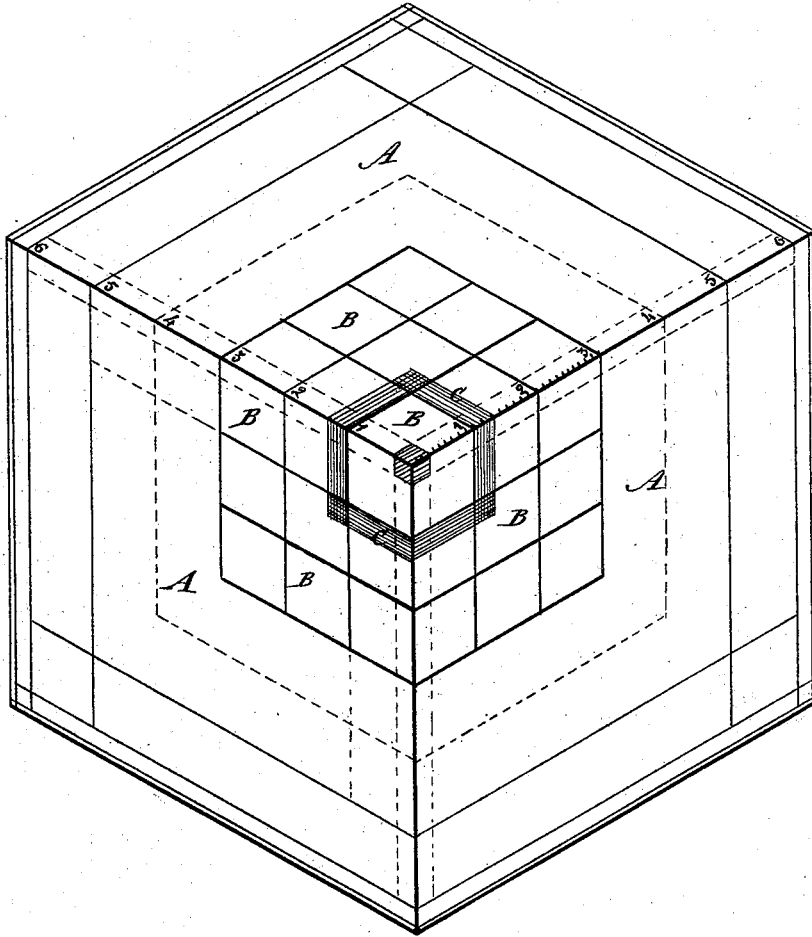## J. R. DAVIS.
Device for Teaching Involution and Evolution.

No. 209,385.   Patented Oct. 29, 1878.

WITNESSES:

C. Neveux

C. Sedgwick

INVENTOR:

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BY Munn & Co

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UNITED STATES PATENT OFFICE.

JOHN R. DAVIS, OF INLAND, OHIO.

IMPROVEMENT IN DEVICES FOR TEACHING INVOLUTION AND EVOLUTION.

To all whom it may concern:

Be it known that I, JOHN R. DAVIS, of Inland, in the county of Summit and State of Ohio, have invented a new and Improved Block for Demonstrating Powers and Roots, of which the following is a specification:

The accompanying drawing represents a perspective view of my improved block for demonstrating square and cube roots.

The object of this invention is to furnish an improved device or block for the purpose of illustrating the extraction of roots of numbers to an indefinite number of places, and also the involution of any number to any power. The block also admits the demonstrating of roots and powers of proper or improper fractions, common or decimal, and admits in simple manner the explanation of the different steps in extracting roots or involving powers from numbers.

The invention consists of a large graduated block of suitable size, being graduated at the edges in tenths or hundredths, and recessed at one corner for a number of smaller cubes that are provided with colored bands.

In the drawing, A represents a large block of suitable size, that is graduated along the upper edges, and provided with a cubical recess at one corner for the purpose of placing therein a corresponding number of smaller cubic blocks, B, that fill up the space cut out for the same.

The outer edges of the smaller blocks may also be graduated, and some of them arranged with colored and graduated bands C, as shown in the drawing.

The small blocks serve in the first place for simplifying the involution to any power of any number—as, for instance, by making one of the cubes equal to 2^3 units, then two cubes $= 2^4 = 16$; four cubes $= 2^5 = 32$; eight cubes $= 2^6 = 64$; sixty-four cubes $= 2^9 = 512$, &c.

By making one of the small cubes equal to 3^3 units $= 3 \times 3 \times 3 = 27$, we obtain a new series: three cubes $= 3^4 = 81$; nine cubes $= 3^5 = 243$; twenty-seven cubes $= 3^6 = 729$, &c.

In this manner any power of any number may be demonstrated clearly by means of the blocks, and thereby involution taught in the manner of object-teaching.

The colored bands C are intended to be used, in connection with the small corner cube, for the purpose of illustrating the involution or evolution to the second or third degree of any number, or of roots from 1 to 1,000 or $\frac{1}{10000}$, and from one to any number of places.

If, for instance, one inch $=$ one unit of tens, or $=$ ten units, then ten inches $=$ one hundred units, (line;) 1^2 inch $= 10^2 = 100$, and 1^3 inch $= 10^3 = 1,000$; then for 1.3^2 inch, 0.3^2 inch is necessary to complete the face of a square.

To represent 1.3^3 inch $= 1.3^2$ inch $\times 1.3$, the colored bands have to be added to the one-inch cube at the corner, which they complete, so as to illustrate 1.3^3 inch.

The colored bands are designed to aid thus in determining the size of the fractional addition, &c.

In the same manner other additions can be made up to two inches dimensions. Then, by adding another block, it makes three inches $= 30$, four inches $= 40$, five inches $= 50$, &c., the powers being explained from 1 to 100 in a ten-inch block, and the roots by inversion according to the formula 1.3 inch $= \sqrt[3]{1.69 \times 1.3}$, (for cubes.)

The block, either the one or ten inch, may be made to represent any number from any one power of ten to any power above, as well as the same number decreased by ten or any power of ten, so as to represent the evolution or involution to second or more degrees of number, ranging from 1 to 100,000,000 or $\frac{1}{100000000}$, or to any number.

The faces of the cube or cubes are intended to illustrate squares in analogous manner to the cubical demonstration.

The colored bands are intended to represent and more easily illustrate the squares and cubes of additions.

My improved block may thus be employed to impart to the pupils in the manner of object-teaching the principles underlying the involution of numbers to any power or the evolution of roots from numbers in an easy and readily-comprehended manner, while it also facilitates the work of the teachers.

By constructing the block on the metric scale and graduating the edges accordingly it may be made use of to explain the metric system, as a cubic decimeter is equal to one liter, and the space thereof filled with water at a certain temperature equal to one kilogram, and so on, illustrating thus the entire metric system of weights and measures.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

An apparatus or block for demonstrating powers and roots, consisting of a main block with corner recess and graduated edges, and a series of cubical blocks fitted into the corner recess of the main block, some of the blocks being arranged with colored bands along the edges, substantially as and for the purpose set forth.

JOHN R. DAVIS.

Witnesses:
    MARION J. GRABLE,
    ELKANAH BENDER.