

(No Model.)

F. G. NELSON.  
CALCULATOR.

No. 526,196.

Patented Sept. 18, 1894.

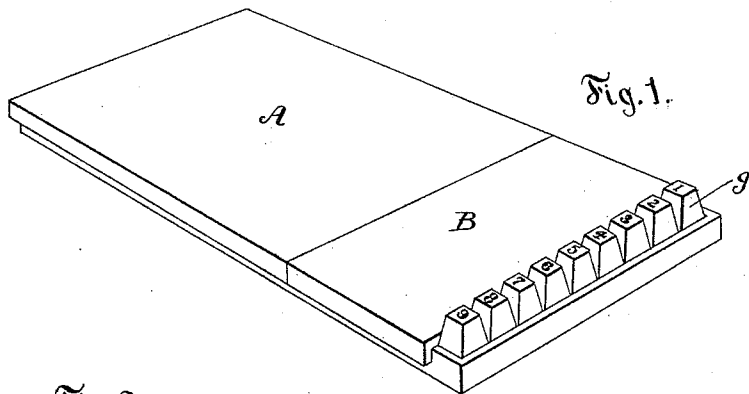


Fig. 2.

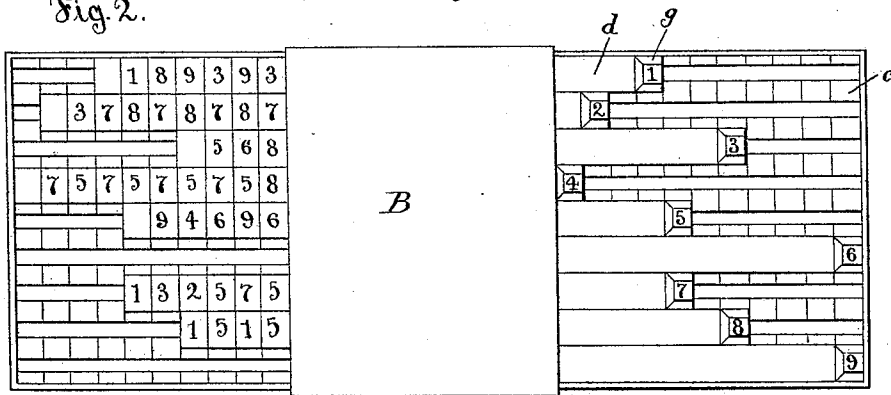
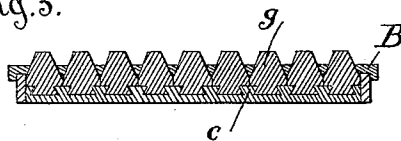


Fig. 3.



Witnesses:  
James Frederic Ritchie  
Charles L. Case

Inventor.  
Frank G. Nelson.

# UNITED STATES PATENT OFFICE.

FRANK G. NELSON, OF NEW YORK, N. Y.

## CALCULATOR.

SPECIFICATION forming part of Letters Patent No. 526,196, dated September 18, 1894.

Application filed March 1, 1894. Serial No. 501,910. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK G. NELSON, a citizen of the United States, residing at New York city, in the county and State of New York, have invented a new and useful Calculator, of which the following is a specification.

My invention relates to the simplification of calculations in cases where a constant divisor or multiplier is to be used for several successive operations; and the objects of my invention are, first, to avoid repetition of the more difficult processes of division and multiplication by substituting therefor the easier process of addition, and, second, to escape the labor and liability to error incurred in ascertaining and setting down the figures of each operation, intermediate between those given and those required, by setting down on the calculator, once for all, before beginning the work, the nine possible combinations of figures by means of which all of the operations can be performed. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a view in perspective of the calculator. Fig. 2 is a plan, with the larger section of the sliding cover removed and with the necessary slides so adjusted as to obtain a desired result; and Fig. 3 is a view of the right hand end of the calculator, with the end of the box removed.

The same letters refer to the same or similar parts throughout the several views.

The shallow box contains parallel, beveled guides, *c*, fastened to the bottom thereof, between which there are retained by means of a reverse bevel, nine or more movable slides, *d*. Each slide has a peg or projection, *g*, at its right hand end for convenience in moving it—the pegs being numbered consecutively downward with the nine digits—and a surface of ivory, silicate, slate, or other erasable material covering the left hand half thereof. The upper surfaces of the slides and guides may be marked by equidistant cross-rulings for convenience in moving each slide to any desired position.

The sliding cover is divided into two parts, A and B, the former of which is removed when the calculator is to be used, while the latter is retained to cover up the figures that are not to be used and to carry to the right

hand end of the box, at the close of each operation, all of the slides that have been used.

In dividing several numbers by a constant or unchanging divisor advantage is taken of the fact that the result obtained by dividing the dividend by the divisor can also be obtained by multiplying the dividend by the reciprocal of the divisor, or by multiplying the reciprocal of the divisor by the dividend. Stated algebraically, the quotient of  $a \div y$  can also be had from  $a \times \frac{1}{y}$  or from  $\frac{1}{y} \times a$ , and if several numbers, *a*, *b*, *c*, *d*, &c., are to be divided by *y*, multiplying  $\frac{1}{y}$  successively by each of them will readily give the desired results.

The words "upper slide" hereinafter used are intended to signify the slide farthest from the operator and by the word "vertically" I mean in a line across the face of the calculator.

The figures of the reciprocal of the divisor are written with a soft pencil upon the upper slide of the calculator, the first significant figure being one place removed from the left hand end of the slide. Upon the second slide twice the reciprocal is written; on the third, three times it; and so on down to the ninth slide on which nine times the reciprocal is written.

All of the slides and the short section of the sliding cover being at the extreme right hand end of the box, push to the left hand end that slide whose peg bears the first figure of the dividend or the figure of highest order. This will carry the cover over the figures of the unused slides. Then push the slide corresponding to the second figure of the dividend over to within one space of the left hand end of the box, the slide corresponding to the third dividend figure over to within two spaces of the end, and so on until slides have been moved for all of the figures of the dividend. Add vertically the exposed figures on the slides; set down the sum, point off the decimal figures correctly, and the desired quotient is obtained.

The sliding cover in being moved back to the right hand end carries with it all of the slides that have been used and the calculator is ready for the next operation.

100

A more comprehensive rule covering all possible contingencies is this, all slides and the cover being at the extreme right hand of the box: Move the slides to the left hand so that the figures on the pegs of the slides which have been moved when added vertically produce the dividend; then the exposed figures on the slides when added vertically and pointed off correctly will give the quotient.

If one or more ciphers appear in the dividend the slides for the figures after the ciphers must be set back one or more places accordingly. If a figure occurs more than once, although there is only one slide for that figure, the proper combination of other slides can generally be easily made.

In Fig. 2 of the drawings the calculator is arranged to reduce four million two hundred and two thousand two hundred and eleven feet to miles by dividing that number by five thousand two hundred and eighty, that is, the reciprocal of five thousand two hundred and eighty is placed on slide one, its product by each of the other digits on the corresponding slides, and the slides have been moved so that the figures on the pegs of the moved slides added vertically give the dividend, while the exposed numbers on the slides added vertically give 795.873292 miles, the result being carried out to six decimal places. Sometimes a dividend is encountered which cannot be formed from the figures on the pegs, nine hundred and ninety-nine thousand nine hundred and ninety-nine, for instance. If such cases are infrequent the difficulty can be overcome by cutting the dividend in two and finding separate quotients for the first group of figures and for the group of the remaining figures, which quotients can be added together afterward; but if these cases occur frequently it is advisable to have one or more auxiliary slides on the upper side of the calculator with their pegs numbered with the smaller digits. No rule is given here for pointing off the quotient because inspection

will always show the proper place for the decimal point. When all of the operations have been performed, a damp cloth or sponge will remove the penciled figures from the slides.

In using the calculator for multiplying, the foregoing description of the process will apply in every respect, if the word "multiplier" is substituted for "reciprocal of the divisor," "multiplicand" for "dividend" and "product" for "quotient."

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A calculator, consisting of a shallow box, with beveled guides fastened to its bottom, retaining nine or more beveled slides, all substantially as described.

2. A calculator, each slide of which has a surface of ivory, silicate, slate or other erasable material, covering its left hand half, and a peg or projection, numbered with one of the nine digits, at its right hand end, for convenience in moving it, and for moving, and being moved by, the sliding cover, all substantially as described.

3. A calculator, having a box or base provided with guides, slides to move in said guides, the guides and erasable surface of the slides of which are marked by equidistant cross-rulings for convenience in moving each slide to any desired position and in making vertical additions, all substantially as described.

4. A calculator, with a sliding cover divided into two parts, one of which is retained over the slides when in use to cover up the figures which are not used, in each operation, and to carry all of the slides, which have been moved, to the right hand end of the calculator, after each operation, all substantially as described.

FRANK G. NELSON.

Witnesses:

FRANK POWELL,  
WILLARD GRAHAM.