R. R. CALKINS.

PUZZLE-BLOCKS.

No. 181,637. Patented Aug. 29, 1876.

Fig. 1.

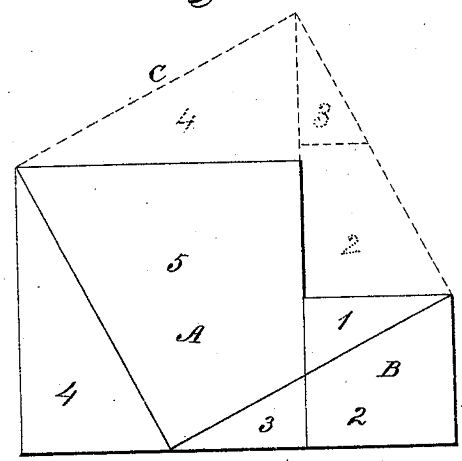


Fig. 2.

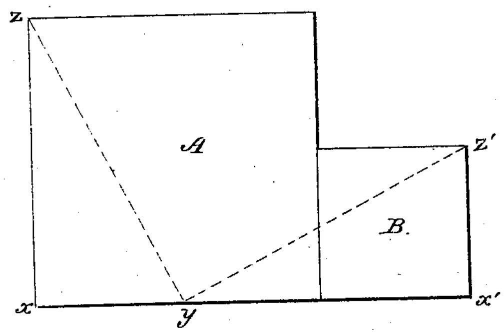
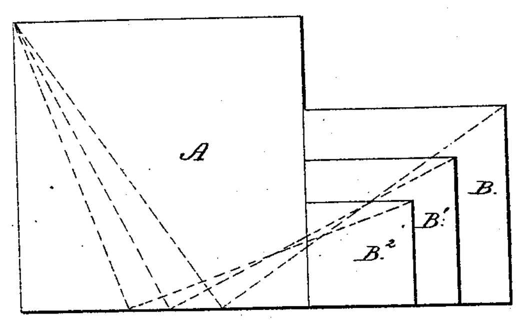


Fig. 3.



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RIPLEY R. CALKINS, OF ST. JOSEPH, MISSOURI.

IMPROVEMENT IN PUZZLE-BLOCKS.

Specification forming part of Letters Patent No. **181,637**, dated August 29, 1876; application filed August 7, 1876.

To all whom it may concern:

Be it known that I, RIPLEY R. CALKINS, of St. Joseph, in the county of Buchanan and State of Missouri, have invented a new and Improved Geometrical Puzzle; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming part of this specification, in which—

Figure 1 is a plan view of the blocks arranged for the two squares upon the base and altitude of a right-angle triangle, with the square upon the hypotenuse constructed therefrom in dotted lines. Figs. 2 and 3 are diagrams illustrating the method of cutting two square blocks of any relative size, so as to form the five blocks.

The object of my invention is to provide a mechanical or material verification of the geometrical problem "that the square described upon the hypotenuse of a right-angle triangle is equal to the sum of the squares upon the other two sides." To this end my invention consists in the combination of five blocks, three of which are in the shape of similar right-angle triangles, one in the shape of a trapezium, and the other in the shape of a trapezoid, which blocks are adapted to be put together to form a single square upon the hypotenuse of a right-angle triangle, or to be transferred and arranged in two squares upon the other two sides, the same to be used in schools for purposes of illustration, or to be used as a puzzle for general amusement.

In the accompanying drawing, 1 2 3 4 5 represent the five blocks, which may be made of wood, metal, ivory, rubber, or other suitable material. Of these blocks, 1, 3, and 4 are similar right-angle triangles—that is to say, right-angle triangles having all of these angles equal and their sides parallel—while 2 is a trapezoid, or a quadrilateral figure having but two of its sides parallel, and 5 a trapezium, or a quadrilateral figure having none of its sides parallel. These blocks will vary in size and shape for the different sizes and shapes of right-angle triangles upon which they are to be arranged, but will always maintain their character as trapezium, trapezoid, and three similar right-angle triangles, and will be capable of illustrating the proposition. Thus in Fig. 1 the two squares A and B represent the squares constructed upon the base and altitude of a right-angle triangle, while the larger square C (shown in dotted lines) represents the square constructed upon the hypotenuse, which is equal to the sum of the squares A and B, as proven by the following: The blocks 1 and 5, being in common to both the dotted square C and the two smaller squares B A, respectively, remain fixed. Triangle 4 is then transferred to and coincides with the dotted space 4, trapezoid 2 is transferred and coincides with dotted space 2, and triangle 3 is transferred and coincides with the dotted space 3, thus completing or fulfilling the square upon the hypotenuse from the irregular disintegrated fragments of the squares constructed upon the base and altitude of the same right-angle triangle, and thereby illustrating in a concrete form, and verifying mechanically, the truth of the proposition above referred to.

In cutting my blocks the same can readily be accomplished in an accurate and rapid manner without the use of patterns, and in a manner also to produce variable sizes or shapes of the three geometric forms. To do this, two squares of any absolute or relative size are taken and placed adjacent to each other, and with one of their sides in alignment, so as to form one hundred and eighty degrees, as shown in Fig. 2. Upon their aligned sides x x', as a base, a point, y, is established, which may be determined in two ways: first, by measuring from x the distance of one side of the small square, which will be x y, or by measuring from x' the distance of the side of the large square, which will be x' y, either and both of which always determine the point y. Now, if lines be drawn to the extreme uppermost and outermost angles z z', these lines will, when the squares are placed as above, always indicate the line of cut which will divide the two squares into the five blocks capable of effecting the illustration before given.

The point y varies in its position on the line x x' according to the relative size of the squares. Thus the greater the difference in size between the same the more nearly will the point y approach x, as illustrated in Fig. 3, and vice versa. The angle z y z' will be a right angle, and the sides z y and z' y will be two of the sides of the square constructed upon the hypotenuse.

By means of the blocks as constructed and variably arranged, it will be seen that a teacher may, in a concrete form, give an abstract demonstration of the proposition referred to, while he, at the same time, secures the ready attention and interest of the scholar, thereby reaching his understanding.

I am aware of the fact that it is not new to divide a square into aliquot parts, so that they may be capable of arrangement to form two perfect squares, incidental to which is the idea of illustrating the same proposition; but in this case the parts are equal squares or triangles, and present nothing more than a calculation by commensuration, or a mere aggregation of equal or similar parts, and goes no further than the arithmetical truth that the square of 10 is equal to the sums of the squares of 6 and 8, respectively. My invention, it will be seen, demonstrates the proposition with the smallest possible number of parts, which is not a mere aggregation of similar and equal parts, but an arrangement of irregular parts founded upon a fixed principle, which partakes of the nature of a puzzle, and is correspondingly interesting.

Incidental to my invention, as hereinbefore described, it may be added that a great variety of other geometric forms may be produced besides those for which it was more particularly invented.

Having thus described my invention, what I claim as new is—

The combination of the five blocks, consisting, respectively, of a trapezium, trapezoid, and three similar right-angle triangles, variable in their arrangement, as described, for the purpose of mechanically verifying the geometrical proposition, as set forth.

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