1. INTRODUCTION.

The slide rule is an accurate mechanical device for rapidly and accurately making calculations. Problems involving multiplication, division, proportion, percentages, squares and square roots, cubes and cube roots, diameter, reciprocals, areas, logarithms and exponents, trigonometric formulas and combinations can be solved by means of a slide rule, regardless of one's mathematical knowledge. Accuracy can be obtained in the body, slide and indicator are carefully set, say, to three figures adequate for most practical applications. 

Some of using the slide rule will follow as the result of practice.

2. GENERAL DESCRIPTION OF SCALES.

The following is a brief description of the various scales of the log log rule:

- **S Scale**: A trigonometric scale used with the A and B scales for problems involving the sine of angles.
- **K Scale**: Used with C and D scales for finding cubes and cube roots. 
- **A Scale**: Identical to the D scale and also used with the C and D scales for finding squares and square roots.
- **CI Scale**: A reciprocal scale used with the C, D, and T scales.
- **C Scale**: Identical to the D scale and used with the D scale for multiplication and division.
- **D Scale**: Used with the C scale for multiplication and division.

3. READING THE SCALES.

Before attempting to operate the slide rule, the beginner must learn how to read the scales. The various scales are not graduated uniformly; except the C and D scales and the marks on the scales do not measure length, they represent only numbers. As the reading of all scales is done in much the same manner, it will be sufficient to illustrate the procedure with the C scale. A slide rule only enables one to work with significant figures of a number. The significant figures are the ones that remain after the digits to the right or left of a given number have been removed. For example:

- The significant figures of the following number 0.0689, 0.35, 35.3, 0.0090, are all the same, namely three-five-nine; making a total of three significant figures, due to the manner in which the slide rule is divided.

To illustrate this, we will indicate the location of the three-figure number 254 on the C and D scales in our explanation of the reading of the scales, as follows:

First Step: The C and D scales are divided into ten major divisions numbered from 1 to 10, giving us first significant figure. Figure 1 illustrates the major divisions of the C and D scales, whereas the same explanation applies to the A and B scales. If the first significant figure of number is 1, the number will lie between the zero and 1 units of the C or D scale.

Second Step: Each of these major divisions is subdivided into ten parts or secondary divisions, giving us our second significant figure. (See Fig. 2)

Third Step: Each of these secondary divisions is again subdivided into a third set of divisions, giving us our third significant figure. (See Fig. 3)

In the number 254, the third significant figure —4— indicates that the location is the second tertiary division of 5th secondary division of the third major division as indicated by the arrow in Fig. 3.

The secondary subdivisions between 1 and 2 are each divided into 10 tertiary divisions. The shorter secondary subdivisions between 1 and 2, and between 3 and 4 are divided only into 5 tertiary divisions. The still shorter secondary subdivisions between main divisons beyond 4 are divided into two tertiary divisions because of shortness of space. Had the number been 2543, we should then have located it in 3.10 or the tertiary division between 2540 and 2550. This last shift is made by estimating the 3.10 halfway, as there are no hundred order divisions.

4. SLIDE RULE OPERATIONS.

**MULTIPLICATION**: Use the C-D combination. To multiply one number by another, set either the left or the right index of the C scale over one of the number to be multiplied on the D scale. Read the answer on the D scale under the other number on C scale.
Set the left index of C on the number 1.65 of the D scale. Read the answer 3.96 on the D scale under the number 2.4 on C scale. If the multiplier on C scale is off the D scale, the slider is to be pulled to the left in the ruler until the right index of C is in register with the first factor following on D, and then read the answer on the D scale under the multiplier on C scale.

Squares and Square Roots. Use the A-D combination of scales. To find the square of a number, set the indicator hairline over the number to be squared on the B scale, and read the square of the number on the A scale under the indicator hairline. To find the square root of a number greater than unity—If there are an odd number of figures before the decimal point, set the hairline over the number on A scale, and then read the answer on the D scale under the left index of C on the D scale.

Cubes and Cube Roots. Use the D-K combination of scales. K scale is so constructed that when the indicator hairline is set over a number on the D scale, the cube of the number is under the hairline on the K scale. To find the cube root of a number, set the K hairline on the K scale. On the D scale, the cube of the number is under the hairline on the D scale that is used.

Proportion. Use the C-D combination of scales. Problems of proportion arise, for example, in the conversion of yards to feet, dollars to pounds, gallons to cubic feet, and so on. They are written for example, $\frac{a}{b} = \frac{c}{d}$ and are usually as A is to B as C is to D. Opposite the numerator of the known relationship on the D scale, set the denominator.

Further use of the C-I scale. Multiplication by using the C-I combination. To multiply two numbers together using the C-I scales, set the hairline on one of the factors on the D scale, and bring the other factor on the C-I scale under the hairline. Read the answer on the C scale when the hairline on the D scale is at the right. Since either the left or right index of C-I will always be found using the scale, this method of multiplication may prove more reliable than the index which is frequently unnecessary when multiplying by using the C-D combination. To find the product of three factors, set the hairline on one factor on the C-I scale, and bring the other factor on the C-I scale under the hairline. Move the indicator hairline to the left and read the square root under the hairline on D scale. If the number has an even number of figures before the decimal point, set the hairline over the number on A scale, and then read the answer on the D scale under the left index of C scale.

The Sine Scale. The scale is used with the A and B scales for finding the sines of angles from $34^\circ$ to $90^\circ$. The sines of angles from $34^\circ$ to $90^\circ$ can be read directly on A right. The sines of angles from $34^\circ$ to $54^\circ$ are read directly on A left. Since all practical purposes, the sine and tangent are the same for angles less than $64^\circ$, the tangent of an angle from $34^\circ$ to $64^\circ$ may also read on A left. To find the sine or tangent of angles from $24^\circ$ to $54^\circ$, set the hairline on the A scale, under the hairline on the C-I scale, and read the answer on A right. The tangent A is to COTANGENT A: COTANGENT A = TANGENT A. Angles less than $45^\circ$. To find the tangent of an angle from $54^\circ$ to $45^\circ$, set the hairline over the angle on the B scale under the answer on the D scale.

Logarithm of a number. The L scale (a scale of equal parts) permits the reading of the logarithms (mantissas) of numbers on the D scale. Set the hairline on the number on the D scale as a logarithm of the number on the D scale. The logarithm is one unit less than the number of figures. To find the characteristic, add the number of digits in the characteristic of the logarithm and one unit more than the number of digits of the number.