2 Sheets--Sheet 1.

H. B. MARTIN.

Mechanical Calculators.

No. 158,853.

Patented Jan. 19, 1875.

Fig. 1.

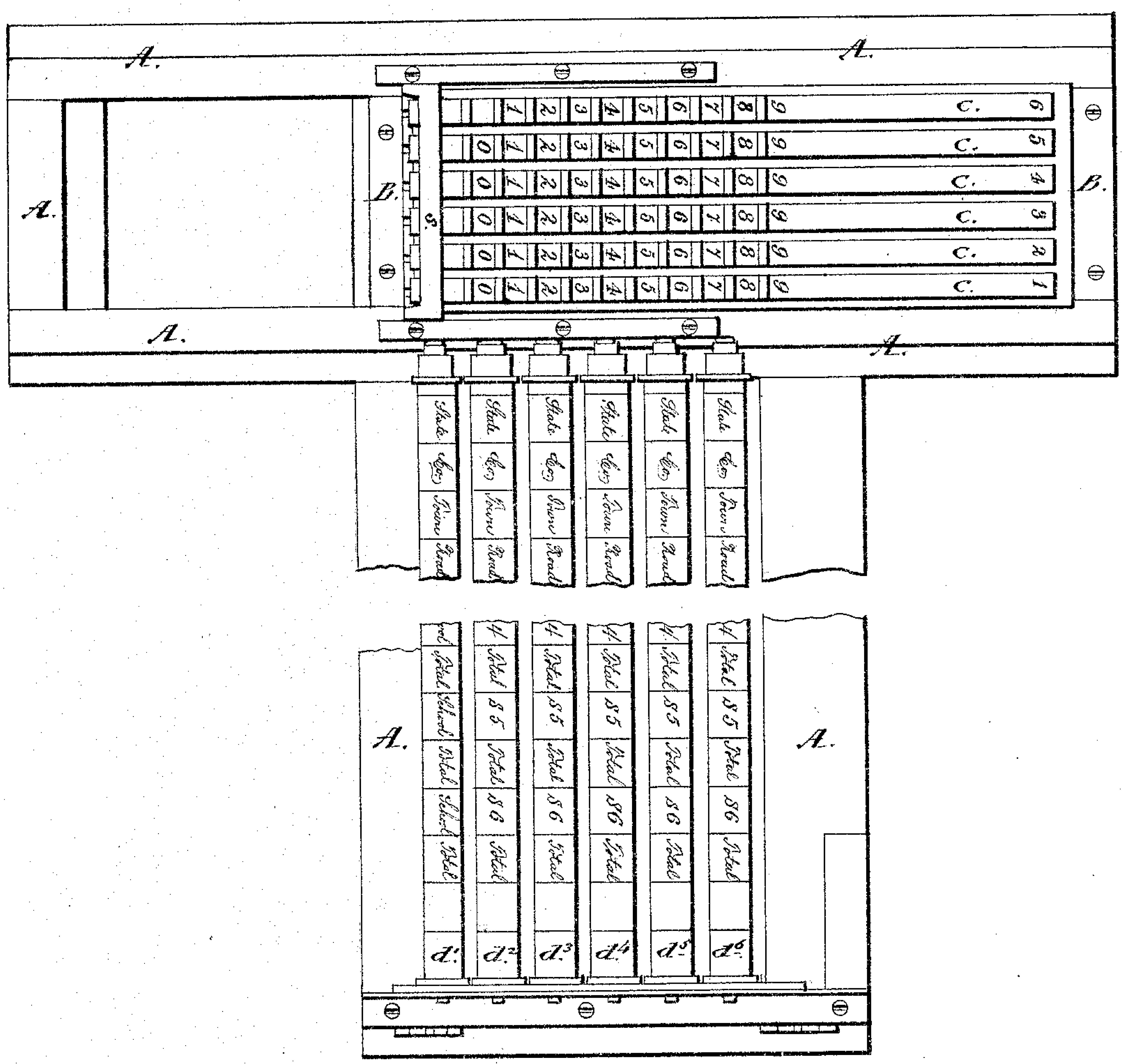
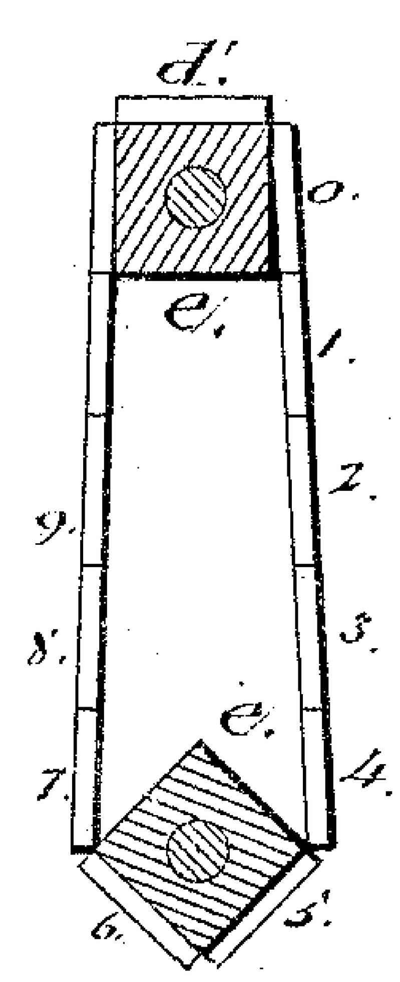


Fig. 2.



Attest;

Edw. W. Donn

M Gardner

Inventor;

Horace B. Martin

THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

2 Sheets--Sheet 2.

H. B. MARTIN.

Mechanical Calculators.

No. 158,853. Fig. 3. Patented Jan. 19, 1875.

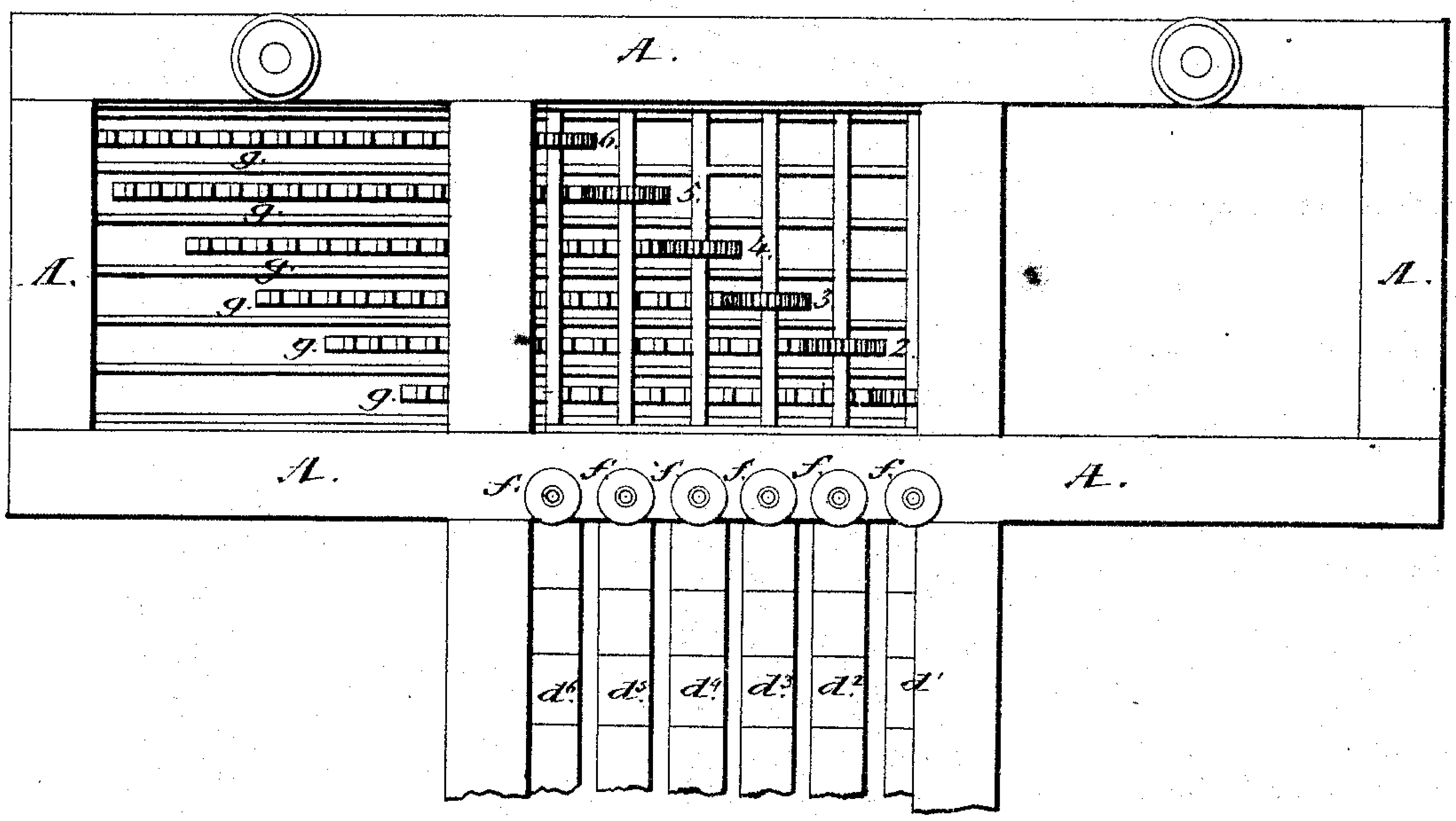
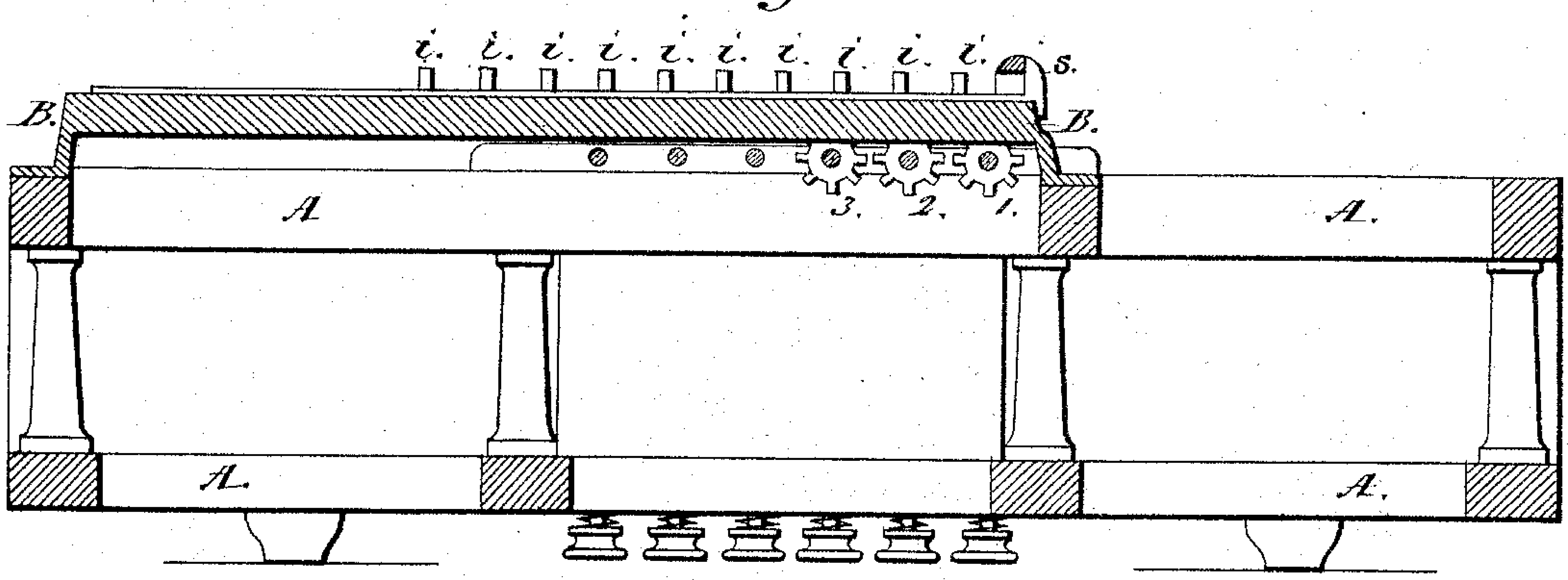


Fig. 4.



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UNITED STATES PATENT OFFICE.

HORACE B. MARTIN, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN MECHANICAL CALCULATORS.

Specification forming part of Letters Patent No. **158,853**, dated January 19, 1875; application filed June 10, 1873.

To all whom it may concern:

Be it known that I, HORACE B. MARTIN, of San Francisco, California, have invented a Mechanical Calculator, of which the following is a specification:

The object of this invention is to produce a mechanical device consisting of flexible movable tables actuated by appropriate machinery to facilitate, expedite, and insure accuracy in the computation of wages, freights, taxes, interest, exchange at par, premium, or discount, make apportionments and such computations as occur in general business and in public offices.

This machine is illustrated in detail in plan view Figure 1, section Fig. 2, bottom view Fig. 3, and transverse section Fig. 4, in which—

A represents a frame to sustain the parts of the machine; B, a grate, between the bars of which are sustained and move slides c^1 c^2 c^3 c^4 c^5 c^6. At one end of grate B is bridge *s*, which should be attached firmly, though capable of being easily moved. c^1 c^2 c^3 c^4 c^5 c^6 represent six slides or racks, more or less, with the numbers 0 1 2 3 4 5 6 7 8 9 stamped on each between projections *i i i*, &c., as shown, and toothed or cogged on the under side to carry pinions 1 2 3 4 5 6, as shown in bottom view, Fig. 3. d^1 d^2 d^3 d^4 d^5 d^6 represent belts, constructed by attaching any odd number (exceeding nine) of strips of bristol or card board, or other stiff similar substance, on a belt of light flexible material, thus forming a belt, rigid in sections, but flexible at regular intervals. These rigid sections are numbered (in the order in which they are laid) 0 1 2 3 4 5 6 7 8 9, as indexes which are marked on the right-hand end of the belts, and which serve as a check to prevent error. They are so arranged that when any given number is brought down on slide *c* to bridge *s* the same index-number on the corresponding belt will appear at the upper surface or section of the belt. These belts run on square or angular rollers *e e*, to prevent slipping, and may be made entire horizontally, or in sections, as may be desired. The strips of card of which they are composed must be of even width with one side of the rollers *e e*, over which it runs. *e e*, Fig. 2, represent the upper and lower rollers, the two being required to carry a single belt, the upper rollers connecting with pinions 1 2 3, &c., and the lower ones having independent bearings, being hooks held down by nuts *f f f*, &c. *g g g g g g* represent the under or toothed side of racks or slides c^1 c^2, &c., which drive pinions 1 2 3 4 5 6; *i i i i i i*, projections on slides *c c c*, &c., between which the finger is introduced to move the slides. These projections occur on the slides at intervals precisely equal to one-fourth of the circumference of pinions 1 2 3, &c., on their pitch-line, so that when any four of the projections are passed under bridge *s* one revolution of the corresponding pinion is produced. 1 2 3 4 5 6 in bottom view, Fig. 3, represent six pinions, more or less, engaging with racks *g*. These pinions, for convenience, are cut with any number of teeth which are a multiple of four, and are so adjusted relatively to racks *g* and projections *i* that two and one-half revolutions of the same shall exhaust the ten projections *i* on the slides *c c*, and also produce ten changes in the upper faces of belts d^1 d^2, &c. *s* represents a bridge, at the end of grate B, just of a sufficient height to permit projections *i i*, Fig. 4, to pass underneath it, and which serves as a gage to arrest the motion of sliding racks *c c c*, &c., at any desired point.

The following is a summary of relations and conditions: Sliding rack c^1 represents units, and moves belt d^1, which also represents units and their results. Sliding rack c^2 represents tens, and moves belt d^2, which represents tens and their results. Sliding rack c^3 represents hundreds, moving belt d^3, also representing hundreds. Sliding rack c^4, moving belt d^4, both represent thousands, and on on. Each sliding rack has an ultimate capacity of producing all the changes on belts d^1 d^2, &c., corresponding to all the ten numerals.

The adjustment is as will now be explained, supposing it is desired to compute taxes at the following rates: On \$100 the following rates are levied, viz: State tax, \$1.45; county tax, 41 cents; town tax, 5 cents; road tax, 11 cents; corporation tax, 50 cents; school tax, \$1.50, making a total of \$4.02 per \$100. All the belts are blank at this point, with the exception of the heading, as state, county, town, &c., as shown in Fig. 1. I place my finger on figure 1 on sliding rack c^3, (that slide representing hundreds,) and draw it down until stopped by bridge *s*. This will bring up section 1 of belt d^3. (See Fig. 2.) Under the proper headings, as shown in plan Fig. 1, I enter the rates, as given in their proper order, as follows: 1.45, .41, .05, .11, .50, 1.50, 4.02. I bring down 2, and enter twice the former numbers, thus: 2.90, .82, .10, .22, 1.00, 3.00, 8.04; and so on until I have the several rates at $100, multiplied by the nine digits, and entered upon belt d^3, which completes the computations for setting the machine for computing the taxes for that year. Belt d^3, or hundreds, being disposed of, I copy the figures on the remaining belts, observing to place them for thousands on d^4, one space further to the left; on d^5 for tens of thousands, two spaces further to the left, and so on; while on d^2 I place the figures one space to the right, and on d^1 two spaces further to the right than on d^3, as d^2 and d^1 diminish in value, and d^4, d^5, and d^6 increase in value over each other in tenfold proportion. Now on d^1 I have all the rates computed for all the units; on d^2 the rates for all the tens; on d^3 the rates for all the hundreds; on d^4 the rates for all the thousands; on d^5 the rates for all the ten thousands, and on d^6 the rates for all the hundred thousands; and, as will be readily seen by choosing any figures on c^1 c^2 c^3, &c., any number less than a million can be brought down, and thus all the rates will be computed, the sum of the several amounts read across the several belts being the aggregate taxes on the entire amount pulled down on the slides.

In constructing machines for constant use, at fixed rates, the belts may be printed to any numerical adjustment required.

Slides c^1 c^2 c^3, &c., may be made to run two or more belts each, and thus extend the tables in a compact form, observing, however, to keep the belts in proper series, as the unit-slide must always carry unit-belts, and ten-slide tens-belts, and so on through the list.

By putting another system of belts on the other side of grate B, and running them with a ratchet, and preventing their return when slides c^1 c^2, &c., are returned to their places, each column will be added up when the computations reach the bottom of each page; still subsequent addition would be necessary to discover whether errors may or may not have occurred in bringing down the initial numbers on the slides.

From the foregoing it will be seen that, in making computation with one or a series of constant factors, by first computing the rates on the nine digits singly, and entering them on the semi-flexible belts *d*, the changes capable of being produced by manipulating sliding racks c^1 c^2, &c., will cover any and every possible amount, as the number of slides and belts may be increased indefinitely, thereby saving time and mental labor, and insuring positive accuracy.

I claim—

The combination of the semi-flexible belts *d* with the square or angular rollers *e* and the sliding racks *c*, as and for the purposes set forth.

HORACE B. MARTIN.

Witnesses:

R. H. WHITTLESEY,

J. C. DOWELL.