

K & E  
**MERCHANT'S**  
*(Calculating)*  
**Slide Rule.**



PUBLISHED BY

**KEUFFEL & ESSER CO.**

NEW YORK, 127 Fulton St. General Office and Factories, HOBOKEN, N. J.

CHICAGO ST. LOUIS SAN FRANCISCO MONTREAL  
516-20 E. Dearborn St. 813 Locust St. 45-50 Second St. 5 Notre Dame St., W.

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# K & E MERCHANT'S (CALCULATING) Slide Rule.

A simple description and directions for the use  
of the slide rule for the Merchant, Importer,  
Exporter, Accountant, Manager, Me-  
chanic, Foreman, and others.



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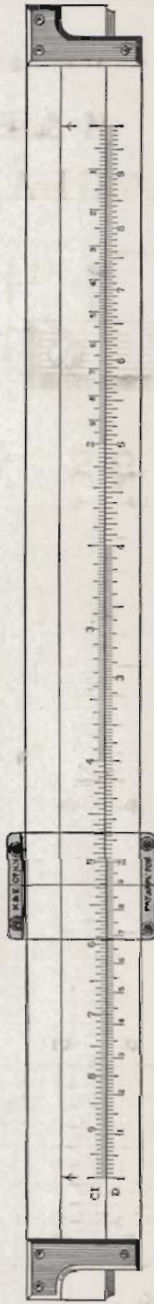


# THE K & E MERCHANT'S (CALCULATING) SLIDE RULE.

No. 4095-3.



Front, showing DF, CF, C and D scales.



Back, showing CI and D scales.

Note: This cut shows the graduations of the 10 inch slide rule. We also carry 5 in. (No. 4095-1S) and 20 in. (4095-5) rules.



**Diagram illustrating the reading of the graduations of the  
K & E MERCHANT'S  
(CALCULATING SLIDE RULE.)**

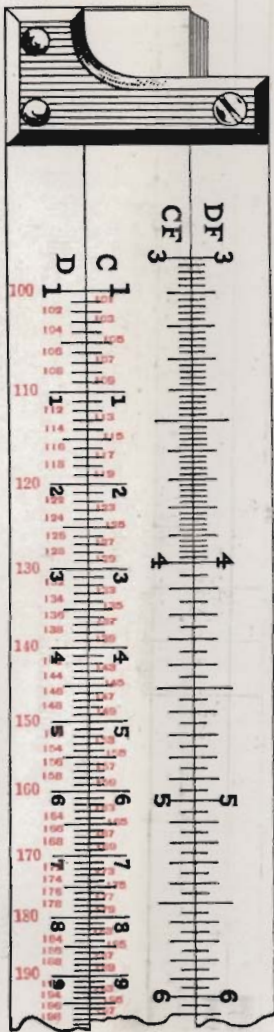


Fig. I.



Fig. II.



Fig. III.





Diagram illustrating the reading of the graduations of the

## K & E MERCHANT'S (CALCULATING SLIDE RULE.)

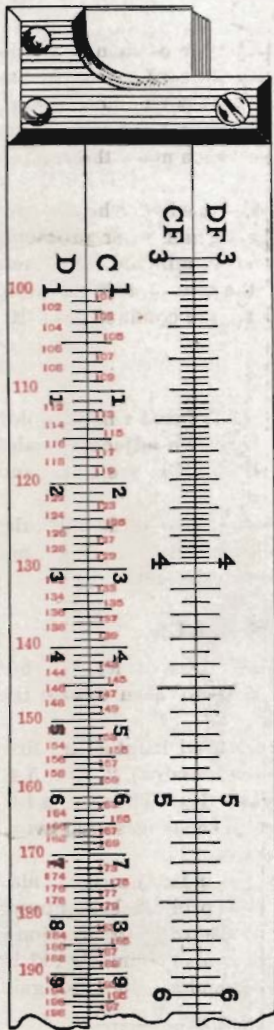


Fig. I.

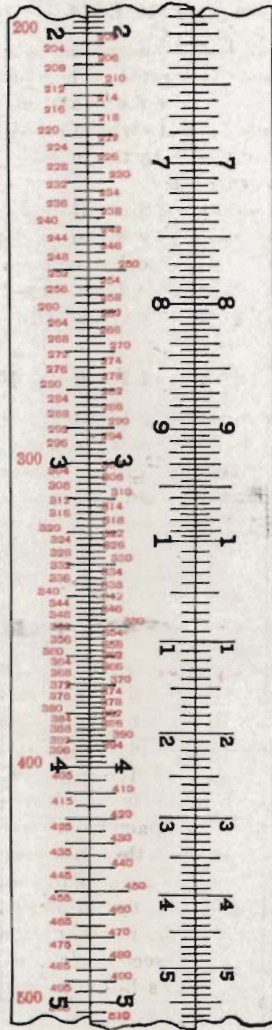


Fig. II.

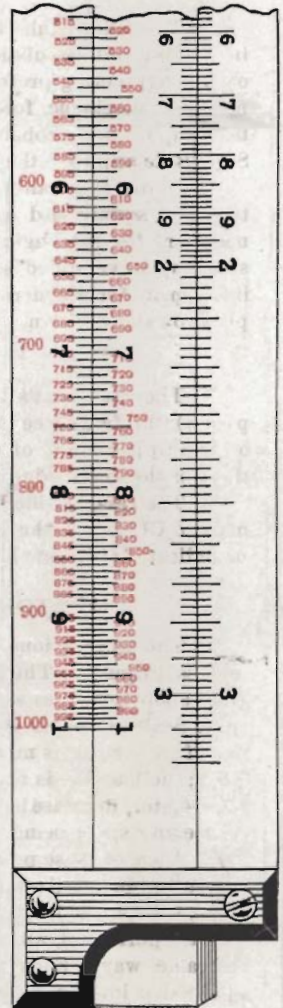


Fig. III.



# THE MERCHANT'S (CALCULATING) SLIDE RULE.

## 1. INTRODUCTION.

The Slide Rule, this useful instrument, a great saver of mental strain in working out calculations, has heretofore been practically confined to the use of the engineering professions. The merchant, importer, exporter, accountant, manager, mechanic, foreman, etc., to whom it is just as valuable, have not yet taken up its use, probably deterred by the many scales which make the regular Slide Rule appear rather complicated.

In the Merchant's Calculating Slide Rule all scales used for the computation of square and cube roots, powers, sines, tangents, and other problems necessary for the engineer or technical man have been eliminated. In their stead we have added several scales which simplify the use of this valuable instrument for the merchant and others, whose problems are confined to multiplication and division.

## 2. DESCRIPTION.

The Merchant's Calculating Slide Rule is a double-faced rule (Duplex patent), the front face of which carries four scales. The two adjacent scales on the upper edges of the rule and slide, marked DF and CF, are alike, and those on the lower edges, marked C and D, are also alike.

The reverse side has only two scales on the lower edge of slide and rule, marked CI and D, the graduations running in opposite directions. A runner or indicator (the new K & E "Frameless" type) encircles the rule.

## 3. HOW TO READ THE SCALES.

The graduations on the slide rule are not measures of length, but represent figures. The first thing for the beginner to do is to learn to read the graduations or scales accurately in terms of numbers.

Scales C and D consist of nine prime spaces of unequal length; the first line of each space is numbered, respectively, 1 (called left index), 2, 3, 4, 5, 6, 7, 8, 9; the last line is numbered 1, and is called the right index. The spaces 1-2, 2-3, 3-4, etc., decrease in length, the space from 1 to 2 being the longest and every succeeding space being shorter than the one preceding it.

Each of these prime spaces is divided into ten (secondary) spaces, also decreasing in length, the nine lines between prime 1 and prime 2 being numbered, 1, 2, 3, 4, 5, 6, 7, 8, 9, in smaller figures than those of the prime graduations. If space permitted, all of the other secondary lines might also be numbered in the same way. Each of the spaces between these secondary lines is again subdivided into ten parts or multiples.

Thus, each secondary space between prime 1 and prime 2 is divided into ten (unequal) parts, numbered 1, 2, 3, etc. The secondary spaces between





prime 2 and prime 4 are subdivided into five (unequal) spaces and if numbered, would carry the numbers 2, 4, 6, 8. The secondary spaces from 4 to the end are subdivided into two (unequal) parts, there being only one line between the two secondary lines, which might be numbered 5, if space permitted.

To find a number, always read the first figure to the left on the prime line, the second figure of the number on the secondary line to the right thereof, and the third figure on the subdivision; thus, to read 435 (say four, three, five, not four hundred and thirty-five) find prime 4, secondary 3 and sub. 5. See Fig. II.

You may now place the decimal point where required; thus, this position may read 435 or any multiple thereof as: 435.00, 4.35, 43.50, 0.435, 0.0435, etc.

In like manner, every other number is found by reading the significant number, then prefixing or affixing the necessary ciphers and assigning the decimal point.

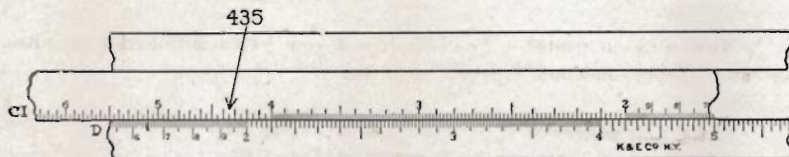
Find in Fig. I, II and III the following numbers: 175, 284, 322, 490, 645, 700, 850, 1501, 208, 405, and then find these same numbers on your Merchant's Slide Rule.

Find 208: (two, naught, eight) prime 2, secondary 0, then sub. 8. (Note that if 0 appears after the prime number, it is found in the space preceding the first secondary number after its prime number.)

The reading of the DF and CF scales (called the folded scales) is accomplished in the same manner, the only difference being that the scales begin and end at about the middle of the rule. Starting with prime 1 in the middle, (called middle index), prime 2 and 3 are to the right thereof, while the remaining scales run from the left and end in the middle at prime 1.

The D scale on the reverse side is like the D scale on the front face and is read in the same manner.

The CI Scale is like the C scale but inverted, i. e. the graduations run in the opposite direction (from right to left) and must be read in that direction; thus, to read 435 on this scale, find prime 4, then secondary 3 to the left and sub. 5 further to the left (see cut below). To distinguish this scale from those graduated from left to right the numbers are in red.

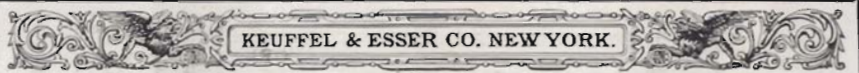


The runner or indicator has a glass on each side with a fine hairline engraved thereon. It is used to facilitate reading and to permit of extended calculations being worked out without the necessity of reading off the intermediate results.

We recommend that the beginner familiarize himself with the reading of the numbers before attempting to make calculations. This can be done in spare moments and the matter will be quickly mastered, if the rules given above are followed.





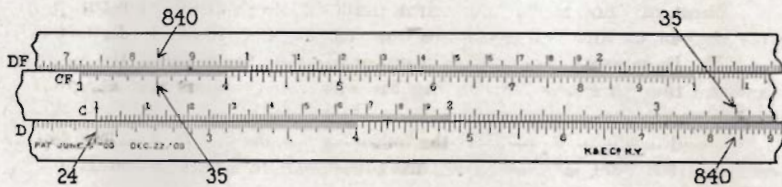


### 4. MULTIPLICATION.

Multiplication is accomplished by setting either index (or 1) of C or CF (onslide) on front face, to the multiplicand on D or DF; then, opposite multiplier on C or CF, find answer on D or DF.

**Example:**  $24 \times 35 = 840$ .

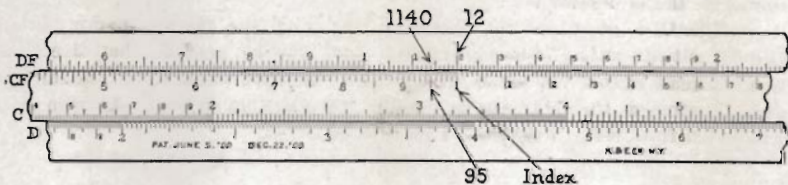
To 24 on D, set Index of C. Opposite 35 on C or CF, find answer, 840 on D or DF.



In this case the answer can be found both on D and DF, but if 24 were to be multiplied, without resetting the slide, by say 45, 62 or 97, etc., the answer could be found only on the DF scale, as the C scale, containing these multipliers, extends beyond the D scale.

**Example:**  $12 \times 95 = 1140$ .

To 12 on DF, set middle index of CF. Opposite 95 on CF, find answer, 1140 on DF.



Now without resetting the slide, the answer of 12 multiplied by any number can be found on either D or DF or both.

Thus, find answer of  $12 \times 15 = 180$  on D and DF.

$12 \times 83 = 996$  on D and DF.

$12 \times 94 = 1128$  on DF only.

$12 \times 28 = 336$  on D only.

It will be noted that line 83 is slightly beyond the sub. line 5, therefore the sub. distance must be estimated, thus prime 9, secondary 9, sub. (5 plus estimated  $\frac{1}{2}$  of the next space) 6 = 996. The same applies to the next example; here the fourth figure must be estimated, thus prime 1, secondary 1, sub. 2, estimated 8 = 1128.



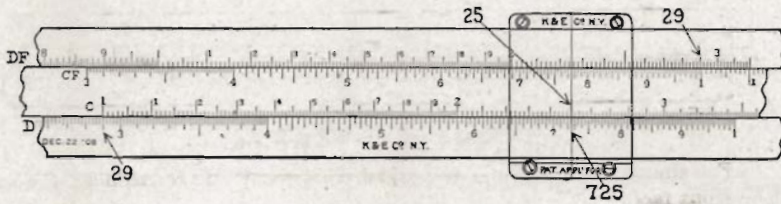


### 5. DIVISION.

To divide one number by another, first find dividend, i. e. the number to be divided, on D or DF, to this set divisor found on C or CF, and opposite either index find answer.

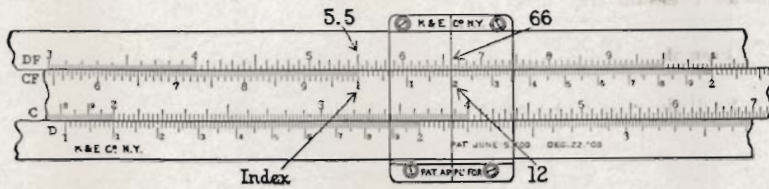
**Example:**  $725 \div 25 = 29$ .

Set hairline of runner (to facilitate reading) to 725 on D, shift slide until 25 on C is under hairline (set at 725). Opposite index of C (and CF) find answer 29.



**Example:**  $66 \div 12 = 5.5$

Set runner to 66 on DF, then 12 on CF to runner. Opposite index CF find answer 5.5 on DF (also opposite index C find answer on D).



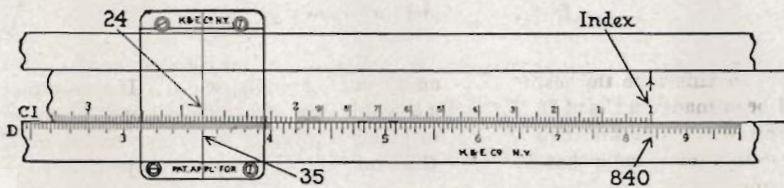
### 6. THE INVERTED SCALE.

By using the CI scale the operation of multiplication and division is reversed.

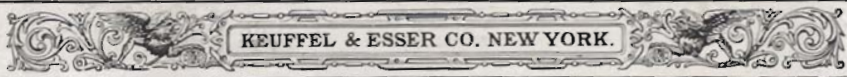
To multiply one number by another, set multiplier on CI to multiplicand on D, opposite index of CI, find answer on D.

**Example:**  $24 \times 35 = 840$ .

To 35 on D set 24 on CI (red side). Opposite Index of CI find answer 840 on D.



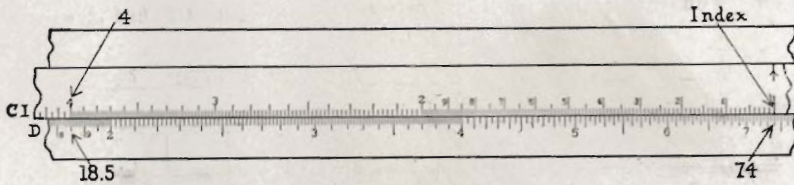




To divide, set index of CI to dividend on D, opposite divisor on CI find answer on D.

**Example:**  $74 \div 4 = 18.5$

To 74 on D set right index of CI. Opposite 4 on CI, find answer 18.5 on D.



For simple multiplication and division, however, we recommend the use of the front face.

### 7. COMBINED MULTIPLICATION AND DIVISION.

We now come to examples involving more than two factors and will illustrate them diagrammatically.

**Example:**  $\frac{24 \times 35}{6} = 140$

24 divided by 6 and multiplied by 35 equals 140.

C	Set 6	Opposite 35
D	To 24	Find answer, 140

**Example:**  $\frac{72 \times 8}{12} = 48$

DF	To 72	Find answer 48
CF	Set 12	Opposite 8
C		Opposite 8
D		Find answer 48

In this case the setting was made on the folded scales. If the setting had been made on C and D, the factor 8 would have projected beyond the scales on the rule. The first two factors on either the upper or lower scales must be set in such manner that not more than one-half of the slide projects beyond the rule.





### 8. MULTIPLICATION OF THREE FACTORS.

Three factors can be multiplied at one setting of the slide. This is accomplished by setting two of the factors on the inverted side and reading the product on the D scale of front face opposite the third factor on the C scale.

**Example:**  $35 \times 6 \times 74 = 15540$ .

CI	Set 35	CF	Opposite 74
D	To 6	DF	Find answer 15540

### 9. CONTINUOUS MULTIPLICATION AND DIVISION.

A combination of multiplications and divisions can be performed, the final result only being noted. To illustrate this we will take the following simple problem:

**Example:**  $\frac{4 \times 6 \times 8 \times 7}{2 \times 5 \times 3} = 44.8$  (R stands for Runner.)

DF				Find answer 44.8
CF		Runner to 6	5 to R	R to 8
				3 to R
C	Set 2			Opposite 7
D	To 4			

### 10. GAUGE POINTS AND EQUIVALENTS.

In many cases a gauge point, noted on the blank space of the reverse side of the rule, for frequently recurring problems is of great assistance. These gauge points should be put on according to the nature of the problems for which the slide rule is used, thus, the accountant would place them for a combination of discounts or interest, while the importer might be more particularly concerned with converting metric measure into inches or yards, or pounds into kilograms, etc.

Below we give a number of equivalents and will show how to make the settings:

$\frac{6}{5} =$ U. S. gallons	$\frac{800}{107} =$ U. S. gallons
$\frac{1}{231} =$ Imperial gallons	$\frac{22}{6100} =$ Cubic feet
$\frac{1}{430} =$ U. S. gallons	$\frac{22}{6100} =$ Imperial gallons
$\frac{69}{26} =$ Cubic inches	$\frac{200}{82} =$ Cubic inches
$\frac{66}{82} =$ Imperial gallons	$\frac{200}{82} =$ Imperial gallons
$\frac{66}{82} =$ Cubic feet	$\frac{200}{82} =$ Liters
$\frac{26}{66} =$ Inches	$\frac{82}{25} =$ Feet
$\frac{66}{82} =$ Centimeters	$\frac{25}{87} =$ Meters
$\frac{82}{75} =$ Yards	$\frac{87}{140} =$ Miles
$\frac{75}{140} =$ Meters	$\frac{140}{140} =$ Kilometers





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$31 = \text{Square inches}$	$140 = \text{Square feet}$
$200 = \text{Square centimeters}$	$13 = \text{Square meters}$
$61 = \text{Square yards}$	$5 = \text{Cubic inches}$
$51 = \text{Square meters}$	$82 = \text{Cubic centimeters}$
$600 = \text{Cubic feet}$	$85 = \text{Cubic yards}$
$17 = \text{Cubic meters}$	$65 = \text{Cubic meters}$
$6 = \text{Cubic feet}$	$14 = \text{U. S. gallons}$
$170 = \text{Liters}$	$53 = \text{Liters}$
$108 = \text{Grains}$	$6 = \text{Ounces}$
$7 = \text{Grams}$	$170 = \text{Grams}$
$75 = \text{Pounds}$	$3 = \text{U. S. gallons of water}$
$34 = \text{Kilograms}$	$25 = \text{Weight in pounds}$
$50 = \text{Pounds per U. S. gallon}$	$10 = \text{Pounds per imperial gallon}$
$6 = \text{Kilograms per Liter}$	$1 = \text{Kilograms per liter}$
$30 = \text{Pounds per U. S. gallon}$	$44 = \text{Feet per second}$
$25 = \text{Pounds per imperial gallon}$	$30 = \text{Miles per hour}$
	$226 = \text{Diameter of circles}$
	$710 = \text{Circumferences of circles}$

Any problem involving any of the combinations enumerated above, can be readily solved by setting the one equivalent number on the slide opposite the other number on the rule.

**Example:** How many pounds in 152 kilograms?

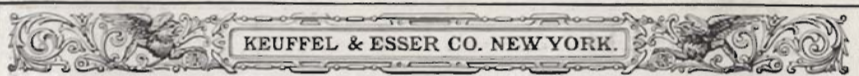
In the Table of Equivalents we find:  $\frac{75 = \text{pounds}}{34 = \text{kilograms}}$

C	Set 34	Opposite 152
D	To 75	Find answer 335.3

Without resetting, any number of pounds on D or DF will be found opposite the equivalent number of kilograms on the C or CF scales. Vice versa, any number of kilograms on C or CF will be found opposite the equivalent number of pounds on the D or DF scales.

To avoid setting the equivalent numbers each time, a gauge point can be marked on the blank space opposite the arrow, (on the back of the rule) after having carefully set the equivalent numbers on the front. This point can be indicated either with a hard pencil, or cut with a knife and suitably marked, if it is to remain permanently. All that is necessary to do then, is to set the arrow to this gauge point and your slide rule is set to read off pounds to kilograms, or vice versa.





### 11. Discounts.

Simple discount is set by reading the scales backwards, deducting direct from 100, thus, for a discount of 18%, set right hand (and middle) index at 82 (100 - 18 = 82) and the rule is set, so that opposite any number on C, the answer will be found on D. This is equivalent to multiplying by 82%.

For a combination of discounts, set by the use of the runner, thus for 27½-15-5%, proceed as follows:

C	Right Ind. R to 85 (100-15)	Ind. to R	R to 95 (100-5)	Ind. to R	Opp. any amount
D	To 72.5 (100-27½)				Find answer

For frequently occurring discounts, a gauge mark should be made on the reverse side at the arrow for future use.

### 12. Profits.

Profits are added by setting left index of C to the amount of profit added to 100 on D, thus: To add a profit of 25%, set left index of C to 125 (100+25) on D. Opposite any number on C find answer on D. This is equivalent to multiplying by 125%.

### 13. Selling Price.

To get selling price of a line of goods by deducting the discount and adding the desired profit; this is accomplished at one setting.

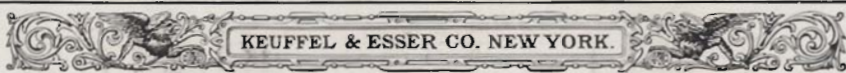
**Example:** What is the selling price of Plumbers Brass Safety Chain on Reels of 500 ft. purchased at a discount of 60-10-5%, to yield a profit of 25% on selling price?

C	Set Index	R to 90	Index to R	R to 95	75 to R	Opp. List
D	To 40 (100-60)					Find selling price.

Size of Chain	List	Selling Price
000	3.30	1.51
00	3.60	1.64
0	4.20	1.96
1	5.20	2.37
2	6.40	2.92
3	9.00	4.11
4	10.30	4.70







### 14. SIMPLE INTEREST.

Prepare your gauge points for the principal rates by setting to 360 (the number of days in the year) on D, the given rate on C. Then when required, set runner to gauge mark, principal on C to runner. Opposite time in days on D or DF find interest on C or CF.

**Example:** \$475.00 for 225 days, at  $4\frac{1}{2}$  per cent. (G.P. stands for gauge point.)

Set R to G. P. on back of rule;

C	475 to R	Find ans. 13.36
D		Opposite 225

### 15. COMPOUND INTEREST.

Space off on scale D (as shown below) the distance 100 plus rate per cent as many times as is the required number of years, and multiply by principal.

**Example:** What will be the amount of \$ 250.00 placed at compound interest for four years at 6 per cent?

C	Set 1	R to 106	1 to R	R to 106	1 to R	R to 106	1 to R	Opp. 250
D	To 106 (100+6%)							Find ans. 315.62

It is evident that gauge points can be readily located for any compound interest rate.

### 16. LUMBER MEASURE.

**Example:** Lumber required for 27 table tops  $38" \times 56" \times 1\frac{1}{4}"$  and cost thereof at \$87.50 per 1000, plus 20% for cutting waste.

CI	Set 38	C	R to 56	144 to R	R to 125 opp.	CI	87.5 to R	C	Opposite. 120
D	To 27	D			Find 498 ft. brd. measure	D		D	Find cost \$ 52.37

$$\frac{27 \times 38 \times 56 \times 125 \times 875 \times 120}{144}$$

$27 \times 38 \times 56$  equals number of square inches, this divided by 144, the number of square feet, this multiplied by 1.25 the square feet in board measure. This multiplied by the cost per square foot,  $8.75 \times 120$  (100 + 20 per cent), equals the cost.





### 17. WEIGHT AND COST OF SHEET BRASS FOR STAMPING.

**Example:** Required 2 gross stampings of No. 16 sheet brass 8 in. wide at 14½ cents per pound, seven pieces to cut from a running foot.

Find number of running feet of brass, number of square feet, weight and cost of same.

These four answers are found with three settings of the slide.

$$\frac{288 \times 8 \times 2.25 \times 14.5}{7 \times 12}$$

C	Set 7	Opposite 1	R to 8	12 to R	Opposite 1	R to 2.25	1 to R	Opposite 14.5
D	To 288	Find number of running ft.—41.2			Find number of sq.ft. 27.4	Find weight 61.7 lbs.		Find cost \$8.95

**Note.** 2.25 is weight of one square foot of brass. These weights are found in any brass manufacturer's catalogue.

### 18. PAPER.

To convert weight per ream (in pounds) to grams per square meter, and vice versa.

The gauge point for this purpose is placed opposite 7031.

**Example:** What is the weight in grams per square meter when a ream (500 sheets) Folio (17 × 22) weighs 16 pounds?

$$\frac{16 \times 703100}{500 \times 17 \times 22} = 60.16 \text{ grams per square meter.}$$

C	Set 500	R to 16	17 to R	R to 1	22 to R	Opposite 1
D	To G.P. 7031					Find answer 60.16.

*From the foregoing it will be found that the use of the slide rule can be extended indefinitely; all that is necessary is to have a little patience and to use common sense in operating it.*









cm. y. kb. eM.