(No Model.)

I. D. BOYER.

INSTRUMENT FOR FACILITATING THE USE OF TABULATED DATA.

No. 480,245. Patented Aug. 9, 1892.

Fig. 7.

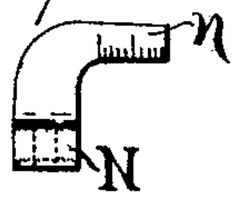
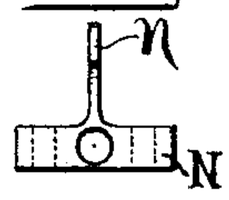


Fig. 8.



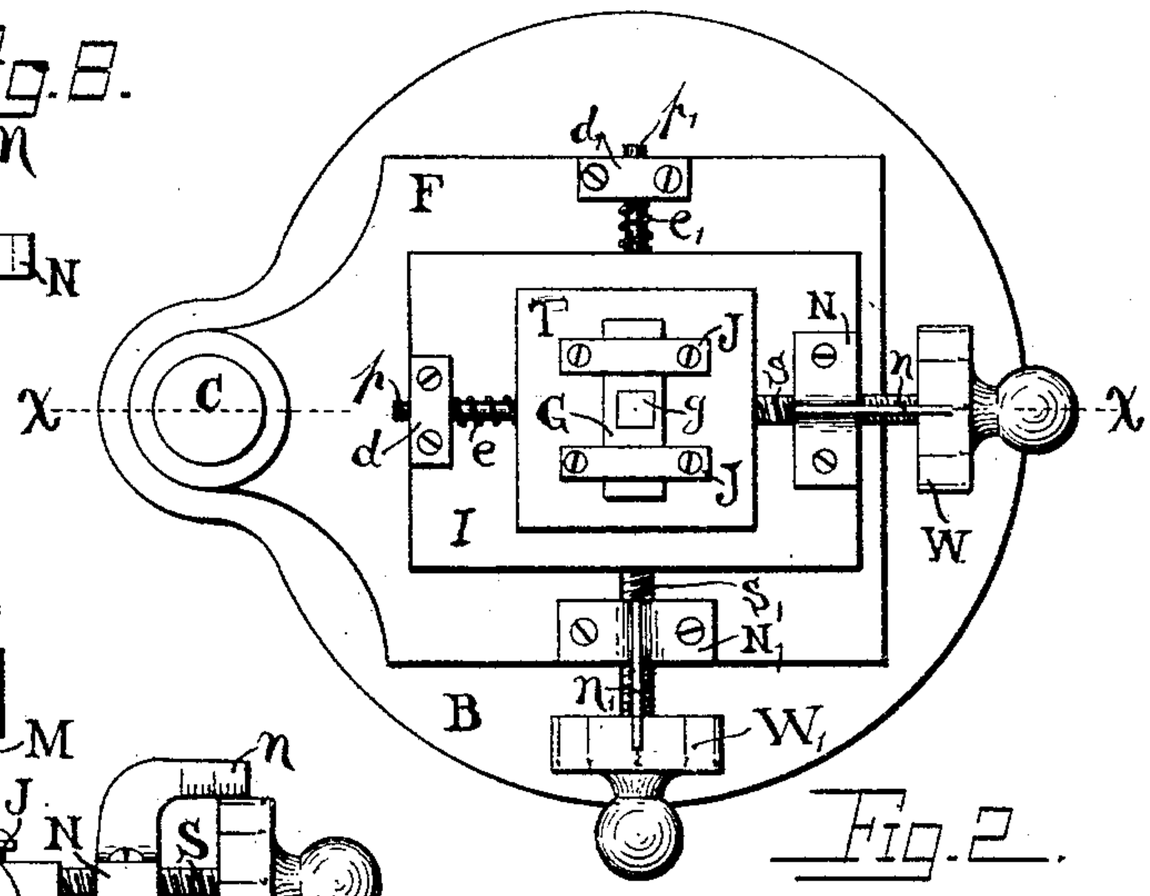


Fig. 2.

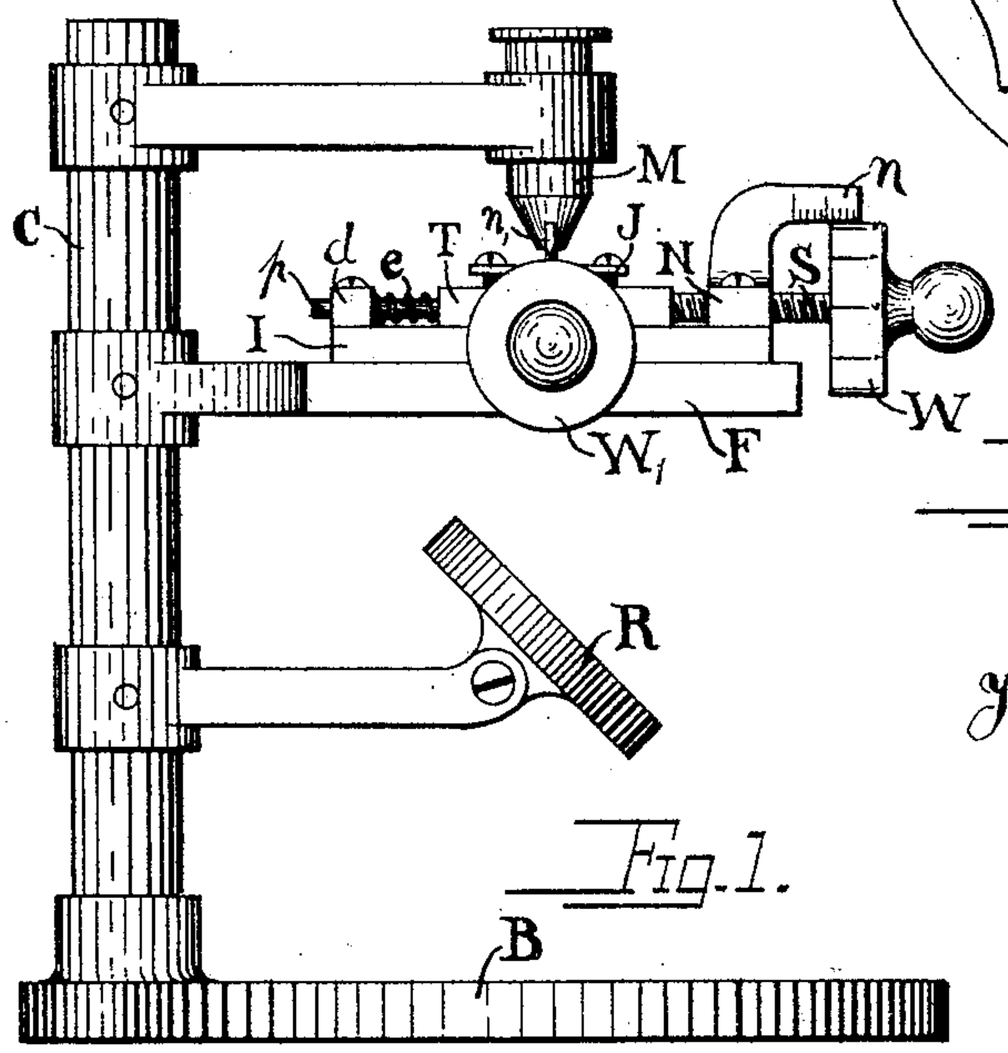


Fig. 1.

Fig. 4

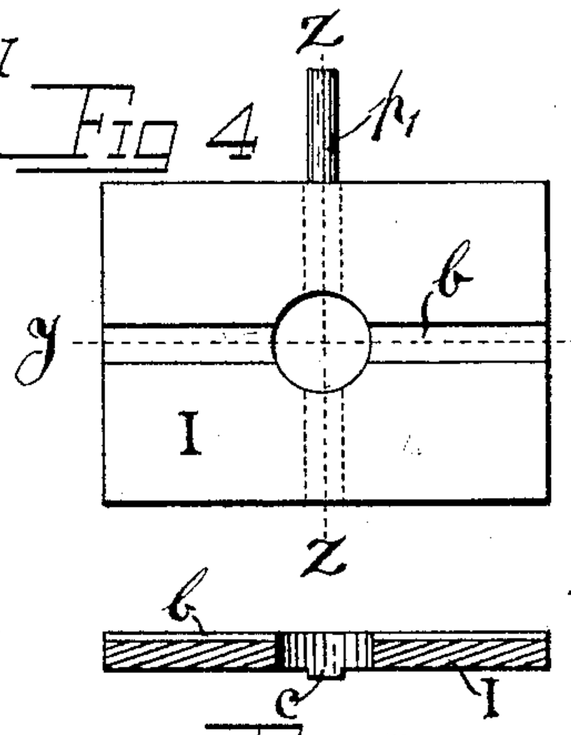
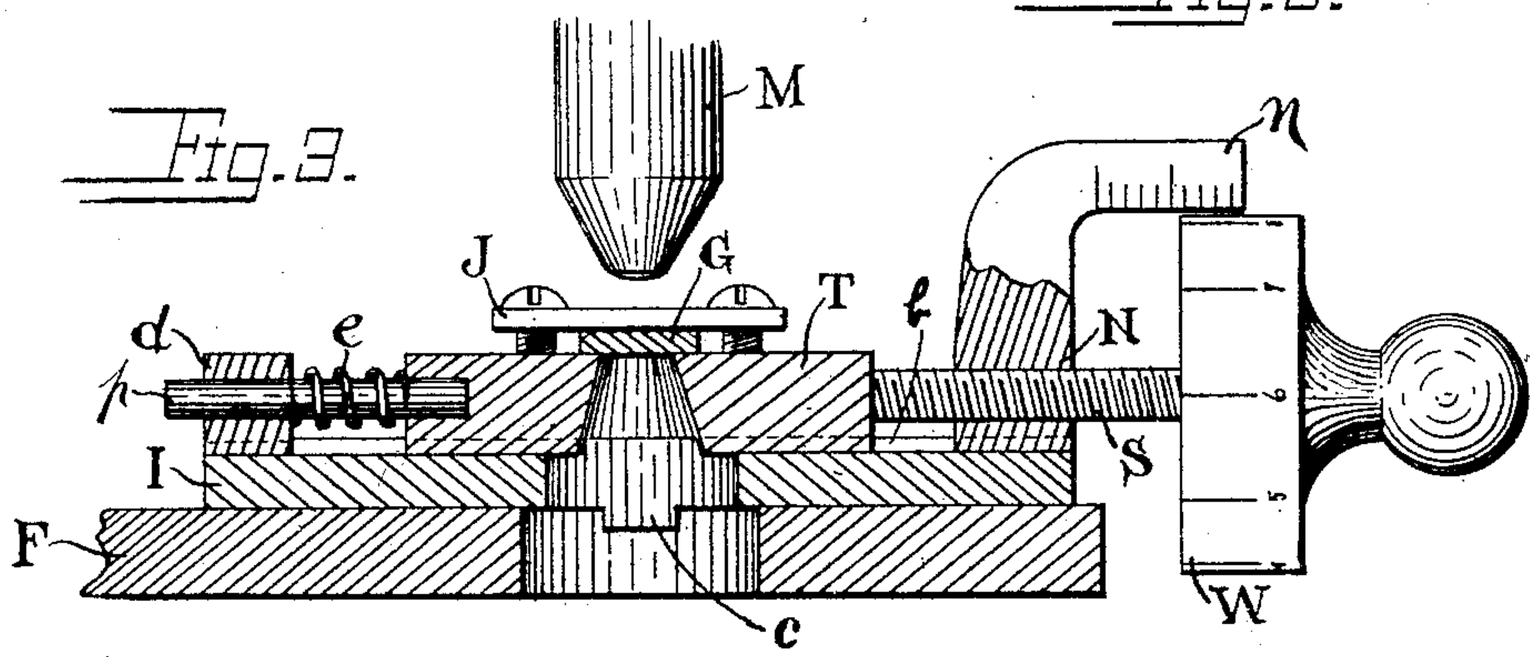


Fig. 5.

Fig. 6.

Fig. 3.



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INSTRUMENT FOR FACILITATING THE USE OF TABULATED DATA.

SPECIFICATION forming part of Letters Patent No. 480,245, dated August 9, 1892.

Application filed September 3, 1891. Serial No. 404,676. (No model.)

To all whom it may concern:

Be it known that I, ISRAEL DONALD BOYER, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented a new and useful Instrument for Facilitating the Use of Tabulated Data, of which the following is a specification.

The objects of my invention are twofold, first, to bring a large amount of information into a small compass, and, secondly, to provide mechanical means for quickly and accurately coming at any desired datum.

The accompanying drawings illustrate the mechanical finding mechanism which I employ.

Figure 1 is a side elevation of the complete instrument. Fig. 2 is a plan of the same with the microscope and its supporting-arm removed. Fig. 3 is a sectional view of the sliding plates and adjacent parts, taken on the line *x x* of Fig. 2. Figs. 4, 5, and 6 are detail views of the intermediate plate I. Figs. 7 and 8 are detail views of the nut N, with the index-arm *n*.

As here shown, the instrument is adapted for use in connection with numerical tables; but it may also be adapted to various other kinds of tables. For the purpose of illustration we will assume a multiplication-table exhibiting all products from unity by unity up to one hundred by one hundred, inclusive—ten thousand products in all. These products I arrange in the form of a great square composed of ten thousand little squares, and I arrange them in such order that the product of any two numbers is found at the intersection of their respective columns and lines. For example, the product of ninety-three by sixty-four is found at the intersection of the ninety-third column and the sixty-fourth line, or vice versa. It is to facilitate the finding of this intersection that my instrument is devised.

By means of photography I reduce the table to microscopic dimensions upon a glass plate and mount it upon a metal plate capable of movement in two directions under a fixed microscope. By means of suitably-graduated micrometer-screws any part of this table may be quickly and accurately brought into the center of the field of view of the microscope, upon looking into which the desired information is seen in plain figures just as it would appear in a printed table.

Referring to the drawings, B is the foot-casting or base supporting the vertical column C, to which are rigidly attached three arms. The upper arm supports the microscope M. The middle arm is expanded into a horizontal plate F, while the lower one supports a reflector R, the purpose of which is to illumine the table *g* on the glass plate G by throwing a beam of light upward through a central aperture. The glass plate G is fastened by clips J J to the top sliding plate T. This plate rests on an intermediate plate I and is capable of lateral motion on it in the direction of the axis of the screw S. The plate I has a similar motion on the fixed plate F, but in a direction at right angles to that of the plate T or the plate I.

Referring to Figs. 4, 5, and 6, it will be seen that on the upper side of plate I is a groove *b*, which serves as a guide for the top plate T, while on the bottom of plate I is a tongue *c*, which slides in a corresponding groove in the fixed plate F. The screw S works through the nut N, which is rigidly secured to plate I. Pin *p* is rigidly fastened to plate T, but slides freely through the block *d*, which is rigidly attached to plate I. It forms a guide for spring *e*, which serves to keep plate T always in contact with the end of the screw S. On the end of screw S is a wheel graduated in this instance into ten divisions, while on the nut N is an arm *n*, which carries a scale corresponding to the threads of the screw S. This scale, in connection with the graduation of the wheel W, constitutes a familiar form of micrometer reading. The plate I is moved on plate F in the same manner that plate T is moved on plate I.

This form of micrometer being well known, I do not deem it necessary to describe it in detail. Suffice it to say that when it stands at the reading "1" the first column of the miniature table *g* is directly under the center of the field of the microscope M. When the wheel W is advanced one division, the reading will be "2" and the second column of the miniature table will be centered under the microscope, and so on, the columns of the miniature table *g* and the graduations of the wheel W

corresponding the one to the other. In the same manner the lines of the miniature table correspond to the graduations of the wheel W′. Suppose the wheel W to remain at "2," while the wheel W′ is turned until it indicates "75." All this time the second column has remained centered under the microscope. The effect of turning wheel W′ has simply been to traverse that column under the microscope until the seventy-fifth square has been reached. We now have under the microscope the intersection of the second column with the seventy-fifth line, and on looking into it we see "150," the product of seventy-five multiplied by two. In a similar manner we can find the intersection of any line and column, and may thus find any product from one multiplied by one up to one hundred multiplied by one hundred, inclusive.

It will be noticed that each of the plates T and I and F has a hole through its conter. These holes are of such size that the plates in moving do not travel far enough to cut off the beam of light sent upward by the reflector R.

I do not limit myself to the precise construction shown in the drawings, as it is evident that it may be modified in various ways without departing from the spirit of my invention. For instance, the microscope may be movable, while the table remains fixed, or the microscope may have motion in one direction and the table in another direction.

Instead of the screws shown, wedges may be used, or a system of levers may be employed to effect the movements; but, in fact, none of these movers are essential, as, if the table be not too minute, the necessary adjustments may be made by hand, with the aid of one or two graduated scales with or without verniers. I, however, prefer to use the screws. It is not necessary, either, that the tables be arranged in a square. They may even be arranged in a circle or a spiral and a circular or a spiral movement substituted for the rectangular movements; but I prefer to arrange the table in the form of squares and provide two right-line movements at right angles to each other in the manner specified. To bring these tables to small dimensions, I prefer to photograph them on a glass plate, although it is quite possible that other means might be employed.

What I claim as my invention is—

In an instrument for facilitating the use of tabulated data, the combination, with a microscope, of a mounting-plate T, having motion in two directions, two graduated scales W W′ for adjusting the plate in two directions, and a miniature table of data *g*, mounted on plate T and reduced to a scale corresponding to the graduations of the scales W W′, the whole being arranged substantially in the manner and for the purpose specified.

ISRAEL DONALD BOYER.

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