DIRECTIONS
for the use of the

..NOVOTNI..
WEIGHT SLIDE RULE

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NOVOTNI SLIDE RULE
Manufacturers of SPECIAL SLIDE RULES
MEDIA —:— PENNSYLVANIA

Any one who has ever used the Weight Slide Rule knows its tremendous advantage over the common practice.

With this instrument calculations can be made *quickly* and accurately by all who can read an ordinary measuring rule, and a knowledge of mathematics is not essential. *Why?* Because fractions are graduated where needed instead of decimals. Length can be read in feet or inches while thickness and width remain in inches. Double slide permits two operations in one. Result read direct. *No pointing off of Decimal Points being necessary.*

Manufacturers can *Save* in the forging shop by the *elimination of waste.* A metal worker will often guess at the amount of metal required to make a forging. One hundred pounds wasted in this way in one day, at 3 cents per pound, would cover the cost of one rule.

These small *wonder* working tools, should be welcomed to every *efficient* organization, their unique designs elimate troublesome problems, prevent mistakes, *save time* and material and greatly advance the modern method of *standardization.*

Why spend 6 minutes to figure the weight of a steel ring when you can do it in 6 seconds?

Our engineers are at your service. Let the slide rules solve your industrial problems. Send us your requirements.

Directions for the use of WEIGHT SLIDE RULE

THE WEIGHT SLIDE RULE was designed to meet the requirements of Blacksmiths, Estimators, Stockkeepers, Auditors, Foundrymen, Patternmakers, etc.; in fact, everyone whose daily duties involve the figuring of weights, and with its aid, considerable *Time* and *Energy* are *Saved.*

Attention is called to some features of the WEIGHT SLIDE RULE which simplify its operation as compared with ordinary slide rules; particularly in the computing of weights, viz.: Common fractions are graduated where needed instead of decimals. Length can be read in feet or inches, while Thickness and Width remain in inches. Double slide permits two operations in one. Results read direct, *No Pointing Off of Decimal Points being necessary.*

IMPORTANT

We would suggest that the operator of the WEIGHT SLIDE RULE read all of the instructions given, test the rule with problems as outlined, and prove some problems of his own. This should enable him to become familiar with the working of the rule and insure accuracy in its operation.

Construction

All dimension scales are graduated in inches and fractions thereof, the weight in pounds scale being pounds and tenths.

In explaining the use of the WEIGHT SLIDE RULE, we will designate scales by name, as follows:

First: The top scale being stationary, we have designated "THICKNESS," and is read from left to right, 1/32 being the first graduation, 1/16 the second graduation, the next 3/32, then 1/8", then following consecutively we read 5/32, 3/16, 7/32, etc., up to 1; then continuing we read 1 1/8, 1 1/4, etc., up to 7; at this point, the graduations being too close for 8ths, it is read 7 1/4, 7 1/2, etc., up to 10, then 10 1/2, 11, 11 1/2, etc., up to 20; from 20 to 60 the graduations are read 21, 22, 23, etc.

Your attention is called to the similarity between the readings of this scale and the ordinary measuring rule.

Second: The second scale, "WIDTH," is on the upper portion of a slide and is read from *Right to Left*, beginning with 1/16 and advancing to 100.

Third: The third scale, "LENGTH," is on the lower portion of the same slide and is read from left to right, beginning at 1/4 and advancing to 500.

Fourth: The fourth scale, "KIND OF MATERIAL," is also on a slide and is arranged according to Specific Gravity, to wit: Water, 1; Aluminum, 2.67; Cast Iron, 7.218; Steel, 7.854; Brass (65C-35Z), 8.393; Copper, 8.855; Lead, 11.38. (8th ed. Kent, page 178.)

The operator will note that Copper, Brass, Steel and Cast Iron appear on this scale in two places, the set to the left (*printed in italics*) to be used only when the "LENGTH" scale is read in feet. The right-hand set (also Lead, Aluminum and Water) to be used only when "LENGTH" is read in inches.

Fifth: The fifth scale, "SHAPE OF PIECE," is also on slide, and is arranged as follows: Square or Rectangular Cross Section=1; Hexagon Cross Section=.866; Octagon Cross Section=.8284; Round or Oval Cross Section=.7854; Fillet=.2146; Ball=.5236.

Note that Square, Hex., Oct. and Round are on scale in two places; the left-hand set (*printed in italics*) is to be used only when the right-hand set goes outside of rules or above 2,000 pounds; in this case 1/10 of weight can be read from left-hand set, which makes it possible to read weights up to 20,000 pounds.

Sixth: The sixth scale, "WEIGHT IN POUNDS," is stationary, and is read from left to right. Beginning with1, read 1, 1.1, 1.2, 1.3, etc., up to 10 pounds; 10, 11, 12, etc., up to 100 pounds; 100, 110, 120, etc., up to 1,000 pounds; 1,000, 1,100, 1,200, up to 2,000 pounds.

Examples

COMPUTING WEIGHTS

RECTANGULAR STEEL BAR—1" x 6" x 24" long.

Place 6 on *Width* to 1 on *Thickness* and *Steel* (right-hand set) to 24 on *Length*. Read weight under ▮=41 pounds.

ROUND STEEL BAR—2" diameter x 60" long.

Place 2 on *Width* to 2 on *Thickness* and *Steel* (right-hand set) to 60 on *Length*. Read weight under ● =53½ pounds.

SQUARE, CAST IRON—3" square x 25" long.

Place 3 on *Width* to 3 on *Thickness* and *Cast Iron* (right-hand set) to 25 on *Length*. Read weight under ■ =58¾ pounds.

HEXAGON, BRASS—2" across flats, 16 feet long.

Place 2 on *Width* to 2 on *Thickness* and *Brass* (left-hand set) to 16 on *Length*. Read weight under *Hex.*=202 pounds.

FILLET, CAST IRON—4" radius x 70" long.

Place 4 on *Width* to 4 on *Thickness* and *Cast Iron* (right-hand set) to 70 on *Length*. Read weight under *Fillet*=62½ pounds.

BALL, CAST IRON—10" diameter.

Place 10 on *Width* to 10 on *Thickness* and *Cast Iron* (right-hand set) to 10 on *Length*. Read weight under *Ball*=136 pounds.

HOLLOW CYLINDER STEEL—10" outside diameter x 8" inside diameter x 16" long.

10+8=18: 10—8=2.

Place 18 on *Width* to 2 on *Thickness* and *Steel* (right-hand set) to 16 on *Length*. Read weight under ● =128 pounds.

OVAL CROSS SECTION, CAST IRON—3½" x 2" x 14" long.

Place 3½ on *Width* to 2 on *Thickness* and *Cast Iron* (right-hand set) to 14 on *Length*. Read weight under ● =20 pounds.

TRIANGULAR CROSS SECTION, CAST IRON—Base, 16"; height, 20"; length, 30".

Place 16 on *Width* to 10 (½ of height) on *Thickness* and *Cast Iron* (right-hand set) to 30 on *Length*. Read weight under ■ =1,260 pounds.

The weight of an IRREGULAR OBJECT can be found by dividing it into regular sections and computing each section separately. On pages 6 and 7 is a table showing how to compute the weights of regular solids.

EXAMPLES FOR PRACTICE

Find the weight of the following:

Round Steel Bar, 2½" diameter x 60" long=83½ pounds.

Square Steel Bar, 3" square x 40" long=102 pounds.

Rectangular Steel Bar, 5" x 2¼" x 72" long=230 pounds.

Hexagon Steel Bar, 6½" across flats x 46" long=476 pounds.

Octagon Steel Bar, 3⅛" across flats x 38" long=87 pounds.

Ball, Cast Iron, 5¾" diameter=26 pounds.

Fillet, Cast Iron, 7" radius x 60" long=164 pounds.

Bushing, Cast Iron, 14" outside diameter x 13½" inside diameter x 22½" long=63 pounds.

Plate, Steel, 10½" diameter x ½" thick=12¼ pounds.

Rim for Cast Iron Flywheel, 154" outside diameter x 140" inside diameter x 16" face=13,500 pounds.

Note 154 + 140=294; 154 — 140=14.

Use 14 on *Width*, 16 on *Thickness* and 294 on *Length*. Read 1/10 of weight under ● =1,350, and multiply by 10=13,500 pounds.

Forger's Practice

Practice weight examples before attempting to do the following:

To draw a 3½" round by 16" long from a 5" round steel bar.

Place 3½ on *Width* to 3½ on *Thickness* and *Steel* to 16 on *Length*. Hold bottom slide in this position and place 5 on *Width* to 5 on *Thickness*. Read over *Steel* 7⅞", which represents the length of a 5" bar to be drawn down.

To draw a 3¼" square by 12" long from a 5½" round steel bar.

Place 3¼ on *Width* to 3¼ on *Thickness* and *Steel* to 12 on *Length*. Note weight under ■ =36 pounds. Place ● to 36 pounds. Hold bottom slide in this position and place 5½" on *Width* to 5½" on *Thickness*. Read over *Steel* 5⅜", which represents the length of a 5½" round bar to be drawn down.

To make a gear 10½" diameter by 3" face, from an 8" round steel bar.

Place 10½ on *Width* to 10½ on *Thickness* and *Steel* to 3" on *Length*. Hold bottom slide in this position and place 8 on *Width* to 8 on

Thickness. Read 5 3/16 over *Steel* which represents the length to cut off the 8" bar.

To make a washer or flat ring, 10½" outside diameter by 6½" inside diameter and 1¼" thick, from a 5" round steel bar, by punching a 3" hole 1½" thick and drawing out to size on a mandrel.

First find weight of piece to be punched out. 3" diameter x 1½" long=3 pounds. Then 10½ + 6½=17; 10½ − 6½=4.

Place 17 on *Width* to 4 on *Thickness* and *Steel* to 1¼ on *Length*. Note weight under ┬ =19 pounds and add the 3 pounds=22 pounds. Place ┬ to 22 pounds; hold bottom slide in this position and place 5 on *Width* to 5 on *Thickness*. Read 3 15/16 over *Steel*, which represents the length to cut off 5" bar.

To find the diameter of a steel ball weighing 60 pounds.

Place *Ball* to 60 pounds; hold bottom slide in this position and balance *Width*, *Thickness* and *Length* until the 3 dimensions are the same=7⅜"

EXAMPLES FOR PRACTICE

Draw a 6¼" round x 36" long from an 8½" round bar. Ans., 19½" on 8½" bar.

Draw a 3" x 2" rectangular x 40" long from a 6" round bar. Ans., 8½" on 6" bar.

Draw a 4¼" Hex. x 32" long from a 6" round bar. Ans., 17¾" on 6" bar.

Draw a 5½" round x 38" long from an 8" square bar. Ans., 14⅛" on 8" bar.

Upset a 10" round bar to make a disc. 14" diameter x 3" thick. Ans., 5⅞" on 10" bar.

Make a drop forging to weigh 30 pounds, from a 6" x 2" rectangular bar. Ans., 8⅞" on 6" x 2" bar.

Make a flat ring 14" outside diameter x 10" inside diameter x 2" thick, by punching a 4" hole 2½" thick and drawing out to size on a mandrel. To be made from 6" round bar. Ans., 6½" on 6" bar.

Miscellaneous Calculating

Note line ┌─┐ which connects the scale *Length* to *Weight in Pounds*.

$$(2\tfrac{1}{2})^2 \times 6\tfrac{3}{8} = 39.84375.$$

Place 2½ on *Width* to 2½ on *Thickness* and top of line to 6⅜ on *Length*. Read answer at bottom of line=40.

$$\frac{(7\tfrac{1}{2})^2}{3\tfrac{1}{2}} = \frac{7\tfrac{1}{2} \times 7\tfrac{1}{2} \times 1}{3\tfrac{1}{2} \times 1} = 16.07.$$

Place 1 on *Width* to 7½ on *Thickness* and top of line to 7½ on *Length*. Hold bottom slide in this position and place 3½ on *Width* to 1 on *Thickness*. Read answer at top of line=16.

$$\frac{(3\tfrac{1}{2})^3}{(2\tfrac{1}{4})^2} = \frac{3\tfrac{1}{2} \times 3\tfrac{1}{2} \times 3\tfrac{1}{2}}{2\tfrac{1}{4} \times 2\tfrac{1}{4}} = 8.469.$$

Place 3½ on *Width* to 3½ on *Thickness* and top of line to 3½ on *Length*. Hold bottom slide in this position and place 2¼ on *Width* to 2¼ on *Thickness*. Read answer on *Length* over top of line=8½.

$$10 : 5 :: 50 : x = \frac{50 \times 5}{10} = x = 25.$$

Place 1 on *Width* to 5 on *Thickness* and top of line to 50 on *Length*. Hold bottom slide in this position and place 1 on *Width* to 10 on *Thickness*. Read answer over top of line=25.

$$20^2 : 10^2 :: 5 : x = \frac{10 \times 10 \times 5}{20 \times 20} = x = 1\tfrac{1}{4}.$$

Place 10 on *Width* to 10 on *Thickness* and top of line to 5 on *Length*. Hold bottom slide in this position and place 20 on *Width* to 20 on *Thickness*. Read answer on *Length* over top of line=1¼.

$$\frac{16}{1\tfrac{1}{4}} = 32.$$

Place 1 on *Width* to ¼ on *Thickness*; glance along scales *Width* and *Thickness* and locate where it is the same on each scale. We find it to be ⅛.

Place ½ on *Width* to 1 on *Thickness*. Hold top slide in this position and place bottom of line to 16 on *Weight in Pounds*. Read answer over top of line=32.

$$\frac{40 \times 50 \times 60}{10 \times 20 \times 30} = 20.$$

Place bottom of line to 40 on *Weight in Pounds*, place 10 on *Length* to top of line, place top of line to 50, place 20 to top of line, place top of line to 60, place 30 to top of line, return top of line to 1. Read answer under bottom of line=20.

Find the circumference of a circle 7" diameter.

Place bottom of line to 7" and read answer under $\pi = 22$.

Find the area of a circle 6" dia.=$6^2 \times 7854 = 28.3$.

Place 6 on width to 6 on thickness and top of line to 1 on length read answer under Round=28.3.

How many gallons in a tank 10" dia. x 15" high.

Place 10 on width to 10 on thickness and top of line to 15 on length. (Under Round is volume=1.178 cubic inches) hold bottom slide in this position and place 231 on length to top of line. Hold top slide in this position and place top of line to 1. Read answer on weight in pounds under Round=5.1.

The WEIGHT SLIDE RULE has been designed primarily for the purpose of computing weights, and in order to avoid making the instrument cumbersome and unwieldy, the graduations have been restricted to fulfilling the requirements of this particular purpose. It is obvious, therefore, that in making calculations involving figures other than those shown on the slide rule, such figures must be used in an arbitrary sense. For instance, if it should be necessary to use the figure 5,000, which is not shown on rule, the operator may use the figure 50, and get the required result by multiplying the answer by 100.

The operator will find it to his advantage, in making calculations of this kind, to point off the work before using the slide rule. For example, in a problem involving a series of multiplications and divisions, as

$$\frac{497 \times .181 \times 762}{3300 \times .6517} = x, \text{ the figures may be changed to read}$$

$$\frac{49.7 \times 18.1 \times 76.2}{33 \times 65.17} = x.$$

The relative values of the figures are not changed thereby, but are made to come within the scope of the slide rule.

After doing a few examples of this kind the operator will find that he can readily do the pointing off mentally as he proceeds, without experiencing the slightest difficulty.

There are a large number of miscellaneous problems which can be solved on the WEIGHT SLIDE RULE. We have given a few examples in this circular of what can be done, and believe the operator will be able to work out his own problems; but we shall be very glad to send information in regard to the solution of problems.

WEIGHT SLIDE RULE

Computes weights of all metal, all sizes and shapes.

PAPER SLIDE RULE

Lineal feet and square feet—caliper giving the weight of roll.

PAPER BOX BOARD RULES

Computes number of sheets to bundle, basis 26x38 and 25x40.

LATHE AND PLANER SLIDE RULE

Computes time to take cuts on lathes, planers, boring mills, shapers. When feed and speed are known.

ALSO SPECIAL RULES FOR PRODUCTION AND TIME STUDY

Strength of Spur Gears, strength of Wire Rope, strength and deflection of coil springs, flat rolled slide rule for floor plates.