Jan. 9, 1923.

1,441,914.

N. J. DEISCH.

TABULAR CALCULATOR.

FILED JUNE 25, 1921.

3 SHEETS—SHEET 1.

Fig. 2.

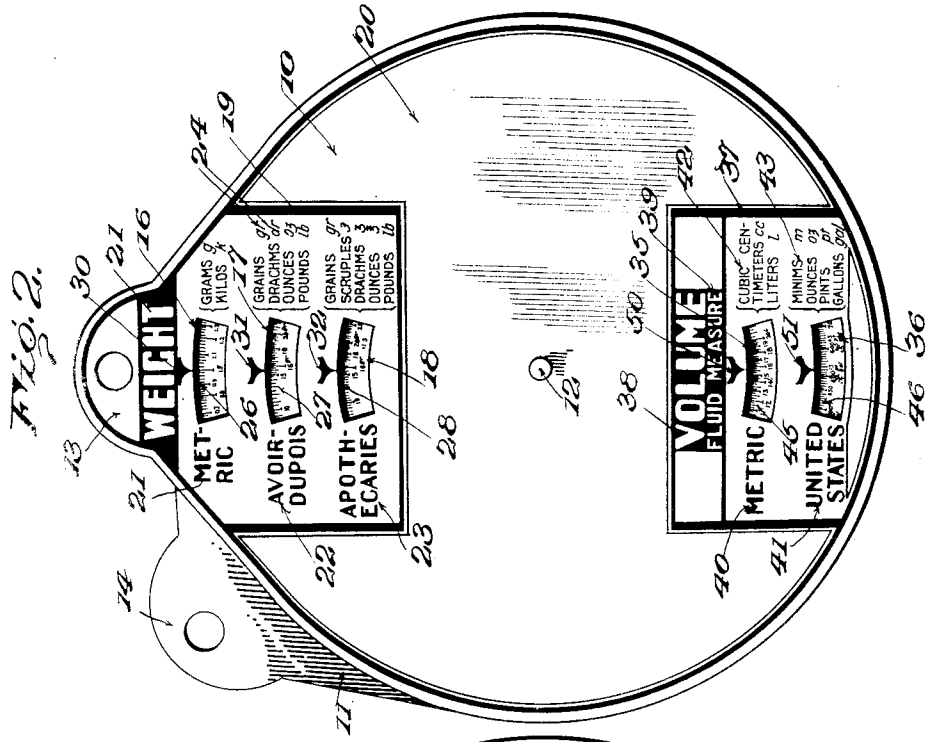
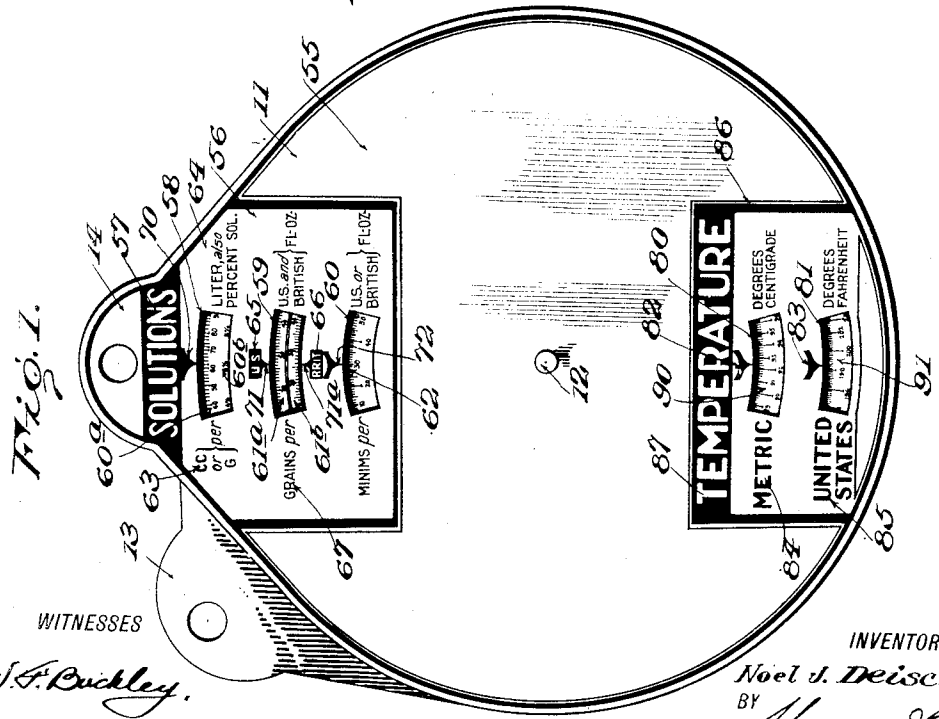


Fig. 1.



WITNESSES

W. F. Buckley.

INVENTOR

Noel J. Deisch.

BY

Munn & Co.

ATTORNEYS

Jan. 9, 1923.

1,441,914.

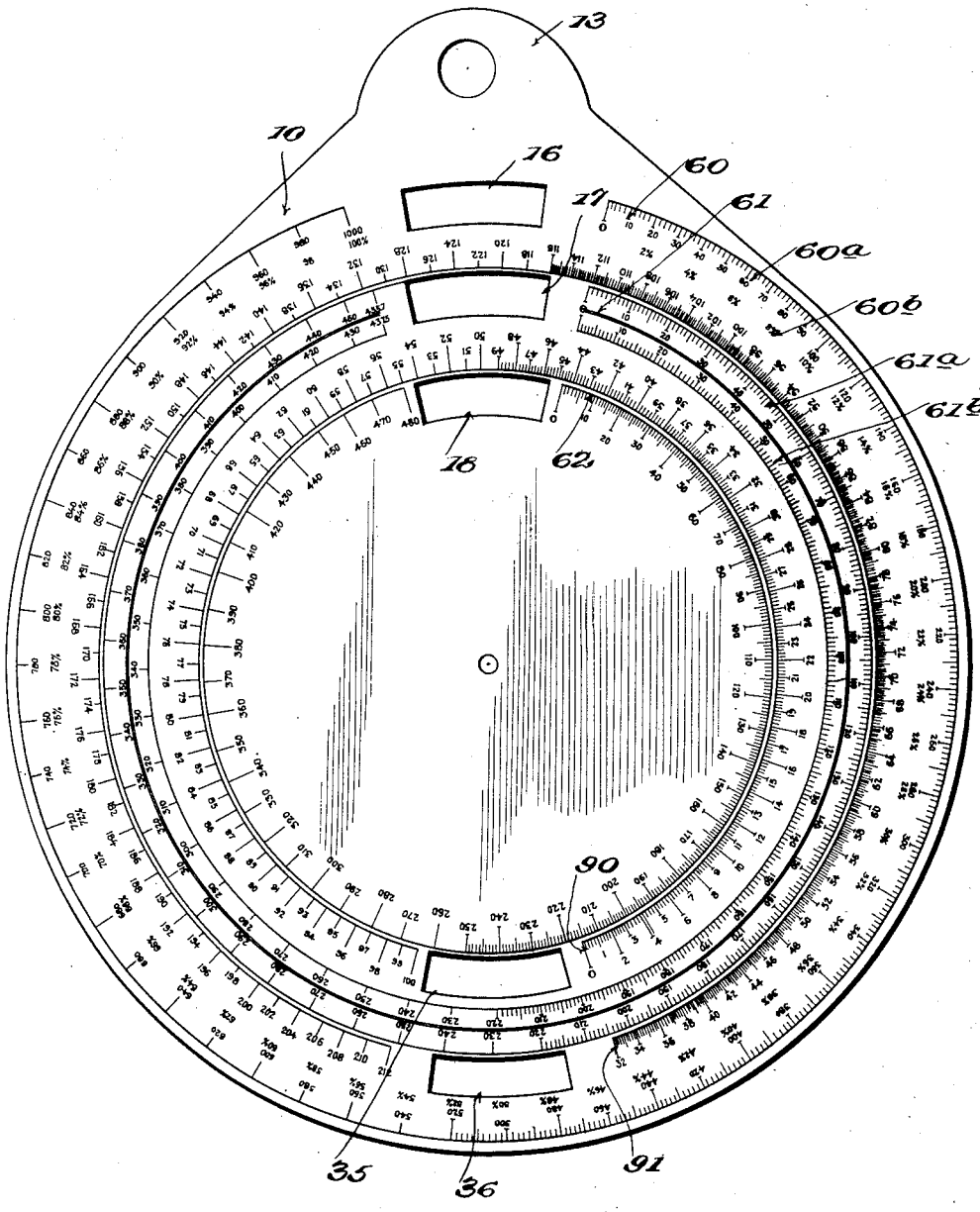
N. J. DEISCH.

TABULAR CALCULATOR.

FILED JUNE 25, 1921.

3 SHEETS—SHEET 2.

Fig. 3.



WITNESSES

W. F. Buckley.

INVENTOR

Noel J. Deisch.

BY Munn & Co.

ATTORNEYS

Jan. 9, 1923.

1,441,914.

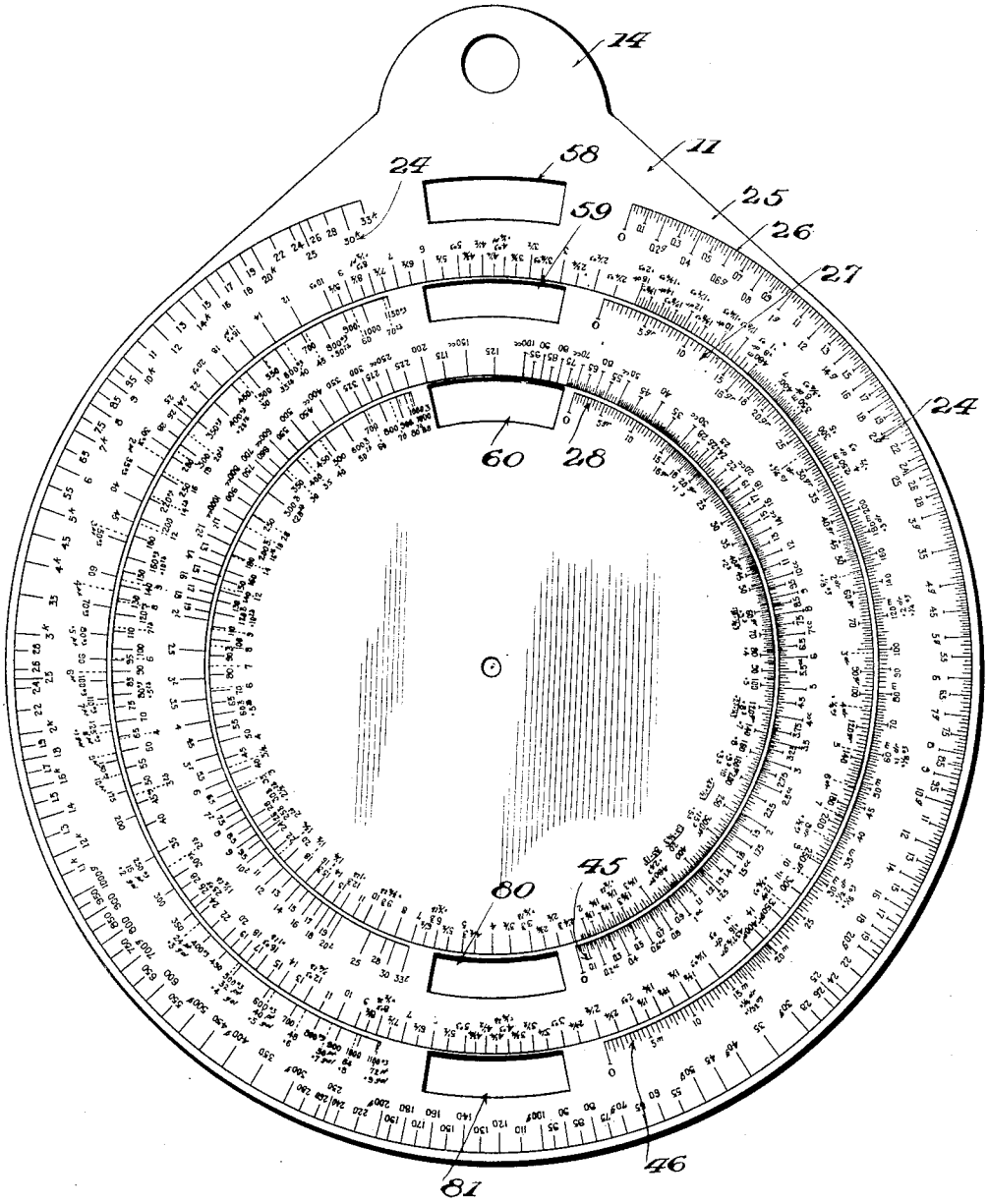
N. J. DEISCH.

TABULAR CALCULATOR.

FILED JUNE 25, 1921.

3 SHEETS—SHEET 3.

Fig. 4.



WITNESSES

W. F. Buckley

INVENTOR

Noel J. Deisch.

BY

Munn & Co

ATTORNEYS

Patented Jan. 9, 1923. 1,441,914

UNITED STATES PATENT OFFICE.

NOEL J. DEISCH, OF BROOKLAND, DISTRICT OF COLUMBIA, ASSIGNOR OF ONE-HALF TO LEO H. CLEARY, OF WASHINGTON, DISTRICT OF COLUMBIA.

TABULAR CALCULATOR.

Application filed June 25, 1921. Serial No. 480,308.

To all whom it may concern:

Be it known that I, NOEL J. DEISCH, a citizen of the United States, and a resident of Brookland, in the District of Columbia, have invented certain new and useful Improvements in Tabular Calculators, of which the following is a specification.

The present invention relates in general to tabular calculators, and more particularly to a disc calculator of this character especially adapted for converting units or numbers from one system of units, such as the metric system into another system of units such as the British or United States systems, or vice versa.

It is frequently necessary for photographers, pharmacists or chemists, in carrying out certain operations, such as in preparing a composition from a formula of foreign origin, to convert the units or numbers expressing the quantity of the ingredients of the formula from the metric system into the United States or British system, or vice versa. Heretofore, in order to accomplish this operation, it has been necessary either to perform the mathematical calculations incident to such conversion or to make use of conversion tables. Conversion tables are voluminous, tedious to use and all leave considerable gaps between the successive values presented, necessitating interpolation in order to ascertain intermediate values. By either of these modes conversion is time consuming and liable to be erroneous. In this connection the preparation of percentage solutions has been a source of especial difficulty, the difficulty being made much more extreme by the fact that the British and United States fluid measure do not coincide.

One of the principal objects of the present invention is to provide a disc calculator whereby all of these difficulties are avoided, the operation of conversion being carried out by a single setting of the disc calculator and the necessity of performing any mathematical calculations or of bearing in mind any of the relations subsisting between the systems of units being entirely avoided, leaving to the operator only the setting of the disc and the reading of the results and thus permitting the conversion to be made by an operator with mathematical accuracy even though the operator does not possess any knowledge of the mathematics of the various systems or of the mathematical relations subsisting between them.

Another object is to provide a calculator of this character which is of extremely simple and durable construction, reliable and extremely accurate in operation and easy and inexpensive to manufacture.

Other objects and advantages of the invention reside in certain novel features of construction, combination and arrangement of parts which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawings forming part of this specification, and in which:

Figure 1 is a view in elevation of one side of the calculator;

Figure 2 is a similar view of the opposite side of the calculator;

Figure 3 is an elevational view of the inner face of one of the discs; and

Figure 4 is a similar view of the inner face of the other disc.

Referring to the drawings wherein for the sake of illustration is shown the preferred embodiment of the invention, the numerals 10 and 11 designate a plurality or pair of sheets preferably in the form of discs which are rotatably secured to each other by means of the pivot 12, the pivot 12 being arranged centrally of the discs. The discs 10 and 11 are provided with apertured tabs, as shown at 13 and 14 whereby the calculator may be suspended from a hook or the like when not in use.

The disc 10 is provided in one portion thereof, with a radial series of openings or windows designated at 16, 17 and 18, respectively, these openings each taking the form of a section of an annulus, the arcs defining the openings being struck from the same center and the openings being symmetrical with respect to a common radius. The openings are arranged in a block or panel 19 which is defined in any suitable manner, preferably by heavy black lines applied to the outer face 20 of the disc and the upper portion of the panel bears the indicia "Weight" in large letters. The openings 16, 17 and 18 have along one side of each opening, respectively, the indicia "Metric," "Avoirdupois," and "Apothecaries," designated at 21, 22 and 23 in Figure 2, and on the opposite side of these openings the key

characters 24 utilized in connection with the tables read through the opening are identified as will hereinafter more fully appear.

The inner face 25 of the disc 11 underlies the openings 16, 17 and 18, and this face 25 of the disc 11 is provided with concentric, radially spaced and upright series of physical tables or scales, designated at 26, 27 and 28. These tables progress circumferentially in a clockwise direction with respect to the disc, as viewed in Figure 4. The table 26 expresses weight in the metric system, the table 27 in avoirdupois and the table 28 in apothecaries', the physical tables relative to the same object being thus expressed in different systems of units. The tables 26, 27 and 28 and the equivalent numbers or values in these tables are radially alined. Since the interval between successive values decreases in a logarithmic progression based on exponents of the powers of 10, the percentage accuracy of the indication at any point along the table is the same as at any other point. The outer face 20 of the disc 10 carries a series of indicators 30, 31 and 32 in the panel 19, the indicators being arranged centrally of and above the openings 16, 17 and 18, respectively, and these indicators respectively cooperating with the tables 26, 27 and 28 which are respectively readable through these openings. The indicators 30, 31 and 32 are radially alined as are the equivalent numbers of the tables 26, 27 and 28 with which these indicators, respectively, cooperate. It now appears that if one of the indicators is set to be coincident with a number or value of its table the other indicators will be coincident with equivalent numbers or values of their tables. Thus if as shown in Figure 2, the indicator 30 is set to be coincident with the scale marking indicating one gram on the table 26, the indicators 31 and 32 will be coincident with equivalent numbers or values on their tables 27 and 28 that is fifteen, and four and a fraction hundreds grains.

It is to be noted that the numerals of the tables 26, 27 and 28 are identified by key characters 24 such as "g" for "grams," "gr" for "grains" and "oz" for "ounces," the key characters being applied to the numerals of the scale and being identified by identification columns placed adjacent each opening or window, as shown in Figure 2.

A second radial series of openings or windows, designated at 35, and 36, is provided in a portion of the disc 10 and diametrically opposite the first series of openings or windows. These openings are disposed in a panel 37 headed by the indicia "Volume," designated at 38, the indicia "Fluid measure," designated at 39, appearing immediately below the indicia "Volume." Along one side of the openings 35 and 36 the words "Metric" and "United States" designated at 40 and 41, are applied and indicate the character of the physical tables presented to view through the openings 35 and 36, respectively. On the opposite sides of the openings the explanatory columns identifying the key characters are arranged and designated at 42 and 43, respectively.

A series of concentric radially spaced and inverted physical tables, designated at 45 and 46, respectively, are provided on the face 25 of the disc 11. These tables are alternately arranged with respect to the tables 26, 27 and 28 of the first series and progress circumferentially from a point angularly spaced from the point at which the first series start and in an opposite direction with respect to the first series. The tables 45 and 46 underlie the openings 35 and 36, respectively, the table 45 expressing volume, fluid measure, in the metric system, that is in terms of cubic centimeters and liters and the table 46 expressing volume, fluid measure, in the United States system that is in terms of minims, ounces, pints and gallons.

Indicators 50 and 51 are applied to the panel 37 adjacent the openings 35 and 36 and these indicators cooperate with the scales or tables 45 and 46, respectively, and like the scales they are radially alined so that when one indicator is arranged coincident with a number or value of its scale the other indicator is coincident with an equivalent number or value of its scale.

The outer face 55 of the disc 11 has formed thereon a panel 56 headed "Solutions," as indicated at 57. Under this heading the proper quantities of substance, liquid or solid, to be added to a liquid to obtain a given percentage solution, either in the metric, United States or British systems may be found and also formulæ contained in English or continental publications may be transposed into United States formulæ or on the other hand the United States formulæ may be transposed into metric equivalents, as desired. For this purpose the disc 11 is provided with a radial series of openings designated at 58, 59 and 60. These openings coact with scales or tables, designated at 60, 61 and 62 (see Figure 2) which constitute a series, of concentrically arranged and radially spaced scales or tables progressing circumferentially in a clockwise direction with respect to the disc as viewed in Figure 3. The table or scale 60 comprises graduations and indicia expressing the number of grams or cubic centimeters per liter of solution required to make up a solution of a given percentage concentration, designated at 60^a and indicia designated at 60^b designating the particular percentage solution. The character of the scale markings and the indicia is explained by the identification columns 63 and 64 applied to the op-

posite sides of the panel adjacent the openings 58. The scale 61 underlying the opening 59 is double, the elements of the scale being indicated at 61^a and 61^b and presenting two annular sections disposed in close concentric relation with respect to each other, the outer section 61^a being graduated according to the United States system of fluid measure, as indicated by the subheading 65, and the inner section 61 being graduated according to the British system of fluid measure, as indicated by the subheading 66, both of these annular sections which go to make up the section 61 serving to indicate the number of grains to be added to a U. S. or a British fluid ounce, respectively, to make up a percentage solution of a given concentration, as explained by the indicia 67 on the panel adjacent the opening 59. The scale 62 presents to the opening 60 graduations serving to indicate the number of minims to be added per United States or British fluid ounce, a single scale serving for this purpose since with respect to minims the U. S. and British systems are identical. Indicators 70, 71 and 71^a and 72 coact with the scales 60, 61^a and 61^b, and 62 respectively, the indicators being radially alined in the same manner as the graduations representing equal values on the tables or scales, whereby when a certain percentage solution is indicated by aligning the number of the percentage scale 60^b with the indicator 70 the cubic centimeters or grams per liter, and the grains per United States or British fluid ounces may be read from the scales or tables 60^a, 61^a, 61^b and 62, the indicators 70, 71, 71^a and 72 respectively being coincident with equivalent values in these tables. It is to be noted that the numbers of the percentage scale are aligned with the numbers of the table or scale 60^a so that a percentage number may be accurately aligned with the indicator 70 by means of the scale 60^a and so that percentages intermediate those indicated by the scale 60^b may be had by means of the scale 60^a.

A radial series of openings, designated at 80 and 81 are provided in the disc 11 diametrically opposite the radial series of openings 58, 59 and 60 and adjacent these openings indicators 82 and 83 are arranged. Explanatory indicia 84 and 85 is arranged alongside each of the openings 80 and 81 and indicate that these openings coact with metric and United States scales, respectively. All of these elements are comprehended in a panel 86 headed by the indicia "Temperature," designated at 87. The inner face of the disc 10 carries a series of tables or scales, designated at 90 and 91 and underlying the openings 80 and 81, respectively, the scale 90 being the centigrade scale and the scale 91 being the Fahrenheit scale. These scales begin at a point angularly spaced from the beginning of the first series of scales carried by this face of the disc 10 and the scales 90 and 91 progress circumferentially in a direction opposite to the direction in which the first series of scales progress and the numbers and scale markings of the scales 90 and 91 are inverted with respect to the scales 60, 61 and 62. Equal values of the scale 90 are radially alined with the scale 91 and as the indicators 82 and 83 which coact with these scales respectively are also similarly alined, it is obvious that upon a setting of one of the indicators coincident with a number of its scale that the other indicator will coincide and will read upon a number or scale marking of equivalent value. Thus when a certain temperature is given or known in centigrade, the equivalent temperature in Fahrenheit may be readily obtained and vice versa.

In use, the tabs 13 and 14 facilitate the manipulation of the discs. The calculator may be held in the hand or laid on a table or other flat surface during its operation, but in any event the proper face of the calculator must be exposed, that is disposed nearest the operator. For instance, if weight or volume is the subject of the calculations, the outer face of disc 10 must be exposed to ready observation, with the panels 19 and 37 under the headings "Weight" and "Volume," respectively, presented to the view of the operator.

If, for example, the calculation consists in the conversion of a formula expressed in one system of units into another, the indicator coacting with the system of units in which the formula is expressed is successively set or made to coincide with the number expressing the quantities of the ingredients of the formula and upon each setting of the indicator, the other indicators of the series are coincident with numbers expressing equivalent quantities in the other system of units whereby the number expressing the equivalent quantities may be readily observed or read by the operator.

I claim:

1. In a calculator, a pair of disks rotatably secured to each other in face to face relation, one of said disks having three radially disposed slots, the other disk having on its inner face three physical tables progressing in concentric arcs around the disk and arranged to underlie the slots, the equivalent numbers of the tables being radially alined, the disk which is provided with the slots also having on its outer face a reading indicator associated with each slot, said reading indicators being radially alined.

2. In a calculator, a pair of disks rotatably secured to each other in face to face re-

lation, one of said disks having a plurality of radially disposed openings, said openings being also radially spaced for a substantial distance, the inner face of the other disk bearing a plurality of physical tables progressing in concentric arcs around the disk and spaced radially for a substantial distance, the equivalent numbers of the tables being radially alined, each of the openings of the one disk overlying a table of the other disk, and radially alined reading indicators arranged on the outer face of the disk having the openings, one such reading indicator being arranged adjacent each opening.

3. In a calculator, a pair of disks rotatably secured to each other in face to face relation, each of said disks having in one portion three radially disposed and radially spaced slots and being provided in a diametrically opposite portion with two radially disposed and radially spaced slots, the inner face of each disk having three concentric radially spaced and upright physical tables progressing circumferentially of the disk in one direction, one of said tables extending in part across that portion of the disk comprehended between the two slots and two concentric radially spaced and inverted physical tables, alternately arranged and progressing circumferentially in an opposite direction with respect to the first mentioned tables and extending in part across the portion of the disk comprehended between the three slots, the three slots of one disk overlying the upright tables of the other disk and the two slots of one disk overlying the inverted tables of the other disk.

NOEL J. DEISCH.