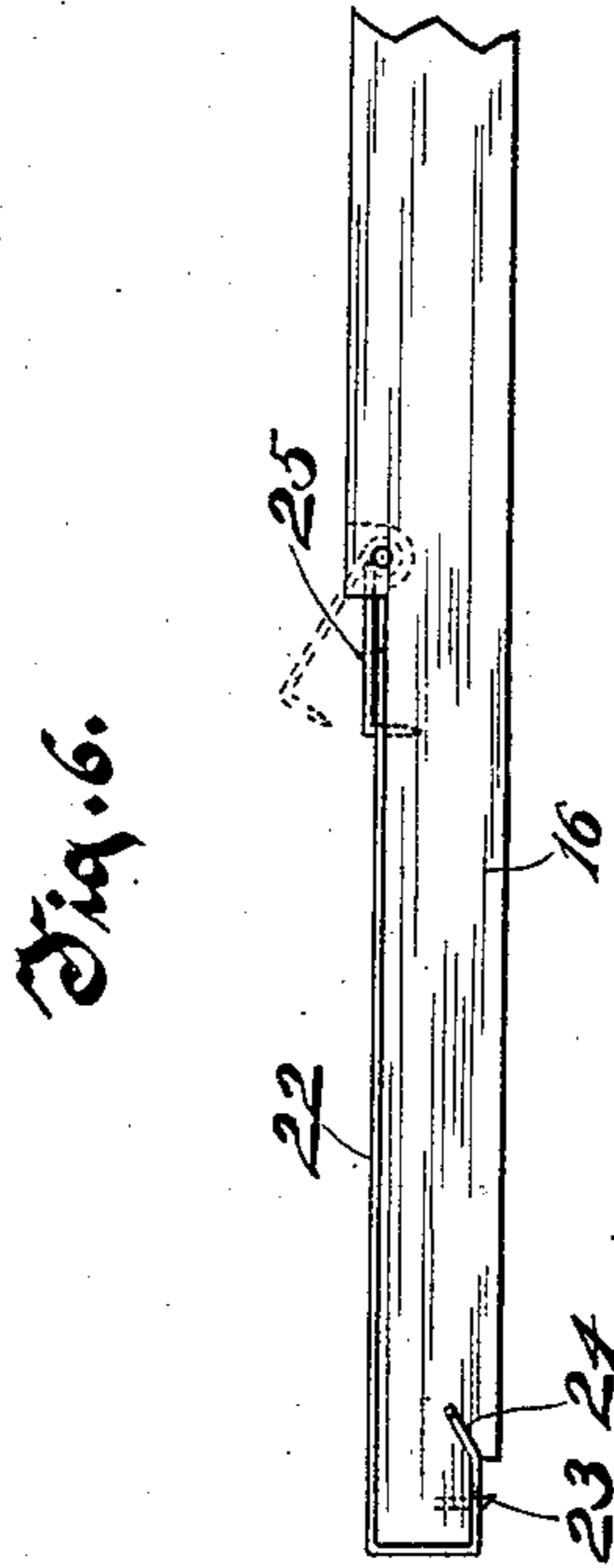
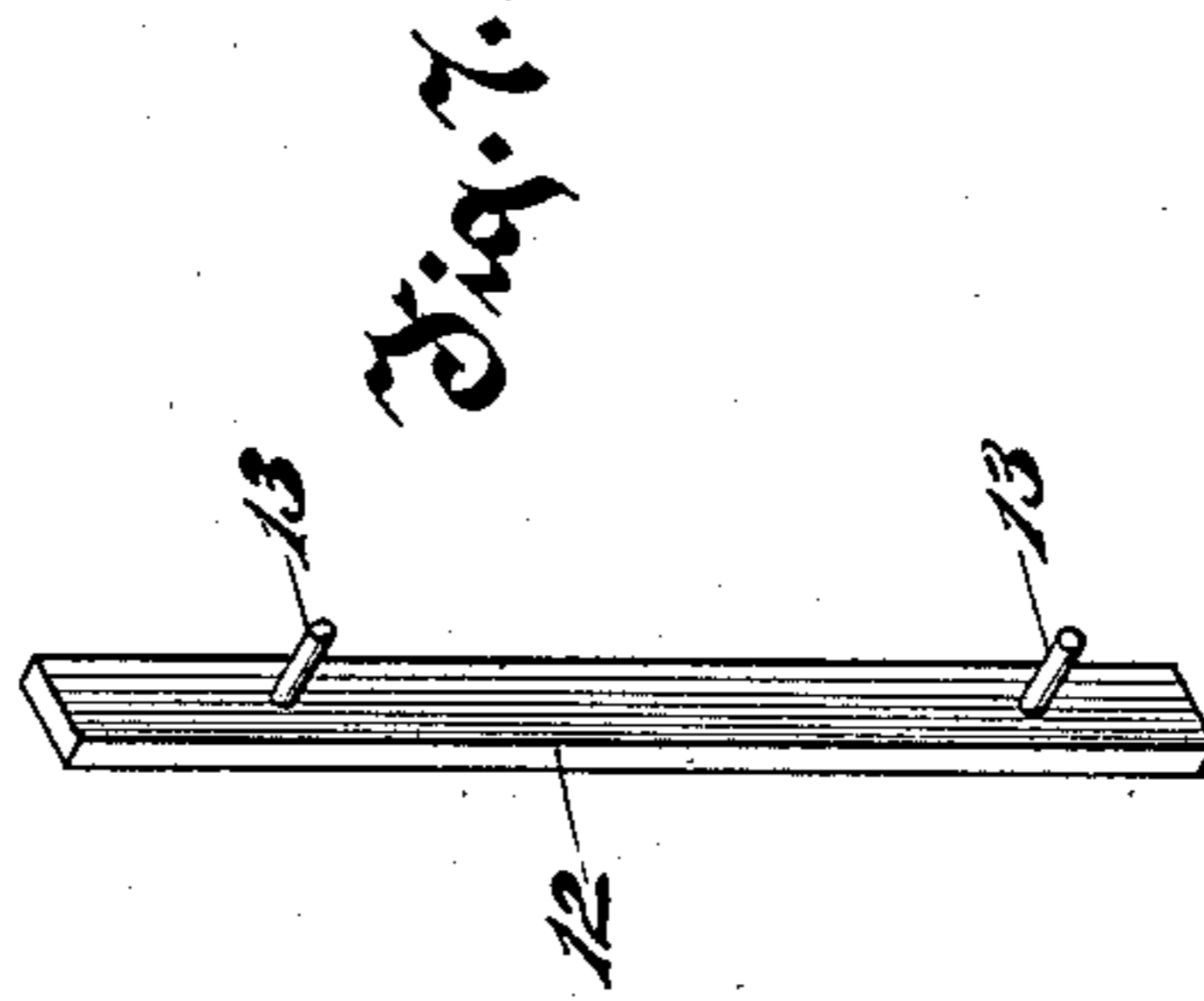
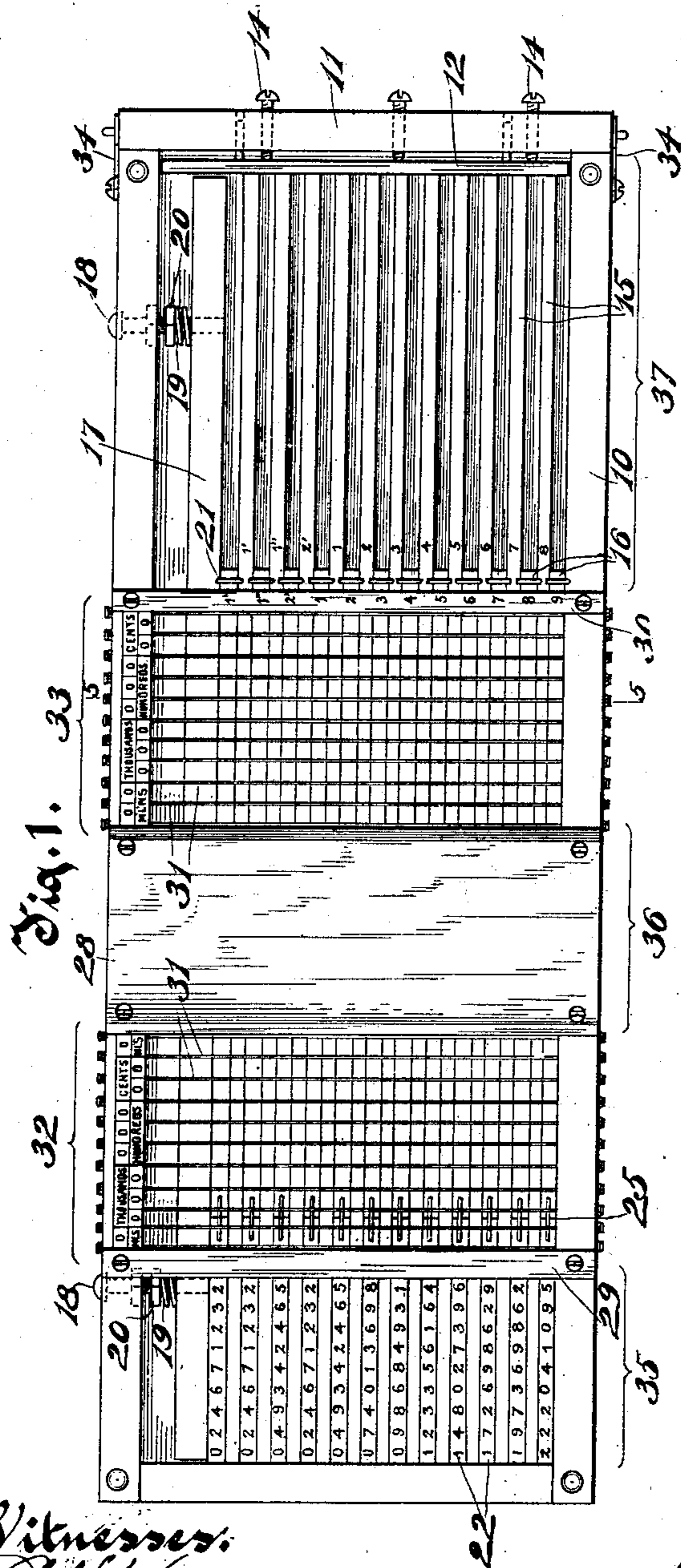


L. D. ROBERTS.
 CALCULATING MACHINE.
 APPLICATION FILED APR. 9, 1908.

917,134.

Patented Apr. 6, 1909.
 3 SHEETS—SHEET 1.



Witnesses:

A. H. Kney.
Anna F. Schmidtbauer

By *Benedict, Morrill & Caldwell,*

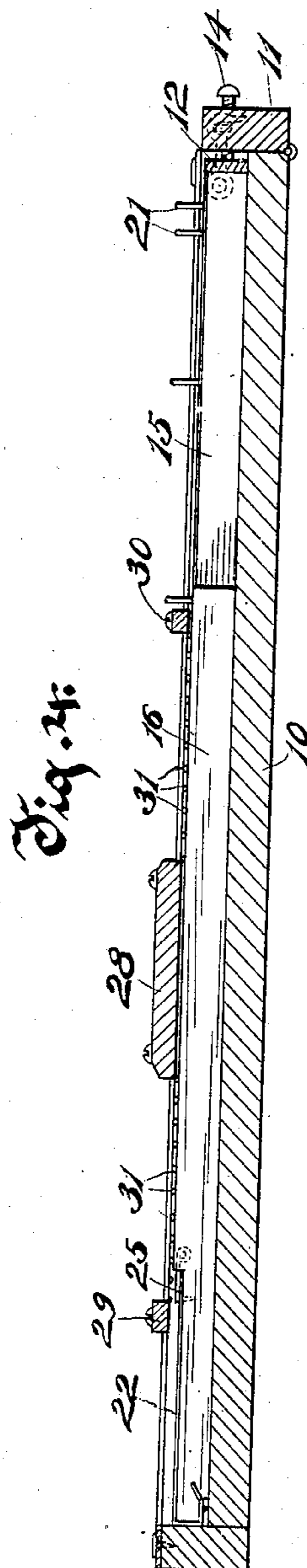
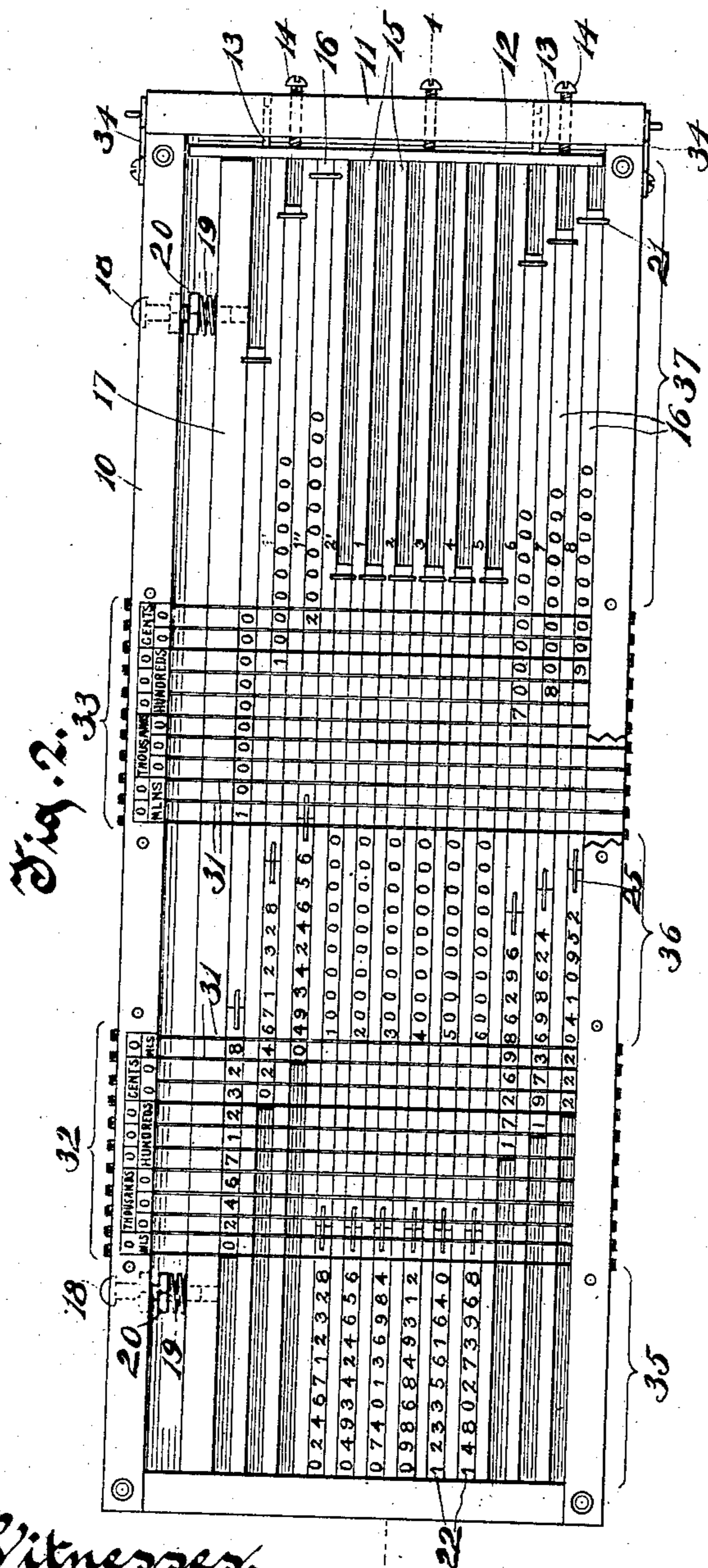
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L. D. ROBERTS.
CALCULATING MACHINE.
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3 SHEETS—SHEET 2.



Witnesses.

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3 SHEETS—SHEET 3.

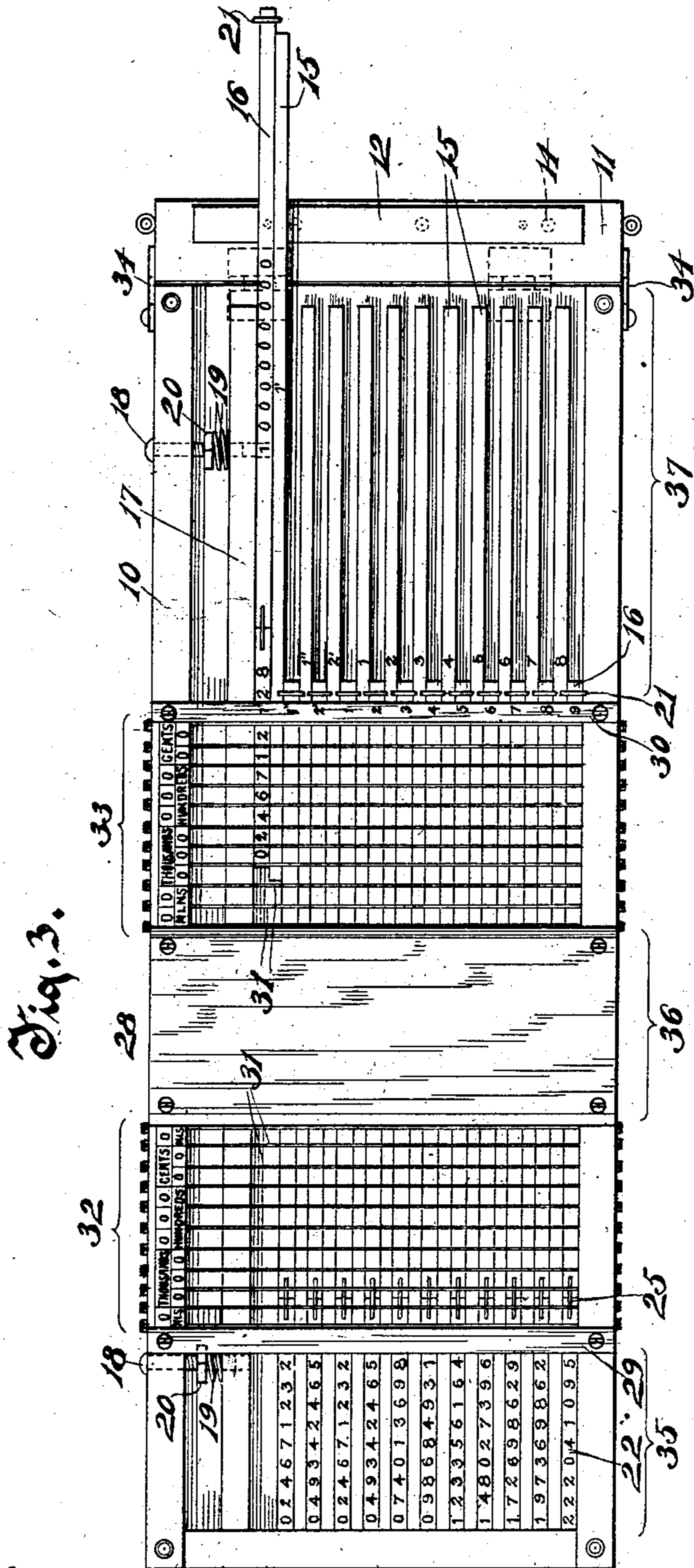


Fig. 8.

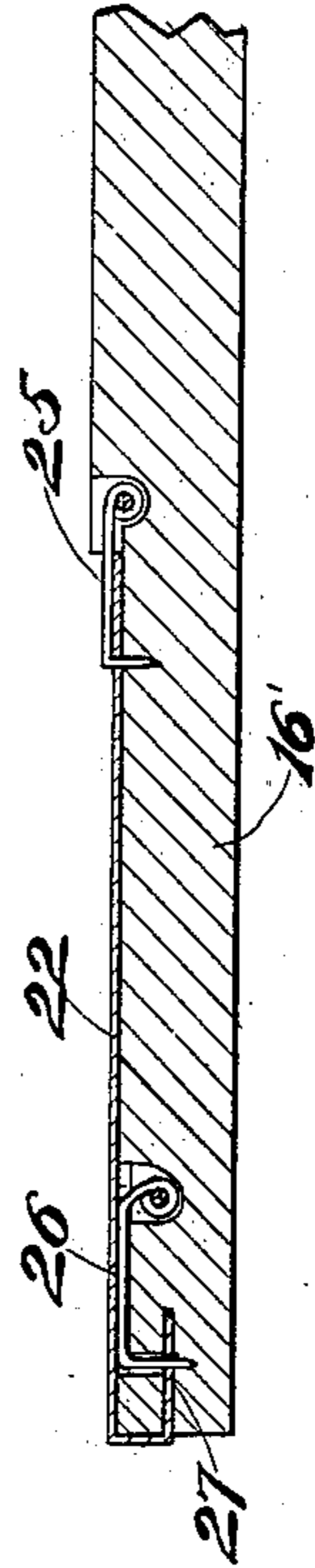
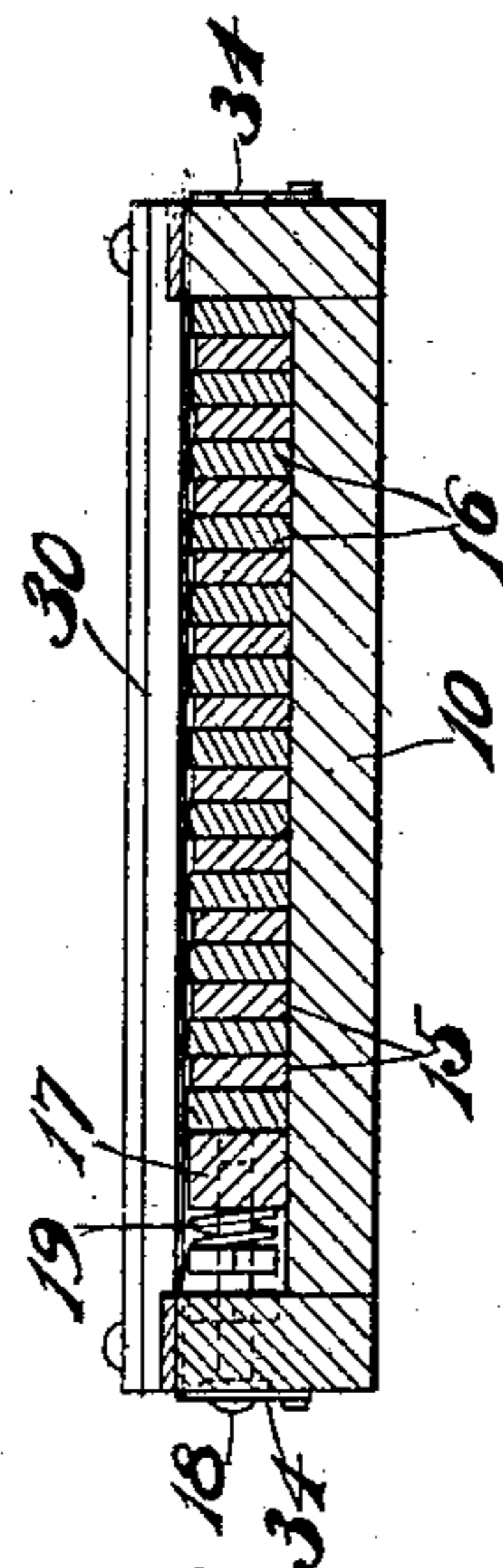


Fig. 5.



Witnesses.

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UNITED STATES PATENT OFFICE.

LORENZO D. ROBERTS, OF SHAWANO, WISCONSIN.

CALCULATING-MACHINE.

No. 917,134.

Specification of Letters Patent.

Patented April 6, 1909.

Application filed April 9, 1908. Serial No. 426,037.

To all whom it may concern:

Be it known that I, LORENZO D. ROBERTS, residing in Shawano, in the county of Shawano and State of Wisconsin, have invented new and useful Improvements in Calculating-Machines, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

The present invention has to do with that class of calculating machines designed for the use of town, county, or city clerks, or more especially for all persons who have the computing of percentages for a considerable series of numbers at a predetermined rate per cent.

This calculating machine is simple in operation, exact in computations, not liable to get out of order, and may be readily used by persons not skilled in mathematical calculations. Its parts are based upon the well known principles of Arabic notation.

Referring to the accompanying drawings, in which like characters of reference indicate the same parts in the different views; Figure 1 is a plan view of a calculating machine constructed in accordance with this invention, in its starting or normal condition, that is with no slide drawn out; Fig. 2 is a similar view thereof with certain slides drawn to positions exemplifying the operation of the device in use and with the braces removed; Fig. 3 is a similar view of the calculator with the end of the frame swung open to permit of the slides and guides being removed therefrom, one slide and its guide being shown in a position for removal; Fig. 4 is a longitudinal sectional view of the machine on the plane of line 4—4 of Fig. 2, with the braces in place; Fig. 5 is a transverse sectional view of the machine on the plane of line 5—5 of Fig. 1; Fig. 6 is a detail view of the end of one of the slides, showing the method of attaching the paper tablet thereto; Fig. 7 is a perspective view of the stay bar; and, Fig. 8 is a longitudinal sectional view of an end of one of the slides, showing a modified form of construction for attaching the tablet.

In these drawings, 10 represents a base or frame consisting of a rectangular shallow box, preferably one inch or less in depth, open at the front or face thereof and having a hinged end 11 at the right carrying a stay bar 12 which is provided with guide pins 13 fitting in corresponding openings in

the end 11 and which is adjusted in its position by means of set screws 14 threaded in the end 11 and bearing thereon. The adjustability of the stay bar 12 is to enable it to bear against the ends of a series of narrow strips forming guides 15, which bear at their other ends against the left end of the frame and which alternate with a series of shorter strips forming slides 16, the stay bar thus preventing the longitudinal movement of the guides 15 while the slides 16 are free to be moved between the guides from their normal position, as shown in Fig. 1, to the stay bar. To afford a ready means for moving the slides, each is provided with a loop or knob 21 at its right hand end.

In order that the slides may be firmly held in any position to which they may be moved the entire series of slides and guides is subjected to pressure by means of a friction bar 17 near the upper edge of the frame, which is loosely mounted on screw posts 18 in said upper edge of the frame and is forced to bear against the series of slides and guides with pressure by means of compression springs 19 surrounding the screw posts 18 and adjusted in their compression by set nuts 20 threaded on the screw posts. By adjusting the nuts 20 on the screw posts 18 the degree of pressure exerted by the friction bar upon the series of slides and guides may be regulated to permit the slides to be readily moved from one position to another at will, though preventing their accidental movement which would interfere with the operation of the machine.

At the left hand end of each slide it is somewhat modified, as shown in Fig. 6, to enable it to carry a tablet 22 consisting of a slip of paper or other suitable material affording a surface on which numbers may be written. In that form of the device shown in Fig. 6, the lower corner of the slide is recessed and contains a spur 23 on which the strip of paper is impaled after its end has been inserted in an oblique slot 24 leading from the recess, the paper then being carried around the end of the slide and placed flat upon the top surface thereof which for a short distance is reduced in height to form a depressed seat for the tablet. At the shoulder formed by this reduction of the slide is mounted a swinging hook 25 let into the top of the slide and swinging down to a horizontal position with its pointed end passing through the end of the

tablet and into the slide, thus securely and tightly fastening the tablet in place. In the modification of this feature of the invention, as shown in Fig. 8, a swinging hook 5 26 corresponding to the hook 25 is let into the reduced end of the slide 16' to engage one end of the tablet 22 which is placed in a slot 27 in the end of the slide, the tablet being drawn over the end of the slide to 10 cover the hook 26 and engaged at its other end by the hook 25 as in the former construction.

As shown in Fig. 2, each slide in addition to the number contained on its removable 15 paper tablet is provided with a permanent number at about midway its length, consisting of a certain digit followed by a series of zeros, said permanent numbers occupying a space on the slides equal to the 20 space occupied by the numbers on the tablets and in the normal position of the slides being entirely hidden from view by a broad brace 28 extending from one side of the frame to the other. Another brace 29 is 25 similarly mounted in a position to cover the column of last digits in the numbers on the tablets of the slides when the slides are in their normal positions, and a third brace 30 is also similarly mounted just in advance 30 of the loops or knobs 21 when the slides are in their normal position.

The spaces between the brace 28 and the braces 29 and 30 respectively are marked off by parallel cords 31 which are regularly 35 spaced apart the distance between the digits of the numbers of the slides, such cords being stretched across the base from side to side thereof in any desirable manner and serving to rule vertical columns upon the 40 numbers of the slides when said numbers are brought therebeneath. For convenience of description the columns formed between the brace 28 and the brace 29 are designated by the numeral 32, while the columns formed 45 between the braces 28 and 30 are designated by the numeral 33. At the top of each of these series of columns is a card having the decimal notation forms marked thereon, as shown in the drawings, and indicating the 50 decimal value of the numbers appearing in the columns therebeneath. The line forming the demarcation between the hundreds and cents is shown in the drawings to be of a different color from the others to aid the 55 eye in reading the figures, and in practice a similar change in color of other lines is used to further assist in this object.

To permit of the slides or the guides being removed for any purpose, as for renew- 60 ing the tablets 22 on the former, the hinged end 11 is swung open, as shown in Fig. 3, permitting the desired members to be drawn out as indicated, and to lock the hinged end in its closed position during the operation 65 of the machine hooks 34 are provided on

the sides of the base which engage projections on the hinged end. Directly above each slide the brace 30 is marked with a number indicating the number of the slide, these numbers being consecutive from 1 to 70 9 in the lower slides, while the three extra slides above them are marked 1', 1'' and 2' respectively. The guides between the slides are correspondingly numbered. These numbers also correspond with the permanent 75 numbers on the slides, as shown in Fig. 2, that is to say the first digit of the permanent number on each slide is the same as the number of that slide as shown by the number on the brace 30 directly in front of it 80 and on the guide directly above it.

In marking the tablets 22, the tablets of slides 1, 1' and 1'' are marked with a number indicating the given rate per cent. forming the basis of the calculations to be made, 85 it being presumed that the decimal point precedes the first digit, so that as shown in the drawing this rate per cent. is .0246712328 and the tablet of each of the other slides is marked with a number which 90 is a multiple of this rate per cent. corresponding to the number of the slide, that is to say slides 2 and 2' have a number showing twice the rate per cent. and slide 3 has a number showing three times the rate per 95 cent. and so forth. These tablet numbers having been provided, and care being taken that the digits thereof shall be regularly spaced apart with the same spacing as between the cords of columns 32 and 33, the 100 numbering being preferably made while the tablet is beneath the cords of columns 32 for this purpose, the digit of the permanent number on the slide being in the left-hand column of series of columns 33, whereupon 105 the machine is in condition to be operated for calculating the given percentage of any number.

The space to the left of the columns 32 is indicated by the reference character 35 and 110 the space between the columns 32 and 33 is indicated by the reference character 36, while the space to the right of columns 33 is indicated by the reference character 37. It will be noted that the spaces 35, 32, 36 115 and 33 are equal, being composed of ten like units of space; and this relation of equality remains should any change be made in the number of like unit spaces; that is, were series of columns 32 and 33 to be made 9 120 columns by taking away the left hand column of each, then one unit of like space must be taken from the right hand of both spaces 35 and 36, the decimal point line (the division between units and tenths or 125 dollars and cents) in series of columns 32 and 33 must be so placed that the left hand column of series of columns 32 shall be one order lower than the left hand column of series of columns 33; and further, so the 130

right hand column of series of columns 32 shall represent one order lower than the right hand column in series of columns 33, as shown further by decided notation at the heads of these columns.

On the tablets of space 35, any rate per cent. up to one hundred per cent. may be written; but if one hundred per cent. or more needs to be written a calculator lengthened the required number of like units of space would be needed, the lengthening being at the left beyond the space 35. That is, the relation of spaces 35, 32, 36 and 33 must not be changed.

The space 37, at the right of series of columns 33 and extending to the stay bar 12, carried by the hinged end 11 of the calculator, must be such that there is room for the guard 30, and for the right hand ends of the slides to move a sufficient distance to bring the initial digit of the permanent number into the lowest order of series of columns 33, as shown by the third slide from the top in Fig. 2, where the numeral 2 is shown in the right hand column of series of columns 33. It will be seen that the tenths place on the tablet of this slide is in the lowest order or in the right hand column of series of columns 32 in which series percentages are shown.

Referring to Fig. 2 it will be seen that the calculations are performed by drawing the required slides to the right until they form in the series of columns 33 the number of which the percentage is to be taken at the rate per cent. for which the machine is set. The rate per cent. for which the machine is set as shown in the drawings is indicated by the second slide from the top in Fig. 2 to be .0246712328 and begins in the tenths column of series of columns 32 and extends to the right into space 36 on the tablet of the same slide; and its base, 1.00 or \$1 on the same slide is in units column of series of columns 33. It will also be seen that the first or top slide has the same digit figure "1" for its permanent number but that the "1" is in the ten million column of series of columns 33 and that orders to right are filled in with zeros, and the tablet of this top slide, though it has the same figures and in the same order as the tablet on the second slide lies in or under series of columns 32 in such a position that the zero or tenths place of the rate per cent. is now in millions order of series of columns 32 and the Fig. 2 of the rate per cent. instead of being in hundredths order, as on the second slide, is now in the highest order of thousands period of series of columns 32, and that successive figures of the rate per cent. shows the percentage (omitting the zero) to be \$246712.328 for the base ten million dollars indicated in series of columns 33. The third slide from the top of

Fig. 2 is to show the position of the first digits of the permanent number and the tablet number when the slide is in its extreme position to the right. The object in providing supplemental slides, as those marked 1' 1'' and 2' is to enable the formation of such numbers as 333, when a slide marked 2 and a slide marked 1 are moved to the same column to count as 3. In the same manner other repeated digits may be formed by combining lower numbers on this principle.

From the preceding, it will be plain that any slide in its normal position or to the extreme left, when drawn to the right as far as possible will have its digit figure of the permanent number passed through successive orders or columns from the highest to the lowest in series of columns 33, forming all the numbers possible to be formed by this manipulation; and that the successive corresponding percentages will be formed or given in the series of columns 32, owing to the fact that the tablet carrying the figures for the necessary corresponding percentages is successively moved through or under series of columns 32. Thus the parts of the numbers, as for (\$789), last three slides of Fig. 2, are shown in series of columns 33 and the percentages for corresponding parts of said number are shown in series of columns 32 in position for adding, the final result being obtained mainly by mechanical methods.

The braces 28, 29 and 30 serve to resist the strain of the cords crossing the face of the calculator as well as to mark off the spaces for the series of columns 32 and 33 and to assist in keeping the slides and guides in place.

With either of the forms of attachment for the tablet the writing thereon is entirely unobstructed, and the tablet, which is of light card board or heavy paper, is held firmly in place while being easily placed in position or removed therefrom.

By means of the construction of the present invention the several slides may be freely moved to the positions desired without causing the movement of the other slides, because of the immovable partitions therebetween, and when moved to the position desired they are securely held against accidental movement by the pressure exerted thereon by the spring actuated friction bar 17. This friction bar 17, besides having the function of retaining the slides in their adjusted positions, also has the further function of regulating undue lateral friction between the slides and guides arising from swelling or shrinking or warping of the slides and guides by changes in temperature or absorption of moisture. Should the slides become difficult to move, it is only necessary to adjust the nuts 20 so as to relieve the

compression of springs 19 and the desired degree of frictional pressure on the slides may be produced.

The adjustability of the stay bar 12 permits it to be moved in more or less to bear against the ends of the guides 15 and thus effectively prevent their longitudinal movement which might otherwise permit the movement of a slide to cause the movement of another slide.

The freedom with which the slides may be removed and replaced is also a feature of this invention, facilitating the renewal of the tablets when a change is made in the rate per cent. for which the machine is set. Either arrangement for removably securing the tablets in place assures an efficient connection and avoids all possibility of the tablet being torn in passing beneath the braces or the column cords.

By means of this invention a person whose duty is to compute percentages for large numbers, as the town, county or city clerk in ascertaining the tax on given valuations at a fixed tax rate, may quickly and accurately move the slides to indicate by their permanent numbers in the series of columns 33 the numbers representing the valuation for which the tax or other percentage is desired and then by adding together the figures appearing in the series of columns 32 the desired result is obtained.

What I claim as my invention is;

1. A calculating machine, comprising a frame, a series of slides therein provided with numbers, a spring pressed friction bar bearing on the slides and pressing them together to prevent accidental movement thereof, and means on the frame by which the numbers on the slides may be read in different decimal orders according to the position of the slides.

2. A calculating machine, comprising a frame, a series of slides therein provided with numbers, a spring pressed friction bar bearing on the slides and pressing them together to prevent accidental movement thereof, and cords extending across the frame to form series of columns by means of which the numbers on the slides may be read in different decimal orders according to the position of the slides.

3. A calculating machine, comprising a frame, a series of slides therein provided with numbers, a spring pressed friction bar bearing on the slides and pressing them together to prevent accidental movement thereof, cords extending across the frame to form series of columns by means of which the numbers on the slides may be read in different decimal orders according to the position of the slides, and braces extending across the frame and secured to the sides thereof to brace the frame against the tension of the cords and to mark off spaces therebetween for the said series of columns.

4. A calculating machine, comprising a frame, a series of slides therein provided with numbers, a series of guides alternating with the slides, a spring pressed friction bar bearing on the slides and pressing them together to prevent accidental movement thereof, and means on the frame by which the numbers on the slides may be read in different decimal orders according to the position of the slides.

5. A calculating machine, comprising a frame, a series of slides therein provided with numbers, a friction bar bearing on the series of slides, posts mounted on the frame and entering openings of the friction bar, springs surrounding the posts and bearing on the friction bar, adjusting nuts threaded on the posts and bearing on the springs for varying the compression of the springs to cause the friction bar to apply pressure to the series of slides, and means on the frame by which the numbers on the slides may be read in different decimal orders according to the position of the slides.

6. A calculating machine, comprising a frame, a series of slides therein provided with numbers, a series of guides alternating with the slides, a spring pressed friction bar bearing on the slides and pressing them together to prevent accidental movement thereof, an adjustable stay bar at the end of the frame bearing against the ends of the guides to prevent longitudinal movement thereof, and means on the frame by which the numbers on the slides may be read in different decimal orders according to the position of the slides.

7. A calculating machine, comprising a frame, a series of slides therein provided with numbers, a series of guides alternating with the slides, a hinged end on the frame having openings therein, a stay bar provided with pins riding in the openings of the hinged end of the frame, set screws mounted on the hinged end of the frame and bearing against the stay bar to adjust the position of the stay bar and cause it to bear against the ends of the guides to prevent their longitudinal movement, means for holding the hinged end of the frame in its closed position, and means on the frame by which the numbers on the slides may be read in different decimal orders according to the position of the slides.

8. A calculating machine, comprising a frame, a series of slides therein provided with numbers, a series of guides alternating with the slides, a spring pressed friction bar bearing on the series of slides and guides to hold the slides in their adjustments with pressure, an adjustable stay bar at the end of the frame bearing on the ends of the guides

to prevent their longitudinal movement, and means on the frame by which the numbers on the slides may be read in different decimal orders according to the position of the slides.

9. A calculating machine, comprising a frame, a series of slides therein provided with numbers, a series of guides alternating with the slides, a friction bar bearing on the series of slides and guides, posts mounted on the frame and entering openings of the friction bar, springs surrounding the posts and bearing on the friction bar, adjusting nuts threaded on the posts and bearing on the springs for varying the compression of the springs to cause the friction bar to apply pressure to the series of slides and guides, a hinged end on the frame provided with openings, a stay bar having pins sliding in the openings of the hinged end of the frame, set screws mounted on the hinged end of the frame and bearing on the stay bar to hold the stay bar against the ends of the guides, and means on the frame by which the numbers on the slides may be read in different decimal orders according to the position of the slides.

10. A calculating machine, comprising a frame, a series of alternating slides and guides in the frame, means for applying pressure to the slides and guides, each of the slides being provided with two numbers, a series number and a number which is the multiple of a given number by the said serial number, means by which the serial

numbers may be read in different decimal orders according to the positions of the slides, and means by which the multiple numbers may be read in corresponding decimal orders at such times.

11. A calculating machine, comprising a frame, alternating slides and guides contained in the frame, each slide having a permanent number and a temporary number thereon, means by which the permanent numbers may be read in different decimal orders according to the positions of the slides, and means by which the temporary numbers may be read in corresponding decimal orders at such times.

12. In a calculating machine, a slide having its end reduced to form a tablet base below the plane of the top of the slide and having a recess in the under part of its end with an inclined slot extending therefrom, a spur located in the recess, a tablet adapted to have its end fitted in the slot and impaled on the spur and bent around the end of the slide to lie on the tablet base, and a swinging hook mounted at the shoulder of the slide formed by the reduced portion thereof to engage the other end of the tablet.

In testimony whereof, I affix my signature, in presence of two witnesses.

LORENZO D. ROBERTS.

Witnesses:

FRANK M. WELNIAK,
JOHN BOHR.