No. of Wire Gage	Size of Each No. in Decimal Parts of an Inch
0000	.3938	11	.1205	24	.0230
000	.3625	12	.1055	25	.0204
00	.3310	13	.0915	26	.0181
0	.3065	14	.0800	27	.0173
1	.2830	15	.0720	28	.0162
2	.2625	16	.0625	29	.0150
3	.2437	17	.0540	30	.0140
4	.2253	18	.0475	31	.0132
5	.2070	19	.0410	32	.0128
6	.1920	20	.0348	33	.0118
7	.1770	21	.0317	34	.0104
8	.1620	22	.0286	35	.0095
9	.1483	23	.0258	36	.0090
10	.1350				

Packed 2 in a box.

See page 255 for comparison of wire gage standards.

Music Wire Gage No. 295

Hardened

American S. & W. Co. Standard

For measuring and checking steel music wire.

This gage has black finish and has the decimal equivalents of each number stamped on the back. Each gage carefully tested after hardening.

No. of Wire Gage	Size of Each No. in Decimal Parts of an Inch	No. of Wire Gage	Size of Each No. in Decimal Parts of an Inch	No. of Wire Gage	Size of Each No. in Decimal Parts of an Inch
6-0	.004	8	.020	21	.047
5-0	.005	9	.022	22	.049
4-0	.006	10	.024	23	.051
3-0	.007	11	.026	24	.055
00	.008	12	.029	25	.059
0	.009	13	.031	26	.063
1	.010	14	.033	27	.067
2	.011	15	.035	28	.071
3	.012	16	.037	29	.075
4	.013	17	.039	30	.080
5	.014	18	.041	31	.085
6	.016	19	.043	32	.090
7	.018	20	.045	33	.095

No. 295 Numbers 6-0 to 33.....Price,

Packed 2 in a box.

Steel Music Wire Gage No. 280

Hardened

Washburn & Moen Standard

Sizes and Numbers of Steel Music Wire Gage

No. of Gage	Size of Each No. in Decimal Parts of an Inch	No. of Gage	Size of Each No. in Decimal Parts of an Inch
8-0	.0083	12	.0296
7-0	.0087	13	.0314
6-0	.0095	14	.0326
5-0	.010	15	.0345
4-0	.011	16	.036
3-0	.012	17	.0377
2-0	.0133	18	.0395
1-0	.0144	19	.0414
1	.0156	20	.0434
2	.0166	21	.046
3	.0178	22	.0483
4	.0188	23	.051
5	.0202	24	.055
6	.0218	25	.0586
7	.023	26	.0626
8	.0243	27	.0658
9	.0256	28	.072
10	.027	29	.076
11	.0284	30	.080

Each gage has a bright finish and is carefully tested after hardening.

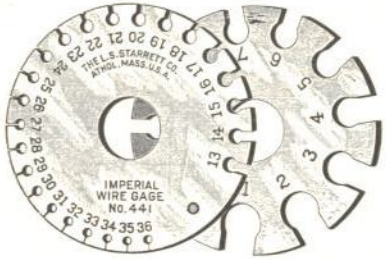
No. 280 Numbers 12 to 28.....Price,

Packed 2 in a box.

See page 255 for comparison of wire gage standards.

Imperial Standard Wire Gages Nos. 441 and 442

Hardened



The decimal equivalents of each number are stamped on the back.

Each gage is carefully tested after hardening. No. 441 with friction spring retains any position at which it may be set, and is made with bright finish.

No. 441 made in two sections, which fold together. Diameter, approximately 2⅛ inches.

No. 442 made in one piece with black finish. Diameter, approximately 3¼ inches.

No. 441 Numbers 1 to 36 .....Price,
No. 442 Numbers 1 to 36 .....Price,

Packed 2 in a box.

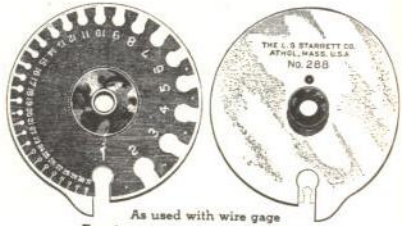
See page 255 for comparison of wire gage standards.

Wire Gage Guide No. 288

A timesaver and mistake eliminator for all workmen using a wire gage on duplicate work. The gage is held on the central stud, and may be securely locked in any position, so that all but the required number will be covered, thus making mistakes impossible, and saving the time formerly used in hunting for the size.

Size A made to be used with English Standard Wire Gage No. 189 and American Standard Wire Gage No. 282.

Size B made to be used with English Standard Wire Gage No. 188 and American Standard Wire Gage No. 281; United States Standard Gage No. 283 and Washburn & Moen Standard Wire Gage No. 287; also Imperial Standard Gage No. 442. Specify No. 288 A or No. 288 B when ordering.



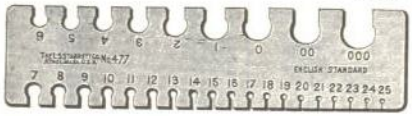
Front — As used with wire gage — Reverse

No. 288 A .....Price,

No. 288 B .....Price,

Rolling Mill Gages

Hardened



These gages are especially adapted to the hard use they are likely to receive in rolling mills and in places where constant measurements are to be taken quickly. The decimal equivalents of each number are stamped on the back with extra large figures. They are hardened and tempered and each gage is carefully tested. They are approximately 3/16 inch thick, 1 1/16 inches wide and 5⅞ inches long, and have black finish.

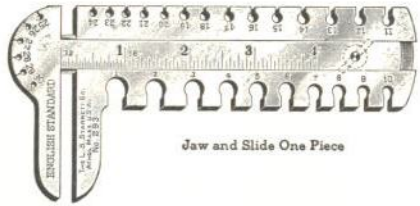
No. 477 English or Birmingham Standard. Numbers 000 to 25 .....Price,
No. 478 English or Birmingham Standard. Numbers 1 to 32 .....Price,
No. 479 U. S. Standard. Numbers 000 to 25. (The recognized commercial standard in the United States for uncoated sheet and plate iron and steel, and is based on weights in ounces per square foot) .....Price,

Packed 3 in a box.

Caliper and Wire Gage No. 293

Hardened

Specially for Use in Steel Mills



Jaw and Slide One Piece

This gage is made only in the English or Birmingham Standard and the United States Standard for sheet and plate iron and steel. As gages in rolling mills are preferred as compact as possible, yet strong enough to withstand hard usage, the movable jaw and graduated slide are made in one piece. It is hardened and finished bright. Graduations first inch are 32nds, remainder 16ths. Opening of caliper, 4 inches. Depth of jaws, 1⅛ inches. Width, 1½ inches.

No. 293 A Sizes 1 to 30, English or Birmingham Standard.....Price,
No. 293 B Sizes 1 to 30, United States Standard.....Price,

Packed 1 in a box.

Screw and Wire Gage No. 227

Front

The gage is made of spring-tempered steel and is easily carried in the pocket by those often handling screws and wire in hardware stores, stock rooms, etc. As shown by the cuts, this is an angular gage marked to show at the right of the opening (front view) all sizes of the American Standard Screw Gage from 0 to 30 and is equally adapted to measuring wire, as well as machine and wood screws. The gage can also be used to measure A.S.M.E. Standard Screws. Although there is a difference of one or two thousandths for the same number, it is not enough to affect the reading of the gage. At the left of the opening it is marked to read fractions of an inch from 1/16 to 7/16 inch. The shorter intermediate lines make possible readings by 32nds of an inch.

The 3½-inch scale, 2½ inches graduated by 16ths and 1 inch by 32nds, is ordinarily sufficient to take length measurements of screws, etc.

One end of the scale is cut out for a countersunk head screw, while the other end is made square to measure from a sharp right angle.

The reverse side of the gage is graduated to read by the old standard or English Wire Gage from 17 to 0000 and by the new standard or American Wire Gage from 15 to 0000.

Reverse

A screw or wire is measured by placing it in the opening until its weight brings up against both sides; the division at contact point indicates the number of the gage.

No. 227.....Price,

Packed 3 in a box.

Master Precision Level No. 199

For Erecting and Testing Machinery, Etc.

With 10-Second Level Vial

A new addition to our extensive line of iron levels. Designed only after much thought and experimentation to give the set-up men and manufacturers of all kinds of machinery a real precision and sensitive level. Too many machines are erroneously condemned when the whole fault is improper leveling. Present-day production and accuracy, to a large degree, depends on the levelness of the set-up. With this level, the operator can read and readily figure the exact variation from level and make the necessary adjustments.

Attention is called to the following phases of construction:

Main ground and graduated vial of 10-second accuracy, one division equaling ½ thousandth (0.0005) of an inch per foot.

An auxiliary level to aid setting true horizontal, showing position laterally.

Level vials set so breakage is reduced to a minimum.

Fool-proof adjustment to avoid tampering, once set.

Special alloy iron employed to obtain freedom from thermal effects.

Castings thoroughly seasoned, machined and scraped.

Non-machined surfaces have a black crackle finish.

Insulation from handling through the top plate of non-conductive material.

The length is 15 inches; height, 3 inches; width, 1½ inches, and the weight about 5½ pounds.

No. 199 Including finished wood case.....Price,

Packed 1 in a box.

Adjustable Bench Levels

With plain or ground and graduated vials—accurate and very sensitive.

Note: A ground vial is ground slightly concave on the inside, removing any small particles on the surface, giving a more sensitive bubble.

These levels are so constructed that they can be accurately adjusted, and when so adjusted are not liable to get out of true, the vials being set in tubes having solid ends which are firmly clamped to the base. The tubes are nickel plated and the bases are japanned. The outer tube being conveniently knurled with its friction fit may be turned so as to protect the glass when not in use. These levels have the longitudinal groove mentioned on page 238.

4, 6 and 8 inch sizes

12-in. size. The 18-in. is similar, but with double plumb

No. 95

4-inch, with plain vial.....Price,
6-inch, with plain vial.....Price,
8-inch, with plain vial.....Price,
12-inch, with plain vial with plumb.....Price,
18-inch, with plain vial with double plumb.....Price,

No. 96

4-inch, with ground and graduated main vial.....Price,
6-inch, with ground and graduated main vial.....Price,
8-inch, with ground and graduated main vial.....Price,
12-inch, with ground and graduated main vial with plumb.....Price,
18-inch, with ground and graduated main vial with double plumb.....Price,

Above numbers packed 1 in a box.

Cross-Test Level and Plumb No. 134

Nickel Plated

This is a well made and reliable tool, and valuable in plumbing, approximate squaring and leveling work. Just the level to use about a planer or in setting up machinery. Leveling is indicated every way without moving the tool.

It weighs 3 ounces. Size, 2 inches by 3 inches by ½ inch thick. Can be easily carried in the pocket.

No. 134.....Price,

Packed 1 in a box.

Improved Levels For Testing Shafting, Etc.

With Plain or Ground and Graduated Vials

In addition to the regular parallel vial, the bases have a cross level which enables one to place or hold the base on a shaft level in its cross section, not canted sidewise; for the shape of a level glass is such that, though true as adjusted on a flat surface, it will not be reliable when canted sidewise. Hence the value of the cross level, not only to test the truth of shafting, but other surfaces which tend to throw the level base into a canting position.

The base of this level has our concaved groove running through the length of its base, leaving a flat margin each side, which improves its seat for flat work, while forming an absolutely true and reliable seat for shafting, etc. These levels are adjustable and have the outer tube for protecting the glass when not in use.

6 and 8 inch sizes

12-in. size. The 18-in. is similar, but with double plumb

No. 97

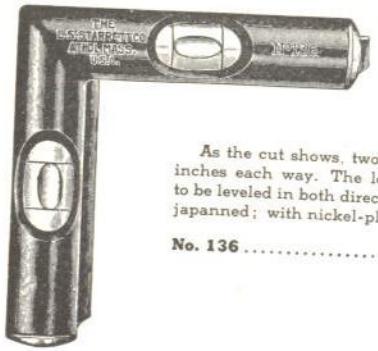
6-inch, with plain vial.....Price,
8-inch, with plain vial.....Price,
12-inch, with plain vial with plumb.....Price,
18-inch, with plain vial with double plumb.....Price,

No. 98

6-inch, with ground and graduated main vial.....Price,
8-inch, with ground and graduated main vial.....Price,
12-inch, with ground and graduated main vial with plumb.....Price,
18 inch, with ground and graduated main vial with double plumb.....Price,

Above numbers packed 1 in a box.

Cross-Test Level No. 136

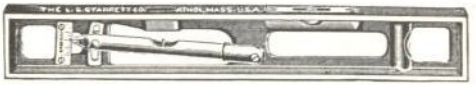


As the cut shows, two levels in one frame, extending at right angles 2¼ inches each way. The level weighs but 4 ounces. When placed on work to be leveled in both directions, it will not be necessary to move the tool. It is japanned; with nickel-plated ends.

No. 136.....Price,

Packed 1 in a box.

Engineers' and Plumbers' Levels No. 133



The above represents an adjustable, incline level, a fixed level, and a plumb. The hinged tube inside the working faces of the frame, carrying a level glass, is adjustable to the graduated plate, and shows any incline by 32nds (or less) to 2 inches to the foot without interfering in the least with the plumb or level. Each 32nd division on graduated plate equals 1/16 inclination of an inch per foot.

A longitudinal groove in seat of frame (not shown in cut) adapts it to rest on a cylindrical shaft or pipe as well as on flat surfaces, making it convenient to determine the pitch in laying tile pipe, drain pipes, etc.

These levels are supplied with either ground or plain glasses.

No. 133 A 10-inch, with plain vials.....Price,
No. 133 B 15-inch, with plain vials.....Price,
No. 133 C 10-inch, with ground and graduated vials.....Price,
No. 133 D 15-inch, with ground and graduated vials.....Price,

No. 133 A sent unless otherwise ordered.

No. 133 M

Metric

The same as No. 133, except that the plate has metric graduation, and shows any incline by millimeters or less up to an incline of 4 to 30 centimeters.

No. 133 M-A 25 cm., with plain vials.....Price,
No. 133 M-B 38 cm., with plain vials.....Price,
No. 133 M-C 25 cm., with ground and graduated vials.....Price,
No. 133 M-D 38 cm., with ground and graduated vials.....Price,

No. 133 M-A sent unless otherwise ordered.

Above numbers packed 1 in a box.

Iron Level No. 130

Bench Level

No. 130 3½-inch.....Price,

Bench Levels with Double Plumbs
No. 132

4-inch, with square ends .....Price,
6-inch, with square ends .....Price,
9-inch, with square ends .....Price,

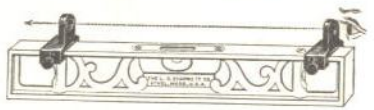
12-inch, with square ends .....Price,
18-inch, concave ends .....Price,
24-inch, concave ends .....Price,

All Starrett levels contain glass vials with two or more graduated lines, insuring greater accuracy.

Our levels, Nos.95, 96, 97, 98, 132 and 133, have longitudinal grooves in seat of base, as shown in small cut, adapting them to rest on cylindrical work, piping, shafting, etc., and also improving them for flat work. This concave groove is a section of a 1-inch circle and is true in relation to the base. The outer edges of the concave groove only touch the surface of a round piece, unless it be less than 1-inch diameter, and is an improvement over a deep V groove.

Above numbers packed 1 in a box.

Level Sight Attachments
No. 131



These attachments are made to slip on and off the top side of our iron levels and are held in place by suitably knurled clamp screws. They have sight holes—one with a cross wire to line accurately from top of and parallel with level. Sighting through the holes will enable one to use the common level for leveling a plot of ground from a fixed point at long range.

These attachments are made to fit 6, 9, 12, 18, and 24 inch No.132 levels, as well as our No.133 levels.

No. 131.....Price, per pair,

Packed 1 pair in a box.

Nickel-Plated Pocket Levels
No. 135

These levels are made from hexagonal stock ¾ and ½ inch respectively. With the convex ends and bright nickel finish they are all that could be desired for the pocket or on small work.

No. 135 2½-inch.....Price, **No. 135** 3½-inch.....Price,

Packed 1 in a box; 6 boxes in a carton.

Hexagon Aluminum Levels
No. 805

There are endless occasions where a check on the horizontal is made without regard to extreme accuracy and because the above levels are compact, light and inexpensive, they are gaining in popularity. Made from ⅜-inch hexagonal tubing. Vials filled to show yellow. Two lines to center bubble.

Commonly used when installing oil burners, etc.

No. 805 4-inch length; weight, ¼ ounce.....Price, each,
No. 805 6-inch length; weight, ½ ounce.....Price, each,

Packed 6 in a box.

Aluminum Line Level
No. 108

Weight, only ½ ounce

Line levels are used in laying foundations, tile pipe, cement and brick walls, working ditches, determining grades, building roads, trimming hedges, etc. Can also be used as a surface level. Note the reverse position of the slots which prevents its dropping off the line when in use. The lightness of this level tends to eliminate sag in the line. Made from ⅜-inch hexagonal stock 3 inches long and weighing but ½ ounce it may be conveniently carried in the pocket. A luminous level glass with a yellowish fluid which is preferable in line levels is furnished in this level.

This level glass has two graduated lines to check true level, also a metal guard to prevent breakage. The approximate level can be determined with this metal guard.

No. 108.....Price,

Packed 1 in a box; 6 boxes in a carton.

Gas Heaters No. 100

Useful in Various Mechanical Trades, Radio Work, Etc.

These Double Tube Gas Heaters are made with nickel-plated burners and japanned bases, and, with their attachments, are most convenient and effective heaters.

Their effectiveness lies in their scientific construction, being so made as to cause the gas and air to become thoroughly mixed for perfect combustion while passing through deflectors in base of tubes. The tubes are so formed as to cause the flames to penetrate each other at cross angles, thus producing a clean, intense heat, free from smoke and with no waste of gas.

The heater will be found very useful in the machine shop, as it is convenient for tempering small tools, melting lead, babbitt, etc., and as a forge for light work it will be found very valuable. Plumbers, tinsmiths, electricians, jewelers, dentists, barbers and others will also find it valuable. For laboratory and household use it has no equal. Over it a quart of water will boil in six minutes.

Screw the burner to the base so that the tool holder E (when in use) will be horizontal. If blaze is not vertical, bend one of the deflectors in or out. They are made for directing the flow of gas to the ducts. Do not get them too close together.

In hardening tools, the burner should be shielded from light and draft. Avoid leakage at joints. Best results are attained with a full head of gas, which with the air is injected through the mixing chamber, producing a blast.

Do not turn the blaze below a blue color, as good results cannot be obtained with a white blaze. If a white blaze appears on lighting, turn out and relight. For holding small pieces to be heated, roll up different sized tubes of tin to act as holders.

Soldering irons with short handles can be used with this heater, without fear of heating the handle.

The two and three burner heaters are made with a graduated adjusting tube on the end to supply the gas to one or more burners. For example, if gas is desired in one burner only, adjust the tube so that the figure one will coincide with the index mark on the base; for gas in two burners have the figure two coincide with the index, and so on.

No. 100 A Burner only, without base.....Price,
No. 100 B One Burner, with base.....Price,
No. 100 C Two Burners, with base.....Price,
No. 100 D Three Burners, with base.....Price,
No. 100 E Tool Holder only.....Price,
No. 100 F Dish Holder.....Price,
No. 100 G Ladle only, 14 inches long, 12 ounces in weight.....Price,
No. 100 H One Burner with base (B), with tool holder (E) and dish holder (F)...Price,

No. 100 H sent unless otherwise ordered.

Hack Saw Frames

Recognized as leaders by all who use Hack Saw Frames; the same as Starrett Tools are known to every user of tools. The best grade of material is used in these frames, while the bends are all uniform so that the blade lines up parallel with the back of the frame. Many features and improvements are embodied in STARRETT Frames to withstand the greatest strain and give the longest service.

Particular attention is called to the STARRETT "Pistol Grip" and "Easy Grip" frames. Either of these handles conform to the shape of the hand, permitting perfect control of the frame at all times. Hand cramp is unknown where this type of handle is used. The various frames as listed, while slightly different in finish or certain refinements, are all made with the same high regard for quality and durability.

No. 150

A narrow frame holding an 8-inch blade is often in demand in many places where the conventional run of hack saw frames cannot be used, and where it is not practical to attempt any cut with the blade only.

A good frame for cutting small pipe, cutting into conduit, B-X, tubing, insulation, etc. Has ample rigidity, our usual 4-way blade adjustment and is nickel plated.

An excellent frame for use with our No.249 Screw Slotting Blades. (See page 254.)

No. 150 With one blade.....Price,

Nos. 140 and 145

Depth of Frame, 2¾ inches

Showing Spring Plunger

Depth of Frame, 2½ inches

Spring plungers overlap the ends of the saw, automatically holding it in position. By slightly pushing them back the saw may be instantly removed, thus furnishing the most convenient way of attaching or detaching the saw ever devised. An improved nut within the handle, turning with it, gives the desired tension to the saw, which may be quickly and conveniently set at any required angle. The adjustable or extension back frames have improved spring pawls which securely hold the frames to receive saws of various lengths. The frames are neither too light nor too heavy—just right—are finely finished and nickel plated. In appearance, workmanship, and utility these tools are not approached by any other hack saw frames made. No.145 takes 8 to 12 inch saws.

One 8-inch saw blade furnished with each frame.

No. 140 With one blade.....Price,
No. 145 With one blade.....Price,

Above numbers packed 1 in a box.

Hack Saw Frames
No. 141

This solid steel frame is very rigid, the stock in same being wider than commonly used, and it cannot be cramped by straining the blade. The saws may be set to cut in any one of four directions and tightened by simply turning the handle. It is well made in every way.

Polished and nickel plated.

No. 141 8-inch, with one blade .....Price,
No. 141 9-inch, with one blade .....Price,
No. 141 10-inch, with one blade .....Price,
No. 141 12-inch, with one blade .....Price,

No. 146

This is, we believe, a better frame for the price than any other made. The stock is wider and more rigid than commonly used and cannot be cramped when saws are tightened up, and will not tremble when used. It is well made with our improved adjustable back and will take in 8, 9, 10, 11, and 12 inch saws, which may be set to cut in any one of four directions, and tightened by simply turning the handle. Polished and nickel plated.

Depth of Frame, 2½ inches

No. 146 With one blade .....Price,

No. 143

This solid steel frame is not as highly polished as our other solid frame, No. 141. Made with dull nickel finish.

The saws may be set to cut in any one of four directions, and tightened by simply turning the handle.

No. 143 8-inch, with one blade .....Price,
No. 143 9-inch, with one blade .....Price,
No. 143 10-inch, with one blade .....Price,
No. 143 12-inch, with one blade .....Price,

No. 144

This frame is nickel plated, dull finish. It is well made, with our improved adjustable back, and will take in 8, 9, 10, 11 and 12 inch saws, which may be set to cut in any one of four directions, and tightened by simply turning the handle.

No. 144 With one blade .....Price,

One 8-inch saw blade furnished with each of the above frames.

Above numbers packed 1 in a box.

Hack Saw Frames
No. 153

With Pistol Grip

A real hack saw frame with a "hang" that gives it the name, pistol grip. Other features of its structure are: easily and rapidly adjustable back; resistance to buckle, when using longer blades; reversible wing nut so tension of blade can be made at opposite end from the illustration, thus removing possible interference with stroke; ample finger space inside the handle, and a tough black composition handle moulded as one piece.

Takes 8 to 12 inch saws which are faceable in four directions. Bright nickel-plated frame.

No. 153 With one blade .....Price,

Packed 1 in a box.

No. 169

Patented

Anyone using this hack saw frame will appreciate the design, adjustment, rigidity and equalization of balance. It has just the right "hang" and there is ample finger room inside the handle. The constant spring tension on the bolts holding the blade and the adjustment on the back make changing a blade an easy and quick operation. The blade may be set to cut in any one of four directions. This frame has a moulded handle, and all steel parts are nickel plated. The depth of the frame from the cutting edge of the blade is about 3⅜ inches. The adjustment by means of the pawl as shown in the cut permits the use of blades 8 to 12 inches inclusive.

No. 169 With one blade .....Price,

Packed 1 in a box.

No. 489

A very rigid frame and with "Easy Grip" hardwood handle. Can be set to cut in any one of four directions and the desired tension obtained by turning the wing nut. Will accommodate saws from 8 to 12 inches. Nickel plated.

No. 489 With one blade .....Price,

Packed 1 in a box.

One 8-inch saw blade furnished with each of the above frames.

Starrett

Heavy Hack Saw Frames

No. 142

For cutting girders, steel rails, etc. With hardwood handle. Takes 12-inch saws only. Depth of frame from teeth of saw to inside edge of frame, 5¼ inches. Nickel plated.

No. 142 With one blade .....Price,

Packed 1 in a box.

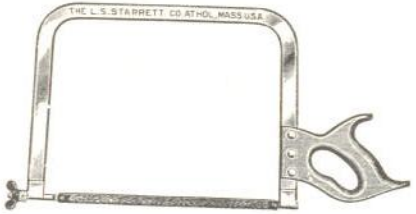
No. 148

For cutting girders, steel rails, etc. With hardwood handle. Takes 12-inch saws only. Depth of frame from teeth of saw to inside edge of frame, 7¼ inches. Nickel plated.

No. 148 With one blade .....Price,

Packed 1 in a box.

No. 149



For cutting girders, steel rails, etc. With hardwood handle. Takes 12-inch saws only. Depth of frame from teeth of saw to inside edge of frame, 10¼ inches. Nickel plated.

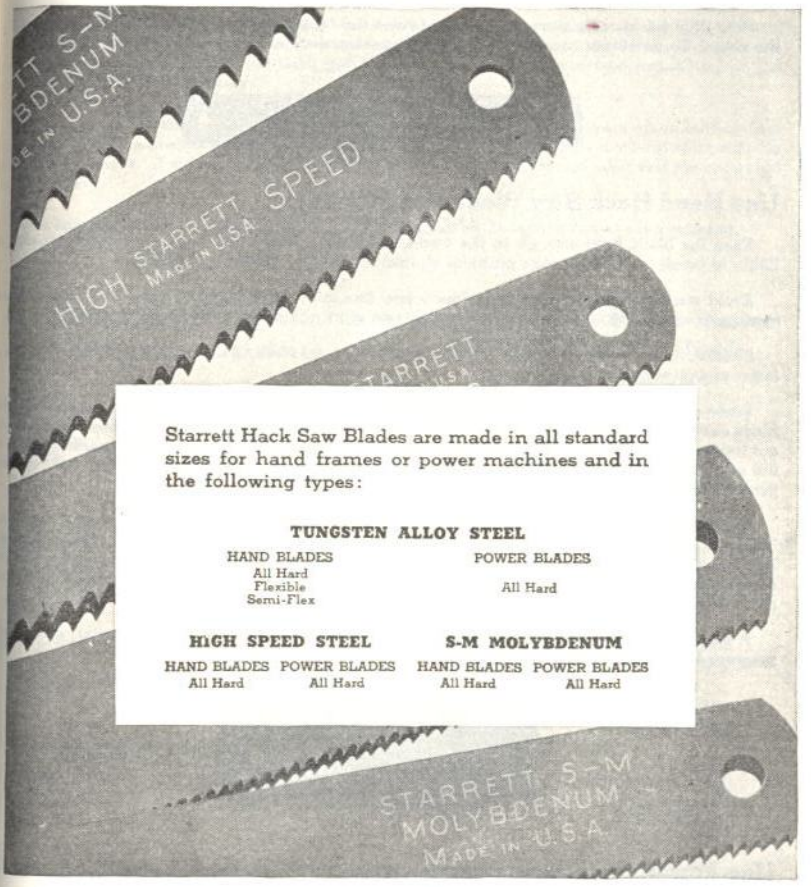
No. 149 With one blade .....Price,

Packed 1 in a box.

One 12-inch saw blade furnished with each of the above frames.

A SAW FOR EVERY METAL CUTTING JOB

STARRETT S-M MOLYBDENUM HIGH-SPEED STEEL TUNGSTEN ALLOY HACK SAWS



Starrett Hack Saw Blades are made in all standard sizes for hand frames or power machines and in the following types:

TUNGSTEN ALLOY STEEL

HAND BLADES	POWER BLADES
All Hard	
Flexible	All Hard
Semi-Flex	

HIGH SPEED STEEL		S-M MOLYBDENUM	
HAND BLADES	POWER BLADES	HAND BLADES	POWER BLADES
All Hard	All Hard	All Hard	All Hard

Standardize on STARRETT HACK SAWS

Suggestions

How little attention is given to the use of Hack Saw Blades as compared to other tools used in the shop. To use them correctly will greatly increase their efficiency.

Use Hand Hack Saw Blades as follows:

Keep the blade tight enough in the frame to hold it straight and taut. Too much tension is liable to break the blade at the pinholes should the saw be twisted or cramped.

Avoid starting a cut on corners unless a very fine tooth blade is used, then being sure when starting to use a light, steady stroke until the teeth cut through the corner into the thicker stock.

Short cutting strokes should be avoided, whereas a long steady downward stroke will produce a faster and cleaner cut.

When cutting sheet metal use a fine tooth blade so as to engage as many teeth as possible. The blade should be used at an angle. Coarse tooth blades would straddle the work and rip the teeth out immediately. To prevent ripping at least two teeth should be cutting at the thinnest section of the material being cut. On material too thin for the finest pitch blades made, start the cut very gently and with very little pressure.

The larger the surface to be cut, the coarser the teeth. When a hand blade is used for cutting larger surfaces of soft material, 14 or 18 tooth blades will be found most suitable. Soft materials being easily cut, the coarser tooth blade digs in more, removes larger chips easier from the cutting surface. Finer tooth saws on similar work would clog the teeth with chips and make the cutting more difficult.

A slower cutting stroke should be used when cutting tougher or harder material, also more pressure is required when cutting heavier stock.

Use Power Hack Saw Blades as follows:

Keep all power hack saw machines in good condition.

The selection of the proper type blade for the material to be cut is most essential. Length, width, thickness and correct number of teeth must be considered.

Much depends on the correct insertion of the blade in the machine. When operating a draw-cut machine the teeth of the blade should point away from the operator while on a push-cut machine, toward the operator.

The teeth should point in the direction in which the cutting is done.

Keep the blade tight in the machine. Loose blades are liable to cut crooked and wear out faster.

The correct amount of weight when using a new saw is very essential. Too much weight wears it out quickly and will also cause the saw to run; too little weight causes the saw to slide over the work without cutting, dulling the teeth quickly. The correct speed and feed depending on the material being cut is necessary.

A coolant which will help reduce wear and friction should be used except when cutting iron castings. Should a blade wear out or break, do not insert a new blade in the same cut as it generally will stick or wedge. A worn-out blade should never be run as the power and labor cost per cut would be too great.

As a saw dulls, increase the pressure, which keeps the blade cutting rather than rubbing.

Applications for Hand Blades of Tungsten Alloy Steel

14 TEETH at approx. 60 Strokes per min.

Bronze	Cast Iron
Brass	Rails
Soft Steel	Heavy Angles

18 TEETH at approx. 40 Strokes per min.

High Speed Steels	Drill Rod

18 TEETH at approx. 60 Strokes per min.

Small Solids	Light Angles

24 TEETH at approx. 60 Strokes per min.

Metal Conduit	Brass Tubing
Heavy BX	Iron Pipe

32 TEETH at approx. 60 Strokes per min.

Light BX	Thin Tubing
Sheet Metal	Flush Pipe

When using S-M Molybdenum or High Speed Steel Saws, the same pitch of teeth may be followed, but the speed can be increased.

Applications for Power Blades of Tungsten Alloy Steel

Coolant Should Be Used

Light Power Sizes

14 TEETH at approx. 60 Strokes per min.

Copper	Iron Pipe
Bronze	Wrought Iron

18 TEETH at approx. 60 Strokes per min.

Thin Metals	Light Angle Iron
Copper Tubing	

Heavy Power Sizes

4 TEETH at approx. 60 Strokes per min.

Large Solid Stock	Large Die Blocks

6 TEETH at approx. 60 Strokes per min.

Soft Steel	Machine Steel
Solid Stock	

10 TEETH at approx. 60 Strokes per min.

Bronze	Iron Pipe
Brass	Steel Rails
Tool Steel	Heavy Angle Iron

14 TEETH at approx. 60 Strokes per min.

Hard Materials	Steel Tubing
Light Angle Iron	

When using S-M Molybdenum or High Speed Steel Saws, the same pitch of teeth may be followed, but the speed should be increased to about 90-100 strokes per minute. The pressure may also be increased.

Starrett Hack Saws

Made from steels especially selected for each particular type of blade, scientifically set teeth for fast cutting, particular attention to the milled teeth insuring uniform cutting, proper heat treating furnaces for correct hardening, are some of the important features, which, with our many years of manufacturing experience, insure the user Dependable Hack Saws.

Select the saw that suits your job.

When ordering specify stock number and size required.

The illustrations below show sections of a few Starrett Hack Saws.

Note the difference in number of teeth per inch.

This is a heavy 10-tooth power blade for cutting tool steel, cast iron, rails, etc.

This is an 18-tooth hand blade, the all-round saw for general work. Most commonly used for cutting tool steel, high carbon and high speed steel.

This blade has 32 teeth and is recommended for cutting extra fine stock, thin pipe, tubing and sheet metal.

Tungsten Alloy Steel Hack Saws

Hand Blades

"Semi-Flex" recommended for cutting all kinds of soft metals

Size Inches	STOCK NUMBER 14 Teeth per Inch	18 Teeth per Inch	24 Teeth per Inch	32 Teeth per Inch	Approximate Weight per Gross	List Price per Gross
8 x 7/16 x .025		941	942	943	3¾ lbs.	
10 x ½ x .025	940	941	942	943	4¾ lbs.	
12 x ½ x .025	940	941	942	943	5¾ lbs.	

14 and 18 Tooth Saws have Alternate Tooth Set.

24 and 32 Tooth Saws have Wavy Tooth Set.

When cutting pipe, electrical conduit, wire cable, BX cable, tubing and cornices, without breakage or stripping of teeth, this blade is unexcelled. Should not be used on tool steel, drill rod or other heavy sections.

The saw for "trouble" jobs. Guaranteed to be practically unbreakable as to blade or teeth when in use.

Packed ½ gross in a box.

When ordering specify stock number and size required.

Tungsten Alloy Steel Hack Saws

Hand Blades

All Hard

All Hard. Preferred by skilled mechanics and bench workers where material to be cut is held rigid.

Size Inches	STOCK NUMBER 14 Teeth per Inch	18 Teeth per Inch	24 Teeth per Inch	32 Teeth per Inch	Approximate Weight per Gross	List Price per Gross
8 x 7/16 x .025	....	103	102	253	3¾ lbs.	
10 x ½ x .025	*103 B	103	102	253	4¾ lbs.	
12 x ½ x .025	*103 B	103	102	253	5¾ lbs.	
12 x 9/16 x .025	*103 A 14	103 A 18	103 A 24		6¾ lbs.	

Packed ½ gross in a box.

The above numbers are all furnished with Alternate Tooth Set.

Hand Blades

Flexible Back

Flexible Back, with hardened teeth only, to eliminate breakage. Preferred by electricians, plumbers, automotive repairmen and for maintenance work in cramped or out-of-the-way places.

Size Inches	STOCK NUMBER 14 Teeth per Inch	18 Teeth per Inch	24 Teeth per Inch	32 Teeth per Inch	Approximate Weight per Gross	List Price per Gross
8 x 7/16 x .025		250	**252	258	3¾ lbs.	
10 x ½ x .025	*250 D	250	**252	258	4¾ lbs.	
12 x ½ x .025	*250 D	250	**252	258	5¾ lbs.	
12 x 9/16 x .025	*250 A 14	250 A 18	250 A 24		6¾ lbs.	

Packed ½ gross in a box.

Flexible Blades all have Alternate Tooth Set except No. 252—10 and 12 inch—which may be had with Wavy Set. Alternate Set shipped unless otherwise specified.

For best results we suggest:

14-Tooth Saws—For cutting soft steel, solid brass, bronze, cast iron, rail and aluminum, etc.

18-Tooth Saws—For cutting tool steel, high carbon and high speed steel, light structural shapes, etc. For general use.

24-Tooth Saws—For cutting iron pipe, brass, medium tubing, copper, drill rod, etc.

32-Tooth Saws—For cutting thin tubing, thin sheet metals, special BX and electrical conduit, etc.

* **Nos. 103B, 103 A 14, 250 D and 250 A 14** All 14-Tooth Saws—specially recommended for cutting rails.

* * **No. 252 Flexible Back** The proper saw for the garage mechanic.

All Hand Frame Blades measure from center to center of holes. 14, 17 and 18 inch Power Blades measure 13½, 16½ and 17½ inches respectively between centers of holes.

All other Power Blades measure from center to center of holes.

When ordering specify stock number and size required.

Tungsten Alloy Steel Hack Saws

Power Blades

All Power Saws have the Clearance or Raker Tooth Set

For Light Power Machines

Size Inches	STOCK NUMBER 14 Teeth per Inch	STOCK NUMBER 18 Teeth per Inch	Approximate Weight per Gross	List Price per Gross
12 x ⅝ x .032	112 A 14	112 A 18	9½ lbs.	
12 x ¾ x .032	114	115 B	11 lbs.	
14 x ¾ x .032	114		12½ lbs.	

Packed ½ gross in a box.

14-Tooth Saws—For cutting tool steel, wrought iron, cast iron, copper, brass solids and rails.
18-Tooth Saws—For cutting iron pipe, heavy tubing, thin wall stock, brass castings, etc.

For Medium Power Machines

Size Inches	STOCK NUMBER 10 Teeth per Inch	STOCK NUMBER 14 Teeth per Inch	Approximate Weight per Gross	List Price per Gross
12 x ¾ x .049	255 C	255	17½ lbs.	
14 x ¾ x .049	255 C	255	20¼ lbs.	

Packed ½ gross in a box.

10-Tooth Saws—For cutting cast iron, machine steel and bronze.
14-Tooth Saws—For cutting tool steel, wrought iron, cast iron, copper and brass solids, all of small diameters, also thin wall stock.

For Heavy Power Machines

Size Inches	STOCK NUMBER 10 Teeth per Inch	STOCK NUMBER 14 Teeth per Inch	Approximate Weight per Gross	List Price per Gross
12 x 1 x .049	254 B	254 A	23 lbs.	
14 x 1 x .049	254 B	254 A	27 lbs.	
17 x 1 x .049	254 B	254 A	33 lbs.	

Packed ⅓ gross in a box.

10-Tooth Saws—For cutting cold rolled and machinery steel, shafting, etc
14-Tooth Saws—For cutting tool steel, high speed steel, etc.

For Extra Heavy Power Machines

Size Inches	STOCK NUMBER 10 Teeth per Inch	Approximate Weight per Gross	List Price per Gross
14 x 1¼ x .065	952 C	46 lbs.	
17 x 1¼ x .065	952 C	54 lbs.	
18 x 1¼ x .065	952 C	59 lbs.	
21 x 1¼ x .065	955 C	82½ lbs.	
24 x 1½ x .065	955 C	95 lbs.	

Packed ¼ gross in a box.

10-Tooth Saws—For cutting tool steel, cast iron, rails, etc.

When ordering specify stock number and size required.

Starrett

"S-M" Molybdenum Hack Saws

The letters "S-M" identify Starrett Molybdenum Hack Saws. They distinguish Starrett "S-M" Saws from our Tungsten and High Speed Steel Blades. Use these letters to simplify ordering.

Starrett "S-M" Molybdenum Hack Saws are the result of long and careful experimental work. You will find that, like every other Starrett Hack Saw Blade, they are outstanding in their class.

Starrett "S-M" Hack Saws combine the newest developments in heat treating with the hard, long-wearing qualities of Molybdenum. No matter what you cut—nickel, monel metal or stainless steel alloys; high speed, manganese or tool steel; phosphor bronze; solids, angles, channels, pipe, rails, etc.,—you can do the job better and faster and at the same time save real money.

Check these facts in your shop on your own metal cutting problems. A short test will quickly demonstrate the extra efficiency and economy of Starrett "S-M" Molybdenum Hack Saws.

Hand Blades

Supplied in Alternate Tooth Set only

	Size Inches	14 Teeth per Inch	18 Teeth per Inch	24 Teeth per Inch	32 Teeth per Inch	Weight per Gross	List Price per Gross
Regular	10 x ½ x .025	839 "S-M"	840 "S-M"	841 "S-M"	842 "S-M"	5 lbs.	
Regular	12 x ½ x .025		840 "S-M"	841 "S-M"	842 "S-M"	6½ lbs.	
Heavy	10 x ⅝ x .032		844 "S-M"			7¼ lbs.	
Duty	12 x ⅝ x .032		844 "S-M"			9¾ lbs.	

14-Tooth Saws—For cutting soft steel, brass, cast iron, heavy angles and rails.
18-Tooth Saws—For cutting drill rod, light angles, high speed steel, small solids.
24-Tooth Saws—For cutting brass tubing, heavy BX cable, iron pipe, metal conduit.
32-Tooth Saws—For cutting thin tubing, sheet metal, light BX cable, flush pipe, channels.

Packed ½ gross in a box.

Power Blades

Size Inches	4 Teeth per Inch	6 Teeth per Inch	10 Teeth per Inch	14 Teeth per Inch	Weight per Gross	LIST PRICE per Dozen	LIST PRICE per Gross
12 x 1 x .049				860 "S-M"	25 lbs.		
12 x 1 x .065		852 "S-M"	850 "S-M"		31¼ lbs.		
14 x 1 x .049				860 "S-M"	27½ lbs.		
14 x 1 x .065		852 "S-M"	850 "S-M"		35½ lbs.		
14 x 1¼ x .065	854 "S-M"	856 "S-M"	853 "S-M"		47 lbs.		
17 x 1 x .049				860 "S-M"	35 lbs.		
17 x 1 x .065		852 "S-M"	850 "S-M"		44½ lbs.		
17 x 1¼ x .065	854 "S-M"	856 "S-M"	853 "S-M"		56 lbs.		
18 x 1 x .065			850 "S-M"		47 lbs.		
18 x 1¼ x .065	854 "S-M"	856 "S-M"	853 "S-M"		61 lbs.		
21 x 1½ x .065	857 "S-M"	858 "S-M"	859 "S-M"		85 lbs.		
24 x 1½ x .065		858 "S-M"	859 "S-M"		97½ lbs.		

Extra Heavy Power "S-M" Molybdenum Saws

18 x 1½ x .072	864 "S-M"	866 "S-M"		78 lbs.
21 x 2 x .072	867 "S-M"	868 "S-M"		140 lbs.
24 x 2 x .072	867 "S-M"	868 "S-M"		146 lbs.

Recommended for cutting at approximately 100 strokes per minute with a moderate feed.

4-Tooth Saws—For cutting heavy solid bars of soft stock, etc.
6-Tooth Saws—For cutting machine steel, soft metals, large section metals, bronze and brass, etc.
10-Tooth Saws—For cutting high speed steel, tool steel, heavy angle iron, thick wall pipe, cast iron, heavy structural shapes, etc.
14-Tooth Saws—For cutting tool steel, high speed steel, light structural shapes, steel tubing, pipe, etc.

Packed 1 dozen in a box.

Specify "S-M" Saws (as shown in listing) when ordering.
When ordering specify stock number and size required.

High Speed Steel Hack Saws

For cutting on a production scale, or for hard-to-cut metals like high alloy steel, stainless steel, phosphor bronze, tool steel, rails, etc., the slightly higher investment in Starrett High Speed Blades will be amply repaid. They are often more convenient for the ordinary run of work because High Speed Blades of one pitch of teeth will cut a wider range of metals.

Starrett High Speed Blades are made from selected High Speed Steel, carefully hardened and finished to Starrett standards. In most cases they will cut twice as fast and make many times the number of cuts you get with regular Tungsten Blades. Use them in hand frames or power machines for greater economy, efficiency, and production.

All Hand Frame Blades measure from center to center of holes. 14, 17 and 18 inch Power Blades measure 13⅛, 16½ and 17½ inches respectively between centers of holes.

All other Power Blades measure from center to center of holes.

Hand Blades

Size Inches	STOCK NUMBER 14 Teeth per Inch	18 Teeth per Inch	24 Teeth per Inch	32 Teeth per Inch	Approximate Weight per Gross	List Price per Gross
10 x ⅝ x .025		840	841	842	6¼ lbs.	
12 x ⅝ x .025	839	840	841	842	7 lbs.	

Packed ½ gross in a box.

14 and 18 Tooth Saws have Alternate Tooth Set only.
24 and 32 Tooth Saws have Alternate and Wavy Tooth Set (specify).

14-Tooth Saws—For cutting soft steel, brass, cast iron, heavy angles and rails.

18-Tooth Saws—For cutting tool steel, machine steel, cast iron, bronze, copper and brass.

24-Tooth Saws—For cutting pipe, angles, channels, conduit, drill rod, sheet metal, metal trim and tubing thicker than 18 gage.

32-Tooth Saws—For cutting pipe, angles, channels, conduit, drill rod, sheet metal, metal trim and tubing thinner than 18 gage.

Power Machine Blades

Size Inches	STOCK NUMBER 4 Teeth per Inch	6 Teeth per Inch	10 Teeth per Inch	14 Teeth per Inch	Approximate Weight per Gross	LIST PRICE per Dozen	per Gross
12 x 1 x .049					26½ lbs.		
12 x 1 x .065		852	850	860	38 lbs.		
14 x 1 x .049					30¾ lbs.		
14 x 1 x .065		852	850	860	40½ lbs.		
14 x 1¼ x .065	854	856	853		50 lbs.		
17 x 1 x .049					37 lbs.		
17 x 1 x .065		852	850	860	48 lbs.		
17 x 1¼ x .065	854	856	853		61½ lbs.		
18 x 1 x .065					50¾ lbs.		
18 x 1¼ x .065	854		850		64 lbs.		
21 x 1½ x .065	857	856	853		90 lbs.		
24 x 1½ x .065		858	859		106 lbs.		
		858	859				

Packed 1 dozen in a box.

4-Tooth Saws—For cutting heavy solid bars of soft stock in extra heavy feed power machines.

6-Tooth Saws—For cutting machine steel, bronze, brass and large sections of other metals in a high speed positive feed machine.

10-Tooth Saws—For cutting tool steel, high speed steel, cast iron, thick wall pipe, monel metal, heavy structural shapes and other metals in a medium speed gravity feed machine.

14-Tooth Saws—For cutting high speed steel, pipe, structural shapes, tool steel, etc.

When ordering specify stock number and size required.

Starrett Hack Saw Blades

The Greatest Economy Obtained by Selecting the Correct Pitch

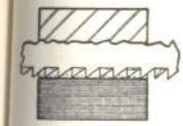
Correct | **Incorrect**

Plenty of Chip Clearance

14 Teeth Per Inch

For Mild Material
Large Sections

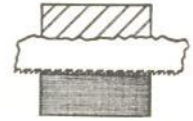
Fine Pitch. No Chip Clearance. Teeth Clogged



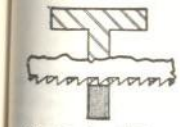
Plenty of Chip Clearance

18 Teeth Per Inch

For Tool Steel, High Carbon and High Speed Steel



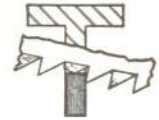
Fine Pitch. No Chip Clearance. Teeth Clogged



Two Teeth and More on Section

24 Teeth Per Inch

For Angle Iron, Brass. Copper, Iron Pipe, Etc.



Coarse Pitch Straddles Work Stripping Teeth

Two or More Teeth on Section

32 Teeth Per Inch

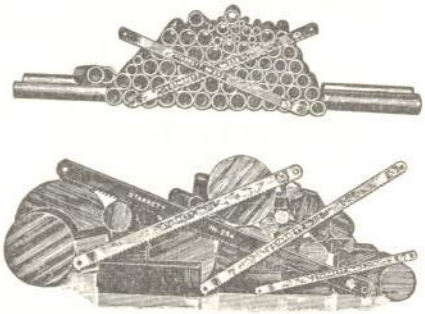
For Conduit and Other Thin Tubing Sheet Metal Work

Coarse Pitch Straddles Work

For General All-Round Work in Hand Frames We Recommend 18 Teeth Per Inch

Starrett Hack Saws

For Any Metal Cutting Job



Screw Slotting Saw Blades No. 249

These blades are made for cutting slots in screw heads and can be used in any adjustable or 8-inch hack saw frame. They are hardened throughout, and taper in thickness from the teeth to the back, thus providing good clearance, which prevents binding and allows the blades to cut easily and quickly.

All blades are 8 inches long by ½ inch wide. They are made in four different thicknesses, covering a wide range of work, and will be found invaluable in any machine shop or garage.

Packed three dozen of one thickness in a box, also in sets of four, consisting of one blade of each thickness, twelve sets to a carton.

Furnished with either 14 or 24 teeth to the inch. Specify which is wanted when ordering.

14 teeth sent unless otherwise ordered.

24 teeth commonly used for pistons.

	Approximate Thickness at Teeth	Price per Dozen	Price per Gross
No. 249 A	.049 inch		
No. 249 B	.065 inch		
No. 249 C	.083 inch		
No. 249 D	.109 inch		
No. 249 E Set of four blades, one of each thickness, per set			

Starrett

Different Standards for Wire Gages in use in the United States

Dimensions of Sizes in Decimal Parts of an Inch

Number of Wire Gage	American or Brown & Sharpe	Birmingham or Stubs' Iron Wire	Washburn & Moen, Worcester, Mass.	W. & M. Steel Music Wire	American S. & W. Co.'s Music Wire Gage	Imperial Wire Gage	Stubs' Steel Wire	U. S. Standard Gage for Sheet and Plate Iron and Steel	Number of Wire Gage
00000000	.....	.....	.....	.0083	.....	.....	.....	.....	00000000
0000000	.....	.....	.....	.0087	.....	.....	.....	.....	0000000
000000	.....	.....	.....	.0095	.004	.464	.....	.46875	000000
00000	.....	.....	.....	.010	.005	.432	.....	.4375	00000
0000	.460	.454	.3938	.011	.006	.400	.....	.40625	0000
000	.40964	.425	.3625	.012	.007	.372	.....	.375	000
00	.3648	.380	.3310	.0133	.008	.348	.....	.34375	00
0	.32486	.340	.3065	.0144	.009	.324	.....	.3125	0
1	.2893	.300	.2830	.0156	.010	.300	.227	.28125	1
2	.25763	.284	.2625	.0166	.011	.276	.219	.265625	2
3	.22942	.259	.2437	.0178	.012	.252	.212	.250	3
4	.20431	.238	.2253	.0188	.013	.232	.207	.234375	4
5	.18194	.220	.2070	.0202	.014	.212	.204	.21875	5
6	.16202	.203	.1920	.0215	.016	.192	.201	.203125	6
7	.14428	.180	.1770	.023	.018	.176	.199	.1875	7
8	.12849	.165	.1620	.0243	.020	.160	.197	.171875	8
9	.11443	.148	.1483	.0256	.022	.144	.194	.15625	9
10	.10189	.134	.1350	.027	.024	.128	.191	.140625	10
11	.090742	.120	.1205	.0284	.026	.116	.188	.125	11
12	.080808	.109	.1055	.0296	.029	.104	.185	.109375	12
13	.071961	.095	.0915	.0314	.031	.092	.182	.09375	13
14	.064084	.083	.0800	.0326	.033	.080	.180	.078125	14
15	.057068	.072	.0720	.0345	.035	.072	.178	.0703125	15
16	.05082	.065	.0625	.036	.037	.064	.175	.0625	16
17	.045257	.058	.0540	.0377	.039	.056	.172	.05625	17
18	.040303	.049	.0475	.0395	.041	.048	.168	.050	18
19	.03589	.042	.0410	.0414	.043	.040	.164	.04375	19
20	.031961	.035	.0348	.0434	.045	.036	.161	.0375	20
21	.028462	.032	.03175	.046	.047	.032	.157	.034375	21
22	.025347	.028	.0286	.0483	.049	.028	.155	.03125	22
23	.022571	.025	.0258	.051	.051	.024	.153	.028125	23
24	.0201	.022	.0230	.055	.055	.022	.151	.025	24
25	.0179	.020	.0204	.0586	.059	.020	.148	.021875	25
26	.01594	.018	.0181	.0626	.063	.018	.146	.01875	26
27	.014195	.016	.0173	.0658	.067	.0164	.143	.0171875	27
28	.012641	.014	.0162	.072	.071	.0149	.139	.015625	28
29	.011257	.013	.0150	.076	.075	.0136	.134	.0140625	29
30	.010025	.012	.0140	.080	.080	.0124	.127	.0125	30
31	.008928	.010	.0132	.....	.085	.0116	.120	.0109375	31
32	.00795	.009	.0128	.....	.090	.0108	.115	.01015625	32
33	.00708	.008	.0118	.....	.095	.0100	.112	.009375	33
34	.006304	.007	.0104	.....	.....	.0092	.110	.00859375	34
35	.005614	.005	.0095	.....	.....	.0084	.108	.0078125	35
36	.005	.004	.0090	.....	.....	.0076	.106	.00703125	36
37	.004453	.....	.....	.....	.....	.0068	.103	.006640625	37
38	.003965	.....	.....	.....	.....	.0060	.101	.00625	38
39	.003531	.....	.....	.....	.....	.0052	.099	.....	39
40	.003144	.....	.....	.....	.....	.0048	.097	.....	40

Table of Decimal Equivalents

of

8ths, 16ths, 32nds, and 64ths of an Inch

8ths

1/8 = .125
1/4 = .250
3/8 = .375
1/2 = .500
5/8 = .625
3/4 = .750
7/8 = .875

16ths

1/16 = .0625
3/16 = .1875
5/16 = .3125
7/16 = .4375
9/16 = .5625
11/16 = .6875
13/16 = .8125
15/16 = .9375

32nds

1/32 = .03125
3/32 = .09375
5/32 = .15625
7/32 = .21875
9/32 = .28125
11/32 = .34375
13/32 = .40625
15/32 = .46875
17/32 = .53125
19/32 = .59375
21/32 = .65625
23/32 = .71875
25/32 = .78125
27/32 = .84375
29/32 = .90625
31/32 = .96875

64ths

1/64 = .015625
3/64 = .046875
5/64 = .078125
7/64 = .109375
9/64 = .140625
11/64 = .171875
13/64 = .203125
15/64 = .234370

64ths

17/64 = .265625
19/64 = .296875
21/64 = .328125
23/64 = .359375
25/64 = .390625
27/64 = .421875
29/64 = .453125
31/64 = .484375
33/64 = .515625
35/64 = .546875
37/64 = .578125
39/64 = .609375
41/64 = .640625
43/64 = .671875
45/64 = .703125
47/64 = .734375
49/64 = .765625
51/64 = .796875
53/64 = .828125
55/64 = .859375
57/64 = .890625
59/64 = .921875
61/64 = .953125
63/64 = .984375

Decimal Equivalent of the Numbers of Twist Drill and Steel Wire Gage

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

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Table of Decimal Equivalents

of

Millimeters and Fractions of Millimeters

1/100 mm. = .0003937 inch

mm.	inches	mm.	inches	mm.	inches
1/50	.00079	26/50	.02047	2	.07874
2/50	.00157	27/50	.02126	3	.11811
3/50	.00236	28/50	.02205	4	.15748
4/50	.00315	29/50	.02283	5	.19685
5/50	.00394	30/50	.02362	6	.23622
6/50	.00472	31/50	.02441	7	.27559
7/50	.00551	32/50	.02520	8	.31496
8/50	.00630	33/50	.02598	9	.35433
9/50	.00709	34/50	.02677	10	.39370
10/50	.00787	35/50	.02756	11	.43307
11/50	.00866	36/50	.02835	12	.47244
12/50	.00945	37/50	.02913	13	.51181
13/50	.01024	38/50	.02992	14	.55118
14/50	.01102	39/50	.03071	15	.59055
15/50	.01181	40/50	.03150	16	.62992
16/50	.01260	41/50	.03228	17	.66929
17/50	.01339	42/50	.03307	18	.70866
18/50	.01417	43/50	.03386	19	.74803
19/50	.01496	44/50	.03465	20	.78740
20/50	.01575	45/50	.03543	21	.82677
21/50	.01654	46/50	.03622	22	.86614
22/50	.01732	47/50	.03701	23	.90551
23/50	.01811	48/50	.03780	24	.94488
24/50	.01890	49/50	.03858	25	.98425
25/50	.01969	1	.03937	26	1.02362

10 mm. = 1 centimeter = 0.3937 inch
10 cm. = 1 decimeter = 3.937 inches
10 dm. = 1 meter = 39.37 inches
25.4 mm. = 1 English inch

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Allowances for Fits

(Newal Engineering Co.)
From Machinery's Handbook (Fifth Edition)

Tolerances in Standard Holes ★

Class	Nominal Diameters	Up to ½ Inch	½-1 Inch	1-2 Inches	2-3 Inches	3-4 Inches	4-5 Inches
A	High Limit	+0.0002	+0.0005	+0.0007	+0.0010	+0.0010	+0.0010
	Low Limit	−0.0002	−0.0002	−0.0002	−0.0005	−0.0005	−0.0005
	Tolerance	0.0004	0.0007	0.0009	0.0015	0.0015	0.0015
B	High Limit	+0.0005	+0.0007	+0.0010	+0.0012	+0.0015	+0.0017
	Low Limit	−0.0005	−0.0005	−0.0005	−0.0007	−0.0007	−0.0007
	Tolerance	0.0010	0.0012	0.0015	0.0019	0.0022	0.0024
	Allowances for Forced Fits						
F	High Limit	+0.0010	+0.0020	+0.0040	+0.0060	+0.0080	+0.0100
	Low Limit	+0.0005	+0.0015	+0.0030	+0.0045	+0.0060	+0.0080
	Tolerance	0.0005	0.0005	0.0010	0.0015	0.0020	0.0020
	Allowances for Driving Fits						
D	High Limit	+0.0005	+0.0010	+0.0015	+0.0025	+0.0030	+0.0035
	Low Limit	+0.0002	+0.0007	+0.0010	+0.0015	+0.0020	+0.0025
	Tolerance	0.0003	0.0003	0.0005	0.0010	0.0010	0.0010
	Allowances for Push Fits						
P	High Limit	−0.0002	−0.0002	−0.0002	−0.0005	−0.0005	−0.0005
	Low Limit	−0.0007	−0.0007	−0.0007	−0.0010	−0.0010	−0.0010
	Tolerance	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Allowances for Running Fits ★★						
X	High Limit	−0.0010	−0.0012	−0.0017	−0.0020	−0.0025	−0.0030
	Low Limit	−0.0020	−0.0027	−0.0035	−0.0042	−0.0050	−0.0057
	Tolerance	0.0010	0.0015	0.0018	0.0022	0.0025	0.0027
Y	High Limit	−0.0007	−0.0010	−0.0012	−0.0015	−0.0020	−0.0022
	Low Limit	−0.0012	−0.0020	−0.0025	−0.0030	−0.0035	−0.0040
	Tolerance	0.0005	0.0010	0.0013	0.0015	0.0015	0.0018
Z	High Limit	−0.0005	−0.0007	−0.0007	−0.0010	−0.0010	−0.0012
	Low Limit	−0.0001	−0.0012	−0.0015	−0.0020	−0.0022	−0.0025
	Tolerance	0.0002	0.0005	0.0008	0.0010	0.0012	0.0013

Formulas for Determining Allowances

Class	High Limit	Low Limit	Class	High Limit	Low Limit
A	$+\sqrt{D}\times 0.0006$	$-\sqrt{D}\times 0.0003$	X	$-\sqrt{D}\times 0.00125$	$-\sqrt{D}\times 0.0025$
B	$+\sqrt{D}\times 0.0008$	$-\sqrt{D}\times 0.0004$	Y	$-\sqrt{D}\times 0.001$	$-\sqrt{D}\times 0.0018$
P	$-\sqrt{D}\times 0.0002$	$-\sqrt{D}\times 0.0006$	Z	$-\sqrt{D}\times 0.0005$	$-\sqrt{D}\times 0.001$

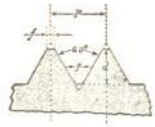
★ Tolerance is provided for holes, which ordinary standard reamers can produce, in two grades, Classes A and B, the selection of which is a question for the user's decision and dependent upon the quality of the work required; some prefer to use Class A as working limits and Class B as inspection limits.

★★ Running fits, which are the most commonly required, are divided into three grades: Class X, for engine and other work where easy fits are wanted; Class Y, for high speeds and good average machine work; Class Z, for fine tool work.

Tapers and Angles

Taper per Foot	Included <			With Center Line <			Taper per Inch	Taper per Inch from Center Line
	Deg.	Min.	Sec.	Deg.	Min.	Sec.		
1/8	0	35	48	0	17	54	.010416	.005203
3/16	0	53	44	0	26	52	.015625	.007812
1/4	1	11	36	0	35	48	.020833	.010416
5/16	1	29	30	0	44	45	.026042	.013021
3/8	1	47	24	0	53	42	.031250	.015625
7/16	2	5	18	1	2	39	.036458	.018229
1/2	2	23	10	1	11	35	.041667	.020833
9/16	2	41	4	1	20	32	.046875	.023438
5/8	2	59	42	1	29	51	.052084	.026042
11/16	3	16	54	1	38	27	.057292	.028646
3/4	3	34	44	1	47	22	.062500	.031250
13/16	3	52	38	1	56	19	.067708	.033854
7/8	4	10	32	2	5	16	.072917	.036456
15/16	4	28	24	2	14	12	.078125	.039063
1	4	46	18	2	23	9	.083330	.041667
1 1/4	5	57	48	2	58	54	.104666	.052084
1 1/2	7	9	10	3	34	35	.125000	.062500
1 3/4	8	20	26	4	10	13	.145833	.072917
2	9	31	36	4	45	48	.166666	.083332
2 1/2	11	53	36	5	56	48	.208333	.104166
3	14	15	0	7	7	30	.250000	.125000
3 1/2	16	35	40	8	17	50	.291666	.145833
4	18	55	28	9	27	44	.333333	.166666
4 1/2	21	14	2	10	37	1	.375000	.187500
5	23	32	12	11	46	6	.416666	.208333
6	28	4	2	14	2	1	.500000	.250000

American National Coarse and Fine Thread Dimensions and Tap Drill Sizes



p = pitch = $\frac{1}{\text{No. thrd. per in.}}$

d = depth = p x .649519

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

Size	Threads per Inch			Outside Diameter Inches	Pitch Diameter Inches	Root Diameter Inches	Tap Drill Approx. 75% Full Thread	Decimal Equivalent of Tap Drill
	NC	NF	NS					
0	....	80	....	.0600	.0519	.0438	3/64	.0469
1	....	....	56	.0730	.0614	.0498	54	.0550
1	64	....	....	.0730	.0629	.0527	53	.0595
1	....	72	....	.0730	.0640	.0550	53	.0595
2	56	....	....	.0860	.0744	.0628	50	.0700
2	....	64	....	.0860	.0759	.0657	49	.0730
3	48	....	....	.0990	.0855	.0719	47	.0785
3	....	56	....	.0990	.0874	.0758	45	.0820
4	....	....	32	.1120	.0917	.0714	45	.0820
4	....	....	36	.1120	.0940	.0759	44	.0860
4	40	....	....	.1120	.0958	.0795	43	.0890
4	....	48	....	.1120	.0985	.0849	42	.0935
5	....	....	36	.1250	.1070	.0889	40	.0980
5	40	....	....	.1250	.1088	.0925	38	.1015
5	....	44	....	.1250	.1102	.0955	37	.1040
6	32	....	....	.1380	.1177	.0974	35	.1065
6	....	....	36	.1380	.1200	.1019	34	.1110
6	....	40	....	.1380	.1218	.1055	33	.1130
8	....	....	30	.1640	.1423	.1207	30	.1285
8	32	....	....	.1640	.1437	.1234	29	.1360
8	....	36	....	.1640	.1460	.1279	29	.1360
8	....	....	40	.1640	.1478	.1315	28	.1405
10	24	....	....	.1900	.1629	.1359	25	.1495
10	....	....	28	.1900	.1668	.1436	23	.1540
10	....	....	30	.1900	.1684	.1467	22	.1570
10	....	32	....	.1900	.1697	.1494	21	.1590
12	24	....	....	.2160	.1889	.1619	16	.1770
12	....	28	....	.2160	.1928	.1696	14	.1820
12	....	....	32	.2160	.1957	.1754	13	.1850
1/4	20	....	....	.2500	.2175	.1850	7	.2010
1/4	....	28	....	.2500	.2268	.2036	3	.2130
5/16	18	....	....	.3125	.2764	.2403	F	.2570
5/16	....	24	....	.3125	.2854	.2584	I	.2720
3/8	16	....	....	.3750	.3344	.2938	5/16	.3125
3/8	....	24	....	.3750	.3479	.3209	Q	.3320
7/16	14	....	....	.4375	.3911	.3447	U	.3680
7/16	....	20	....	.4375	.4050	.3726	25/64	.3906
1/2	13	....	....	.5000	.4500	.4001	27/64	.4219
1/2	....	20	....	.5000	.4675	.4351	29/64	.4531
9/16	12	....	....	.5625	.5084	.4542	31/64	.4844
9/16	....	18	....	.5625	.5264	.4903	33/64	.5156
5/8	11	....	....	.6250	.5660	.5069	17/32	.5312
5/8	....	18	....	.6250	.5889	.5528	37/64	.5781
3/4	10	....	....	.7500	.6850	.6201	21/32	.6562
3/4	....	16	....	.7500	.7094	.6688	11/16	.6875
7/8	9	....	....	.8750	.8028	.7307	49/64	.7656

(Continued on page 262)

American National Coarse and Fine Thread Dimensions and Tap Drill Sizes

(Continued from page 261)

Size	Threads per Inch NC	NF	NS	Outside Diameter Inches	Pitch Diameter Inches	Root Diameter Inches	Tap Drill Approx. 75% Full Thread	Decimal Equivalent of Tap Drill
7/8	..	14	....	.8750	.8286	.7822	13/16	.8125
7/8	....	...	18	.8750	.8389	.8028	53/64	.8281
1	8	....	....	1.0000	.9188	.8376	7/8	.8750
1	....	14	....	1.0000	.9536	.9072	15/16	.9375
1 1/8	7	....	....	1.1250	1.0322	.9394	63/64	.9844
1 1/8	....	12	....	1.1250	1.0709	1.0168	1 3/64	1.0469
1 1/4	7	....	....	1.2500	1.1572	1.0644	1 7/64	1.1094
1 1/4	....	12	.. ..	1.2500	1.1959	1.1418	1 11/64	1.1719
1 3/8	6	....	....	1.3750	1.2667	1.1585	1 7/32	1.2187
1 3/8	....	12	....	1.3750	1.3209	1.2668	1 19/64	1.2969
1 1/2	6	....	....	1.5000	1.3917	1.2835	1 11/32	1.3437
1 1/2	....	12	....	1.5000	1.4459	1.3918	1 27/64	1.4219
1 3/4	5	....	.. ..	1.7500	1.6201	1.4902	1 15/16	1.5625
2	4 1/2	....	....	2.0000	1.8557	1.7113	1 25/32	1.7812
2 1/4	4 1/2	....	....	2.2500	2.1057	1.9613	2 1/32	2.0313
2 1/2	4	...	....	2.5000	2.3376	2.1752	2 1/4	2.2500
2 3/4	4	....	....	2.7500	2.5876	2.4252	2 1/2	2.5000
3	4	...	.. ..	3.0000	2.8376	2.6752	2 3/4	2.7500
3 1/4	4	....	.. ..	3.2500	3.0876	2.9252	3	3.0000
3 1/2	4	...	....	3.5000	3.3376	3.1752	3 1/4	3.2500
3 3/4	4	....	....	3.7500	3.5876	3.4252	3 1/2	3.5000
4	4	....	.. ..	4.0000	3.3786	3.6752	3 3/4	3.7500

American National Pipe Thread

Briggs Standard

Tap Drill Sizes

Pipe Size Inches	Threads per Inch	Root Diameter Small End of Pipe and Gage	Tap Drill Size	Tap Drill Decimal Equivalent
1/8	27	.3339	R	.339
1/4	18	.4329	7/16	.437
3/8	18	.5676	37/64	.578
1/2	14	.7013	23/32	.719
3/4	14	.9105	59/64	.921
1	11 1/2	1.1441	1 5/32	1.156
1 1/4	11 1/2	1.4876	1 1/2	1.500
1 1/2	11 1/2	1.7265	1 47/64	1.734
2	11 1/2	2.1995	2 7/32	2.218
2 1/2	8	2.6195	2 5/8	2.625
3	8	3.2406	3 1/4	3.250
3 1/2	8	3.7375	3 3/4	3.750
4	8	4.2344	4 1/4	4.250

Letter Sizes of Drills

Diameter Inches	Decimals of 1 Inch	Diameter Inches	Decimals of 1 Inch
A 15/64	.234	N	.302
B	.238	O 5/16	.316
C	.242	P 21/64	.323
D	.246	Q	.332
E 1/4	.250	R 11/32	.339
F	.257	S	.348
G	.261	T 23/64	.358
H 17/64	.266	U	.368
I	.272	V 3/8	.377
J	.277	W 25/64	.386
K 9/32	.281	X	.397
L	.290	Y 13/32	.404
M 19/64	.295	Z	.413

High Temperatures Judged by Color, and Colors for Tempering

Degrees Centigrade	Degrees Fahrenheit	High Temperatures Judged by Color	Degrees Centigrade	Degrees Fahrenheit	Colors for Tempering
400	752	Red heat, visible in the dark	221.1	430	Very pale yellow
474	885	Red heat, visible in the twilight	226.7	440	Light yellow
525	975	Red heat, visible in the daylight	232.2	450	Pale straw-yellow
581	1077	Red heat, visible in the sunlight	237.8	460	Straw-yellow
700	1292	Dark red	243.3	470	Deep straw-yellow
800	1472	Dull cherry-red	248.9	480	Dark yellow
900	1652	Cherry-red	254.4	490	Yellow-brown
1000	1832	Bright cherry-red	260.0	500	Brown-yellow
1100	2012	Orange-red	265.6	510	Spotted red-brown
1200	2192	Orange-yellow	271.1	520	Brown-purple
1300	2372	Yellow-white	276.7	530	Light purple
1400	2552	White welding heat	282.2	540	Full purple
1500	2732	Brilliant white	287.8	550	Dark purple
1600	2912	Dazzling white (bluish-white)	293.3	560	Full blue
			298.9	570	Dark blue

Lubricants for Cutting Tools

Material	Turning	Chucking	Drilling Milling	Reaming	Tapping
Tool Steel	Dry or Oil	Oil or Soda Water	Oil	Lard Oil	Oil
Soft Steel	Dry or Soda Water	Soda Water	Oil or Soda Water	Lard Oil	Oil
Wrought Iron	Dry or Soda Water	Soda Water	Oil or Soda Water	Lard Oil	Oil
Cast Iron	Dry	Dry	Dry	Dry	Oil
Brass	Dry	Dry	Dry	Dry	Oil
Copper	Dry	Oil	Oil	Mixture	Oil
Babbitt	Dry	Dry	Dry	Dry	Oil
Glass			Turpentine or	Kerosene	

Mixture is ⅓ Crude Petroleum, ⅔ Lard Oil. When two lubricants are mentioned the first is preferable.

The Speed of Drills

A feed per revolution of .004 to .007 for drills ¼ inch and smaller, and from .007 to .015 for larger is about all that should be required.

This feed is based on a peripheral speed of a drill equal to:

30 feet per minute for steel; 35 feet per minute for iron; 60 feet per minute for brass.

It may also be found advisable to vary the speed somewhat as the material to be drilled is more or less refractory.

We believe that these speeds should not be exceeded under ordinary circumstances.

Table of Cutting Speeds

Diam. Inches	FEET PER MINUTE										
	15	20	25	30	35	40	45	50	60	70	80
	REVOLUTIONS PER MINUTE										
1/16	917.	1223.	1528.	1834.	2140.	2445.	2751.	3057.	3668.	4280.	4891.
1/8	459.	611.	764.	917.	1070.	1222.	1375.	1528.	1834.	2139.	2445.
3/16	306.	408.	509.	611.	713.	815.	917.	1019.	1222.	1426.	1630.
1/4	229.	306.	382.	458.	535.	611.	688.	764.	917.	1070.	1222.
5/16	183.	245.	306	367.	428.	489.	550.	611.	733.	856.	978.
3/8	153.	204.	255.	306.	357.	408.	498.	509.	611.	713.	815.
7/16	131.	175.	218.	262.	306.	349.	393.	437.	524.	611.	699.
1/2	115.	153.	191.	229.	268.	306.	344.	382.	459.	535.	611.
5/8	91.8	123.	153.	184.	214.	245.	276.	306.	367.	428.	489.
3/4	76.3	102.	127.	153.	178.	203.	229.	254.	306.	357.	408.
7/8	65.5	87.3	109.	131.	153.	175.	196.	219.	262.	306.	349.
1	57.3	76.4	95.5	115.	134.	153.	172.	191.	229.	267.	306.
1 1/8	51.0	68.0	85.0	102.	119.	136.	153.	170.	204.	238.	272.
1 1/4	45.8	61.2	76.3	91.8	107.	123.	137.	153.	183.	214.	245.
1 3/8	41.7	55.6	69.5	83.3	97.2	111.	125.	139.	167.	195.	222.
1 1/2	38.2	50.8	63.7	76.3	89.2	102.	115.	127.	153.	178.	204.
1 5/8	35.0	47.0	58.8	70.5	82.2	93.9	106.	117.	141.	165.	188.
1 3/4	32.7	43.6	54.5	65.5	76.4	87.3	98.2	109.	131.	153.	175.
1 7/8	30.6	40.7	50.9	61.1	71.3	81.5	91.9	102.	122.	143.	163.
2	28.7	38.2	47.8	57.3	66.9	76.4	86.0	95.5	115.	134.	153.
2 1/4	25.4	34.0	42.4	51.0	59.4	68.0	76.2	85.0	102.	119.	136.
2 1/2	22.9	30.6	38.2	45.8	53.5	61.2	68.8	76.3	91.7	107.	122.
2 3/4	20.8	27.8	34.7	41.7	48.6	55.6	62.5	69.5	83.4	97.2	111.
3	19.1	25.5	31.8	38.2	44.6	51.0	57.3	63.7	76.4	89.1	102.

Double Depth of Threads

Threads per Inch N	V Threads D D	Am. Nat. Form D D U. S. Std.	Whitworth Standard D D	Threads per Inch N	V Threads D D	Am. Nat. Form D D U. S. Std.	Whitworth Standard D D
2	.86650	.64950	.64000	28	.06185	.04639	.04571
2¼	.77022	.57733	.56888	30	.05773	.04330	.04266
2⅜	.72960	.54694	.53894	32	.05412	.04059	.04000
2½	.69320	.51960	.51200	34	.05097	.03820	.03764
2⅝	.66015	.49485	.48761	36	.04811	.03608	.03555
2¾	.63019	.47236	.46545	38	.04560	.03418	.03368
2⅞	.60278	.45182	.44521	40	.04330	.03247	.03200
3	.57733	.43300	.42666	42	.04126	.03093	.03047
3¼	.53323	.39966	.39384	44	.03936	.02952	.03136
3½	.49485	.37114	.36571	46	.03767	.02823	.02782
4	.43300	.32475	.32000	48	.03608	.02706	.02666
4½	.38488	.28869	.28444	50	.03464	.02598	.02560
5	.34660	.25980	.25600	52	.03332	.02498	.02461
5½	.31490	.23618	.23272	54	.03209	.02405	.02370
6	.28866	.21650	.21333	56	.03093	.02319	.02285
7	.24742	.18557	.18285	58	.02987	.02239	.02206
8	.21650	.16237	.16000	60	.02887	.02165	.02133
9	.19244	.14433	.14222	62	.02795	.02095	.02064
10	.17320	.12990	.12800	64	.02706	.02029	.02000
11	.15745	.11809	.11636	66	.02625	.01968	.01939
11½	.15069	.11295	.11121	68	.02548	.01910	.01882
12	.14433	.10825	.10666	70	.02475	.01855	.01728
13	.13323	.09992	.09846	72	.02407	.01804	.01782
14	.12357	.09278	.09142	74	.02341	.01752	.01729
15	.11555	.08660	.08533	76	.02280	.01714	.01673
16	.10825	.08118	.08000	78	.02221	.01665	.01641
18	.09622	.07216	.07111	80	.02166	.01623	.01600
20	.08660	.06495	.06400	82	.02113	.01584	.01560
22	.07872	.05904	.05818	84	.02063	.01546	.01523
24	.07216	.05412	.05333	86	.02015	.01510	.01476
26	.06661	.04996	.04923	88	.01957	.01476	.01454
27	.06418	.04811	.04740	90	.01925	.01443	.01422

$$DD = \frac{1.733}{N}$$ For V Thread

$$DD = \frac{1.299}{N}$$ For American Nat. Form, U. S. Std.

$$DD = \frac{1.28}{N}$$ For Whitworth Standard

Rules Relative to the Circle, etc.

To Find Circumference—

Multiply diameter by 3.1416 — Or divide diameter by 0.3183

To Find Diameter—

Multiply circumference by 0.3183 — Or divide circumference by 3.1416

To Find Radius—

Multiply circumference by 0.15915 — Or divide circumference by 6.28318

To Find Side of an Inscribed Square—

Multiply diameter by 0.7071
Or multiply circumference by 0.2251 — Or divide circumference by 4.4428

To Find Side of an Equal Square—

Multiply diameter by 0.8862 — Or divide diameter by 1.1284
Or multiply circumference by 0.2821 — Or divide circumference by 3.545

Square—

A side multiplied by 1.4142 equals diameter of its circumscribing circle.
A side multiplied by 4.443 equals circumference of its circumscribing circle
A side multiplied by 1.128 equals diameter of an equal circle.
A side multiplied by 3.547 equals circumference of an equal circle.
Square inches multiplied by 1.273 equal circle inches of an equal circle.

To Find the Area of a Circle—

Multiply circumference by one-quarter of the diameter.
Or multiply the square of diameter by 0.7854
Or multiply the square of circumference by .07958
Or multiply the square of ½ diameter by 3.1416

To Find the Surface of a Sphere or Globe—

Multiply the diameter by the circumference.
Or multiply the square of diameter by 3.1416
Or multiply four times the square of radius by 3.1416

To Find the Weight of Brass and Copper Sheets, Rods and Bars—

Ascertain the number of cubic inches in piece and multiply same by weight per cubic inch.
Brass, 0.2972
Copper, 0.3212
Or multiply the length by the breadth (in feet) and product by weight in pounds per square foot.

Metric Conversion Table

Millimeters	×	.03937	=	Inches
Millimeters	=	25.400	×	Inches
Meters	×	3.2809	=	Feet
Meters	=	.3048	×	Feet
Kilometers	×	.621377	=	Miles
Kilometers	=	1.6093	×	Miles
Square centimeters	×	.15500	=	Square inches
Square centimeters	=	6.4515	×	Square inches
Square meters	×	10.76410	=	Square feet
Square meters	=	.09290	×	Square feet
Square kilometers	×	247.1098	=	Acres
Square kilometers	=	.00405	×	Acres
Hectares	×	2.471	=	Acres
Hectares	=	.4047	×	Acres
Cubic centimeters	×	.061025	=	Cubic inches
Cubic centimeters	=	16.3866	×	Cubic inches
Cubic meters	×	35.3156	=	Cubic feet
Cubic meters	=	.02832	×	Cubic feet
Cubic meters	×	1.308	=	Cubic yards
Cubic meters	=	.765	×	Cubic yards
Liters	×	61.023	=	Cubic inches
Liters	=	.01639	×	Cubic inches
Liters	×	.26418	=	U. S. gallons
Liters	=	3.7854	×	U. S. gallons
Grams	×	15.4324	=	Grains
Grams	=	.0648	×	Grains
Grams	×	.03527	=	Ounces, avoirdupois
Grams	=	28.3495	×	Ounces, avoirdupois
Kilograms	×	2.2046	=	Pounds
Kilograms	=	.4536	×	Pounds
Kilograms per square centimeter	×	14.2231	=	Pounds per square inch
Kilograms per square centimeter	=	.0703	×	Pounds per square inch
Kilograms per cubic meter	×	.06243	=	Pounds per cubic foot
Kilograms per cubic meter	=	16.01890	×	Pounds per cubic foot
Metric tons (1,000 kilograms)	×	1.1023	=	Tons (2,000 pounds)
Metric tons	=	.9072	×	Tons (2,000 pounds)
Kilowatts	×	1.3405	=	Horse-powers
Kilowatts	=	.746	×	Horse-powers
Calories	×	3.9683	=	B. T. units
Calories	=	.2520	×	B. T. units
Francs	×	.193	=	Dollars
Francs	=	5.18	×	Dollars

By courtesy of the American Machinist, New York.

Tables of Decimal Equivalents

Of 7ths, 14ths, and 28ths of an Inch								Of 6ths, 12ths, and 24ths of an Inch							
7th	14th	28th	Decimal	7th	14th	28th	Decimal	6th	12th	24th	Decimal	6th	12th	24th	Decimal
		1	.035714			15	.535714			1	.041667			13	.541666
	1		.071429	4			.571429		1		.083333		7		.583333
		3	.107143			17	.607143			3	.125			15	.625
1			.142857		9		.642867	1			.166666	4			.666666
		5	.178571			19	.678571			5	.208333			17	.708333
	3		.214286	5			.714286		3		.25		9		.75
		7	.25			21	.75			7	.291666			19	.791666
2			.285714		11		.785714	2			.333333	5			.833333
		9	.321429			23	.821429			9	.375			21	.875
	5		.357143	6			.857143		5		.416666		11		.916666
		11	.392857			25	.892857			11	.458333			23	.958333
3			.428571		13		.928571	3			.5				
		13	.464286			27	.964286								
	7		.5												

Tables for Computing Weight of Cast Steel

Weight in Pounds of a Lineal Foot of Round, Square, and Octagon Steel

Size in Inches	Round	Octagon	Square	Size in Inches	Round	Octagon	Square
1/16	.010	.011	.013	2 1/2	16.79	17.71	21.37
1/8	.042	.044	.053	2 5/8	18.51	19.52	23.56
3/16	.094	.099	.120	2 3/4	20.31	21.42	25.86
1/4	.168	.177	.214	2 7/8	22.20	23.41	28.27
5/16	.262	.277	.334	3	24.17	25.50	30.78
3/8	.378	.398	.481	3 1/8	26.23	27.66	33.40
7/16	.514	.542	.655	3 1/4	28.37	29.92	36.12
1/2	.671	.708	.855	3 3/8	30.59	32.27	38.95
9/16	.850	.896	1.082	3 1/2	32.90	34.70	41.89
5/8	1.049	1.107	1.336	3 5/8	35.29	37.23	44.94
11/16	1.270	1.339	1.616	3 3/4	37.77	39.84	48.09
3/4	1.511	1.594	1.924	3 7/8	40.33	42.54	51.35
13/16	1.773	1.870	2.258	4	42.97	45.33	54.72
7/8	2.056	2.169	2.618	4 1/4	48.51	51.17	61.77
15/16	2.361	2.490	3.006	4 1/2	54.39	57.37	69.25
1	2.686	2.833	3.420	4 3/4	60.60	63.92	77.16
1 1/8	3.399	3.585	4.328	5	67.15	70.83	85.50
1 1/4	4.197	4.427	5.344	5 1/4	74.03	78.08	94.26
1 3/8	5.078	5.356	6.466	5 1/2	81.25	85.70	103.45
1 1/2	6.044	6.374	7.695	5 3/4	88.80	93.67	113.07
1 5/8	7.093	7.481	9.031	6	96.69	101.99	123.12
1 3/4	8.226	8.674	10.474	7	131.61	138.82	167.58
1 7/8	9.443	9.960	12.023	8	171.90	181.32	218.88
2	10.744	11.332	13.680	9	217.57	229.48	277.02
2 1/8	12.129	12.793	15.443	10	268.60	283.31	342.00
2 1/4	13.598	14.343	17.314	11	325.01	342.80	413.82
2 3/8	15.151	15.981	19.291	12	386.79	407.97	492.48

Miscellaneous Measurements

Measures of Length

1 mile = 1760 yards = 5280 feet.

1 yard = 3 feet = 36 inches.

1 foot = 12 inches.

The following measures of length are also used occasionally:

1 mil = 0.001 inch. 1 fathom = 2 yards = 6 feet.

1 rod = 5.5 yards = 16.5 feet. 1 hand = 4 inches. 1 span = 9 inches.

Surveyor's Measure

1 mile = 8 furlongs = 80 chains.

1 furlong = 10 chains = 220 yards.

1 chain = 4 rods = 22 yards = 66 feet = 100 links.

1 link = 7.92 inches.

Nautical Measure

1 league = 3 nautical miles.

1 nautical mile (knot) = 6080.26 feet = 1.1516 statute mile.

One degree at the equator = 60 nautical miles = 69.168 statute miles.

360 degrees = 21,600 nautical miles = 24,874.5 statute miles = circumference of earth at the equator.

Square Measure

1 square mile = 640 acres = 6400 square chains.

1 acre = 10 square chains = 4840 square yards = 43,560 square feet.

1 square chain = 16 square rods = 484 square yards = 4356 square feet.

1 square rod = 30.25 square yards = 272.25 square feet = 625 square links.

1 square yard = 9 square feet.

1 square foot = 144 square inches.

An acre is equal to a square, the side of which is 208.7 feet.

Tap Drill Sizes

75% Depth of Thread

A bolt inserted in an ordinary nut, which has only one-half of a full depth of thread, will break before stripping the thread. Also a full depth of thread, while very difficult to obtain, is only about 5% stronger than a 75% depth.

These tables give the exact size of the hole, expressed in decimals, that will produce a 75% depth of thread, and also the nearest regular stock drill to this size. Holes produced by these drills are considered close enough for any commercial tapping.

$$\text{Diameter of Tap, Minus } \frac{.974}{\text{No. threads per Inch}} = \text{Diameter of Holes}$$

TAP DRILL SIZES—75% Depth Thread
Machine Screw Threads

Tap Size	Threads per Inch	Diameter Hole	Drill	Tap Size	Threads per Inch	Diameter Hole	Drill
0	*80	.048	3/64	10	32	.160	21
1	*72	.060	53	10	*30	.158	22
1	64	.058	53	10	24	149	25
2	*64	.071	50	12	*28	.181	14
2	56	.069	50	12	24	175	16
3	*56	.082	45	14	*24	.201	7
3	48	.079	47	14	20	193	10
4	*48	.092	42	16	*22	.224	2
4	40	.088	43	16	20	.219	7/32
4	36	.085	44	16	18	.214	3
5	*44	.103	37	18	*20	.245	D
5	40	.101	38	18	18	.240	B
5	36	.098	40	20	*20	.271	I
6	*40	.114	33	20	18	.266	17/64
6	36	.111	34	22	*18	.292	L
6	32	.108	36	22	16	.285	9/32
7	*36	.124	1/8	24	18	.318	O
7	32	.121	31	24	*16	.311	5/16
7	30	.119	31	26	*16	.337	R
8	*36	.137	29	26	14	.328	21/64
8	32	.134	29	28	16	.363	23/64
8	30	.132	30	28	*14	.354	T
9	*32	.147	26	30	16	.389	25/64
9	30	.145	27	30	*14	.380	V
9	24	.136	29				

*A. S. M. E. Standard

Starrett

Tap Drill Sizes

75% Depth Thread

American National Form **U. S. and S. A. E. Standard**

Tap Size	Threads per Inch	Diam. Hole	Drill	Tap Size	Threads per Inch	Diam. Hole	Drill	Tap Size	Threads per Inch	Diam. Hole	Drill
1/16	72	.049	3/64	1/4	32	.220	7/32	7/8	*14	.805	13/16
** 1/16	64	.047	3/64	1/4	*28	.215	3	7/8	12	.794	51/64
1/16	60	.046	56	1/4	27	.214	3	** 7/8	9	.767	49/64
5/64	72	.065	52	1/4	24	.209	4	15/16	12	.856	55/64
5/64	64	.063	1/16	** 1/4	20	.201	7	** 15/16	9	.829	53/64
** 5/64	60	.062	1/16	5/16	32	.282	9/32	1	27	.964	31/32
5/64	56	.061	53	5/16	27	.276	J	1	*14	.930	15/16
3/32	60	.077	5/64	5/16	*24	.272	I	1	12	.919	59/64
3/32	56	.076	48	5/16	20	.264	17/64	**1	8	.878	7/8
** 3/32	50	.074	49	** 5/16	18	.258	F	1 1/16	8	.941	15/16
3/32	48	.073	49	3/8	27	.339	R	1 1/8	*12	1.044	1 3/64
7/64	56	.092	42	3/8	*24	.334	Q	**1 1/8	7	.986	63/64
7/64	50	090	43	3/8	20	.326	21/64	1 3/16	7	1.048	1 3/64
** 7/64	48	.089	43	** 3/8	16	.314	5/16	1 1/4	*12	1.169	1 11/64
1/8	48	.105	36	7/16	27	.401	Y	**1 1/4	7	1.111	1 7/64
** 1/8	40	.101	38	7/16	24	.397	X	1 5/16	7	1.173	1 11/64
1/8	36	.098	40	7/16	*20	.389	25/64	1 3/8	*12	1.294	1 19/64
1/8	32	.095	3/32	** 7/16	14	.368	U	**1 3/8	6	1.213	1 7/32
** 9/64	40	.116	32	1/2	27	.464	15/32	1 1/2	*12	1.419	1 27/64
9/64	36	.114	33	1/2	24	.460	29/64	**1 1/2	6	1.338	1 11/32
9/64	32	.110	35	1/2	*20	.451	29/64	**1 5/8	5½	1.448	1 29/64
5/32	40	.132	30	** 1/2	13	.425	27/64	**1 3/4	5	1.555	1 9/16
** 5/32	36	.129	30	1/2	12	.419	27/64	**1 7/8	5	1.680	1 11/16
5/32	32	.126	1/8	9/16	27	.526	17/32	**2	4½	1.783	1 25/32
11/64	36	.145	27	9/16	*18	.508	33/64	**2 1/8	4½	1.909	1 29/32
**11/64	32	.141	9/64	** 9/16	12	.481	31/64	**2 1/4	4½	2.034	2 1/32
3/16	36	.161	20	5/8	27	.589	19/32	**2 3/8	4	2.131	2 1/8
3/16	32	.157	22	5/8	*18	.571	37/64	**2 1/2	4	2.256	2 1/4
3/16	30	.155	23	5/8	12	.544	35/64	**2 5/8	4	2.381	2 3/8
** 3/16	24	.147	26	** 5/8	11	.536	17/32	**2 3/4	4	2.506	2 1/2
13/64	32	.173	17	11/16	*16	.627	5/8	**2 7/8	3½	2.597	2 19/32
13/64	30	.171	11/64	**11/16	11	.599	19/32	**3	3½	2.722	2 23/32
**13/64	24	.163	20	3/4	27	.714	23/32	**3 1/8	3½	2.847	2 27/32
7/32	32	.188	12	3/4	*16	.689	11/16	**3 1/4	3½	2.972	2 31/32
7/32	28	.184	13	3/4	12	.669	43/64	**3 3/8	3¼	3.075	3 1/16
** 7/32	24	.178	16	** 3/4	10	.653	21/32	**3 1/2	3¼	3.200	3 3/16
15/64	32	.204	6	13/16	12	.731	47/64	**3 5/8	3¼	3.325	3 5/16
15/64	28	.200	8	**13/16	10	.715	23/32	**3 3/4	3	3.425	3 7/16
**15/64	24	.194	10	7/8	27	.839	27/32	**3 7/8	3	3.550	3 9/16
				7/8	*18	.821	53/64	**4	3	3.675	3 11/16

*S. A. E. Standard

**U. S. Standard

The Metric System of Measurement

Measures of Length

1 Millimeter (mm.) = ...0.03937079 inch, or about 1/25 inch
10 Millimeters = 1 Centimeter (cm.) = ...0.3937079 inch
10 Centimeters = 1 Decimeter (dm.) = ...3.937079 inch
10 Decimeters = 1 Meter (m.) = ...39.37079 inches, 3.2808992 feet, or 1.09361 yards
10 Meters = 1 Decameter (Dm.) = ...32.808992 feet
10 Decameters = 1 Hectometer (Hm.) = ...19.927817 rods
10 Hectometers = 1 Kilometer (Km.) = ...1093.61 yards, or 0.6213824 mile
10 Kilometers = 1 Myriameter (Mm.) = ...6.213824 miles
1 inch = 2.54 cm., 1 foot = 0.3048 m., 1 yard = 0.9144 m., 1 rod = 0.5029 Dm., 1 mile = 1.6093 Km.

Measures of Weight

1 Gramme (g.) = 15.4324874 gr. Troy, or 0.03215 oz. Troy, or 0.03527398 oz. avoirdupois
10 Grammes = 1 Decagramme (Dg.) = ...0.3527398 oz. avoirdupois
10 Decagrammes = 1 Hectogramme (Hg.) = ... 3.527398 oz. avoirdupois
10 Hectogrammes = 1 Kilogramme (Kg.) = ...2.20462125 lbs.
1000 Kilogrammes = 1 Tonne (T.) = 2204.62125 lbs., or 1.1023 tons of 2000 lbs., or 0.9842 ton of 2240 lbs., or 19.68 cwts.
1 grain = 0.0648 g., 1 oz. avoirdupois = 28.35 g., 1 lb. = 0.4536 Kg., 1 ton (2000 lbs.) = 0.9072 T., 1 ton (2240 lbs.) = 1.016 T., or 1016 Kg.

Measures of Capacity

1 Liter (l.) = 1 cubic decimeter = 61.0270515 cubic in., or 0.03531 cu. ft., or 1.0567 liquid qts., or 0.908 dry qt., or 0.26417 Amer. gal.
10 Liters = 1 Decaliter (Dl.) = 2.6417 gal., or 1.135 pk.
10 Decaliters = 1 Hectoliter (Hl.) = 2.8375 bu.
10 Hectoliters = 1 Kiloliter (Kl.) = 61027.0515 cu. in., or 28.375 bu.
1 cu. foot = 28.317 l., 1 gallon (American) = 3.785 l., 1 gallon (British) = 4.543 l.

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Steel Straight Edges

Where lines are to be scribed straight or when surfaces must be tested for their precision, an accurate standard straight edge is generally used. Straight edges are also necessary on some kinds of work for use in sighting for winding. It is needless to say that such straight edges must be absolutely dependable. We have made a line of straight edges which for accuracy cannot be excelled. The various sizes have been selected as being most convenient. The sizes given are approximate.

Made in pairs when two are wanted of the same width, without extra charge. The prices given are for single straight edges.

No. 380

Not Beveled
Not Graduated

Length Inches	Approximate Width Inches	Approximate Thickness Inches	Price
12	1	3/16	
18	1 1/4	3/16	
24	1 1/2	3/16	
36	2	1/4	
48	2 1/2	1/4	
60	3	1/4	
72	3	1/4	

Packed 1 in a package.

No. 385

Beveled—One Edge Only
Not Graduated

Length Inches	Approximate Width Inches	Approximate Thickness Inches	Price
12	1	3/16	
18	1 1/4	3/16	
24	1 1/2	3/16	
36	2	1/4	
48	2 1/2	1/4	
60	3	1/4	
72	3	1/4	

One edge only is beveled, and this to approximately 1/16 inch thick from 1/2 to 5/8 inch back.

Packed 1 in a package.

No. 383

Graduated—Not Beveled

Graduated on one side only, one edge in 16ths and the other in 8ths of an inch.

Length Inches	Approximate Width Inches	Approximate Thickness Inches	Price
12	1	3/16	
18	1 1/4	3/16	
24	1 1/2	3/16	
36	2	1/4	
48	2 1/2	1/4	

Packed 1 in a package.

No. 387

Graduated—Beveled—One Edge Only

Graduated on beveled edge only in 32nds of an inch.

Length Inches	Approximate Width Inches	Approximate Thickness Inches	Price
12	1	3/16	
18	1 1/4	3/16	
24	1 1/2	3/16	
36	2	1/4	
48	2 1/2	1/4	

Packed 1 in a package

Starrett

Draftsmen's Steel Straight Edges

Nickel Plated

These straight edges are made especially for draftsmen's use. They are nickel plated with dull finish, and with a hole at one end.

No. 381

Not Beveled

Length Inches	Approximate Width, Inches	Approximate Thickness, Inches	Price
12	1 3/8	5/64	
15	1 3/8	5/64	
18	1 3/8	5/64	
24	1 1/2	5/64	
30	1 1/2	5/64	
36	1 3/4	3/32	
42	1 3/4	3/32	
48	2	3/32	
54	2	3/32	
60	2	3/32	
72	2 1/2	7/64	

No. 386

Beveled

Same as No. 381, except one edge is beveled.

Length Inches	Approximate Width, Inches	Approximate Thickness, Inches	Price
12	1 3/8	5/64	
15	1 3/8	5/64	
18	1 3/8	5/64	
24	1 1/2	5/64	
30	1 1/2	5/64	
36	1 3/4	3/32	
42	1 3/4	3/32	
48	2	3/32	
54	2	3/32	
60	2	3/32	
72	2 1/2	7/64	

Above numbers packed 1 in a package.

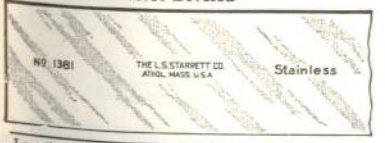
Draftsmen's Straight Edges

Stainless Steel

Straight edges made especially for draftsmen's use. Stainless steel and furnished with a hole at one end.

No. 1381

Not Beveled



Length Inches	Approximate Width, Inches	Approximate Thickness, Inches	Price
15	1 3/8	.07	
18	1 3/8	.07	
24	1 3/8	.07	
30	2	.07	
36	2	.07	
42	2	.07	
48	2 1/2	.07	
54	2 1/2	.07	
60	2 1/2	.07	
72	3	.09	
	3	.09	

No. 1386

Beveled—One Edge Only

Length Inches	Approximate Width, Inches	Approximate Thickness, Inches	Price
15	1 3/8	.07	
18	1 3/8	.07	
24	1 3/8	.07	
30	2	.09	
36	2	.09	
42	2 1/2	.09	
48	2 1/2	.09	
54	2 1/2	.09	
60	3	.09	
72	3	.09	

Above numbers packed 1 in a package.

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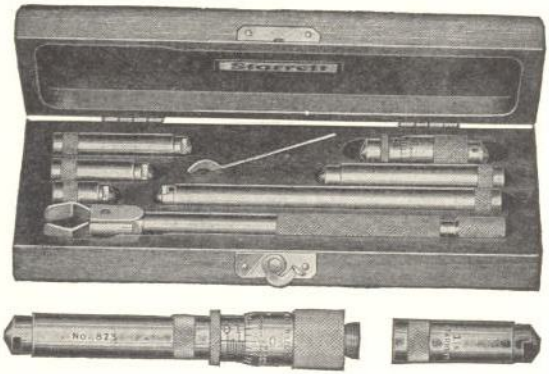
Inside Micrometer Caliper No. 823



Minimum of micrometer head 1½ inches (½" movement of screw). Maximum range 8 inches and 12 inches inclusive. All thousandths lines are numbered.

Extensions or rods are made of steel tubing and are centerless ground. Diameter approximately ⅜ inch.

By removing anvil ends, extensions or rods may be placed at either end of micrometer head, always to the preference of the user.

Adjustment for sense of "feel" and wear is thru the STARRETT friction sleeve and hardened anvils snugly fitted into the tubular extensions. Handle is compact and rigid. Holds readily and fast and grips on the knurled sections as well as on the smooth sections, providing the desired balance.

No. 823 A Has 5 extensions or rods, micrometer head, spanner wrench and handle. Range 1½ inches to 8 inches inclusive.

Complete Set, with finished wood case recessed for all parts—

Price .....

No. 823 B Has 8 extensions or rods, micrometer head, spanner wrench and handle. Range 1½ inches to 12 inches, inclusive.

Complete Set, with finished wood case recessed for all parts—

Price .....