(No Model.)

3 Sheets—Sheet 1.

J. E. MINOTT.

ADDING MACHINE.

No. 548,837. Patented Oct. 29, 1895.

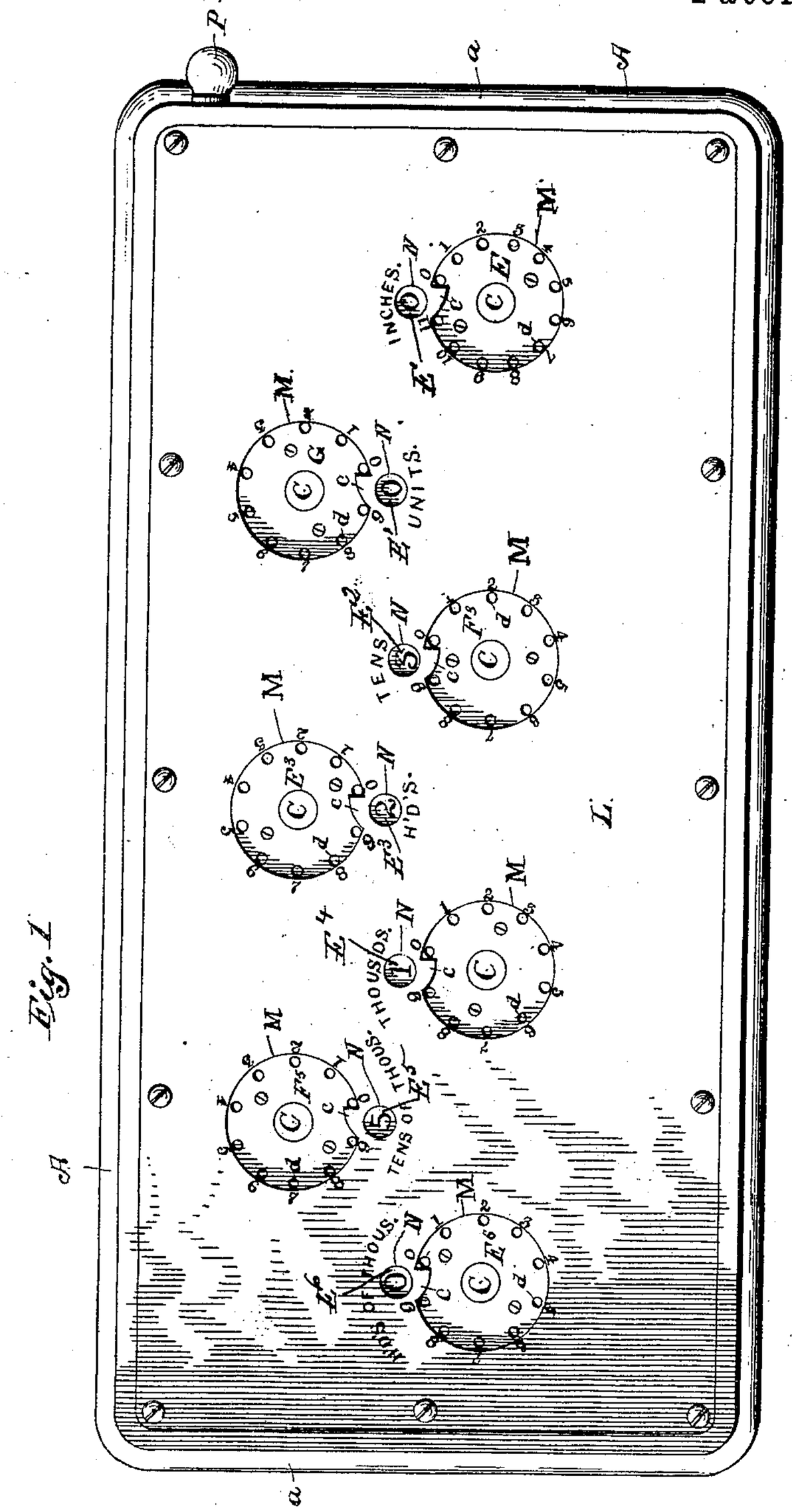

Fig. 1.

WITNESSES.
Howard D. Orr.
J. M. Poul.

INVENTOR.
John E. Minott.
By his Attorneys
John L. Halsted & Son.

(No Model.) 3 Sheets—Sheet 2.

J. E. MINOTT.

ADDING MACHINE.

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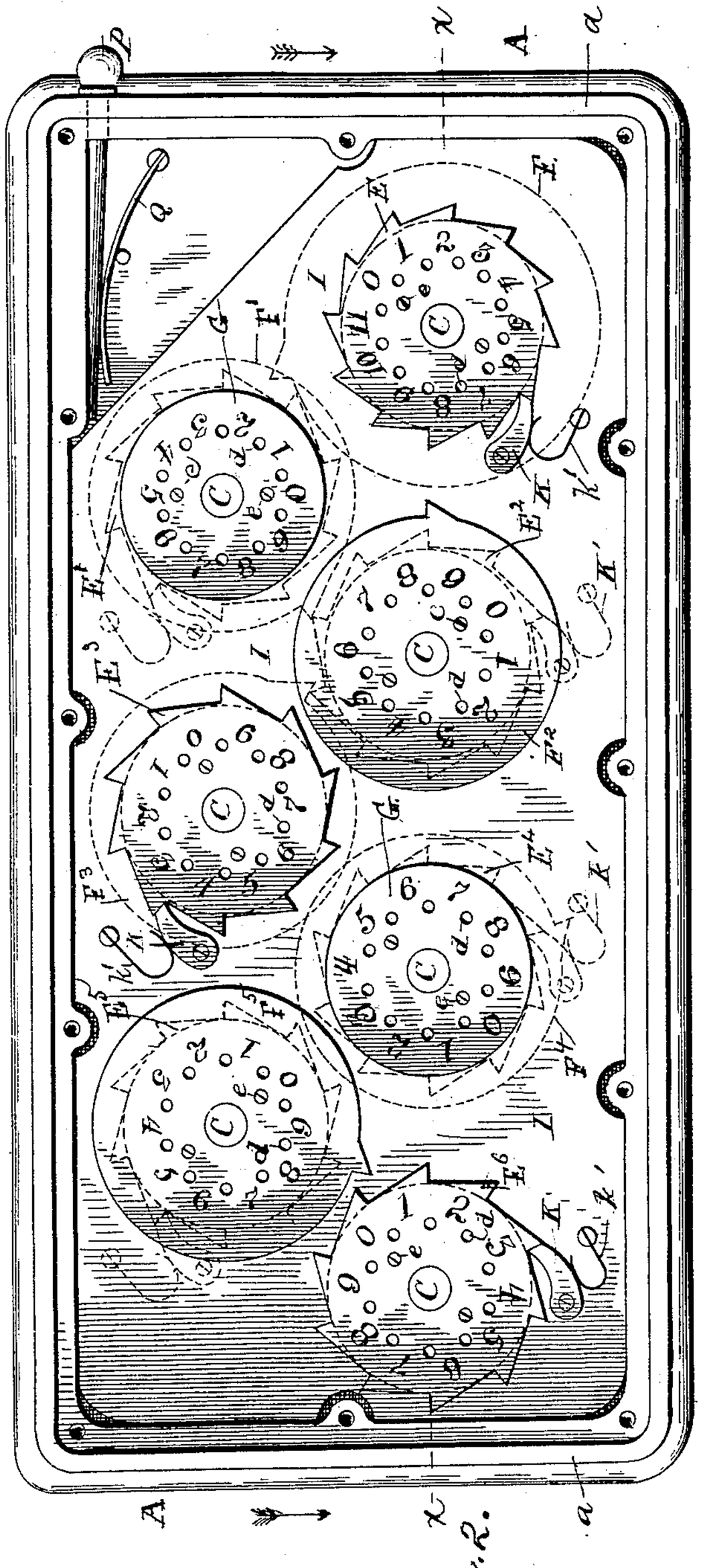

Fig. 2.

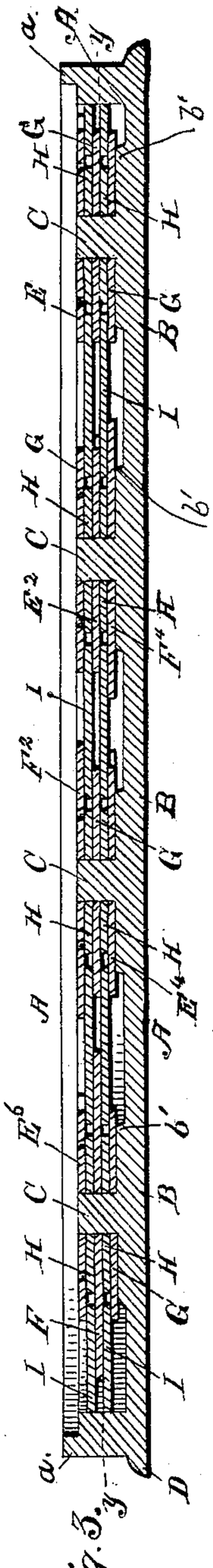

Fig. 3.

WITNESSES

Howard D. Orr.

J. M. Ond.

INVENTOR.

John E. Minott

By his Attorneys,

John L. Halsted & Son

(No Model.) 3 Sheets—Sheet 3.

J. E. MINOTT.

ADDING MACHINE.

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Fig. 4.

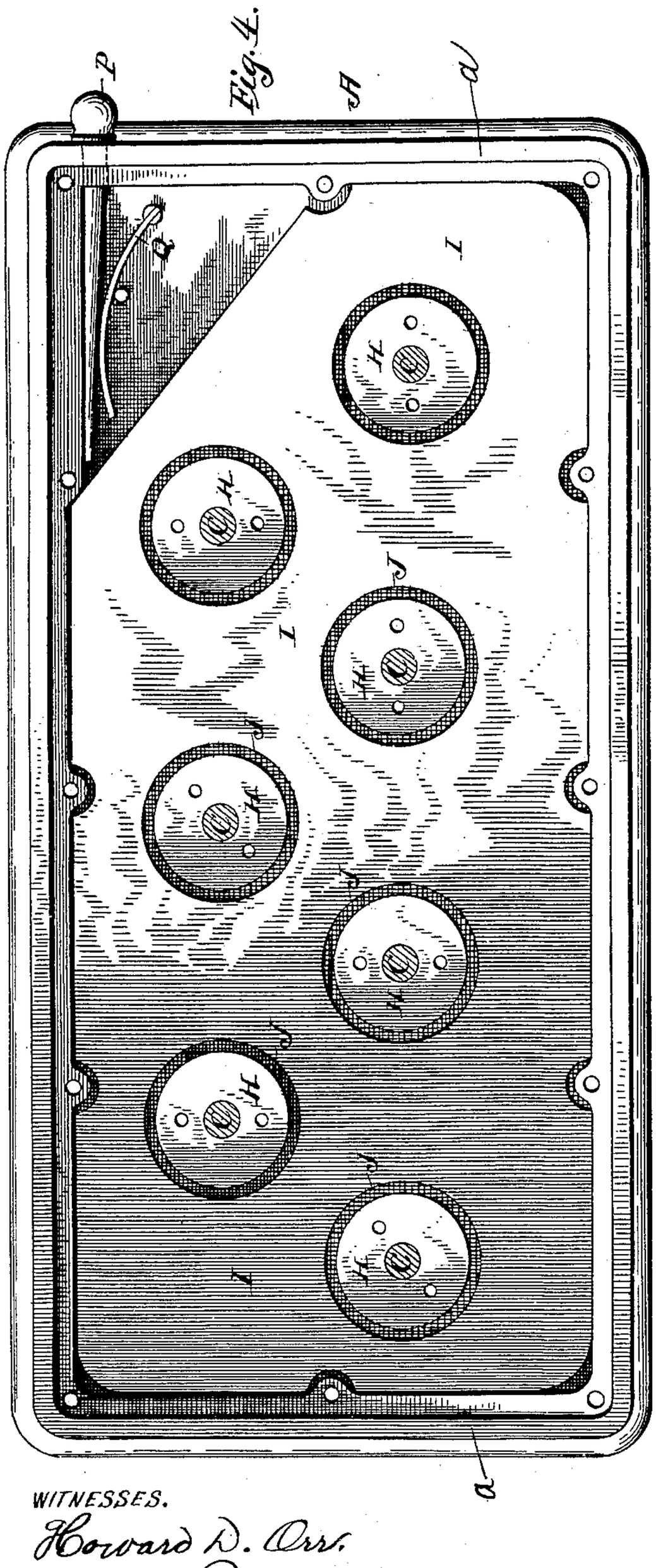


Fig. 9.

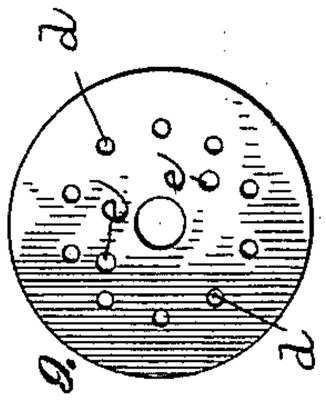


Fig. 11

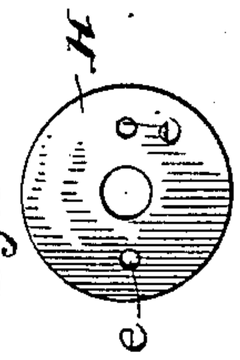


Fig. 10

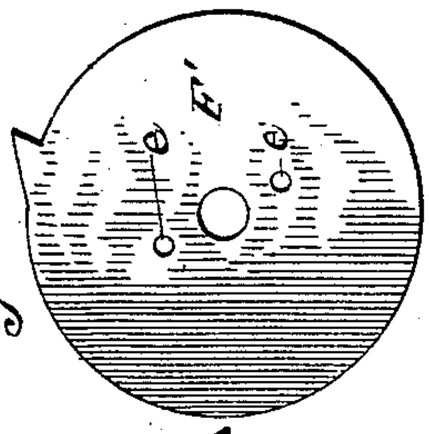


Fig. 8.

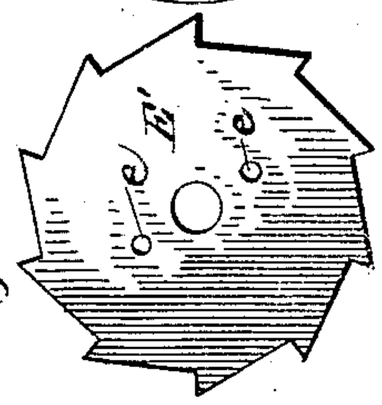


Fig. 6.

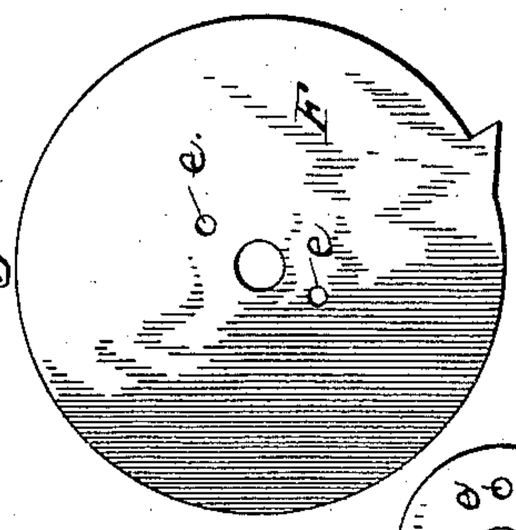


Fig. 7.

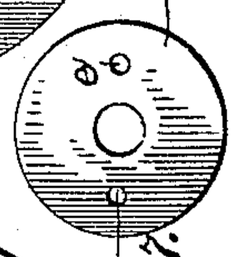
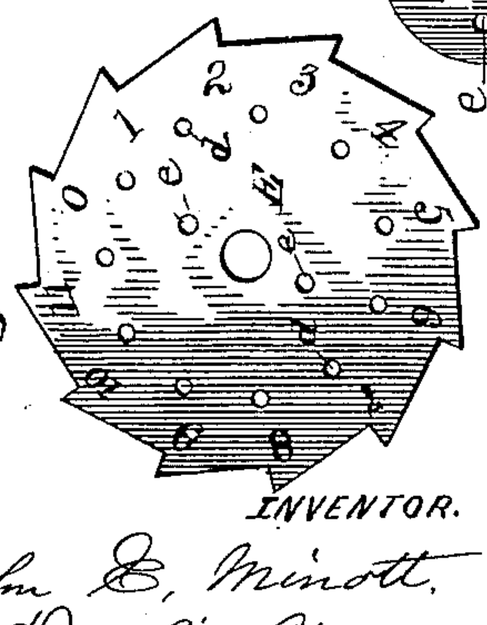


Fig. 5.



WITNESSES.

Howard D. Orr.

J. M. Pond

INVENTOR.

John E. Minott.

By his Attorneys.

John J. Halsted & Son

UNITED STATES PATENT OFFICE.

JOHN E. MINOTT, OF AURORA, ILLINOIS.

ADDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 548,837, dated October 29, 1895.

Application filed November 27, 1894. Serial No. 530,136. (No model.)

To all whom it may concern:

Be it known that I, JOHN E. MINOTT, of Aurora, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Computing or Calculating Machines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

The object of my invention is to provide a cheap and simple computing or calculating machine by which numbers of one or more figures may not only be indicated, but by a very rapid process added, subtracted, or multiplied.

My invention has also for its object the indication of measurements or of weight—say of ounces, pounds, &c.—and the rapid addition, subtraction, or multiplication of such measurements or weights and the indication of the result.

My invention will be readily understood from the following description.

In the accompanying drawings, Figure 1 illustrates a plan view of an apparatus embodying my invention. Fig. 2 is a similar view, but with the top or dial plate removed. Fig. 3 is a longitudinal section through the line *x x* of Fig. 2, looking in the direction of the arrows. Fig. 4 is a longitudinal section through the line *y y* of Fig. 3, but with the machine in the same position as shown in Figs. 1 and 2. Figs. 5 to 11, inclusive, are details, in plan view and detached, of the parts composing the several wheels.

Similar letters represent like parts in all the figures.

A is the box or case constituting the body of the machine, and which is preferably made of metal.

The bottom or base plate B, which supports all the movable parts, has a system of raised circular portions *b'*, having fixed stout pins, studs, or shafts C extending upward from the same. The shafts C constitute fixed journals upon which the calculating-wheels may revolve, while the raised portions B form rests or seats for said wheels. Each calculating-wheel is made up of five parts or disks, viz: a disk having as many teeth as it has numerals of the order or proportional amount which it is intended to indicate on the disks E, E', E^2, E^3, E^4, and E^5, respectively; another disk having only one tooth—as, for instance, F, F', F^2, F^3, F^4, and F^5, respectively; a third disk, such as G, and two washers or collars H.

The disks of each wheel are so arranged that the disk having a circular series of teeth will not engage them with those of any wheel of a higher order or character, but only with the wheel having one tooth of the next lower order. For example, I have shown my machine as adapted for computing, adding, subtracting, and multiplying feet and inches, as well as numbers, where the final result will not be over the hundreds of thousands. E, the farthest wheel to the right, is for indicating inches up to twelve, the measure of a foot, the next adjacent one to the left units, the next tens, the next hundreds, the next thousands, the next tens of thousands, and the last one to the right hundreds of thousands. The wheel E (which may be used or not, as needed) has twelve teeth, each say for an inch, and as these are the lowest order of anything which it is desired to indicate in measuring said wheel E is not in gear with any other wheel. The one-toothed disk F, however, of this inch-wheel (see Figs. 3 and 6) gears with the ten-tooth disk E' of the units-wheel, this being the next highest order to be indicated, which, when used in connection with the inch-wheel, would indicate feet. The one-toothed disk of the units-wheel gears with the ten-toothed disk of the tens-wheel, the one-toothed disk of the tens-wheel gears with the ten-toothed disk of the hundreds-wheel, and so on through the series of succeeding wheels for as many as may be put in the machine.

H H indicate washers or plain disks constituting part of each wheel.

I I are plates, which fit snugly in the casing A, having holes J for the admission of the washers H, and said plates serve to separate the disks of said wheels. The object of said plate and disks is to keep the wheels in their proper positions and to prevent their dropping or sagging and poorly or improperly engaging with other wheels.

K K represent spring-dogs, which are pivoted to the plates I I and engage with the toothed disks E E′, &c., there being one spring-dog for each of said disks. These dogs and their springs *k′* serve to prevent any backward rotation of the calculating-wheels.

L is the top plate of the machine, which rests within and upon the perimetrical recess or shoulder *a* of the casing A. This plate L is screwed or otherwise removably fastened to the casing, as shown in Fig. 1. This plate L is made with circular holes M, situated over the calculating-wheels, these holes being smaller than the circle of numbers on the disks immediately below the plate L. Around the perimeters of each of said holes (see Fig. 1) is a series of small numbers corresponding with those on the disks underneath this plate L and at similar distances apart.

N N indicate a system of smaller holes in the plate L, there being one hole N situated near each hole M, between the number 9 and the highest number on the plate L, adjacent to the hole M, and preferably nearest to said highest number, or to the zero-point, if there be one. (See Fig. 1.) Each of said holes N is of a size to expose to view one number only at a time of those marked on the numbered disk below the same when such number comes into position to be visible through such hole. Extending into each hole M and at a point half-way between the highest number (say 11 or 9, as the case may be) and the number 1, or opposite the zero-point, if there be one, is a shoulder *c*, being portion of plate L. Each numbered disk which is just beneath the plate L has a series of small holes *d*, arranged concentrically on said disk and just within the perimeter of the hole M, and these holes are at equal distances apart and correspond in number and relative positions to the numbers on the numbered disks, as well as to those on the plate L above the same, with the addition of the shoulder *c*.

P is a loose hand-pin, by which the operator can turn the calculating-wheels by inserting said pin in any one of the holes *d* (say of the units-disk G) and turning said wheels in the direction of the arrow until the pin P is stopped by the shoulder *c*. The holes *d* are so arranged that when the pin P strikes said shoulder *c* one of the numbers on the calculating-wheel will be opposite the hole N. (See Fig. 1.) The pin P when not in use may be inserted through a hole in the side of the casing A and held therein by an impinging-spring Q. (See Fig. 1.)

The five disks of each of the calculating-wheels may be cut out of sheet metal, and they are rigidly secured together, (say by screws at *e*,) so as together to constitute one wheel. I have shown in Figs. 5, 6, 7, and 11 such disks as are used to make up the inches-wheel, there being two disks like H, Fig. 11, in each and every wheel, while Figs. 8, 9, 10, and 11 represent disks used to make up the units-wheel.

Whenever any number on any of the computing-wheels is displayed through its corresponding opening N in the plate and said wheel shall be turned in the direction of its arrow for the space of one tooth, the next highest number will appear in said opening, and when in said revolution the zero or 0 of said wheel appears in the opening N the tooth of the one-toothed wheel will have engaged with and turned the adjacent wheel of the next highest order the distance of one tooth and displayed through the proper opening the number next succeeding that which was just before displayed. From this it will be seen that when the inches-wheel (which need not be used when not calculating measurements) is revolved in the proper direction until its zero appears the units-wheel will be rotated to display its next consecutive number, and if the number of the inches-wheel starts with the zero visible, then on making one complete revolution of the same (the distance of all its twelve teeth) or until the zero appears again the units, or in this case the lowest wheel for indicating feet, will be turned the distance of one tooth, so that the next consecutive number of said units-wheel will be indicated. With all the wheels, except the inches-wheel, a complete revolution will be the distance of ten teeth, as the multiple disks of said wheels have only ten teeth each.

The features just above described of wheels having ten teeth and a cam or one toothed disk have been used before; but I am not aware that a wheel having such a cam and a twelve-toothed disk employed in connection with the other decimal-wheels has ever been used before for indicating inches and feet.

The disks H should be a little thicker than the plates I to prevent friction on the several wheels.

It will be evident that changes in the form, proportions, and minor details of construction may be made without departing from the principle and character of my invention and that the number of composite wheels employed may be as many as desired.

The operation of the machine is as follows: If it be desired to compute or calculate with the machine, the several wheels are first rotated by the pin P until the zero on the several wheels is displayed in each of the several openings N. Now suppose it be desired to add a series of figures—for example, the following: 2,138,320, 16, 875. The pin P is first inserted in the hole *d* of the thousands-wheel G^4 opposite the 2 on the plate L and said wheel G^4 is rotated in the direction of its arrow until the pin strikes the shoulder *c*. The pin is next inserted in the hole *d* of the hundreds-wheel E^3 opposite the number 1 on the plate L, and the wheel is rotated by the pin P until the latter comes in contact with the shoulder *c*. The pin P next operates the tens-wheel F^2 in a similar manner, so that said pin, after being inserted in the hole 3 of the wheel F^2, comes in contact with the shoulder *c*, and

then the pin is inserted in hole *d* of units-wheel G opposite the number 8, and said wheel is rotated by said pin until the latter comes in contact with the shoulder *c*. The result will be that the numbers 2, 1, 3, and 8 of the thousands, hundreds, tens, and units wheels will be displayed, respectively, through their openings N. The number 320 is next added, and this is done by proceeding in the same manner as before with the hundreds and tens wheels; but there being a zero as the unit there is nothing to add here for it. The movement of the hundreds-wheel from the figure 3 to the shoulder will be the distance of three teeth and will display the third consecutive number of the hundreds-wheel from that already displayed, which was 1, and this third number will thus be 4. The same reasoning will apply to the tens-wheel, the second consecutive number when added becoming a 5. The first two numbers will thus have been added on the machine and it will indicate the result, 2,458. To next add the number 16,875 to the above result, move the ten-thousands wheel one tooth, displaying the 1, then move the thousands-wheel six teeth, which would display 8, then move the hundreds-wheel eight teeth, which rotation would pass the zero and display 2; but in passing the zero-point said hundreds-wheel will turn the thousands-wheel one tooth more and display a 9. The tens-wheel is then moved seven teeth, which will display a 2, passing the zero, and in so passing move the hundreds-wheel one tooth more, so as to indicate 3 instead of 2. The units-wheel is then turned five teeth, and this rotation will display a 3, but also pass the zero, and in so doing move the tens-wheel one tooth farther, so as to indicate 3 instead of 2. The sum of the three figures 2,138, 320, and 16,875 will thus be indicated—viz., 19,333. The same mode of procedure takes place no matter how many figures be added together, and the result is accurate and exact.

Subtraction.—If it be desired to subtract one number from another and each figure of the subtrahend be smaller than the figure of the same order of the minuend, the appropriate wheels are first turned to indicate the minuend. Through the openings N the pin P is next inserted in the hole of each of the appropriate wheels opposite that number which is the difference between the highest number of the appropriate order and the stated figure of said order of the subtrahend, or that which is to be subtracted. For example, if 375,346 is to be subtracted from 897,658, the greater number or minuend 897,658 is first indicated as above stated. The pin P is next inserted in that hole *d* of the units-wheel which is opposite the figure 4 (as four is the difference between ten and six of the subtrahend) and the wheel is turned in the direction of its arrow until the pin P comes in contact with the shoulder *c*, when the figure 2 of said wheel will be displayed. The pin P is next inserted in that hole *d* of the tens-wheel which is opposite the figure 6, six being the difference between ten and four. The wheel is turned until the pin is stopped by the shoulder, and the figure 1 of the tens-wheel will be displayed. For the same reasons the pin P will be inserted respectively in the holes of the hundreds, thousands, tens-of-thousands, and hundreds-of-thousands wheels opposite the figures 7, 5, 3, and 5, and these wheels are turned in the same manner as was stated of the units and tens wheels, when the figure 5 of the hundreds-of-thousands wheel, the figure 2 of tens-of-thousands wheel, the figure 2 of the thousands-wheel, and the figure 3 of the hundreds-wheel will all be displayed, and the proper remainder 522,312 will be indicated on the machine. If, however, any figure of the subtrahend be higher than that of the corresponding order of the minuend, the pin P should be inserted in the hole of the wheel of the next highest order opposite the figure which is the difference between the highest number of said order and one added to the figure of the same order of the subtrahend. The operation is otherwise the same. For example, if 318,652 is to be subtracted from 572,834 the pin should be inserted first in the eight hole of the units-wheel and said wheel turned until stopped, when the unit 2 will be displayed. Next the pin is inserted in the five hole of the tens-wheel and said wheel turned until stopped, when the 8 of this wheel will be displayed. Next the pin is inserted in the three hole of the hundreds-wheel, (because one added to six of the subtrahend is seven and seven from ten equals three.) The wheel is turned until stopped, when the hundreds 1 will be displayed. For the same reasons the thousands, tens-of-thousands, and hundreds-of-thousands wheels are turned until stopped by the pin P being inserted respectively in the two hole, eight hole, and seven hole of said wheels, respectively, when the thousand 4, the ten thousand 5, and the hundred thousand 2 will be displayed and the correct remainder 254,182 will be indicated.

Measuring.—If thirty-six feet eight inches are to be subtracted from fifty-four feet five inches, the latter number of feet and inches are first indicated. Then there being twelve figures on the inches-wheel E, the pin P is inserted in the four hole of said wheel, the latter is turned until stopped, when nine inches will be displayed. Then one is added to six of the subtrahend, making seven, and the difference between seven and ten being three the pin is inserted in the three hole of the units-wheel, the latter is turned until stopped, when the unit 7 will be displayed. For the same reason the pin is inserted in the six hole of the tens-wheel, and when said wheel is turned until stopped the 1 of this wheel will be displayed and the proper remainder, seventeen feet nine inches, will be indicated.

Multiplication.—If it be desired to multiply one number by another—say, for example, 842 by 356—the machine is first made to indicate zero on every wheel. Then the four wheels, units, tens, and hundreds, are turned by the pin P being placed in the eight, four, and two holes of said wheels, respectively, so that 842 is indicated. Then all of said wheels are turned five times more, making six times in all, when the number indicated will be the multiplicand 842 multiplied by six. The same operation is repeated five times with regard to the wheels representing tens of thousands, thousands, hundreds, and tens, and three times with regard to the wheels representing hundreds of thousands, tens of thousands, thousands, and hundreds, when the proper product will be indicated. If feet and inches are to be multiplied, they should first all be reduced by the usual method to inches and then multiplied as just above stated, when the product can then be separated again into feet and inches.

The construction is cheap and is unusually simple for this class of machines. All the parts are well protected inside the casing. The wheels need no sleeves or sleeves within sleeves, and there are no journal-bearings to become dislodged or to wear out and need oiling.

I claim—

1. In a calculating machine, the series of composite calculating wheels made as described, each having in its upper surface a concentric series of holes *d*, adapted for a hand pin to turn it as needed, combined with plates I. serving to separate the disks and to admit the washers of the several wheels and provided with dogs K.,—and with a top or covering plate L having large openings M. therein one for each wheel, the holes *d*. being all visible and accessible through such openings, this plate L having also smaller openings N. therein beyond the periphery of each opening M. to display a numeral on the wheel beneath, and the plate having a visible circular series of numbers corresponding with those on the wheels beneath.

2. In combination with fixed studs and with the calculating wheels loosely mounted thereon and severally composed of the five parts as described, the plates I fitted within the case and each provided with openings J serving to receive the washers of said wheels, as and for the purposes set forth.

3. In combination with the case, calculating wheels, and plates I, the collars or washers H, located in openings in said plates, and made of greater thickness than such plates, the wheels and their washers being mounted on studs on the base plate, all substantially as set forth.

4. In combination with the covering plate having the described openings therein, and with the plates I having openings to receive the washers of the wheels, the described system of calculating wheels each having a circular series of holes and adapted to be separately operated or adjusted by a hand-pin as set forth, and also having a ratchet thereon, dogs and springs on the plates I. serving to hold said wheels to proper position, all substantially as and for the purposes set forth.

5. In combination with the separating plates I. I. and with the fixed studs or shafts, wheels having washers H. thicker than said plates, and each wheel comprising parts which being united by screws serve to operate as if made all in one, substantially as set forth.

6. In combination with the separating plates, and with the series of decimal wheels made and mounted as described, a wheel adapted for measuring or weighing, composed of five parts as described firmly united together and mounted on a fixed stud, and also adapted to be used at will in conjunction with the decimal wheels, all as set forth.

JOHN E. MINOTT.

Witnesses:
HERBERT BROWN,
E. T. PRINDLE.