(No Model.)

J. DENISON.

DEVICE FOR TEACHING ARITHMETIC.

No. 452,302. Patented May 12, 1891.

Fig. 1.

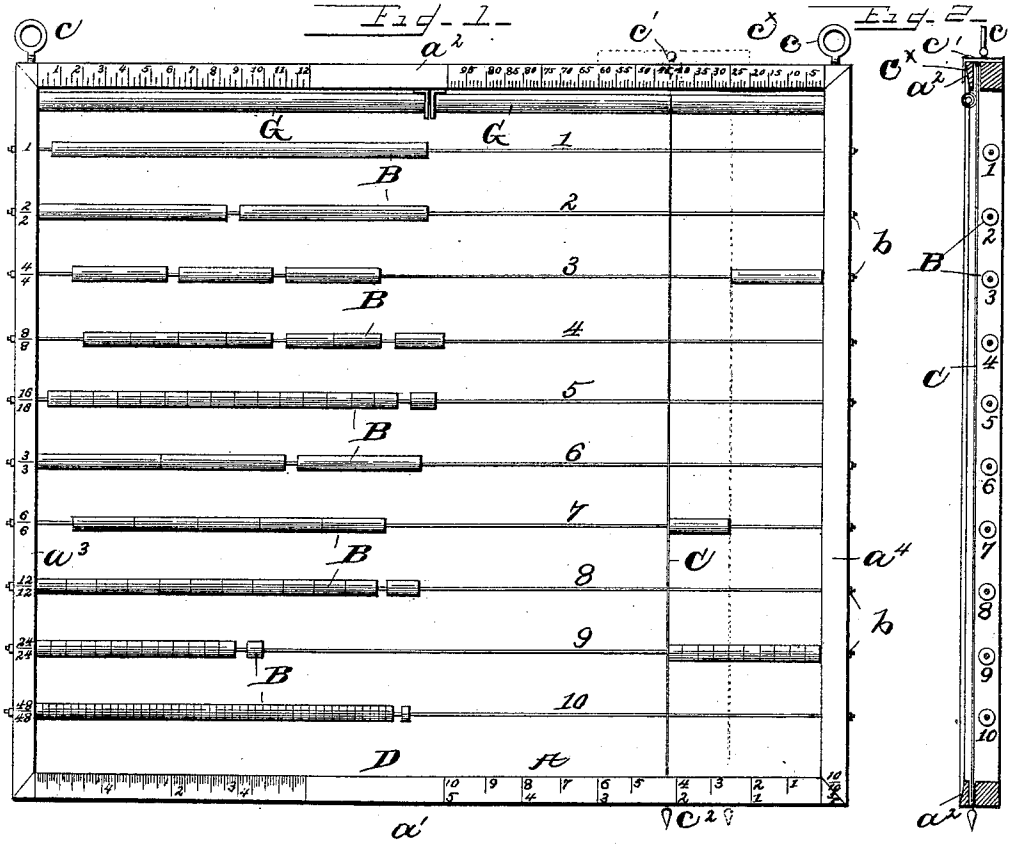


Fig. 2.

Fig. 5.

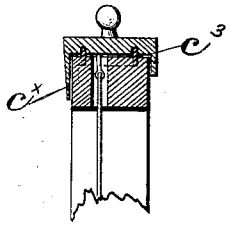


Fig. 3.

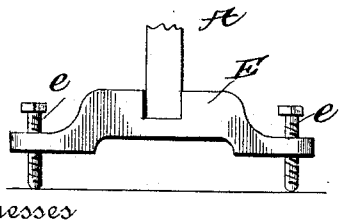
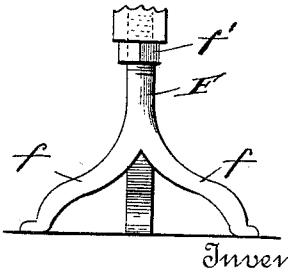


Fig. 4.



Witnesses

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DEVICE FOR TEACHING ARITHMETIC.

SPECIFICATION forming part of Letters Patent No. 452,302, dated May 12, 1891.

Application filed December 3, 1890. Serial No. 373,470. (No model.)

To all whom it may concern:

Be it known that I, JAMES DENISON, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Devices for Teaching Arithmetic; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention is in the nature of a device for teaching arithmetic; and it consists in certain novel features of construction and combination of parts, hereinafter fully described.

My apparatus is especially well adapted to illustrate definitions and operations in common and decimal fractions and percentage, and is arranged to illustrate the principles as applied both to abstract and concrete numbers.

In the accompanying drawings I have shown one form in which I have contemplated embodying my invention, and the same is fully disclosed in the following description and claims.

Referring to the said drawings, Figure 1 is a front elevation of my improved device. Fig. 2 is a vertical transverse section of the same. Fig. 3 is a view of a foot or support for the device. Fig. 4 is a slight modification of the same, and Fig. 5 is an enlarged detail of the top bar in section.

A represents a rectangular frame, which is made of wood, preferably, and its parts are secured together in any desired manner. The upper and lower bars a' a^3 of the frame are provided with longitudinal slots, which extend from one of the vertical bars a^3 of the frame to the other a^4. This slot may be formed by employing two strips instead of a single bar and leaving a narrow space between them, if desired. The frame is provided with a series of horizontal wires or rods 1, 2, 3, &c., which extend from one vertical bar of the frame to the other and are suitably secured thereto. I prefer to extend said wires or rods through the frame on each side and provide them with nuts b on the outside of the frame, as this will enable me to tighten the nuts, drawing the wires or rods taut and at the same time bracing and strengthening the frame. Upon the wires or rods 1 2 3, &c., are strung a series of laterally-movable blocks B B, the blocks on different wires being of different length, as shown in the drawings. Thus on wire 1 is shown a single block which corresponds to a whole number or unit, while on wire 10 are forty-eight small blocks whose aggregated thickness equals the length of the block on wire 1. The blocks on the wires intervening between 1 and 10 are divided to represent different fractions of the large block. The frame is also provided with a vertically-disposed indicator C, which consists in this instance of a plumb and line for use in connection with the blocks B and with certain scales which are marked upon the frame itself. In this instance I have shown the upper bar of the frame provided with a plate c', having a handle or knob for moving the same. To this plate is attached a wire, cord, chain, or other device C, which depends through both slots a^2, and is provided with a plumb-weight c^2 at its lower end, the slots being preferably so arranged that the indicator will hang in front of the wires 1 2, &c., and adjacent to the blocks B. I may employ a slender rod instead of a more flexible connection, if found desirable. The vertical indicator, with its plumb-weight, which I term a "gravity-indicator," acts as a plumb-line and will always assume a vertical position. The plate c is moved along the top bar carrying the indicator with it, as indicated in the drawings. The object of this indicator is to show the relations of various fractions to the whole number or unit and to each other and to illustrate various arithmetical operations with the same. I also provide various portions of the frame with scales and numerals which are to be used in connection with the blocks and indicator. On the right-hand side of the upper bar a I have shown a decimal scale, which is equal in length to the long block on wire 1. At the left of bar a I have shown a scale of one foot divided into inches and fractions of inches. On bar a' at the left is a scale of one foot divided into fractions of a foot, as quarters and one-hundredths, and at the right on said bar is a scale equal in length to the decimal-scale above and divided into tenths and fifths. It is obvious that various scales could be employed and that several scales could be marked on the bars in addition to the two shown by making said bars of

sufficient length or width. I also prefer to mark on the vertical bars figures opposite each of the horizontal wires indicating the fractions which the blocks on said wires represent.

In order to provide means for supporting the frame in such a manner that the plumb-line will hang exactly true with the frame, I provide said frame with adjustable supporting devices and a spirit-level D by means of which the frame can be supported in an exactly true position.

In Fig. 3 I have shown a support for one end of the frame, which consists of the foot portion E, provided with adjusting-screws *e e*, as will be readily understood from the drawings. In Fig. 4 I have shown another form of support, which consists of a standard F, provided with screw-threads at its upper end and having supporting-feet *f* at its lower end. The screw-threaded portion engages an aperture in the frame or a part connected therewith, and is provided below said frame with a nut *f'*. By screwing this nut up or down the end of the frame can be raised or lowered.

If it is desired to support the frame by means of hooks, nails, or projections from a wall or other fixed object, the frame is provided with screw-eyes or other suitable device, which is also preferably capable of adjustment, as indicated in the drawings, to enable the frame to be accurately adjusted, so that the plumb line or indicator will be exactly true with the frame.

The uses to which this invention can be put in the teaching of arithmetical studies are so numerous that only a few will be here particularly referred to. For instance, in teaching fractions, suppose the indicator be in the position shown in dotted lines, Fig. 1. One block on the wire 3 is moved over and the indicator is placed at its inner edge. This block is equal to one-fourth of the whole number represented by the large block on wire 1. If a number of the blocks on wire 9, for instance, be moved over until a sufficient number are in place to come even with the indicator, it will be found that there are six, thus showing that one-fourth equals six twenty-fourths. At the same time by referring to the decimal scale, at the top it will be seen that the indicator is at 25, thus showing that one-fourth or six twenty-fourths equal twenty-five one hundredths.

In adding and subtracting fractions this device can be used with peculiar facility. Suppose having converted the one quarter into six twenty-fourths we wish to add one-sixth to one-fourth. The block indicating one-sixth (on wire 7) is moved over until it is in line with the indicator while in the position shown in dotted lines. The indicator is then moved into the position shown in full lines and enough twenty-fourths are added to fill up the space between the last block on line 9 and the indicator, showing that one-sixth equals four twenty-fourths, while the whole of the blocks to the right of the indicator show that the sum of the two fractions is ten twenty-fourths, while the position of the indicator on the decimal scale will indicate the value of this sum in hundredths. The scale at the bottom will indicate the same in fifths or tenths or other desired fractions. In subtracting fractions the operation would be reversed. In these and many other ways the device can be manipulated and made to demonstrate clearly to a young and untrained mind the relations, values, and forms of fractions and the various operations to be performed with them, and it also enables the rules of percentage to be clearly illustrated. By using the scale of one foot and inches and fractions of inches on the left side of the frame the relative values of fractional concrete numbers can be taught, and these scales will also be found very valuable in teaching the principles of proportionate reduction and enlargement in connection with the study of mechanical drawing. Instead of the gravity-indicator herein described, I might use an indicator secured to a sliding block adapted to move along the top of the frame, as indicated in dotted lines, Fig. 1, the indicator being secured to the block at right angles, and in either case I may dispense with the slots, if desired, and arrange the indicator to pass along the front of the frame.

The plate *c* is preferably provided with a pointer $c^{\times}$, adjacent to the scales marked on the upper bar of the frame to assist in adjusting the indicator to the proper position. I also prefer to provide the top of the upper bar of the frame with a pair of tracks c^3 c^3, as shown in Fig. 5, which engage grooves in the plate, thus guiding the plate in its traversing movement and preventing the pointer from engaging and defacing the scales marked on the bar. I might, however, provide the bar with facing-plates, as indicated in dotted lines. The frame is also provided adjacent to the upper bar with curtains or screens G G of such width that when one side of the frame is being used the curtain above the other side may be drawn down and made to cover the blocks not in use, thus preventing the scholars attention from being drawn away from the lesson. It is also obvious that I may secure several frames arranged to show different fractions and combinations of fractions together, as to arrange two back to back and expose one or the other to view; or I might employ three or more arranged in a polygonal form, in plan view and adapted to revolve about a suitable standard.

I do not wish to be limited to the exact details of construction herein disclosed, as slight variations may be made in the same in the practical manufacturing of the device without departing from the spirit of my invention.

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

1. The combination, with the frame, of block-supports, blocks movably mounted on said

supports, the blocks on each support having a determinate relative size in respect to the blocks of another support proportionate to the values they respectively represent, and an indicator extending across said frame and block-supports, marking equal distances on said block-supports and movable longitudinally of said supports, substantially as described.

2. The combination, with the frame, horizontal block-supports, and blocks movably mounted on said supports, of an indicator extending across said frame and block-supports movable in respect to said frame longitudinally of said supports and held in a vertical position by gravity, substantially as described.

3. The combination, with the main frame, horizontal block-supports, and movable blocks mounted on said supports, of the sliding supporting-plate, the movable indicator secured thereto, and the weight secured to the indicator, substantially as described.

4. The combination, with the main frame provided with slots, the horizontal block-supports, and movable blocks mounted on said supports, of the movable vertical indicator engaging the slots of said frame, the movable supporting-plate, and the weights, substantially as described.

5. The combination, with the main frame provided with one or more fractional scales, of the block-supports, the blocks movably mounted on said supports, the blocks on one support having a determinate relative size in respect to the blocks of another support proportionate to the values they respectively represent, and an indicator extending at right angles across said scales and block-supports, and movable longitudinally of said block-supports, substantially as described.

6. The combination, with the supporting-frame, the block-supports, movable blocks mounted on said supports and the movable gravity-indicator, of supports for said frame provided with adjusting devices whereby said indicator may be maintained in a position at right angles to the block-supports, substantially as described.

7. The combination, with the frame having a decimal scale thereon, of the block-supports, the blocks movably mounted on said supports, said blocks representing a unit and common fractions of a unit, the blocks on the different supports varying in size in proportion to the values they respectively represent, and the movable indicator extending across said scale and the block-supports, substantially as described.

8. The combination, with the main frame provided with one or more fractional scales, of the block-supports parallel to said scales, blocks representing fractions of said scale or scales movably mounted on said block-supports, the blocks of each support having a determinate relative size in respect to the block of another support proportionate to the relation of the fractions of said scales which they respectively represent, and a movable indicator extending at right angles across said scales and block-supports, and marking equal distances on the same, substantially as described.

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

JAMES DENISON.

Witnesses:
JESSIE D. KINGSBERY,
G. A. TAUBUSCHMIDT.