J. H. R. Reffel,

Calculator.

No. 94,772.   Patented Sep. 14. 1869.
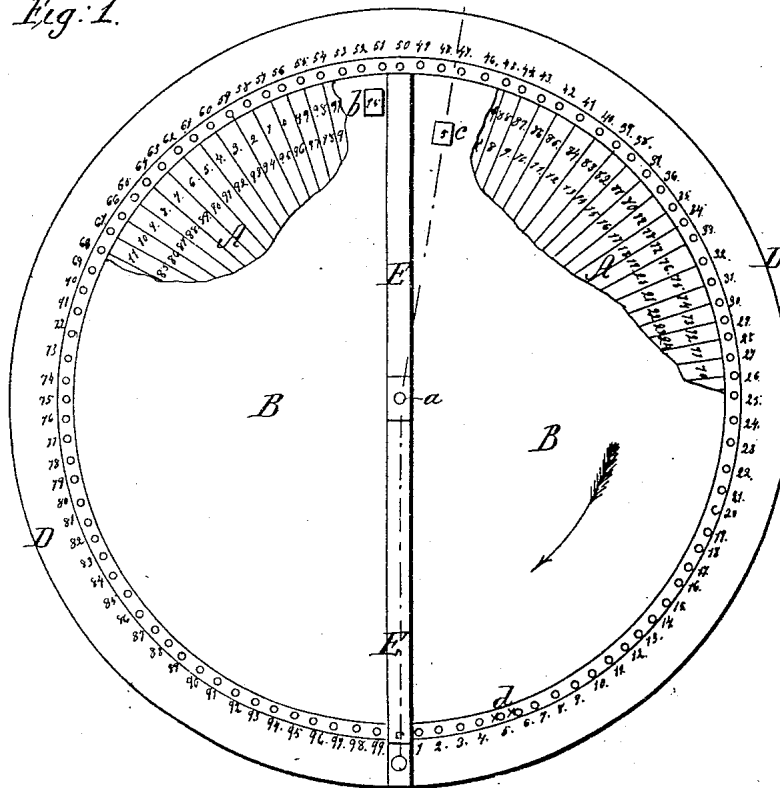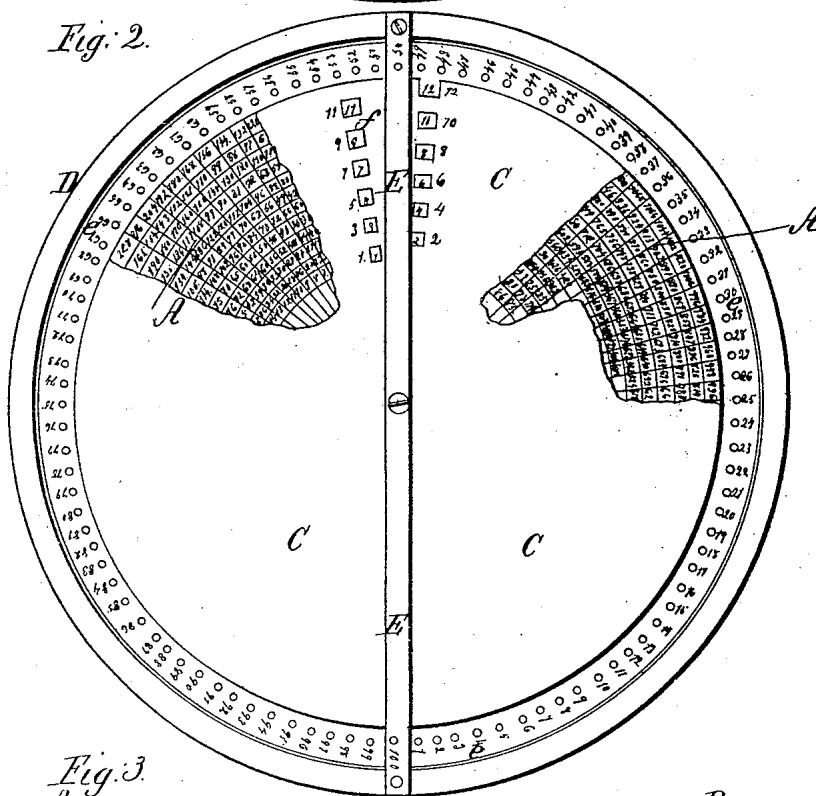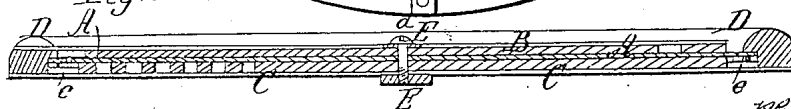
Fig: 1.

Fig: 2.

Fig: 3.

Witnesses;
Jno. E. Brooks
Geo. N. Weaber.

Inventi
J. H. R. Reffel
per
Attorn

JOHN HERMANN RUDOLPH REFFELT, OF HOBOKEN, NEW JERSEY.

IMPROVEMENT IN CALCULATING-MACHINE.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern :

Be it known that I, JOHN HERMANN RUDOLPH REFFELT, of Hoboken, in the county of Hudson, and State of New Jersey, have invented a new and improved Calculating-Machine; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawing, forming part of this specification, in which—

Figures 1 and 2 are face views, partly in section, of my improved calculating-machine, showing opposite sides of the same.

Figure 3 is a central section of the same.

Similar letters of reference indicate corresponding parts.

This invention has for its object to provide an apparatus by means of which either one of the four rules of arithmetic, viz, addition, subtraction, multiplication, and division, can be successfully exercised for practical and educational purposes.

The invention consists chiefly in the arrangement of a disk, or turn-table, working between two slotted disks, or plates, and carrying a system of figures and dots, or apertures, by which the required calculating systems are most effectually produced.

The invention will be of great importance in schools and for commercial purposes. The calculations can be carried on with very large numbers without difficulty or inconvenience, and the mode of procedure can be easily learned by all persons.

A, in the drawing, represents a circular plate, made of sheet-metal or other suitable material, of suitable diameter. It is, by a central pin, *a*, pivoted to and between two plates, B and C, which are arranged in an annular frame, D.

Diametral cross-bars E, on both sides of the frame D, serve to hold the various plates, or disks in their respective positions and to support the pivot *a*.

The disk A can be freely turned on the pivot, while the other two plates, B C, are fixed. The diameters of the plates B C are smaller than that of the disk A, so that an annular portion of the latter disk remains visible between the edge of each plate B C and the frame D. This annular portion is divided into one hundred equal parts, and has the divisions indicated by one hundred dots on both sides.

In order to obtain better control and account of the dots, the frame D has, on one side, also been divided into one hundred spaces, and each space marked with a figure, the figures being in regular succession from one to one hundred, as in fig. 1.

The other side of the frame is not subdivided, but in its place the dots on the plate A are marked directly, as in fig. 2, with figures from one to one hun-

dred, successively, as shown. It is evident that the number of such dots, figures, and subdivisions can be varied at will.

The plate B has two apertures, *b* and *c*, cut through it. Each of these apertures is above a separate circular line of figures written upon the face of the plate A. These two circles contain the figures, from one to one hundred successively, written in opposite directions, as is clearly shown in fig. 1. The figures under the aperture *b* are written in the same order as those on the frame D, while those under the aperture *c* are written in reverse order.

The dots through the plate A may, as shown, be in the shape of small holes, each apt to receive a pin, or handle. One of these small holes, *d*, is marked by a cross or crosses, or otherwise, as shown in fig. 1.

When it is brought against the bar E, the figures *o* will be visible through the apertures *b c*. When figures are to be added, the pin, or handle is placed into that dot, or small hole, which is opposite the figure on the frame representing the number to be added. Thus, if the apparatus stands at zero, with the cross-mark *d* at the bar E, and if the figure 12 is to be added to 15, the handle is first placed into the hole opposite 12, on D, and then the disk A is turned until the handle strikes the bar E. The figure 12 is then visible through *b*. Then the handle is fitted into the hole opposite 15, on D, and carried to the cross-bar, when the plate is turned fifteen-one-hundredths more parts of its circumference, whereby the figure 27 is brought under the aperture *b*. Thus addition can be carried on indefinitely and accurately. The hundreds can be marked off by the counter, or may be recorded by a supplementary apparatus.

For subtracting, the said procedure is followed: The figure 99, being supposed to be under the aperture *c*, and the figure 10 to be subtracted, the handle is placed into the hole opposite 10, on D, and is carried against E, in the same direction in which it was formerly turned, *i. e.*, in the direction of the arrow in fig. 1. As the figures on the subtracting-circle stand in the reverse order to those of the frame D, the value carried under *c* will be so much less than that formerly there, as the value carried by the handle represented when the handle was applied.

The other face of the plate A is, where it is covered by the plate C, divided into twelve, or more or less concentric rings, and each ring divided into one hundred, or more or less equal spaces. The innermost ring contains the figures from 1 to 100, in regular succession. The next contains those figures from 2 to 200, which are divisible by 2, in regular succession; the next, those from 3 to 300, divisible by 3; the next, those divisible by 4, and so forth, the outermost ring in fig. 2 being represented to contain, in regular suc-

cession, those figures between 12 and 1,200 that are divisible by 12.

Through the plate C are cut twelve apertures, f, one above each of the twelve rings, each large enough to display one division of each ring. The figures on these rings are so arranged that when the figure 1, on the outer annular visible part e of the plate A is brought against the cross-bar, as in fig. 2, the figures displayed through the apertures f will be the results of the multiplication of said figure 1 with the figures from 1 to 12 respectively.

The quotients are marked on the plate C, near the apertures f. Thus, when any figure on the part e is brought against the cross-bar, the results of multiplication of the same with one of the figures from 1 to 12 will appear.

For the multiplication of larger numbers, the amounts are divided, so that when, for instance, 123 is to be multiplied by 5,689, the latter figure is first multiplied by 12 and then by 3, and the results put together and added in proper manner.

Division is produced on the same table. Suppose 108 is to be divided by 12. The latter figure is carried to the cross-bar, when one of the figures displayed through the apertures f will be 108, and the figure placed alongside of such aperture upon the plate C will be the quotient sought for.

When 56,000 is to be divided by 14, the latter figure is brought against E, when, through one aperture, f, the figure 56 will appear opposite to the quotient 4. The addition of the three naughts will produce the true quotient, 4,000.

Having thus described my invention,

What I claim as new, and desire to secure by Letters Patent, is—

The turning disk A, arranged between the stationary plates B C, attached to the frame D by means of the cross-bars E, when the same is provided with the dotted outer part, the two adding and subtracting-circles on one side, and the multiplying and dividing circles on the other side, as herein shown and described, for the purpose set forth.

J. H. R. REFFELT.

Witnesses:
FRANK BLOCKLEY,
C. L. TOPLIFF.