(Model.)

A. HADLOCK.

PUZZLE.

No. 551,278. Patented Dec. 10, 1895.

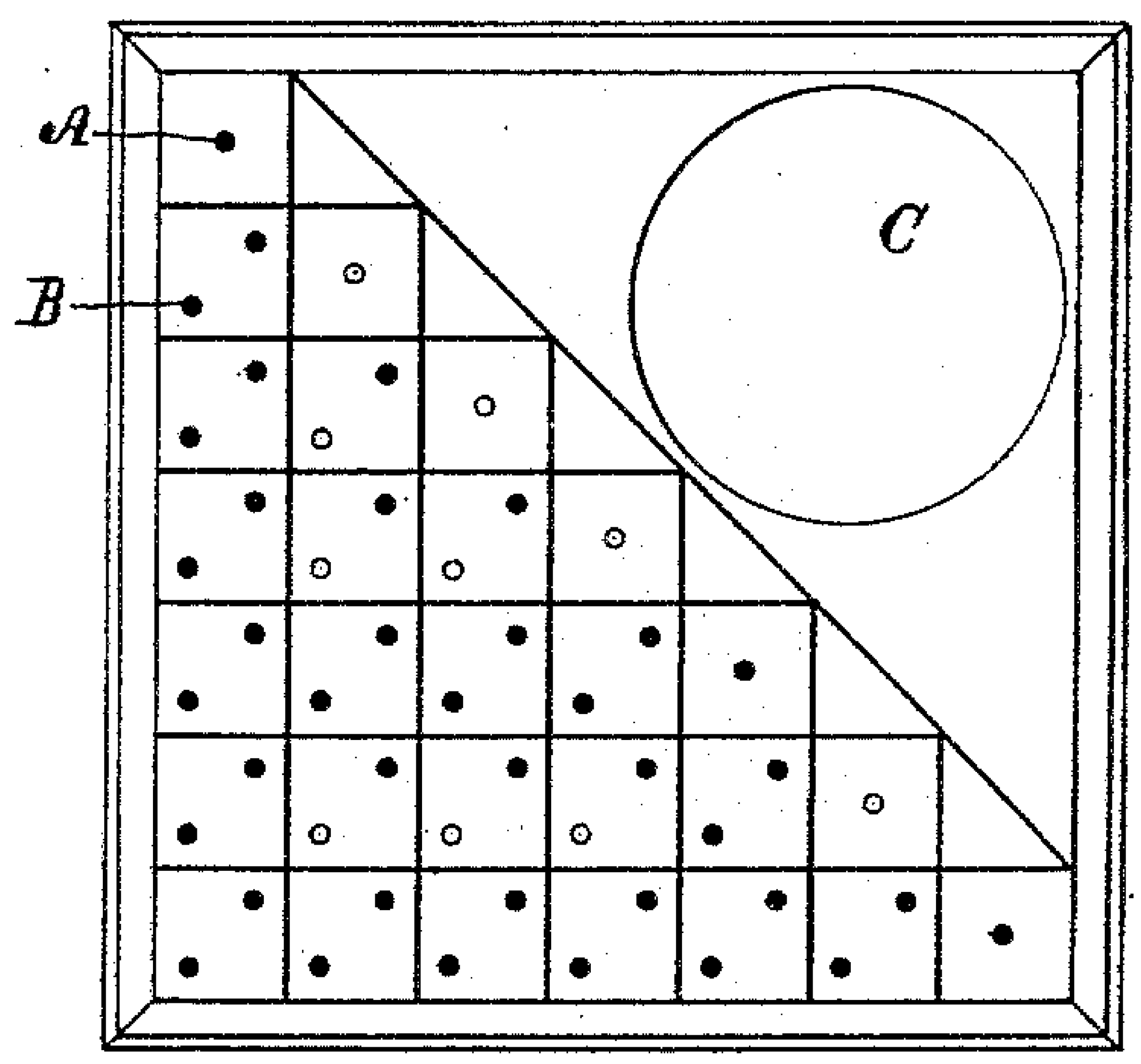

Fig.1

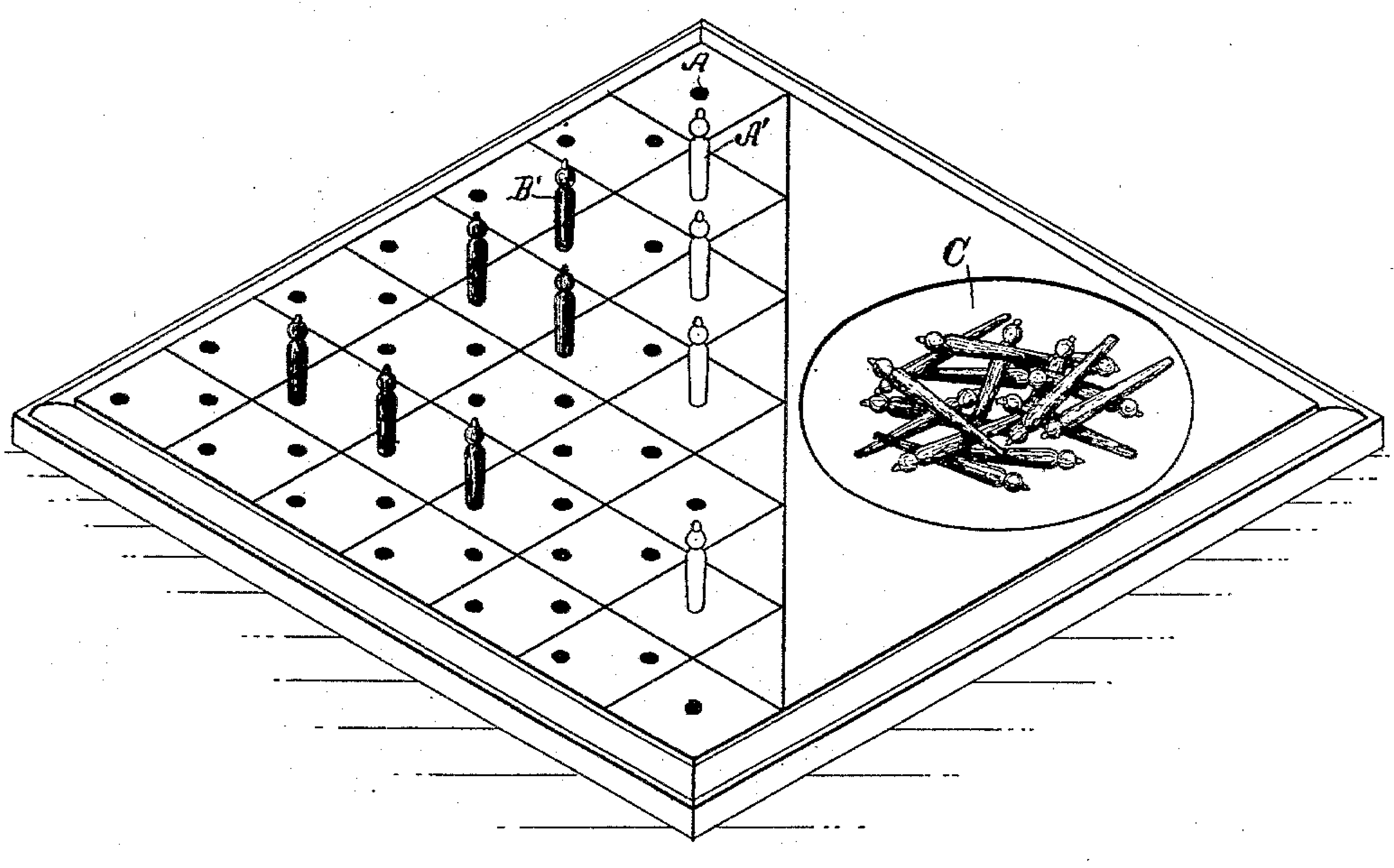

Fig 2

Witnesses:

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Att'y.

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UNITED STATES PATENT OFFICE.

ALEXANDER HADLOCK, OF KALAMAZOO, MICHIGAN, ASSIGNOR OF ONE-HALF TO FREDERICK W. WILCOX, OF SAME PLACE.

PUZZLE.

SPECIFICATION forming part of Letters Patent No. 551,278, dated December 10, 1895.

Application filed June 26, 1894. Serial No. 515,714. (Model.)

To all whom it may concern:

Be it known that I, ALEXANDER HADLOCK, a citizen of the United States, residing at the city of Kalamazoo, in the county of Kalamazoo and State of Michigan, have invented a certain new and useful Puzzle, of which the following is a specification.

My invention relates to puzzles.

The object of my invention is to provide a puzzle that is neat, convenient, attractive, and yet very difficult of solution. I accomplish this by the device shown in the accompanying drawings, in which—

Figure 1 is a top plan view of my invention. Fig. 2 is a view of the same in perspective.

The puzzle consists of a board in which are numerous perforations or holes for the reception of pegs. Fig. 1 shows these holes, in which figure the holes of the longest diagonal are marked "A" and the remaining holes are marked "B."

Fig. 2 shows a number of the pegs inserted according to a rule hereinafter explained.

C in Figs. 1 and 2 is a receptacle for holding the pegs. The lower left-hand portion of the board, as shown in Fig. 1, is divided into squares. These squares are made in columns, and are in rows also transverse to the columns. In the top row there is one square, in the next to the top row two, and the next row to that three, and so on down to the bottom row, in which there are seven squares. This formation, it will be noted, puts the squares in line both vertically, horizontally, and diagonally, there being seven squares on the vertical side and on the horizontal side, and, of course, seven squares on the longest diagonal.

In each of the squares on the longest diagonal is a hole A for a pin. In the other squares (other than those in the longest diagonal) two holes B are made in each square. In the longest diagonal are placed four white pins A′ in any order. These white pins or pegs I call "master-pegs," because they control the position of the pegs in the remaining part of the field. Having placed four white master-pegs in the longest diagonal, the other pegs are placed by beginning at the top of the column at which the topmost master-peg stands and passing down that column to the row opposite the next lower master-peg, when one, and only one, of the black pins B′ is placed in that square. Passing down the same column to the row on which the third master-peg is situated, the second black pin B′ is placed, and passing on down the same column farther to the row in which the bottom master-peg is situated another pin B′ is located. Then beginning at the top of the column in which the second master-peg A′ is located, go down the column to the row in which the third master-peg is situated and place one, and only one, of the black pegs; and passing still farther down the column to the row in which the bottom master-peg is situated place one, and only one, of the black pins B′. Then beginning at the top of the column of the third master-peg pass down that column to the row in which the bottom master-peg is placed and place one, and only one, of the black pegs. It will be seen that six of the black pegs have been inserted. When this operation is completed the position of one or more of the master-pegs A′ is changed (always keeping them in the longest diagonal) and six more pegs B′ are set in like manner. After each six have been placed, placing only one in each square at each time, the master-pegs A′ are again changed and the process continued until all the holes in all of the squares, except those in the longest diagonal, are filled with pins. If for any position of the master-pegs six black pins cannot be placed as directed before all the holes B have been filled the player is defeated and should try again.

I have shown this puzzle and described it specifically, pointing out a popular form of the same. By following simple rules the length of the diagonal and the number of squares in the puzzle can be varied at pleasure and the formula for constructing the puzzle where four master-pegs are used so that it shall involve the same principle of this puzzle and be capable of solution and yet meet the requirements of being difficult of solution and present another number of pins that will accomplish the same will be indicated by the result obtained from the following fraction formula—$\frac{n(n-1)}{4\times3}$—which should be reduced to its lowest terms, with the exception that the "3" must not be canceled into the "n." n in this instance represents the number of squares on each side of the triangle for this puzzle and in the longest diagonal. When the same is reduced to its lowest terms the denominator will always give the number of holes to be made in each square B to make the puzzle possible of solution and yet have the same principle of my invention.

My invention is a practical application of the solution of a difficult problem in mathematics, and the difficulty of the solution of the problem is brought into the puzzle where it will seem very simple but will at the same time be very difficult of solution. The formula I have given is correct for the solution of the same where four master-pegs are used.

It will be evident to any one that to place in this same puzzle any multiple of the number of holes indicated by the formula in each square is but to multiply the puzzle by that number and does not add materially to the puzzle. I have indicated the principle, as I said before, by which this same puzzle can be constructed with any number of squares on a side and state that it is immaterial what number of squares is used so long as it is determined in this way, of course the larger the number of squares the more difficult of ready solution the problem will be.

I desire to say further that this puzzle can be constructed in substantially the same way with a different number of master-pegs than four and the workings of the puzzle be carried out according to instructions, placing a pin at the crossing of the column of each master-peg with the rows of the lower master-pegs, and where the number of master-pegs is greater than two the full interest of the puzzle will still be maintained. The number of holes in each square can be determined arbitrarily. To determine the number of holes in each square in forming this puzzle when an equal number is desired, it will be necessary to substitute in the formula above given in place of the "4" in the denominator the number of master-pegs desired and in place of the "3" the number of master-pegs minus one (1). Otherwise the determination of the number of pins in each square outside the long diagonal will be the same. The formula for giving the number of pins or holes in each square will then read $\frac{n(n-1)}{n'(n'-1)}$, in which "n" is the number of squares on the long diagonal and "n'" is the number of master-pegs. In reducing this formula no factor of $(n'-1)$ should be canceled into n. When the formula is reduced to lowest terms subject to this restriction, the denominator will indicate the number of pins to each square outside the longest diagonal. To give a practical illustration of the same, we will suppose that it is desired to construct a puzzle having seven squares on its longest diagonal and have the number of master-pegs three. In the formula, substituting 7 for the n and substituting 3 for the n' we will have $\frac{7\times6}{3\times2}$. Canceling as directed the 2 and 3 below will cancel the 6 above and the fraction produced is $\frac{7}{1}$, indicating that but one hole is necessary in each square to make the puzzle according to these requirements.

It will be readily seen that the number of master-pegs must be less than the number of squares on each side of the puzzle in order to make it a puzzle and that the number of master-pegs must be greater than two (2) in order to make it a puzzle at all difficult of solution.

In the claims the term "column" will be considered to be the vertical line of squares and the term "row" the transverse line of squares.

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

1. In a puzzle the triangular group of squares arranged in columns and rows so that there are the same number of squares in the longest column and in the longest row and in the longest diagonal; a number of pegs greater than two, called "master pegs," to be placed in single holes in each of the squares of the longest diagonal and other pegs to be placed in holes in the remaining squares of the triangle at all of the intersections of the rows and columns of the master pegs, when they are shifted along the longest diagonal, the numerical relation of the holes of the squares in the longest diagonal to the holes in the remaining squares of the triangle being such that when the master pegs are shifted along the longest diagonal all the holes of all the remaining squares can be filled in the manner specified.

2. In a puzzle, a triangular group of squares arranged in columns and transverse rows, so that there shall be seven squares in the longest column, in the longest row and in the longest diagonal, the squares of the longest diagonal each containing one hole, all the remaining squares containing two holes; four pins called "master pegs" to be placed in the single holes of the longest diagonal, and different pegs to be placed in the remaining squares, substantially as described for the purpose specified.

3. In a puzzle, a triangular group of squares arranged in columns with "n" squares in the longest column, the longest row, and the longest diagonal; n' master pegs to be placed in the holes in said longest diagonal; and holes in each of the remaining squares of the group

determined by the denominator of the formula $\frac{n(n-1)}{n'(n'-1)}$ reduced to its lowest terms without canceling $(n'-1)$ or any other factor thereof into "n;" and pins for each of the holes not in the longest diagonal used in the same manner described, for the purpose specified.

In witness whereof I have hereunto set my hand and seal in the presence of two witnesses.

ALEXANDER HADLOCK. [L. S.]

Witnesses:
WALTER S. WOOD,
JOHN W. ADAMS.