

THE A·LIETZ COMPANY  
SAN FRANCISCO U·S·A



CATALOG  
15TH EDITION

MANUFACTURERS OF  
ENGINEERING, SURVEYING,  
MINING *and* NAUTICAL  
INSTRUMENTS

DRAWING MATERIALS  
FIELD EQUIPMENT



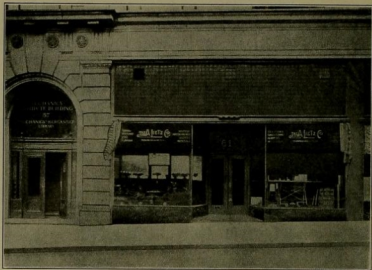
THE A. LIETZ COMPANY

*Established 1882*

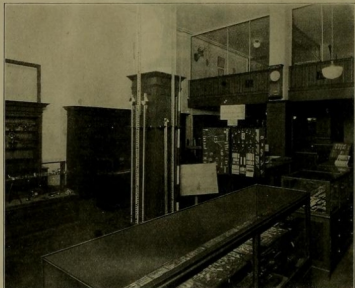
MAIN OFFICE *and* SALESROOMS: 61 POST ST.

FACTORY: 632-634 COMMERCIAL ST.

SAN FRANCISCO, U. S. A.



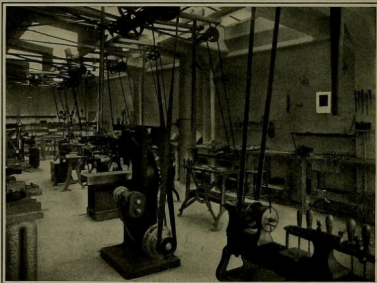
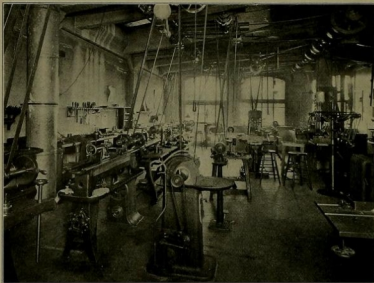
EXTERIOR OF THE A. LIETZ CO. SALESROOMS  
61 Post Street, San Francisco, U. S. A.



INTERIOR VIEW OF THE A. LIETZ CO. SALESROOMS



THE A. LIETZ CO. FACTORIES



VIEWS OF OUR MANUFACTURING DEPARTMENT

DESCRIPTION OF

## THE LIETZ INSTRUMENTS

INCLUDING REMARKS ON THEIR USE, HANDLING, CARE,  
PRESERVATION AND ADJUSTMENTS

### THE ENGINEERS' TRANSIT OR THEODOLITE

In reviewing the different parts of the transit and theodolite, it will answer our purpose to include them, for the present, under one head, using both terms as synonymous—the word theodolite having been defined as an instrument of angular measure, possessing two graduated circles, normal to each other, which during manipulation are set in horizontal and vertical planes respectively. Authorities say that it is generally believed that the word theodolite (theodolith) is a combination of *theo* sight, *odos* road, and *lithos* stone, and that in order to understand this derivation it must be known that formerly all supports upon which theodolites were placed were made of stone. This meaning, however, seems somewhat ambiguous, and other derivations have been sought. The etymology of the word is uncertain.

In classifying there appear two distinct groups of theodolites: the simple theodolite, in which the lower clamp and tangential movement is neglected; and the repeating theodolite, possessing the double horizontal movement on spindle and plate, which is the principal feature of all complete field instruments made for the engineer at the present time.

The various parts of the transit or theodolite may be grouped under the following heads, viz.:

Beginning from the base-plate we have:

- 1—The tripod connection with the leveling, plumbing and centering apparatus (Page 10);
- 2—The centers (Page 11);
- 3—The graduated plate and verniers (Page 11);
- 4—The compass and variation plate (Page 13);
- 5—The standards with the vertical arc and its movements (Page 15);
- 6—The gradienter (Page 16);
- 7—The spirit levels (Page 16);
- 8—The telescope (Page 17).



## SLIDE RULES

The Slide Rule is an indispensable aid to anyone who in his business is called upon to make calculations. The principles with which one must be familiar are few and simple and are easily mastered with little practice.

Abstract from Kent's Mechanical Engineers' Pocket Book, 9th Edition, 1916.

The slide rule is based on the principles that the addition of logarithms multiplies the numbers which they represent, and subtracting logarithms divides the numbers. By its use the operations of multiplication, division, the finding of powers and the extraction of roots, may be performed rapidly and with an approximation to accuracy which is sufficient for many purposes. With a good 10-inch Mannheim rule the results obtained are usually accurate to  $\frac{1}{4}$  of 1 per cent. Much greater accuracy is obtained with cylindrical rules like the Theacher's.

The rule consists of a fixed and a sliding part both of which are ruled with logarithmic scales, that is, which are spaced not equally, as in an ordinary scale, but in proportion to the logarithms of a series of numbers from 1 to 10. By moving the slide to the right or left the logarithms are added or subtracted, and multiplication or division of the numbers thereby effected. The scales on the fixed part of the rule are known as the *A* and *D* scales, and those on the slide as the *B* and *C* scales. *A* and *B* are the upper and *C* and *D* are the lower scales. The *A* and *B* scales are each divided into two, left hand and right hand, each being a reproduction, one half the size, of the *C* and *D* scales. A "runner," which consists of a framed glass plate with a fine vertical line on it, is used to facilitate some of the operations. The numbering on each scale begins with the figure 1, which is called the "index" of the scale. In using the scale the figures 1, 2, 3, etc., are to be taken either as representing these numbers, or as 10, 20, 30, etc., 100, 200, 300, etc., 0.1, 0.2, 0.3, etc., that is, the numbers multiplied or divided by 10, 100, etc., as may be most convenient for the solution of a given problem.

The following examples will give an idea of the method of using the slide rule:

**Proportion.**—Set the first term of a proportion on the *C* scale opposite the second term on the *D* scale, then opposite the third term on the *C* scale read the fourth term on the *D* scale.

**EXAMPLE.**—Find the fourth term in the proportion 12 : 21 :: 30 : *x*. Move the slide to the right until 12 on *C* coincides with 21 on *D*, then opposite 30 on *C* read *x* = 32.5. The *A* and *B* scales may be used instead of *C* and *D*.

**Multiplication.**—Set the index or figure 1 of the *C* scale to one of the factors on *D*.

**EXAMPLE.**—25 × 8. Move the slide to the right until the left index of *C* coincides with 25 on the *D* scale. Under 8 on the *C* scale will be found the product on the *D* scale, = 75.

**Division.**—Place the divisor on *C* opposite the dividend on *D*, and the quotient will be found on *D* under the index of *C*.

**EXAMPLE.**—750 ÷ 25. Move the slide to the right until 25 on *C* coincides with 750 on *D*. Under the left index of *C* is found the quotient on *D*, = 30.

**Combined Multiplication and Division.**—Arrange the factors to be multiplied and divided in the form of a fraction, one factor in the numerator than the others in the denominator, supplying the factor 1 if necessary. Then perform alternate division and multiplication, using the runner to indicate the several partial results.

**EXAMPLE.**— $\frac{4 \times 3 \times 6}{2 \times 8} = 8.9$  nearly. Set 3 on *C* over 4 on *D*, set runner to 5 on *C*, then

set 6 on *C* under the runner, and read under 8 on *C* the result 8.9 — on *D*.

**Invention and Evolution.**—The numbers on scales *A* and *B* are the squares of their coinciding numbers on the scales *C* and *D*, and also the numbers on scales *C* and *D* are the square roots of their coinciding numbers on scales *A* and *B*.

**EXAMPLE.**—4 = 2<sup>2</sup>. Set the runner over 4 on scale *D* and read 2 on *A*.

$\sqrt{16} = 4$ . Set the runner over 16 on *A* and read 4 on *D*.

In extracting square roots, if the number of digits is odd, take the number of the left-hand scale of *A*, if the number of digits is even, take the number of the right-hand scale of *A*. To cube a number, perform the operations of squaring and multiplication.

**EXAMPLE.**—2<sup>3</sup> = 8. Set the index of *C* over 2 on *D*, and above 2 on *B* read the result 8 on *A*.

**Extraction of the Cube Root.**—Set the runner over the number on *A*, then move the slide until there is found under the runner on *B* the same number which is found under the index of *C* on *D*; this number is the cube root desired.

**EXAMPLE.**— $\sqrt[3]{8} = 2$ . Set the runner over 8 on *A*, move the slide along until the same number appears under the runner on *B* and under the index of *C* on *D*; this will be the number 2.

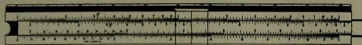
**Trigonometrical Computations.**—On the under side of the slide (which is reversible) are placed three scales, a scale of natural sines marked *S*, a scale of natural tangents marked *T*, and between these a scale of equal parts. To use these scales, reverse the slide, bringing its under side to the top. Coinciding with an angle on *S* its sine will be found on *A*, and coinciding with an angle on *T* will be found the tangent on *D*. Sines and tangents can be multiplied or divided like numbers.

See price list in back of catalog.

## MANNHEIM SLIDE RULES

Best Quality

Adjustable



These Rules are engine divided on white celluloid facings. The divisions are clear, distinct, permanent and accurate.

Each

**No. 2960.** 5-inch Mannheim Rule in sewed leather case, with instructions. Each .....

**No. 2960M.** Same as No. 2960, but in morocco case. ....  
These rules are subdivided as closely as the 10-inch rule No. 2964.

**No. 2964.** 10-inch Mannheim Rule in morocco case, with instructions. Each .....

**No. 2965.** 10-inch Mannheim Rule, like No. 2964, but subdivided as closely as the 20-inch rule, in morocco case, with instructions. Each .....

**No. 2967.** 16-inch Mannheim Rule in morocco case, with instructions. Each .....

This rule is subdivided as closely as the 20-inch Rule No. 2964.

**No. 2969.** 20-inch Mannheim Rule in morocco case, with instructions. Each .....

Rules Nos. 2965, 2967 and 2969 have from 200 to 20 subdivisions between the prime numbers, while the shorter rules have from 100 to 10, therefore the reading is closer by at least one figure.

**No. 3060H.** Glass Indicator with two hairlines instead of one, add. ....

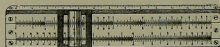
For complete line of Indicators, Instruction Books and Slide Rule Accessories see page 380.

See price list in back of catalog.

## MANNHEIM SLIDE RULES

Best Quality.

### THE JUNIOR SLIDE RULE



No. 2970

**No. 2970.** Junior Mannheim Slide Rule, 5 in. long, mahogany stock with white celluloid facings. Graduations engine divided, with magnifier. In sewed leather case with instructions. . . . . Each

The Junior Mannheim Slide Rule No. 2970 combines the accuracy of a regular 10-inch slide rule with the convenience afforded by its compactness. The subdivisions are as fine as those on a regular 10-inch rule, and by means of a neat but powerful magnifying glass attached to the indicator their value is easily ascertained with the same degree of accuracy as can be obtained on the larger rule.

### THE VEST POCKET SLIDE RULES



Nos. 2972-73

**No. 2972.** Also Vest Pocket Slide Rule, 3/4 in. long, 3/4 in. wide, thin mahogany stock with white celluloid facings; engine divided, graduations are clear, distinct, permanent and accurate. Complete with indicator in sewed leather case. . . . . Each

**No. 2973.** Vest Pocket Slide Rule, 5 in. long, thin mahogany stock with white celluloid facings. Narrow for pocket use. Complete with indicator, case and instructions. . . . .

**No. 2973L.** Same as No. 2973, but in sewed leather case. . . . .

### ECONOMY SLIDE RULES



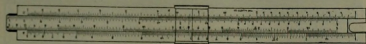
No. 2974

**No. 2974.** Economy (Mannheim) Slide Rule, 10 inches long, divisions on white celluloid facings. Complete with indicator, case and instructions. . . . . Each

The Economy Slide Rule is of the same pattern as Mannheim Slide Rule No. 2964, but is not adjustable.

See price list in back of catalog.

## STUDENTS' SLIDE RULE



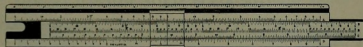
No. 2975

**No. 2975.** Students' (Mannheim) Slide Rule, 10 in., with transparent celluloid indicator. Engine divided on polished boxwood. Graduations clear and accurate. In case with instructions. Each. . . . . Students' Slide Rule No. 2975 is similar to our Economy Slide Rule No. 2974, but graduations are on polished boxwood instead of white celluloid.

## THE POLYPHASE SLIDE RULE

Best Quality

Adjustable



The Polyphase Slide Rule has in addition to the regular scales of the Mannheim Rule a scale of cubes and an inverted scale through the center of the slide. These scales may be used in connection with the others, by means of the indicator. The inverted scale enables taking three factors at one setting of the slide, and reading reciprocals by means of the indicator. Almost any combination of three factors involving square, square root, cube and cube root may be solved at one setting of the slide.

Rules are engine divided on white celluloid facings. The divisions are clear, distinct, permanent and accurate.

**No. 2980.** 5-inch Polyphase Rule in sewed leather case, with instructions. Each . . . . .

**No. 2980M.** Same as No. 2980, but in morocco case. Each . . . . .

**No. 2984.** 10-inch Polyphase Rule in morocco case, with instructions. Each . . . . .

**No. 2985.** 10-inch Polyphase Rule like No. 2984, but subdivided as closely as the 20-inch rule, in morocco case, with instructions. Each . . . . .

**No. 2989.** 20-inch Polyphase Rule in morocco case, with instructions. Each . . . . .

### NOTICE

Owing to the large variety of Slide Rules now being offered for varied or special purposes, we have listed only such types as are widely used. We are in position to furnish any type of slide rule which may better suit the requirements of our trade.

See price list in back of catalog.

### THE PRECISION SLIDE RULE



The Precision Slide Rules are similar to other Mannheim Slide Rules, but the results obtained are of a considerably greater accuracy. The increase in accuracy is obtained by making the scale length of the logarithmic unit equal to 20 inches instead of 5 or 10 inches. The scale is not, however, made in one length of 20 inches, but in two lengths of 10 inches each. All the other scales, including those on the back of the slide, are based on the scale length of 20 inches; so that all calculations with this slide rule have a uniform and considerably greater degree of accuracy than those made with the ordinary slide rule.

Rules are engine divided on white celluloid facings. The divisions are clear, distinct, permanent and accurate.

- No. 2994.** 10-inch Precision Slide Rule in morocco case, with instructions. Each .....

### THE ALCO SLIDE RULE



This Slide Rule differs from those hitherto ordinarily employed in that it has on its front face not only the four middle scales (two on the rule A and D; and two on the slide B and C), but also two other scales, viz., an evenly divided scale E, on the lower margin, and a logarithmic scale F, at the top, the latter consisting of three similar scales, placed consecutively.

By this arrangement, logarithms, cubes and cube roots can be directly and easily determined. With the ordinary slide rules these calculations, especially the extraction of cube roots, are somewhat complicated, and necessitate the use of the slide.

All calculations such as multiplication, division, involution, evolution, etc., are carried out with the first mentioned scales, A, B, C, D.

Engine divided on white celluloid facings. The divisions are clear, distinct, permanent and accurate.

- No. 3024.** 10-inch Alco Slide Rule, in morocco case with instructions. Each .....
- No. 3029.** 20-inch Alco Slide Rule, in morocco case with instructions. Each .....

See price list in back of catalog.

### THE ELECTRIC SLIDE RULE



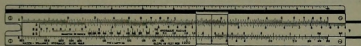
Especially evolved in response to a demand for a suitable Slide Rule for Electrical Engineers and for students in Electro-Technology.

Serves in an excellent manner the facility of calculation of all electro-technical problems. The table of constants, on the reverse of the rule, makes the reference to hand-books almost superfluous.

Engine divided on white celluloid facings. The divisions are clear, distinct, permanent and accurate.

- No. 3034.** 10-inch Electric Slide Rule, in morocco case, with directions. Each .....

### HAZEN-WILLIAMS HYDRAULIC SLIDE RULE



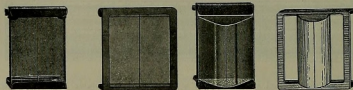
No. 3044

The Hazen-Williams Hydraulic Slide Rule is used principally for determining the velocity and quantity of the flow of water in pipes and channels, but is also adapted for ordinary slide rule calculations. Special computations may also be solved by its use, as, for instance, to determine the corresponding flow at any other slope or head, when the flow of water through a pipe or system of pipes produced by a given slope or head is known; to find what size of pipe must be used to produce the same discharge for any other slope, when the discharge in a given size of pipe at a given slope is known; to compute the discharge through a compound pipe, that is, a pipe of larger diameter connecting with a pipe of smaller diameter, or a series of such pipes; to compute the friction of a given amount of water flowing through two pipes of different diameters and different lengths, freely connected at each end; to get with one setting of the slide the quantity of water corresponding to any slope; to get with one setting of the slide the quantities of water discharged by pipes of different sizes for a given slope and coefficient. In size and general appearance the rule is like an ordinary Mannheim 10-inch slide rule. On the back of the rule are several tables to aid in the convenience of computations to which the rule is applicable. Engine divided on white celluloid facings. The divisions are clear, distinct, permanent and accurate.

- No. 3044.** 10-inch Hazen-Williams Hydraulic Slide Rule, in morocco case, with directions .....

See price list in back of catalog.

### SLIDE RULE ACCESSORIES



Frameless Indicator

Indicator with Aluminum Frame

No. 3071

No. 3072

#### INDICATORS

No. 3060A. For all 5 in. and vest pocket rules. Each.....

No. 3060B. For all 10 and 20-in. rules. Each.....

Be sure to specify the number of the rule for which indicator is desired and whether frameless type or indicator with frame is wanted.

#### GLASSES ONLY FOR FRAMELESS INDICATORS

No. 3062A. For Slide Rules up to and including 10 in. long, each....

No. 3062B. For Slide Rules over 10 in. long, each.....

#### MAGNIFIERS

No. 3070. Detachable Magnifier for Slide Rule Indicator. Each....

When ordering please specify for which Slide Rule the Magnifier is wanted.

No. 3071. Indicator with full-size Magnifier for slide rules. Each....

No. 3072. Indicator with half-size Magnifier for slide rules. Each....

When ordering please specify for which Slide Rule the Indicator is wanted.

#### CASES FOR SLIDE RULES

No. 3073. Morocco Case for Slide Rules.  
Inches long— 5 10 16 20  
Each .....

No. 3074A. Sewed Leather Case for Slide Rules.  
Inches long— 5 10 16 20  
Each .....

No. 3074B. Sewed Leather Case with space for Magnifier.  
Inches long— 5 10 16 20  
Each .....

#### BOOKS ON THE SLIDE RULE

BK1. Instructions in the use of Slide Rules. 55 pages with illustrations and complete instruction for all our slide rules. Each.....

BK2. Instructions for the use of the Slide Rules, published by A. W. Faber. Each .....

BK3. "The Use of the Slide Rule," by F. A. Halsey, Fourth Ed., 18 Ill., 7 folding plates. Each .....

BK4. "The Slide Rule," by Chas. N. Pickworth. A practical manual of instruction, 17th Ed., illustrated. Each .....

See price list in back of catalog.

### THE IMPROVED HALDEN CALCULEX

2 3/4 inches diameter by 3/4 inch thick.

This is a very compact, convenient and accurate instrument and very simple to operate. It is made entirely of metal and its construction is extremely simple, so that it is impossible for the instrument to get out of order.

The book of rules accompanying each instrument is most extensive and complete, yet very clear and easy to understand. It has been arranged so as to fit in a separate compartment of the leather case containing the instrument, so that both together can be conveniently carried in the vest pocket.

The Calculex, briefly described, consists of a disc within a fixed ring, which together form a dial with logarithmic scales on both sides, surrounded by a metal rim with an indicator hair line marked thereon.

The instrument is operated by turning the disc, holding the nut on either side between finger and thumb. The outside ring is fastened to the rim.

Logs of numbers, squares, square roots,

cubes, cube roots, angles, can be read direct from the indicator line, without turning the disc.

The front face contains five circles of scales. The outer scale No. 1 is a scale of Logs; Nos. 2 and 3 are the calculating scales A and B; Nos. 4 and 5 are the square roots of B scale.

The reverse contains six circles of scales. The outer scale, No. 6, is a scale of angles, Nos. 7 and 8 are calculating scales for reverse proportions, Nos. 9, 10 and 11 are cube roots of scale B.

No. 3075. Halden Calculex Slide Rule, in leather case, with book of instructions. Each .....

No. 3075G. New Glass for Halden Calculex. Each.....

### THE BOUCHER CALCULATOR

About 2 inches diameter by 9/16 inch thick.

This instrument resembles an ordinary stem-winding watch, with glass-covered dials back and front. Ratios are set off by means of pointers, which, as well as the movable dial, are moved by means of the stem-winder key. Instrument of convenient size to carry in pocket.

No. 3080. Boucher Calculator, illustrated metal dials. Each .....

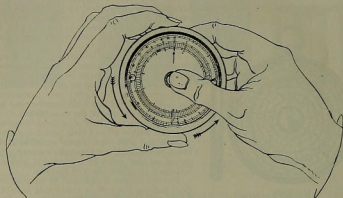


No. 3080

See price list in back of catalog.



### THE MIDGET CIRCULAR CALCULATOR



No. 3082

This compact little instrument is 2½ inches in diameter and only ¼ inch in thickness, contained in imitation leather case and will fit the vest pocket. The divisions are clear and accurate and finely cut on two white dials. The covers are made of non-breakable glass, provided with indicator lines and two transparent buttons for turning to desired position.

To operate take hold of instrument by the two center knobs with the thumb and forefinger of the right hand and turn the case with the left hand. Turn glass dial with indicator by means of the buttons provided.

Instrument is fitted with square, cubic, logarithmic, sine and tangent scales and by means of the fore and back non-breakable glass slides it is possible to solve immediately the following calculations:

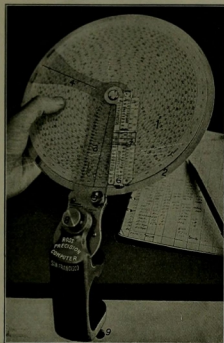
- |                                       |                           |
|---------------------------------------|---------------------------|
| 1. Watt reduced to H. P.              | 7. To cubic.              |
| 2. H. P. reduced to Watt.             | 8. Cubic extraction.      |
| 3. Circle surface by circle diameter. | 9. Logarithmic numerus.   |
| 4. Circle diameter by circle surface. | 10. Logarithmic mantissa. |
| 5. To square.                         | 11. Sine.                 |
| 6. Square extraction.                 | 12. Tangent.              |

This instrument is operated in the same manner as the ordinary slide rule. It is not influenced by heat or cold and its compactness and durability and nominal cost have established its popularity.

**No. 3082.** Midget Circular Calculator in imitation leather case, with instructions. Each .....

See price list in back of catalog.

### THE ROSS PRECISION COMPUTER



Multiplies—Divides.  
Gives Reciprocal.  
Solves Proportions.  
Handles constant multipliers.  
Handles constant divisors.  
Handles constant ratios.  
Reads 5-place logs and anti-logs.  
Solves exponential problems.  
Gives 8-place answers instantly.  
Solves  $a \times b \times c \times d$  expressions like  $e \times f \times g \times h$

With its trigonometric functions many engineers use it for traverses, obtaining 5-place accuracy, about 1 inch per mile.  
Operation:  $879.64 \times 7.2638 = ?$   
Set 87964 under arm 1, clamp;  
Set 72638 under arm 4.  
Answer 6389.6 is under arm 3.  
Slide checks answer—locates decimal.

The Ross Precision Computer is a new multiplier-and-divider of unusual precision. It solves problems like  $879.64 \times 72.638 = 74,749 = 854.58$ , with an accuracy of 5 figures, i. e., to an ultimate accuracy of 1/1000 of 1%, or 1 in 100,000.

On the back of the Precision Computer are scales of natural sines, cosines, tangents and cotangents. They read minutes exact, interpolable to fractions of a minute. The Precision Computer is used for figuring earthwork, monthly and final estimates, unit cost and payroll, traverses for final design and reports. It is intended primarily for precise calculations where an accuracy of four to five significant figures is indispensable.

The Ross Precision Computer is particularly effective in heavy tabular work, with Constants. After setting Constants, each succeeding item requires only one turn of dial. Constants remain locked, and cannot shift accidentally, however numerous the items. This feature is valuable in figuring payroll, unit-cost, pro-rating, etc., etc. It permits three to five 5-place calculations per minute, 240 to 300 per hour,—as fast as an assistant can call off the data and write down the results.

#### MECHANICAL DETAILS

The Ross Precision Computer is graduated directly on heavy metal plate, easy to read and thoroughly durable; aluminum frame, trimmed in nickel; precisely machined, of fine workmanship and construction.

Nine inches in diameter; weighs net 1½ lbs.; packed in fibroid case. Clamp is finely polished; trimmed in nickel; solid, durable.  
For convenience, accuracy and rigidity the Computer may be attached instantly and firmly to any desk-edge, by the Tilted Duplex Clamp. It permits fine settings to be made with great precision—with either the right, left, or both hands. Can be faced about in any convenient direction. A turn of Thumbst 8 releases the Computer, ready to put in your desk or value, among your papers.

Clamp is finely japanned, has polished nickel trimmings; solid, durable.

**No. 3090.** Ross Precision Computer, complete with tilted duplex clamp, case and full directions. Each .....

See price list in back of catalog.



### THE ROSS RAPID COMPUTER



**OPERATION**

Set problem under arm;  
Long arrow shows ANSWER,  
Short arrow proves it.

**TRIG. and LOG. PROBLEMS**

Set identically, but  
use the special scales.

The new Ross Rapid Computer solves all numeric, logarithmic and trigonometric problems. Polyphase duplex in principle, but with simpler, longer, and more complete scales. Solves in one setting problems like  $a/b$ ,  $a \sin x / c \cos y$ ,  $ab \tan x / (a/bc)$ , etc. 5-inch diam., 125° contact scales, like upper scales of 25° rule.

Has 360° protractor and all 6 functions; actually practical for trigonometric work, traverses, stadia, etc. Figures quantities, capacity, unit cost, earthwork, etc. Shows answer and proof. Answer never runs off scale, no blank movements, each movement is effective. Unwarpable, unshrinkable; instantly convertible for desk or pocket.

Computer consists of scaled metal dials 1 and 2, set flush, and mounted on aluminum back. The graduations are sharply and deeply engraved into the basic metal; they will never wear out; but if accidentally marred or disfigured, dials may be renovated repeatedly, like new.

Aluminum arm 3 carries Thumbnut 4 for locking constants, and key to operation in plain sight of user.

No. 3092. Ross Rapid Computer, with full directions. Each.....

No. 3092A. Fine sewed leather pouch for No. 3092. Each.....

Magnifier, 1½-inch diam., adjustable in focus, radius and direction. Makes interpolations more accurate, readings appear larger than ordinary typewriting. A touch of finger turns it aside; instantly detachable for separate use.

No. 3092B. Magnifier complete, with post and thumb-lock. As illustrated. Each.....

Desk Clamp, increases accuracy and convenience; relieves strain from hand and eye, like tripod for compass; permits writing with one hand while figuring with other. Instantly detachable. Made of aluminum, trimmed in nickel, finely machined, weight ½ pound.

No. 3092C. Desk Clamp for No. 3092. Each.....

Loose Leaf sewed leather case for Computer and Magnifier; directions bound in, supplied with standard 3¼x4½ sheets in variety of rulings, for personal notes; folds to 5x7; fits coat, breast or back pockets.

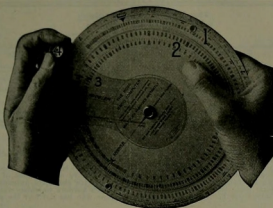
No. 3092D. Loose Leaf Case, with fillers and rings. Each.....

No. 3092X. Complete Set as illustrated and described. Each.....

For highest efficiency the Ross Rapid Computer was designed to be used as a Complete Set; this increases accuracy and comfort to the eye, is more convenient to use, permits one-hand operation, and is instantly convertible for desk or pocket, field or office. Purchasers are urged to avail themselves of these advantages.

See price list in back of catalog.

### THE ROSS RAPID COMPUTER



**8-INCH RAPID COMPUTER**; graduated like No. 3092, but made of heavy celluloid, in 2 colors, with solid, heavy metal arm that can be locked on any setting. The scales are open and easy to read. Durable, metal center; protective transparent cover. Packed in 8x9 loose-leaf fabrikooid book, with rings, fillers, and full directions.

No. 3094. 8-inch Celluloid Rapid Computer, complete. Each.....

### ROSS COMMERCIAL COMPUTER

Commercial Rapid Computer—The Rapid Computer is also made for commercial use, without technical scales, for figuring payroll, simple and compound interest, discount, freight, profit and loss, prorating, unit costs, foreign exchange, mensuration, weight, in fact any and every calculation involving multiplication and division in any form. Very simple to operate; construction like No. 3094. Packed in 8x9 loose-leaf fabrikooid book, with rings, fillers and full directions.

No. 3095. 8-inch Commercial Computer, complete. Each.....

### STUDENTS' RAPID COMPUTER

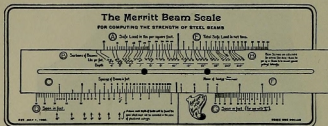
**STUDENTS' RAPID COMPUTER**; 5-inch diameter, scales like No. 3094, but made of heavy celluloid in 2 colors, with self-locking friction arm. Fits pocket without bulge, very light and handy. Packed in fabrikooid pouch, with full directions.

No. 3096. Students' Rapid Computer, complete. Each.....

See price list in back of catalog.

### THE MERRITT BEAM SCALE

For computing the strength of steel beams.



No. 3097

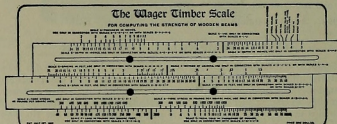
Absolutely accurate. Adapted to all conditions. Load, spacing, span, etc., found instantly. Mistakes absolutely eliminated.

The Merritt Beam Scale for computing the strength of steel beams is based on the principle of the Engineer's Slide Rule and was designed to simplify computations of this kind, and to eliminate all chance of errors. Tables and formulae are absolutely unnecessary when the Merritt Beam Scale is used, and the speed with which answers to widely varying problems may be solved can hardly be appreciated by anyone who has not had the pleasure of using it.

No. 3097. Merritt Beam Scale, on heavy bristol board. Each.....

### THE WAGER TIMBER SCALE

For computing the strength of wooden beams.



No. 3098

For computing the strength of wooden beams. Absolutely accurate. Adapted to all conditions. Load, spacing, span, etc., found instantly. Mistakes absolutely eliminated.

To illustrate the simplicity of the Scale the following is given:  
How far apart shall 6 in. x 12 in. timbers of white oak be placed to safely support a load of 150 pounds per square foot, the span being 18 feet, and New York law governing the design?

Select the fibre stress for white oak allowed in New York City (given on back of scale: 1000 pounds). Place 12 in scale B below 6 in scale A. Place 1000 in scale E over 150 in scale F. Above 18 in scale D read 2 ft.-0 in. in scale C.

The Wager Timber Scale, for computing the strength of wooden beams, contains more information than could be given in 500 pages of tables. It is based on the principle of the Engineer's Slide Rule, and five minutes' inspection will convince anyone that it is simplicity itself.

No. 3098. Wager Timber Scale, on heavy bristol board. Each.....

See price list in back of catalog.

### STADIA COMPUTORS

COX STADIA COMPUTER

The Cox Stadia Computer is a circular slide rule of about fifteen inches effective length. The fixed outer scale, or base, is graduated to the logarithms of numbers from 1 to 1000. The movable inner disc, concentric with it, is graduated on a portion of its circumference to the logarithms of one-half the sine of twice the angles from 3 min. to 45 deg., and inscribed "Difference in Elevation." Another portion of its circumference is graduated to the logarithms of the cosine squared of the angles from 0 to 45 deg., and inscribed "Hor. Distance."

Printed on heavy celluloid, size 5 $\frac{1}{2}$ x5 $\frac{1}{2}$  inches, suitable for carrying in coat pocket.

No. 3104. Cox Stadia Computer. Each.....

### STADIA SLIDE RULES



No. 3110. Stadia Slide Rule, engine divided, 10 in., white facing, glass indicator, in morocco case.....

No. 3111. Stadia Slide Rule, like No. 3110, but 20 in., in morocco case.

This is a very simple form of Stadia Slide Rule. When the stadia rod reading and elevation of the telescope are known the horizontal distance and vertical height can in every case be obtained at once by one setting (always to the left) of the slide. The rule can also be used for ordinary computations as the under side of the slide has a scale corresponding to the lower scale of the rule and resembling the A and B scale of the ordinary Mannheim rule. Directions are printed on the rule.

### GRUNSKY STADIA REDUCTION DIAGRAM

No. 3112. Grunsky Stadia Reduction Diagram, paper, horizontal distances to 1000, differences of elevation 100, vertical angles to 30°.....

See price list in back of catalog.

2975	Page 377	Each	\$ 1.50
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3074B			3.00
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2522		1.80
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2530		1.80
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2755W		.55

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