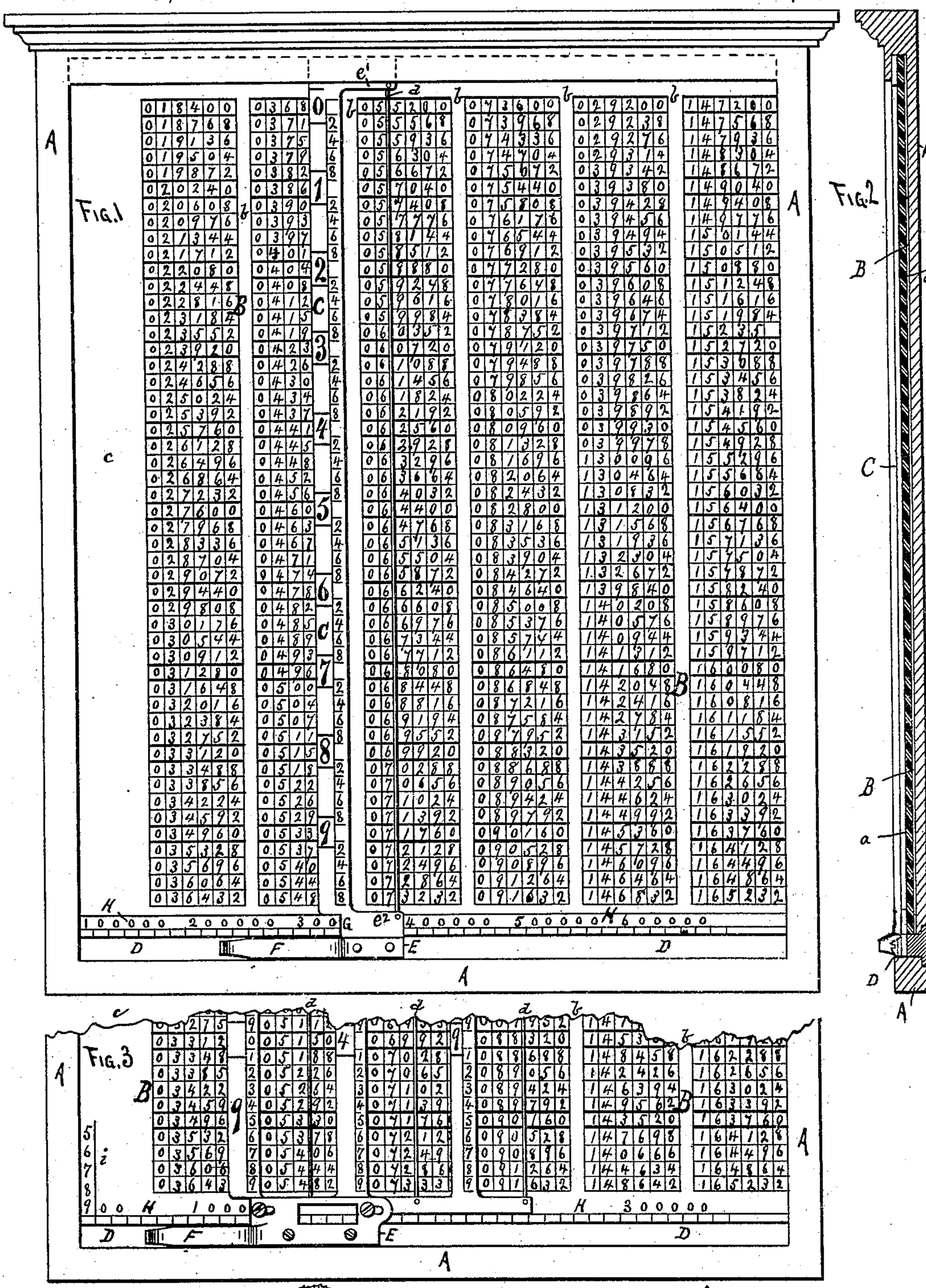
(No Model.) 2 Sheets—Sheet 1.

U. CURTIS.

INSTRUMENT FOR CALCULATING INTEREST, &c.

No. 295,152. Patented Mar. 18, 1884.



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(No Model.) 2 Sheets—Sheet 2.

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FIG. 5

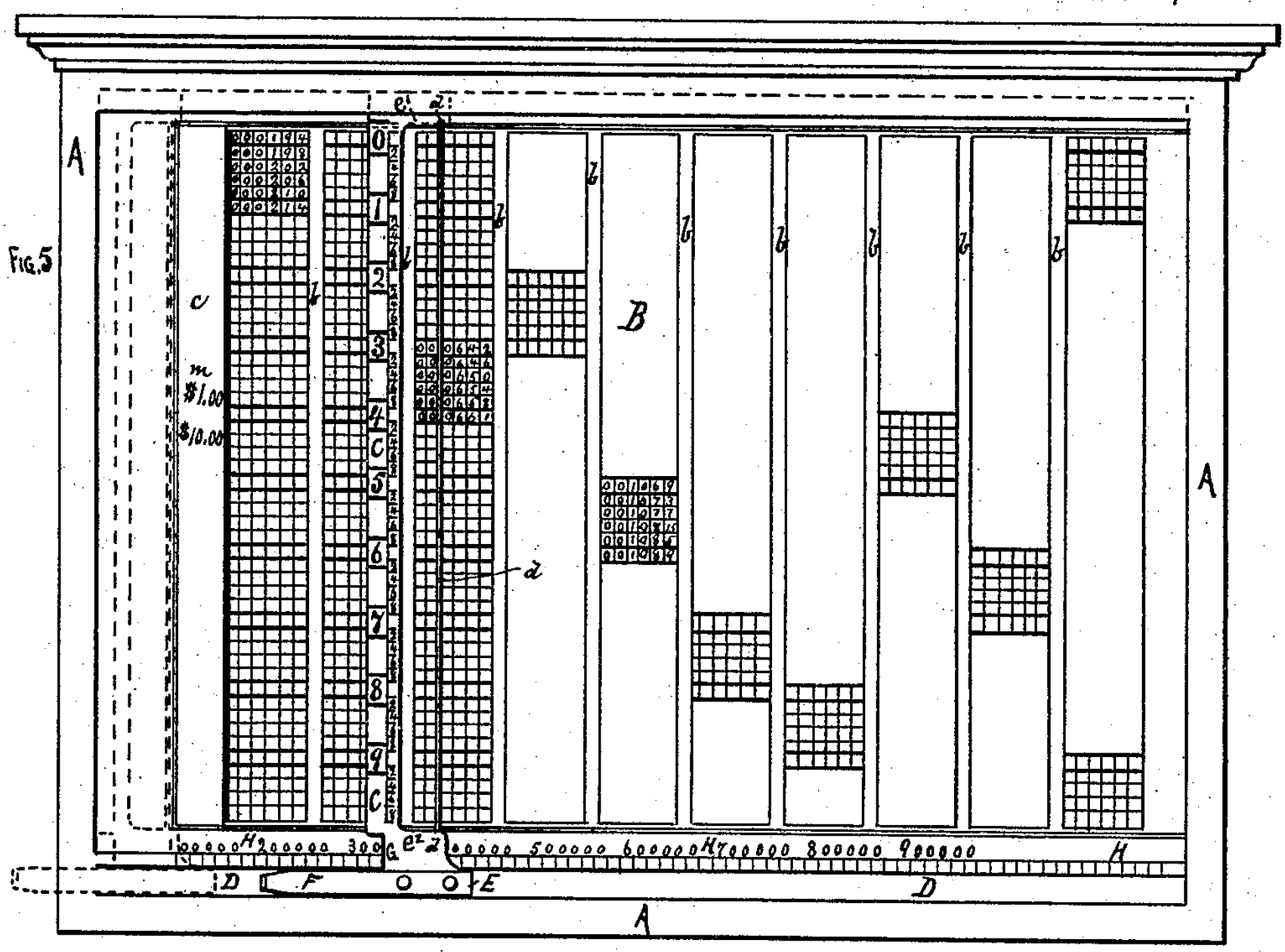


FIG. 6

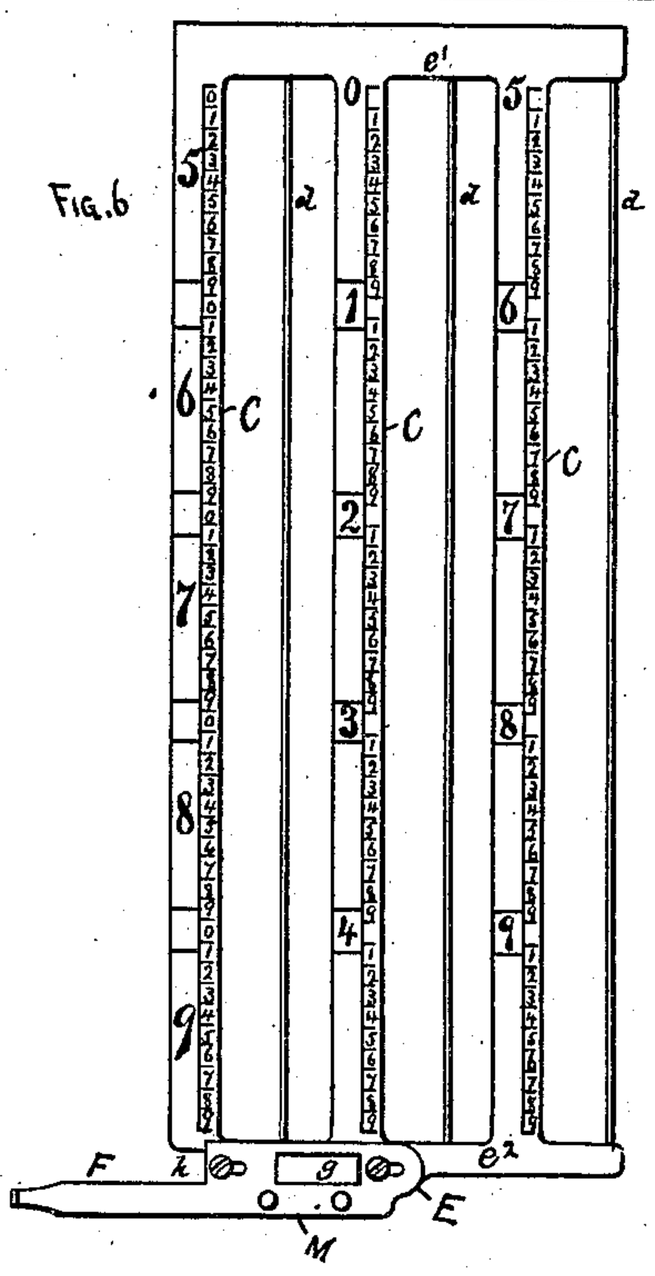
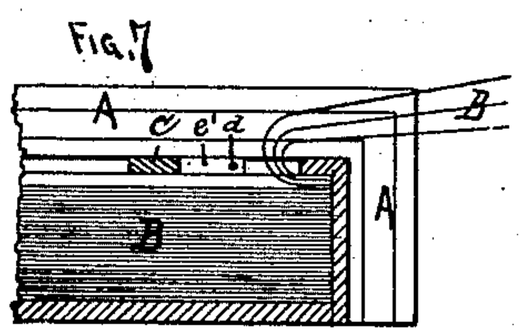


FIG. 7



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UNITED STATES PATENT OFFICE.

URIAH CURTIS, OF CONCORD, MINNESOTA.

INSTRUMENT FOR CALCULATING INTEREST, &c.

SPECIFICATION forming part of Letters Patent No. 295,152, dated March 18, 1884.

Application filed August 14, 1882. (No model.)

To all whom it may concern:

Be it known that I, URIAH CURTIS, a citizen of the United States, and a resident of Concord, in the county of Dodge and State of Minnesota, have made certain new and useful Improvements in Instruments for Calculating Interest, Taxes, &c., set forth in the following specification.

This invention relates to instruments for calculating interest, taxes, &c.; and it consists in the construction and arrangement of parts, as hereinafter shown and described and specifically claimed.

In the drawings, Figure 1 is a front view, and Fig. 2 is a sectional side view, of the apparatus with a table for calculating taxes arranged therein. Fig. 3 is a view of the lower part of Fig. 2, illustrating the variation in the arrangement of the gage and key-strip necessary to adapt one set of tables to calculate an increased amount of taxes or interest. Fig. 4 is a detached perspective view of a portion of the lower part of the gage shown in Fig. 3, to illustrate its construction. Fig. 5 is a front view, showing one manner of adapting the instrument to calculating interest. Fig. 6 is a view of the triple gage as used in Fig. 3, reduced. Fig. 7 is a sectional view of one end of Fig. 5.

This device consists in a casing or frame, A, preferably with a glass front, *a*, beneath which a printed table, B, is held, the figures of the table being arranged in columns of six figures each, with a large space, *c*, at the left-hand side and narrow spaces *b* between each column, as shown. Nine of these columns will usually be employed; but only six are shown in the drawings, which are sufficient to illustrate the operation of the apparatus. Every fifth horizontal row of figures across all the perpendicular columns is arranged to be readily distinguishable from the remainder, either by making heavy lines above and below them, or printing them in a heavier type, or with ink of a different color from the other figures, or in any other manner to render every fifth row readily distinguishable. This is also one object of forming the spaces *b* between the columns—viz., to render the columns readily distinguishable from each other, and also to adapt the table to the triple gage shown in Figs. 4 and 6. By this means the figures of the table are divided up into blocks of figures each containing six rows one way and five rows the other way. The method of forming this table for calculating taxes is as follows: The rate of taxation being known, this sum, expressed decimally, is taken as the base and set in the upper left-hand row. In the drawings eighteen and four-tenths mills is the base expressed decimally—thus, .018400—as shown. One fiftieth ($\frac{1}{50}$) of this sum, or .000368, is taken as a constant addend., which, added to the first sum, .018400, makes it .018768, which is set in the second row below the .018400, as shown. The addend. .000368 is then added to the second row, .018768, making the third sum, .019136, which is placed in the third row, and so on, adding .000368 to each new row throughout the whole set of figures, and dividing every fifth row by distinguishable marks or lines, as before described. Below the columns of figures is a key scale or slip, H, corresponding in divisions with the perpendicular columns above. Each of these divisions, as shown, is marked by the figures 100000, 200000, 300000, &c., one set for each of the perpendicular columns above, but not necessarily directly below them.

C is a metal gage adapted to slide back and forth across the table of figures, as shown. A channel, D, is formed below the glass covering, in which a slide, E, runs to steady the gage, and a small thumb-piece, F, to assist the handling, is attached to the slide E. This gage is graduated, and provided with figures in line with the horizontal rows, the figure on the gage opposite every fifth horizontal row on the table being made readily distinguishable from the remainder by being made heavier, of another color, or set off to one side, as shown, these prominent figures on the gage being 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9, the cipher opposite the upper horizontal row of figures, and one of the remaining figures opposite each prominent fifth horizontal row, as shown. Between each of the prominent figures of the gage the figures 2, 4, 6, and 8 are stamped in regular order, as shown, one opposite each horizontal row of figures between the prominent rows.

d is a wire stretched from two projecting

points, e' e^2, upon the upper and lower ends of the gage C, and at a distance from the face line of the gage equal to three perpendicular rows of the figures of the table, to form a decimal-pointer for the figures, as hereinafter set forth. The lower part of the gage C is cut away to enable the edge G to come at the proper point on the key-slip H to denote the required amount, as hereinafter shown.

The valuations upon which taxes are to be computed are shown by the figures upon the key-slip and gage. When the valuations are expressed by a single figure—as 1 2 3, &c.—the figures on the gage are not brought into use, unless we wish to know the tax on fractional parts of a dollar, which is seldom or never required in practice. The tax on such sums as one dollar, two dollars, three dollars, &c., is always found at the head of the various columns. The local value of the prominent figures upon the gage is always one-tenth of the local value of the significant figure of the key-slip exposed to view at the left of the gage; also, the local value of the small figures upon the gage is one-tenth the local value of the prominent figures. To illustrate: If the numbers 10 20 30, &c., on the key-slip H are exposed beyond the edge G, the prominent figures on the gage indicate units, and the small figures are then only brought into use in computing taxes upon fractional parts of a dollar. If the numbers 100 200 300, &c., are exposed, the prominent figures indicate tens, and the intermediate or small figures indicate units. When the significant figures of the key-slip are made, by the position of the gage, to denote thousands, then the prominent figures upon the gage denote hundreds and the intermediate figures indicate tens, &c.

To illustrate the manner of using this instrument, we will suppose that we wish to ascertain the tax upon three hundred and forty-six dollars. We move the gage along until the figures 300 of the key-slip H are exposed beyond the edge G, as shown in the drawings. The local value of the 3 of this index-number being hundreds, the local value of the prominent figure 4 upon the gage is tens, and the value of the small 6 immediately below is units, and in the table upon the same line with the 6 is the tax upon the valuation, consisting of three hundreds, four tens, and six units, or 346, which is $6.3664. If we wish the tax on three hundred and ninety-two dollars, we look opposite the first 2 below the prominent 9 on the gage, and find the amount to be 7.2128, the wire *d* representing the decimal-point. Thus any amount between three hundred dollars and four hundred dollars can be found without moving the gage. If we wish to ascertain the amount on, say, thirty-eight dollars, we simply move the gage back one space, which decreases the value of the figures of the gage by ten times; hence the amount opposite the prominent figure 8 would be the tax, which would be sixty-nine cents. Should we wish to ascertain the tax on dollars and fractions of a dollar—for instance, thirty-six dollars and forty cents—we set the gage so that 30 is exposed at G, and take the amount opposite the first figure 4 below the prominent figure 6 of the gage, which is .66976, or sixty-six cents and a fraction. If we wish the tax on still smaller fractional amounts—say thirty-six dollars and forty-two cents—we ascertain the amount on thirty dollars, as before described, which is .552, and then move the gage along until the figure 6 appears beyond the edge G. Then the amount opposite to the first figure 2 below the prominent figure 4 on the gage, which is the tax on six dollars and forty-two cents, equal to .154928, is added to the .552, making .706928—the tax on thirty-six dollars and forty-two cents. In practice, however, the fractions of dollars are seldom or never used in culculating taxes; but if these amounts are ever required they can be readily ascertained by this device. Should the tax on amounts above the hundreds be required, the gage is moved one space ahead, which increases the value of the figures thereon ten times, as before described. For instance, the tax on three thousand six hundred and eighty dollars would be found opposite the first 8 below the prominent 6 of the gage, which is $67.712—the amount required. Should the tax be required on a sum containing a fractional part of ten dollars—for instance, on three thousand six hundred and eighty-four dollars—we first ascertain the tax on three thousand six hundred and eighty dollars and then on four dollars, which is at the top of the fourth column, and then add them together, or ascertain the amount on three thousand and then on six hundred and eighty, or ascertain the amount on three thousand six hundred and then on eighty-four, and add the results in each case. The first plan, however, is preferable, as the addition of the unit-figure can be made mentally. This same apparatus may be used in calculating interest, as shown in Fig. 5, by simply inserting a table constructed in the same manner as the tax-table, by computing the interest for one day for a base, and taking one-fiftieth of the result as a constant addend. To illustrate, in Fig. 5 we show a portion of a table computed in this manner at the rate of seven per cent. The interest at seven per cent. for one day on one dollar is .000194, and one-fiftieth of this sum, .00000388, added to it would make .000198, and so on throughout the table, the last amount in a table of nine columns of fifty rows each, $1.941, being the interest on one dollar for nine thousand nine hundred and eighty days, as hereinafter shown. By this it will be seen that a table of nine columns of fifty rows each will give the interest only on sums of one, ten, one hundred, one thousand, &c.; hence a separate table is required for each number, such as one for the sums of two, twenty, two hundred, two thousand, &c., and another for the sums of three, thirty, three hundred, three thou-

sand, &c., and so on. Thus ninety-nine tables would be required to compute all sums. For convenience, these tables will be bound together, as shown in Fig. 6, and marked on the margin, as shown at *m* in Fig. 5, the figure $1, $10, or $2, $20, as the case may be, so that by sliding the gage to one side, as shown by dotted lines in Fig. 5, the leaves of the tables may be turned over until the desired one is found, and the gage run over its face and the interest ascertained in the same manner as in the tax-tables. This arrangement is shown in Fig. 7, which shows a cross-section of one side of the casing and the leaves of the tables, A being the casing, C the gage, *d* the wire decimal-pointer, B the leaves, three of them—numbers $1, $10, $2, $20, and $3, $30—turned back to expose the fourth leaf, or the one showing interest on four dollars, forty dollars, four hundred dollars, &c., and the gage C in position to show the largest amount, or four thousand nine hundred and ninety-eight dollars, or forty-nine thousand nine hundred and ninety-eight, for nine thousand or ninety thousand, &c. In this construction the glass face will be used or not, as desired. The figures on the key in the interest-calculator denote days, while in the tax-calculator they denote dollars. The same apparatus shown in Fig. 1 may be used to calculate interest by simply inserting another table in place of the tax-table, the same gage-frame and key-slip being used for both, the only difference being, as before stated, that the key-slip denotes days when used to calculate interest, and dollars when used to calculate taxes, &c. One table in the tax-calculator covers all possible amounts, and as the rate of taxation is uniform upon all valuations in the same township or corporation, the small trouble of removing the old table and inserting a new one when the rate is changed is of little importance; but with the interest-calculator, where one table only covers one set of amounts, and where ninety-nine tables are required to cover all amounts, and when every table may be required in one day, it is very essential that the tables should be easily and quickly accessible; hence the advantage of binding the tables in the form of a book and holding them in the frame A, as shown in Fig. 7.

Figs. 3 and 6 represent a variation in the form of the gage and key-slip, whereby the value of the figures on the table are doubled. This consists in numbering the graduations on the key-slip 1 2 3 4, &c., in the same place where on the other key-slip they were marked 2 4 6 8, &c., leaving the spaces marked 3 5 7 9, &c., in the first key-slip vacant on the second key-slip, forming the gage with a treble bar, or with three graduated bars, C, as shown. The central and right-hand bars are graduated with lines corresponding to the horizontal rows of figures of the table, and with large prominent figures 0 1 2 3 4 opposite every other one of the prominent horizontal rows of the figures in the table. This leaves nine spaces or graduations between each prominent figure on the bars, and in these intermediate graduations the figures 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9 are marked, as shown. The remaining left-hand bar is similarly graduated and marked, except that the prominent figures are marked midway between the sections of ten figures each, as shown in Fig. 6, which is on a smaller scale than Fig. 3. Each bar of the triple gage is provided with a pointing-wire, *d*, the same as the single gage. Within the lower part of the triple gage a slot, *g*, is formed, through which the graduations on the key-slip can be read for the central and right-hand bars, and an edge, *h*, to mark the figures for the left-hand bar. To use this gage for sums less than five, fifty, five hundred, &c., we move the gage along until the desired number is shown through the slot *g*, and then read the amount opposite the proper figure on the gage. For instance, we wish the tax on two hundred and ninety-four dollars. We set the gage as before, so that 200 on the key-slip shows through the slot *g*, and read the amount opposite the first 4 below the prominent 9 on the right-hand bar, which is $10.819—just twice as much as the amount opposite the first 4 below the prominent 9 of the single gage shown in Fig. 1, when set in the same manner on the key-slip shown in Fig. 1, which is $5.4096. Suppose we wish the tax on two hundred and forty-four dollars, we set the gage as before, and take the amount opposite the first 4 below the prominent 4 on the central bar, which is $8.9792—just twice as much as the amount opposite the first 4 below the prominent 4 on the single gage shown in Fig. 1, when set in the same manner on the key-slip of Fig. 1, which is $4.4896. The central and right-hand bars will give any amount for sums less than five, fifty, five hundred, &c., as before stated; and to ascertain the tax on larger amounts, without extending the table, I attach the left-hand gage and provide the key-slip with an independent set of graduations, *i*, and mark them 5 6 7 8 9, and a row of ciphers, as shown. To illustrate the use of this scale, we will suppose we wish the amount of tax on fifty-four dollars. We place the gage so that the upright row of figures 5, 6, 7, 8, and 9 only appear beyond the edge *h*. The amounts opposite the first ten graduations denote the tax upon fifty, fifty-one, fifty-two, fifty-three, &c., or five hundred and ten, five hundred and twenty, five hundred and thirty, and so on up to six hundred, six thousand, &c., while the amounts opposite the second ten graduations denote the tax upon sixty, sixty-one, sixty-two, and so on up to seven hundred, seven thousand, &c., and thus down the scale to ninety, ninety-one, ninety-two, &c., up to nine hundred or nine thousand, &c. Knowing these facts, we take the amount $1.98, opposite the 4 in the first section of graduations marked by the prominent 5, as the tax on fifty-four dollars, which is twice the amount .99 on the same

sum ascertained by the single gage shown in Fig. 1. By this arrangement the scope of each set of tables is doubled, so that by providing these two gages and two key-slips, only one-half as many different tables will be required. Upon the lower part of the triple gage a small slotted plate, M, is set, and adapted to be set over to move the edges *g h* one place to the left, and thus increase the value of the amounts ten times by causing the wires *d* to divide the amounts decimally one place farther to the right. By this means the scope of the tables is still further increased, so that if a rate ten times as great as the rate on the table already formed is desired, it is only necessary to move the piece M along one space to the left. This piece M is also arranged upon the single gage shown in Fig. 1 to increase the rate ten times; or it may be arranged to be set one space to the right, and thus decrease the value of the table ten times.

What I claim as new is—

1. The combination of a table of figures computed to denote the progressive amounts of interest or taxation at a given rate, arranged in columns, which are divided into blocks by suitable means of indication, substantially as described, a key-scale divided, numbered, and arranged to correspond with the table, as set forth, and a sliding gage graduated with prominent figures in the order of the digits, and with intermediate figures, as specified, and provided with a decimal index-wire, all for the purposes herein set forth.

2. A table of figures computed to denote the progressive amounts of interest or taxation from a given rate, arranged in columns and divided into blocks, as described, in combination with a key-scale divided and numbered to correspond with the columns of figures, as set forth, a series of sliding gages, graduated as specified, and provided with decimal-pointers, whereby the several parts will operate as and for the purposes set forth.

3. The combination of a table of figures computed to denote the progressive amounts of interest or taxation from a given rate, a key, and a movable gage divided and numbered to indicate the valuations on which the computation is to be made, a decimal-pointing wire connected to the gage, and an adjustable plate for increasing or decreasing the rate, the several parts being arranged to operate substantially as set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

URIAH CURTIS.

Witnesses:
G. B. EDGERTON,
JOHN INGALLS.