No. 704,979. Patented July 15, 1902.

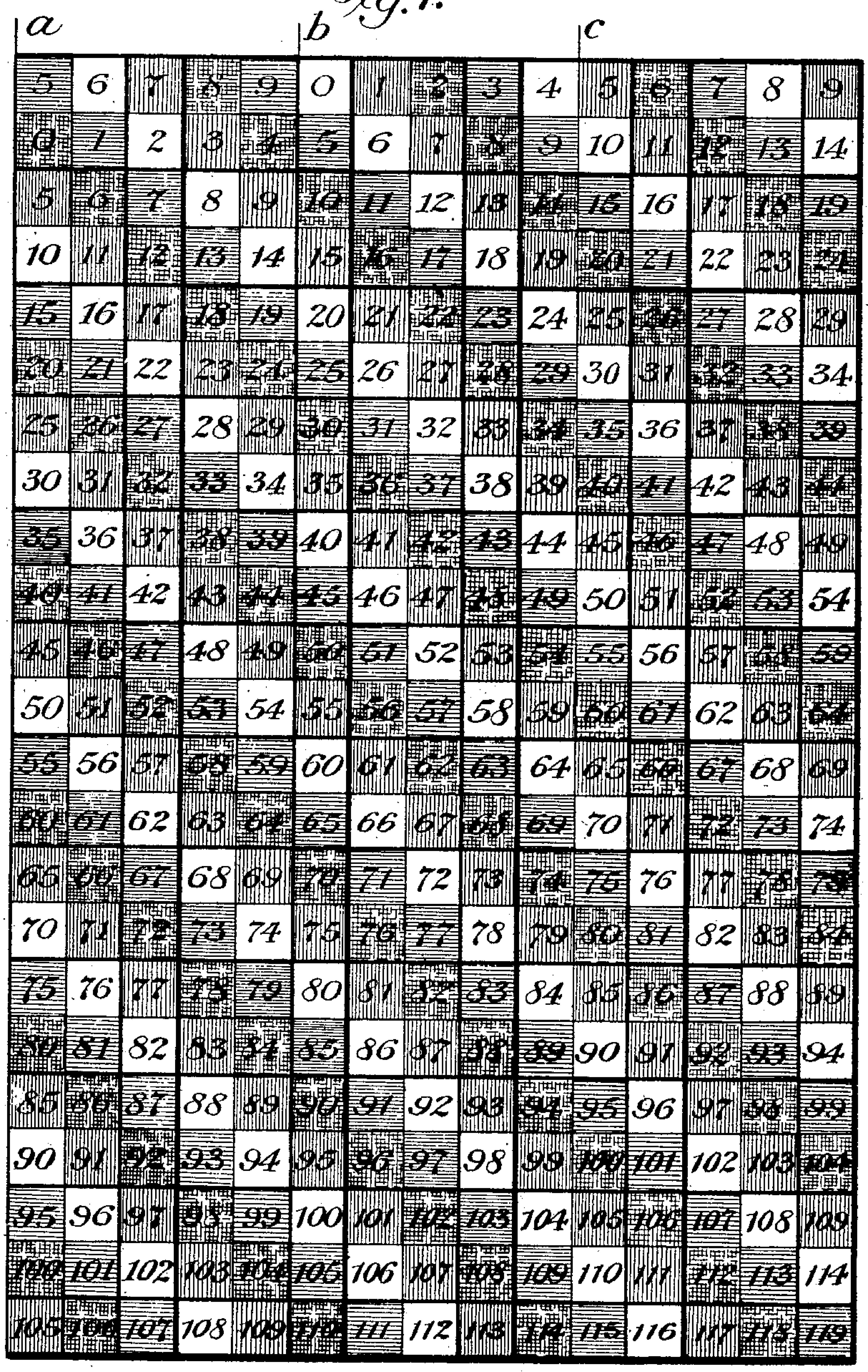
J. J. TERRAZAS.

DEVICE FOR TEACHING ARITHMETIC.

(Application filed June 3, 1901.)

(No Model.) 9 Sheets—Sheet 1.

Fig. 1.



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9 Sheets—Sheet 2.

Fig. 2.

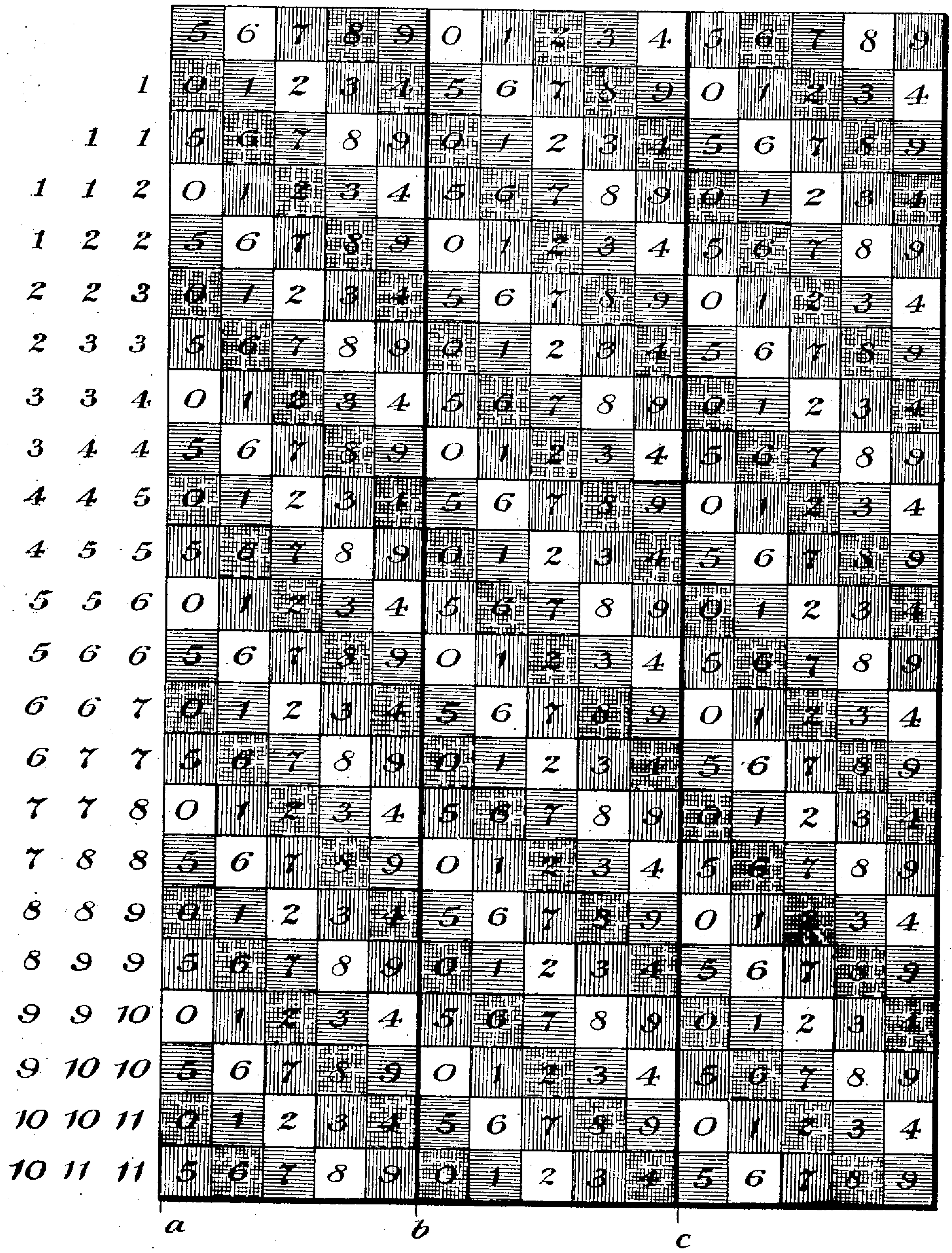

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Fig. 3.

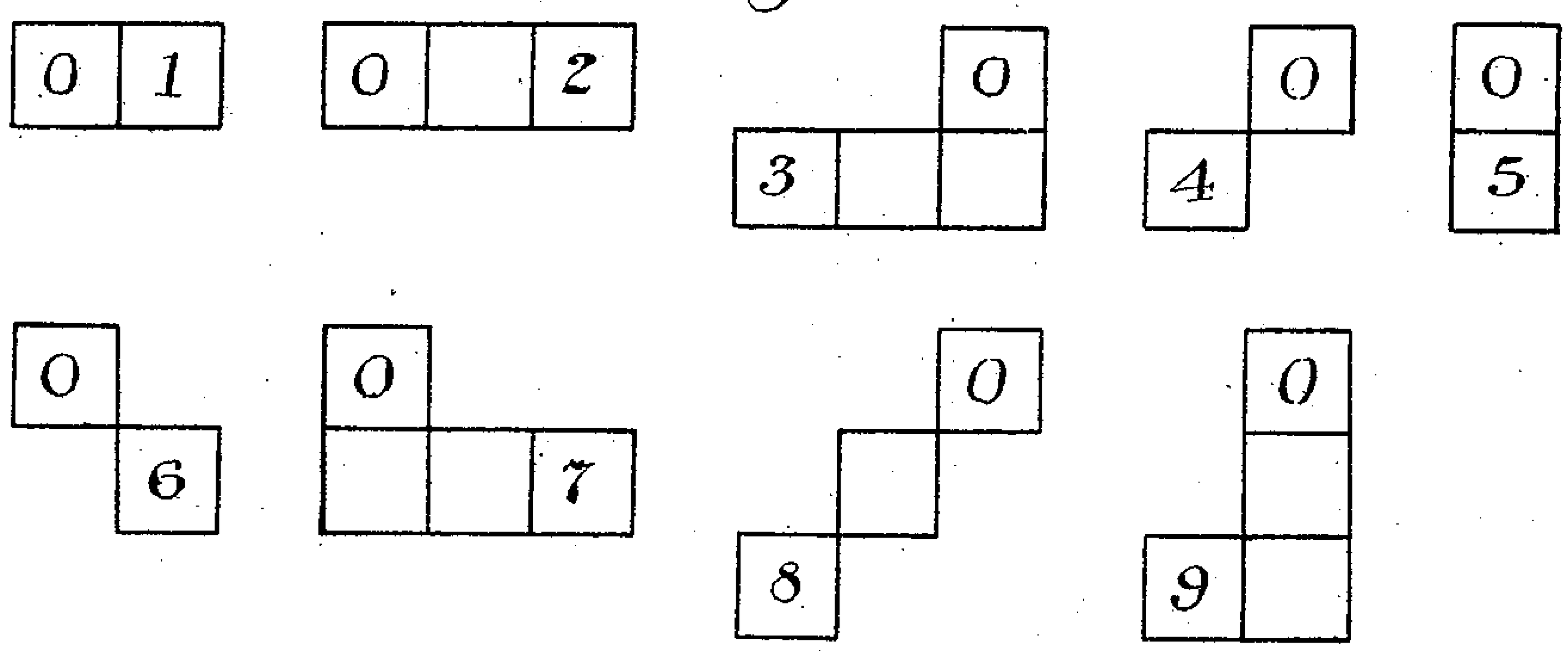


Fig. 5.

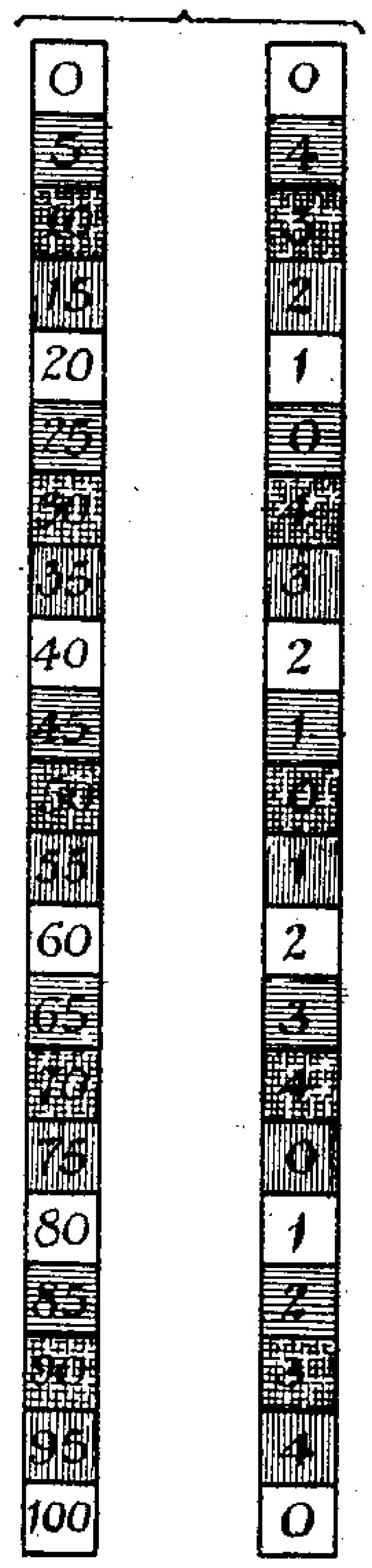
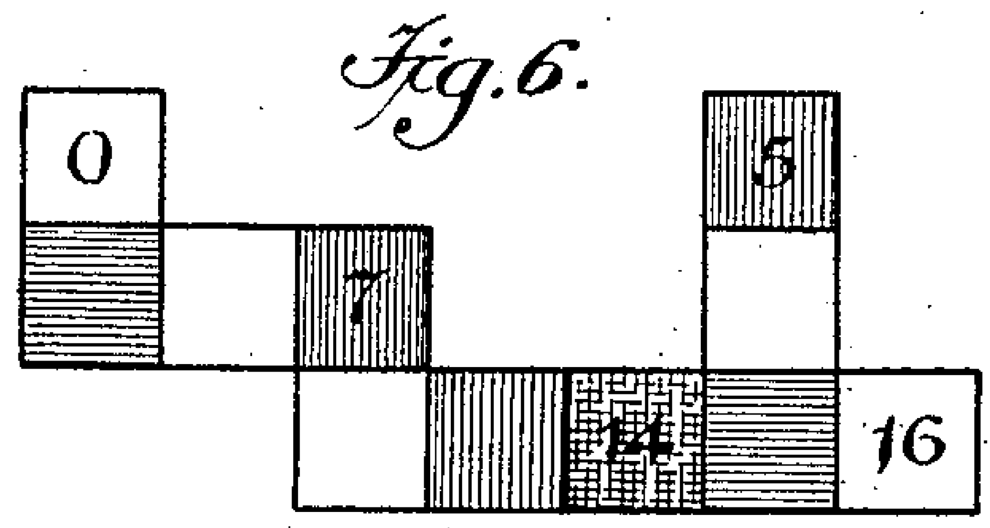


Fig. 6.



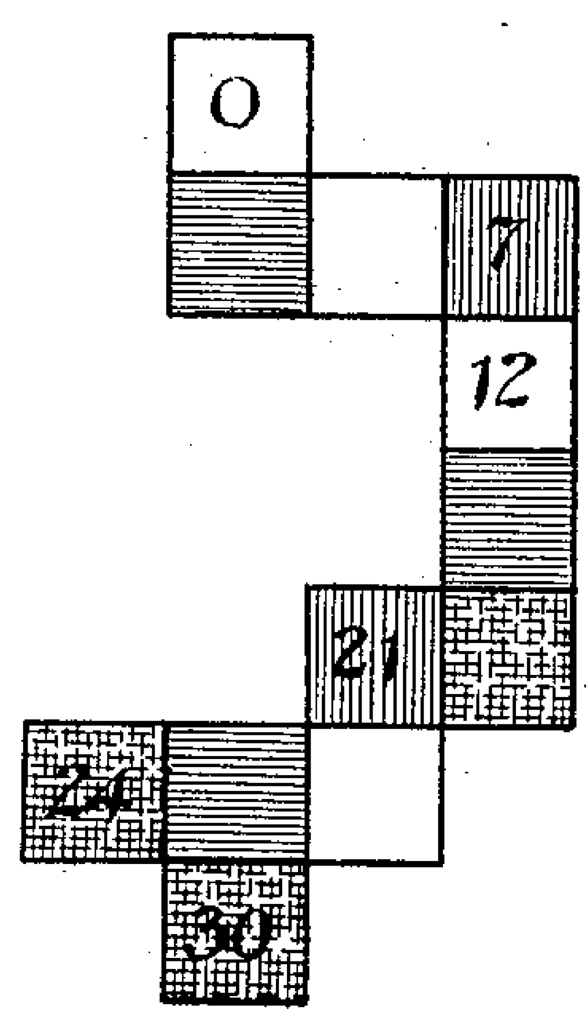


Fig. 7.

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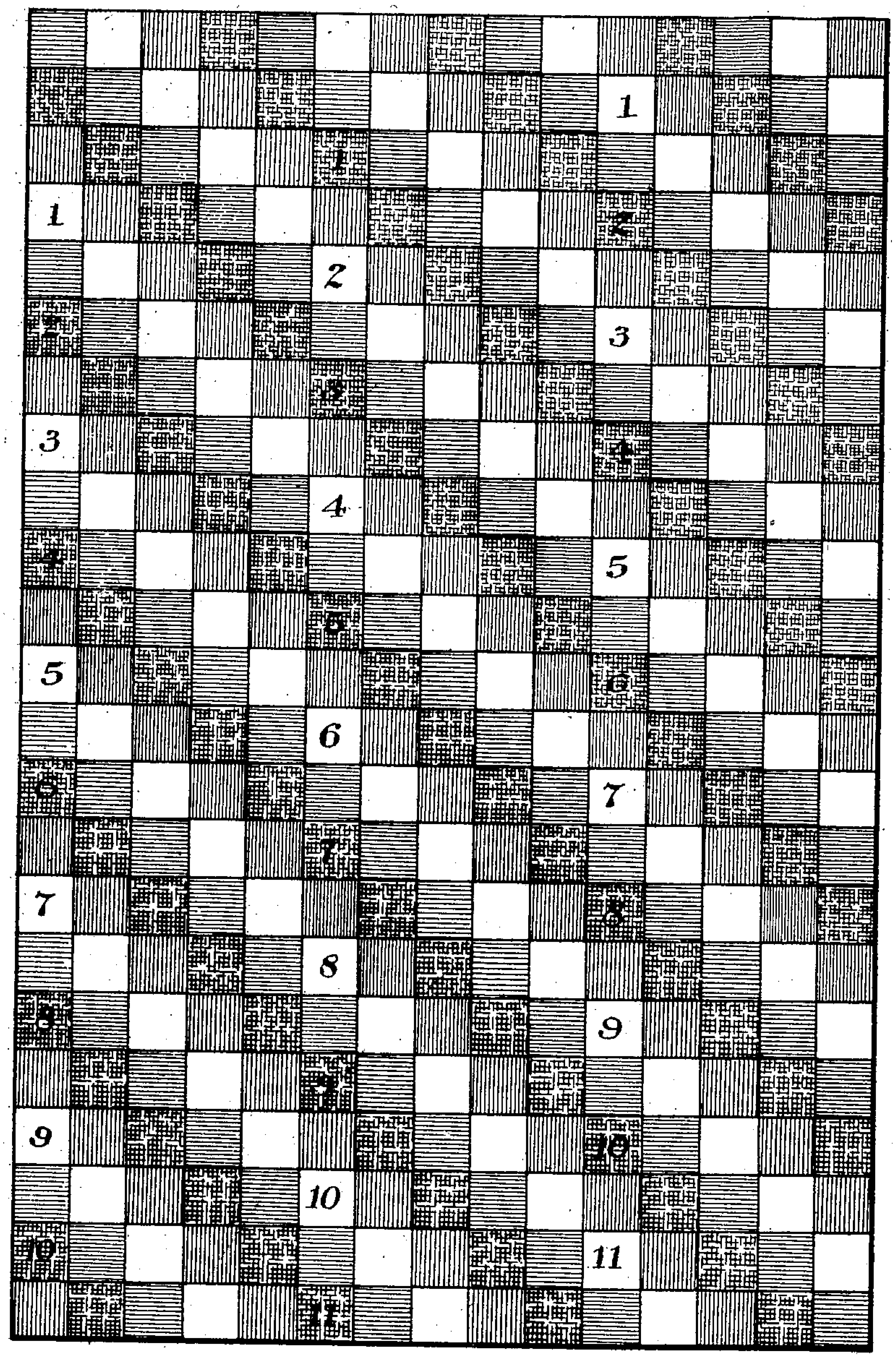
Fig. 4.



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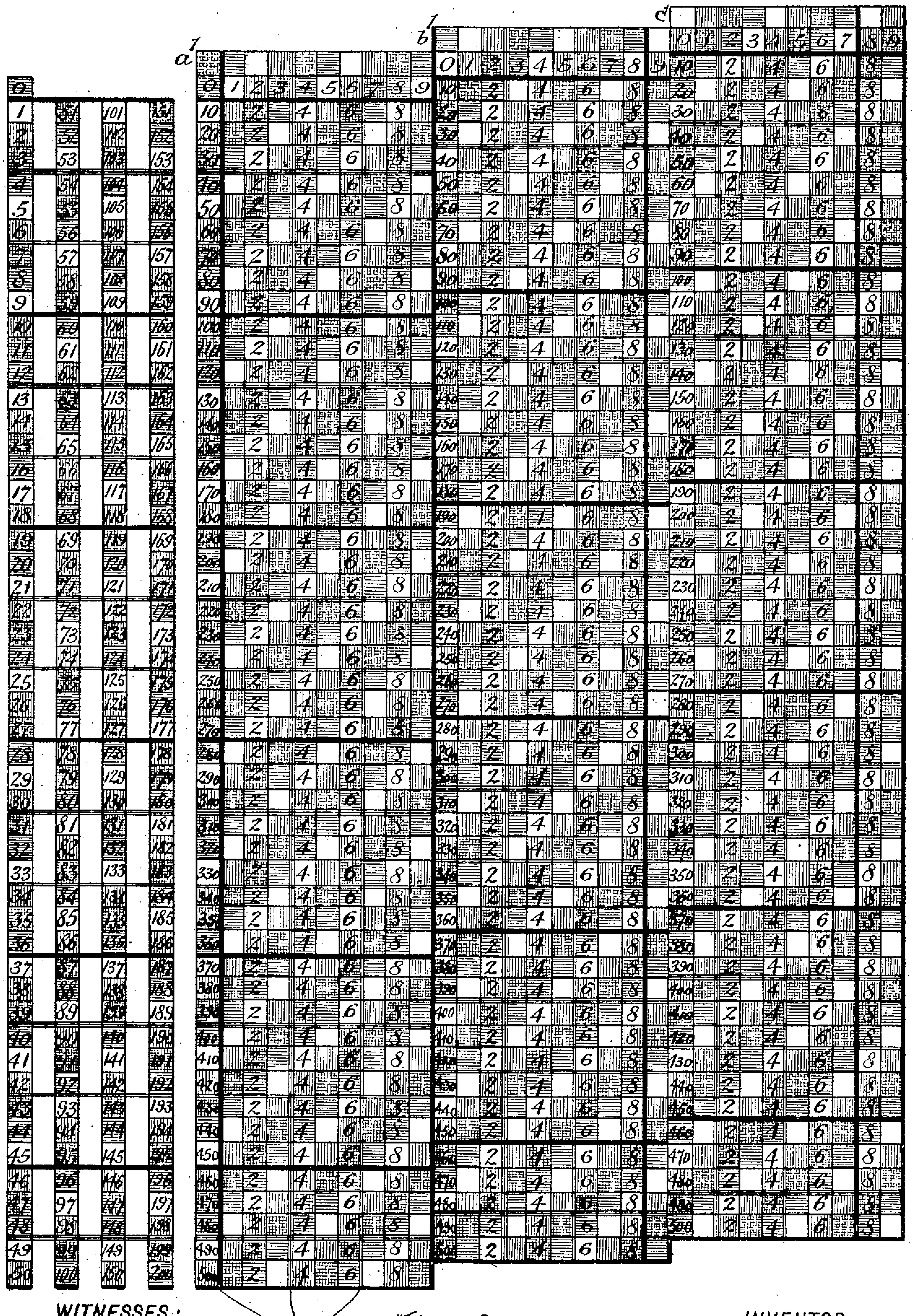

Fig. 8.

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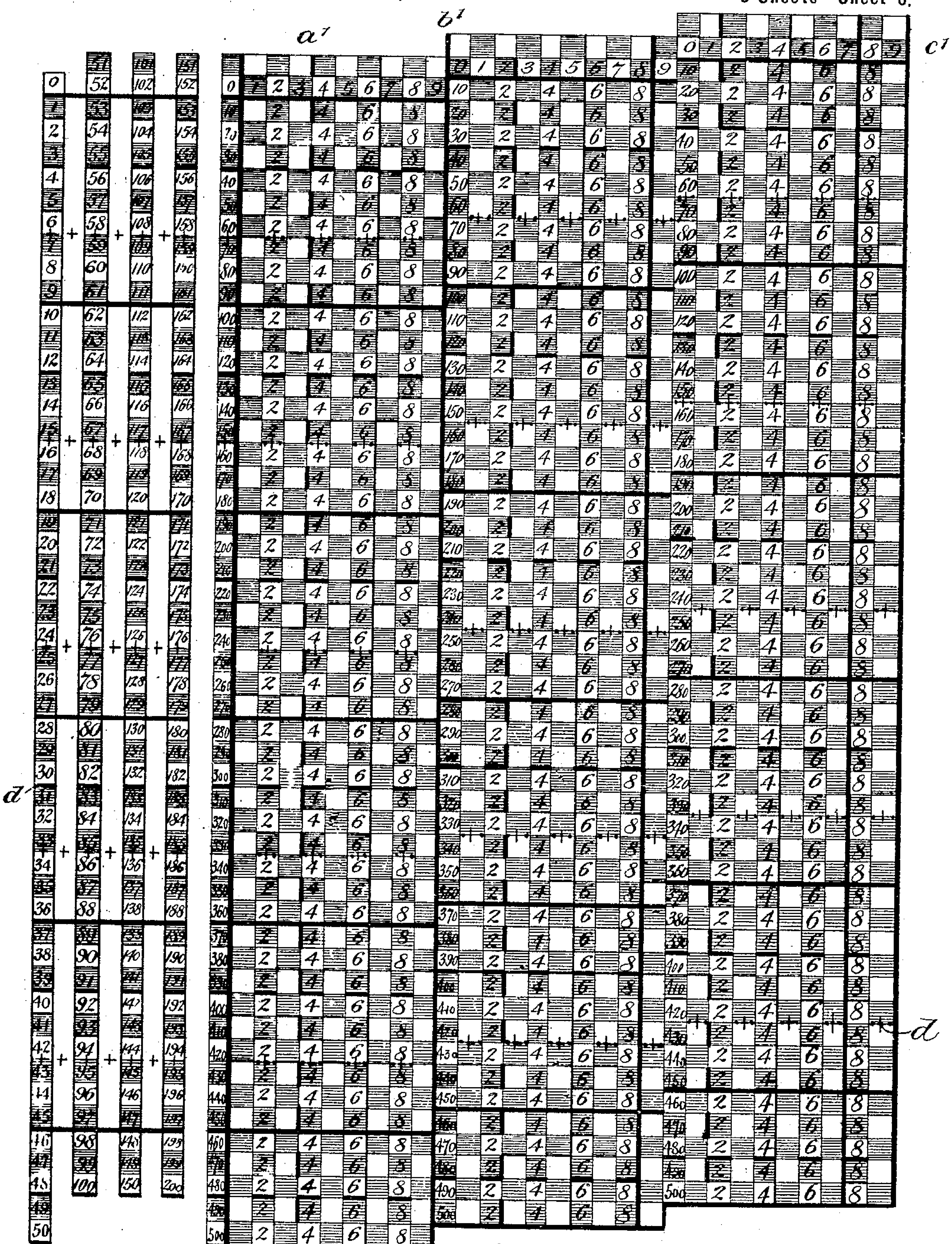

Fig. 9

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Fig. 11.

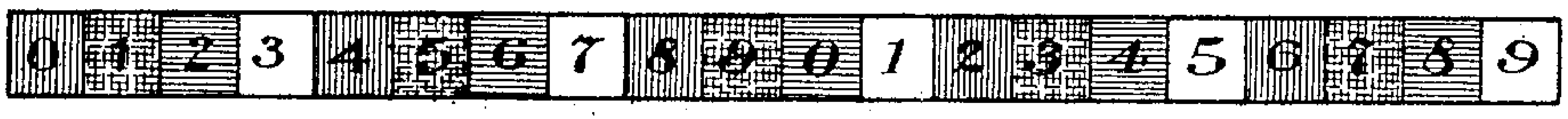

Fig. 10.

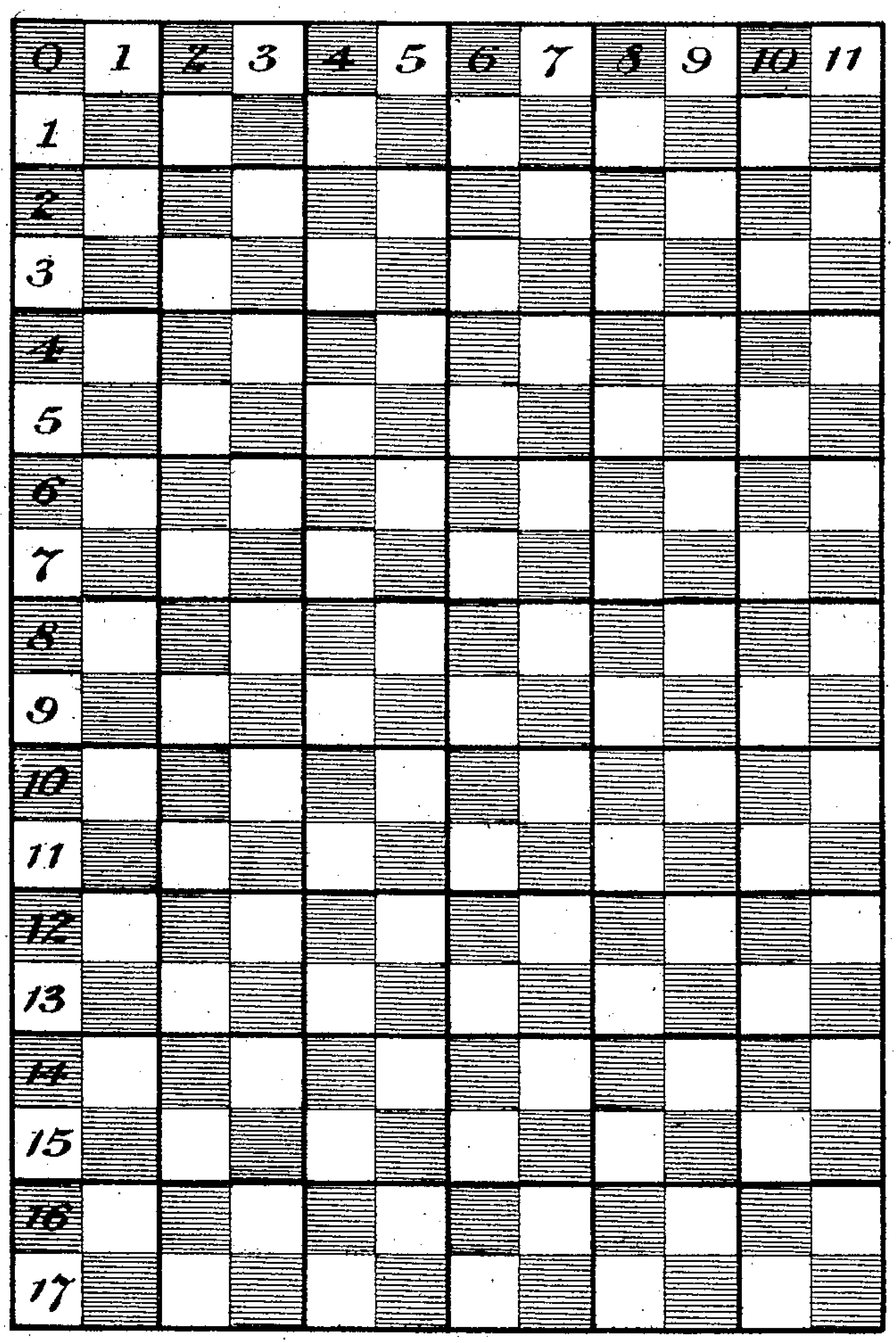

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Fig. 12.

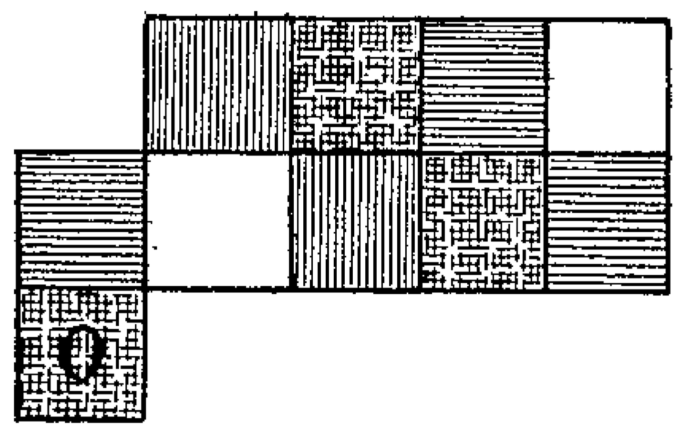


Fig. 13.

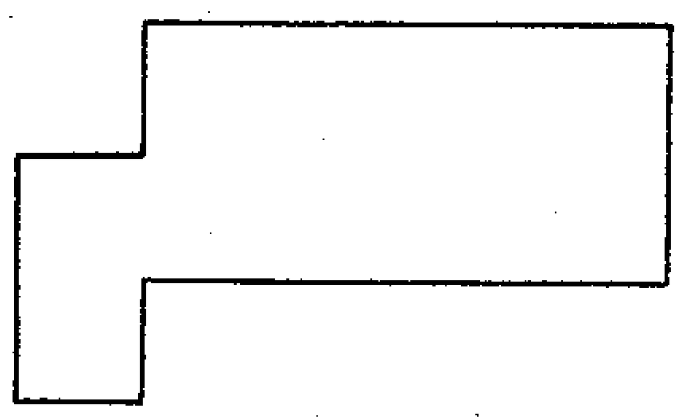
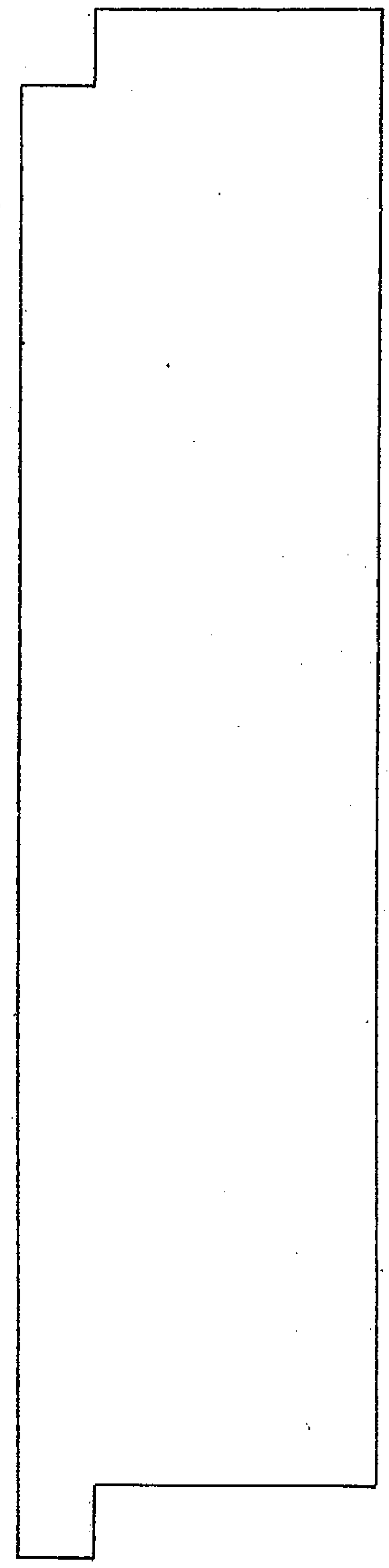


Fig. 14.



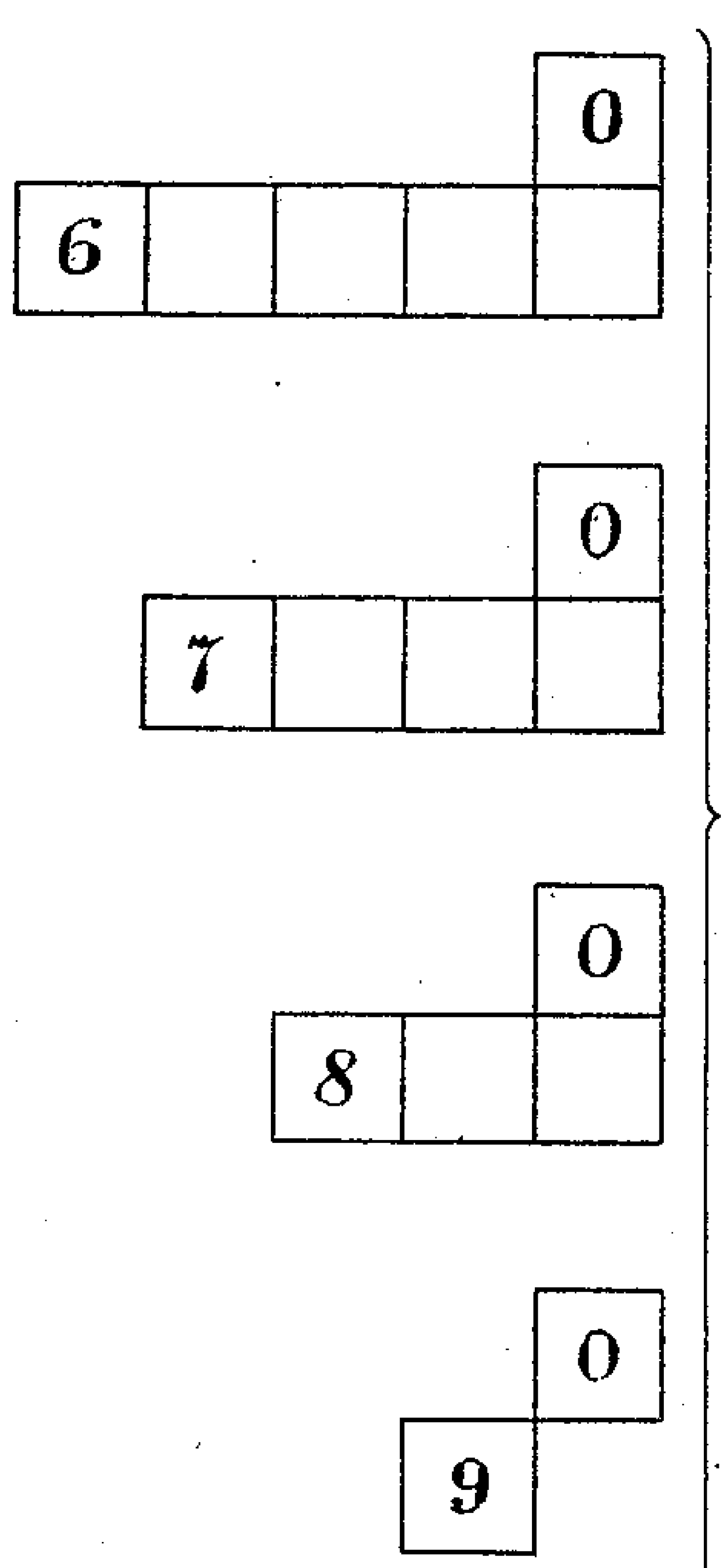


Fig. 17.

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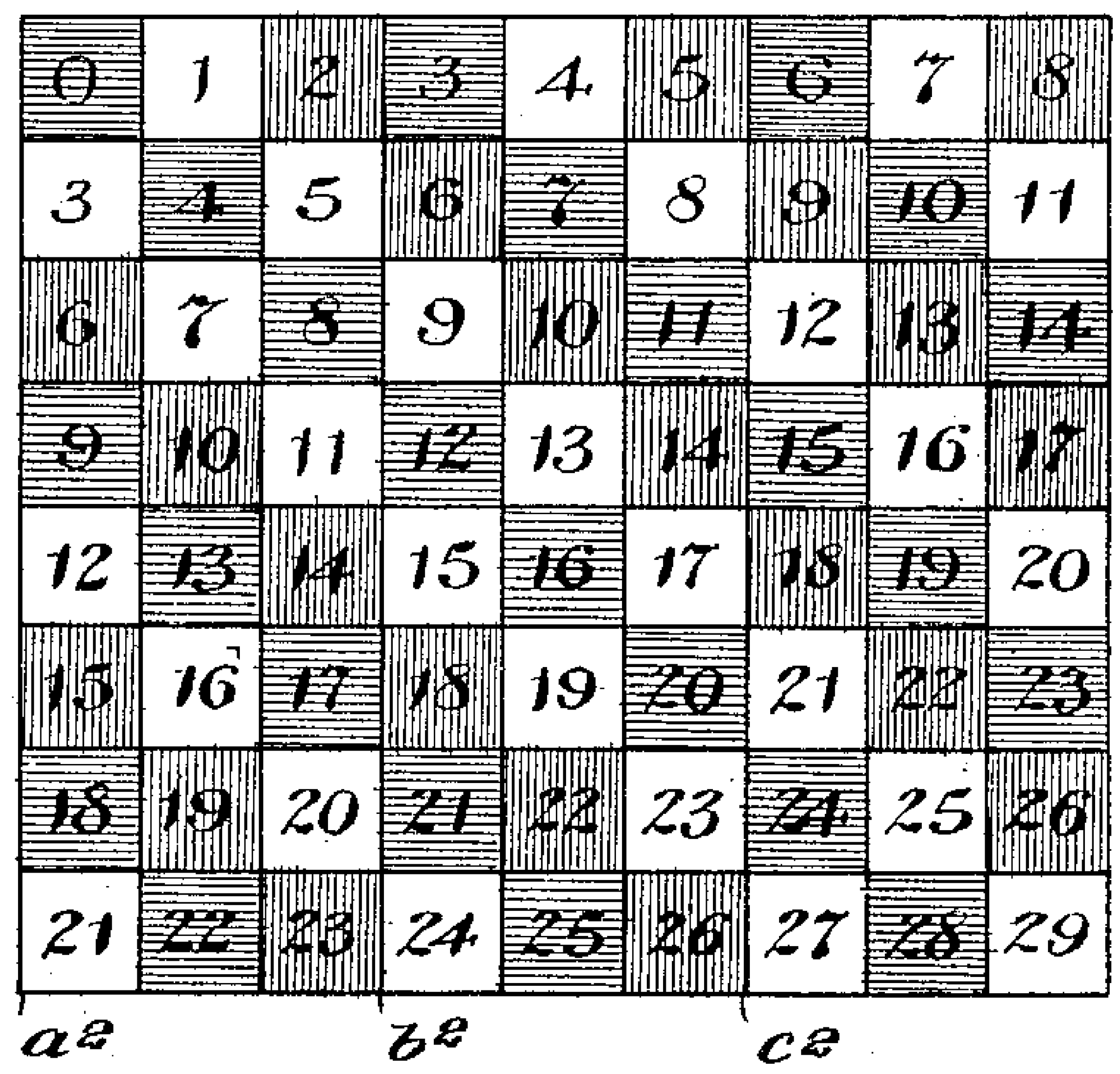

Fig. 15.

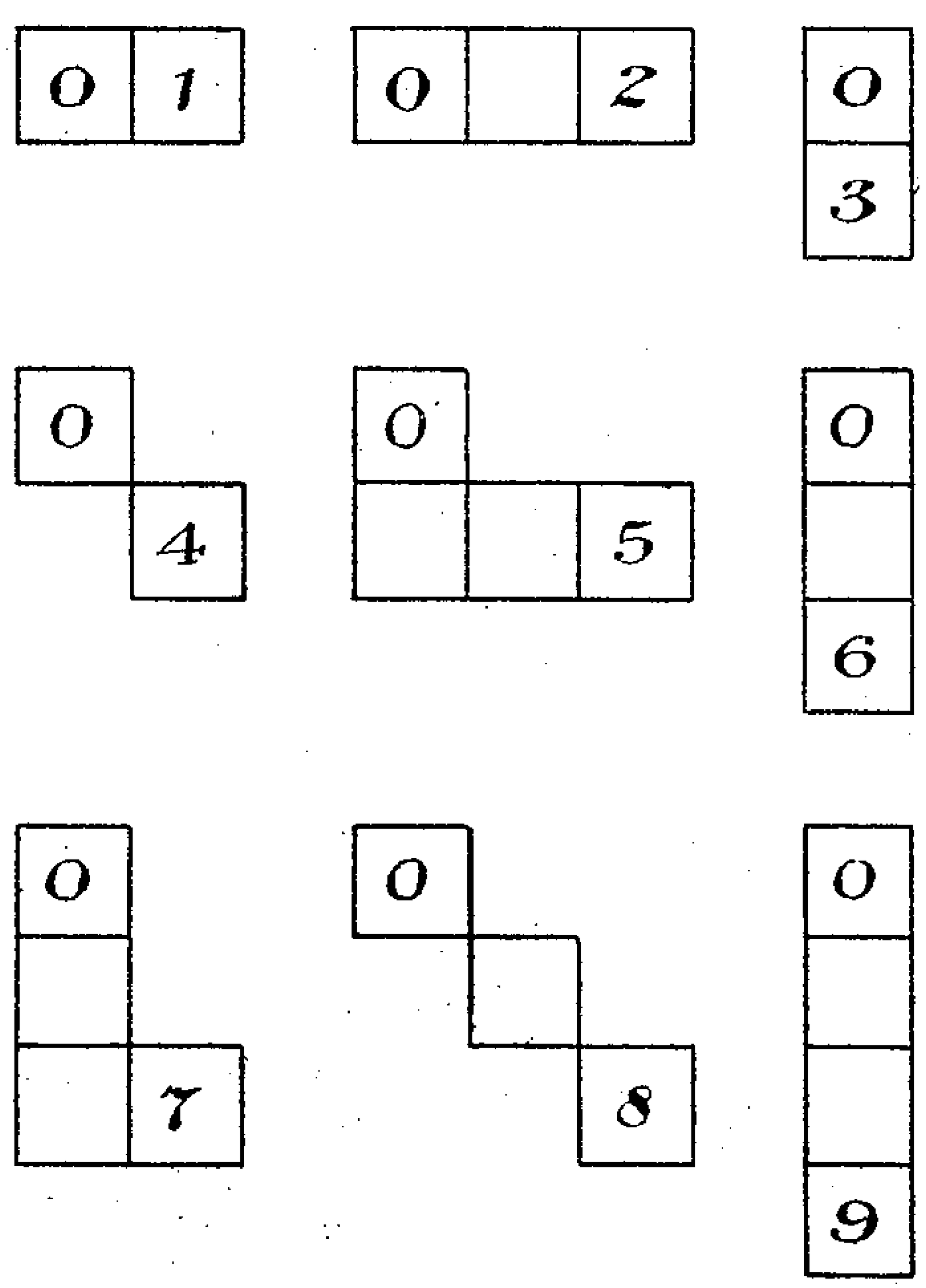

Fig. 16.

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UNITED STATES PATENT OFFICE.

JOSÉ JOAQUIN TERRAZAS, OF MEXICO, MEXICO.

DEVICE FOR TEACHING ARITHMETIC.

SPECIFICATION forming part of Letters Patent No. 704,979, dated July 15, 1902.

Application filed June 3, 1901. Serial No. 62,972. (No model.)

To all whom it may concern:

Be it known that I, JOSÉ JOAQUIN TERRAZAS, a citizen of the Republic of Mexico, and a resident of the city of Mexico, Mexico, have invented a new and Improved Device for Teaching Arithmetic, of which the following is a full, clear, and exact description.

My invention relates to means for teaching arithmetic, and has for its object to provide a simple device by the aid of which the operations of adding and subtracting may be readily performed in a mechanical way, thereby lessening mental labor and the chances of errors. The improved educational appliance also enables me to give pupils a concrete and readily-intelligible representation of the relative values of various numbers, and particularly of round numbers, such as ten or one hundred.

To this end my invention consists of certain tables and adjuncts, as will be fully described hereinafter and particularly pointed out in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figures 1, 2, 4, 8, 9, 10, and 15 are plans of various tables embodying my invention. Fig. 3 illustrates the movements to be performed in adding the several digits when using the tables shown in Figs. 1, 2, and 4. Fig. 5 is a plan of an auxiliary table for quick addition or subtraction. Figs. 6 and 7 are illustrations of certain examples hereinafter referred to. Fig. 11 is a table for adding or subtracting with a continuous movement for each of these two operations, as will be fully set forth. Figs. 12, 13, and 14 show the representations of "10" and "100" according to my invention. Fig. 16 illustrates the movements to be performed in adding the several digits when using the table shown in Fig. 15; and Fig. 17 illustrates the movements to be performed in adding the digits "6," "7," "8," and "9" when using the tables shown in Figs. 8 and 9.

The table shown in Fig. 1 comprises three sections almost identical with one another. I shall therefore first describe one section only and then point out the relative arrangement of the sections. Each of the sections *a b c* consists of a series of squares disposed in columns and rows and each bearing a numeral. In the example shown each section has five columns, and the squares are numbered consecutively from "0" to "4" in one row, (near the top,) from "5" to "9" in the next row below, and so on. Owing to this arrangement, the first column will contain all numbers terminating in "0" and "5," the second column all numbers terminating in "1" and "6," and so on. The squares are distinguished by colors, and preferably four colors are employed, and all squares which are upon the same diagonal from the upper left-hand portion to the lower right-hand portion are of the same color, the arrangement being, for instance, as follows: In the left-hand section *a* the squares "0," "20," "40," "60," "80," "100" and those on the same diagonals therewith, as "6," "12," "18," "24," "26," "32," &c., are yellow, the squares "1," "7," "13," "19," "15," "21," "27," &c., are green, the squares "2," "8," "14," "16," "22," &c., are white, the squares "3," "9," "5," "11," "17," &c., are red, and the squares "4," "10," &c., are yellow. It will be seen that sequence of colors is the same in each of the columns and that in each column three squares intervene between squares of the same color. In the first column, therefore, all even tens will be of the same color (yellow) and all odd tens of another color, (white.) The lines separating the columns are preferably distinguished in groups of three—for instance, one line will be a thin black line, the next a red line, and the third a heavy black line.

The sections *b c* are exact repetitions of the section *a* so far as the arrangement of the numbers within each section is concerned. The section *b* is, however, as it were, raised by one row relatively to the section *a*, and the section *c* is similarly raised by one row relatively to the section *b*—that is to say, the same row which in section *a* begins with "0" will in section *b* begin with "5" and in section *c* with "10." Owing to this arrangement, numbers will read consecutively in each row from left to right throughout the three sections; also, the numbers of each diagonal row (of the same color) will form an arithmetical series with the constant difference six. The diagonals of the same colors are continued through the three sections, the result being that while in the sections *a* and *c* the same numbers will be on squares of the same color in the central section *b* squares bearing the same numbers as certain squares of the other sections will be of a different color. Thus "40" will be on a yellow square in sections *a* and *c*, but on a white square on section *b*. Any number in the section *b* will be on a square of the same color as said number minus ten in the section *a* or as said number plus ten in the section *c*. Thus "70" in the section *a*, "80" in the section *b*, and "90" in section *c* are on squares of the same color—viz., white. To complete the first section, I prefer to add at the top a row with the numbers "5, 6, 7, 8, 9," as shown.

It will be observed that, within each section, the position of each digit-square relatively to the zero-square is different. This will be understood best by reference to Fig. 3, in which the position of each digit-square relatively to the zero-square has been illustrated. These diagrams may be used to facilitate the memorizing of the movements to be performed in adding or subtracting, but are not absolutely necessary, as the table itself will indicate the proper movement. Thus to add one move one space to the right; for two, two spaces to the right; for three, two spaces to the left and one space downward, &c. The groups of squares shown in Fig. 3 may be cut out in metal or other suitable material, and by superimposing them on the table the operations will be taught readily.

An example will explain the manipulation of the table. Suppose we have to find the sum "7 + 5 + 9 + 3 + 6." (See Fig. 7.) Starting from the white zero-square of the central section *b* the pupil with a pencil or with the finger passes first to the square marked "7" in said central section, then moves down one square to add five, finding the result twelve; then moves down two spaces and one to the left, finding twenty-one; then down one space and two to the left, finding twenty-four, and finally down one space and one space to the right, finding the final result thirty. In practice of course the pupil will soon learn to make a movement at a single stroke instead of dividing it into its components. When subtracting, the movements are performed in the opposite direction, and, if desired, numbers above ten may be added or subtracted, as will be seen from the following example, (see Fig. 6:) "7+7−9+11." The adding of seven will be obvious from the foregoing explanation. Nine is then subtracted by moving one space to the right and two spaces up, finding five. Then to add eleven, the pupil ascertains the relative position of "11" to "0" in any one of the sections. He will find that a movement of two spaces down and one space to the right is required to pass from "0" to "11." The same movement, starting from the square numbered "5," will yield the final result, sixteen. Fig. 6 will also illustrate the example "7+7+2−11." The square numbered "14" is reached, as above explained, then two is added by moving two spaces to the right, reaching sixteen, and finally eleven is subtracted by moving one space to the left and two spaces up, yielding the result, five.

It may happen that the movements carried out in accordance with the rules explained above would go beyond the limits of the table. Thus the pupil might reach, say, the square "28" (7+7+7+7) of section *c*, and if he then had to add, say, two this would carry him beyond the right-hand edge of the table. In such a case the pupil will pass to the square numbered "28" in the section *b*, which square is in the row below that in which the same number is located in the section *c*. From this square in the section *b* the operation will then be continued, finding "28+2=30." If, on the other hand, the pupil should reach the left-hand edge of the table, say, having to add from the square "16" of section *a* the number "3," he will pass to the square numbered "16" in the section *b*, which is in the next row above, and will find then "16+3=19," according to the rules previously given. Should the lower edge of the table be reached, as in adding "112+9," the pupil will pass upward in the same column to the uppermost square of the same color, which will be found to bear a number just one hundred less, or "12" in the particular case under consideration. From this square the operation will be continued, yielding "12+9=21," and each time the pupil has to pass from the bottom of the table to the top he will add or carry one hundred, and as a remainder he may mark down a horizontal dash for the first one hundred, a vertical line crossing it for the second one hundred, and so on, so that each cross will mean two hundred to be carried. In the particular case under consideration the total will therefore be put down as one hundred and twenty-one. It will be noticed that the number of rows contained in the table is so proportioned that for any square of the two lowermost rows the uppermost square of the same color in the same column will bear a number just one hundred units smaller.

When passing from a square of one of the side sections *a* or *c* to that square of the central section *b* which bears the same number, it will be observed that the color of the last-mentioned square is the same as that of the square diagonally adjacent to the first-mentioned square in the direction of the central section. An example will explain this. If from "62" in section *c* it is desired to pass to the same number of section *b*, the pupil moves diagonally downward one space toward the central section to the square "66," which is yellow, and then passes to the left on the same row to the next square of the same color, which is numbered "62." Similarly to pass from "60" in section *a* to "60" in section b the pupil moves diagonally upward one space toward the central section b to the square "56," which is white, and then moves to the right on the same row until the next white square is reached, which is numbered "60." By so using the colors as a guide the pupil would find the correct squares even if no numbers were produced thereon.

Calculations may often be facilitated by noting the difference in the colors of the squares and by remembering that every fourth square in a row or column is of the same color. Thus to add a quadruple multiple to any number the pupil will have to go to a square of the same color as the one he starts from. For instance, moving horizontally from the yellow square "10" in section b and adding ten plus four multiplied by four (or, expressed in a different way, fourteen times four) the pupil knows the result must be found on a square of the same color—that is, yellow. Similarly moving horizontally from the green square "5" in section b and adding five plus four multiplied by seven (or, expressed in a different way, nine times seven) the pupil knows the result will be found on a green square. These movements, of course, are possible only with a larger number of sections than shown.

It will be observed that each single movement in a lateral direction does not exceed two spaces, and to facilitate the repeated addition or subtraction of the same number I may make the horizontal lines which separate the rows alternately black and red and the vertical lines between the columns heavy black, thin black, and red, so that a total movement of eight spaces to the right performed by moving over two places each of four times, as in the example mentioned above, will be performed readily.

While the principle of my table is to so arrange the numbers that a different movement will be required for the addition (or subtraction) of the several digits, such movements may be resolved into the vertical and horizontal components. If downward movements and movements toward the right are considered positive and movements in the opposite directions negative, the following table (to be memorized) may be derived from Fig. 3: For the digits 1 2 3 4 5 6 7 8 9 the vertical movements are 0 0 1 1 1 1 1 2 2 and the lateral movements are 1 2 -2 -1 0 1 2 -2 -1. By means of this table all movements can be resolved into a vertical and a horizontal component, and the algebraical sums of these components being formed mentally will indicate the position of the square on which the result will be found. Thus if the numbers one, three, four, and six are to be added the sum of the vertical components will be "$0+1+1+1=3$," and the sum of the horizontal components "$1-2-1+1=-1$." The result of the addition will therefore be found by going three spaces downward from the initial or "0" square and then one space to the left, where the number "14" will be found. The mental addition of the components is much easier than that of the numbers themselves, inasmuch as no component is greater than two. Of course for numbers to be subtracted the components will be given the contrary signs.

To assist in the mental addition just referred to, I may employ the auxiliary table shown in Fig. 5. This table comprises two sections, one of which, at the left, is substantially a reproduction of the first column of the central section b of Fig. 1. The other section at the right consists of a number of squares equal in number and color to the corresponding squares of the companion section; but the initial square or starting-square numbered "0" is at the center—that is, on the same line with the square numbered "50" in the left-hand section. From this starting-square the others are numbered in succesion, both upward and downward, "1, 2, 3, 4, 0, 1, 2, 3, 4," and so on. The left-hand section serves for adding the vertical components and the right-hand section for adding the horizontal components, as will be understood best by reference to examples. If, for instance, it is desired to add one, three, four, and six, as before, we have the vertical components "0," "1," "1," and "1." The pupil therefore starts at the top of the left-hand section in Fig. 5 and moves his finger or a pencil down three spaces, reaching the square numbered "15." This square is suitably marked, as by placing a disk or other object thereon. Then starting from the central or starting square of the right-hand section of Fig. 5 the lateral components are added, counting upward for positive components and downward for negative ones—that is, in the particular case under consideration the movements will be one space upward, two spaces downward, another space down, and one space up, thus reaching finally the space numbered "1" immediately below the starting-square, the value of this number therefore being "-1." The result is found by simply adding (algebraically) the two numbers found—viz., "15" and "-1"—that is, "14." Should the right-hand section be insufficient in extent, the operations can be continued by returning to the initial square and moving the result in the left-hand section up or down two spaces, according as the lower or upper end of the right-hand section is reached. It will be obvious that a movement to the upper end of the right-hand section (corresponding to the addition of ten units) is the equivalent of a downward movement of two spaces in the left-hand section.

The foregoing will explain the use of the tables shown in Figs. 1 and 5 in connection with the diagrams, Fig. 3, and the examples in Figs. 6 and 7.

The table represented in Fig. 2 is substantially the same as that shown in Fig. 1, but is somewhat simplified by the omission of the tens from the squares, so that nothing but the digits appear on the squares. At the left-hand margin, however, three series of columns of numbers are produced, indicating, respectively, the tens belonging in the same row to the first, second, and third sections of the table. Thus the last numbers of the three sections are to be read, respectively, as "109," "114," and "119." As only one digit appears on each square, the table may be made of small dimensions without detriment to clearness, and this is the main object of the arrangement shown in Fig. 2, which in other respects is identical with that described above, so that no further explanation will be required.

The table shown in Fig. 4 is a further simplification, the arrangement and coloring of the squares being the same as before, but only figures designating tens are produced in the other squares of the table. The position and color of the other squares will indicate their value just as definitely as if every one of them was designated by a numeral. The figures indicating tens occur every other row. This table also is used in the same manner as the one shown in Fig. 1.

In Fig. 8 I have shown a table which may be used for the simultaneous addition of three columns of figures. This table comprises four sections, the first of which is separate from the others and consists of four columns (preferably spaced from each other, so as to prevent confusion) each of fifty squares or spaces which are of four different colors repeated at regular intervals, so that every fourth square is of the same color. These squares are numbered consecutively from "1" to "200," running from the top of the first column to the bottom, then continuing at the top of the second column, and so on. Preferably an additional square numbered "0" is located at the top of the first column. This section is intended for adding hundreds. The other sections a' b' c' are arranged similarly to the three sections of the tables shown in Figs. 1, 2, and 4—that is, section b' has its rows raised the distance of one row relatively to the section a', and the same remarks hold as to sections c' and b'. The squares are of four colors alternating in regular succession, and each section has at the top a row of blank squares. The next row bears the numerals from "0" to "9;" but in the following rows I prefer to indicate the even numbers only, so that some columns will bear no numbers, thereby guiding the eye and preventing confusion. The initial column of each section contains tens from "0" to "500." To facilitate the quick counting of spaces, I may separate groups of three rows and of three columns by distinguishing-lines d, and these lines may be black, red, and yellow in regular succession, so that lines of the same color will inclose a group of nine rows or nine columns. The sections a' b' c' of this table may be used in the same manner as has been explained with reference to the table, Fig. 1, and the diagrams, Fig. 3, it being of course understood that the movements are partly different from those indicated in Fig. 3—that is, to add one, two, three, four, or five units with the table shown in Fig. 8 the pupil will simply move as many spaces to the right, (through the sections b' c'.) To add six, seven, eight, or nine, the pupil will perform the movements indicated by the diagrams, Fig. 17—that is, for instance, one space down and four to the left for adding six. The manipulations are exactly analogous to those fully described with reference to Fig. 1, and further explanation is therefore deemed unnecessary. The table may, however, be used in a different way, as follows: To add units, start from the zero of the sections a' and move to the right a distance corresponding to the number to be added. As each color is repeated after four squares, it will not be necessary for the pupil to count the squares. Thus if five is to be added the pupil will simply move his finger or pencil to the right to the square one space beyond the next square of the same color. Every fourth and eighth square being of the same color, it will be easy to add six, as four plus two, seven, as eight minus one, nine, as eight plus one, &c., without counting all the twenty-nine moves. Should the limit of the table be reached, the pupil will return to the analogous space of the section a' (in the same row) and will then drop his finger or pencil two rows, continuing his operation from the square thus reached. For instance, if the pupil is at "38" in section c' and has to add six, he will move back to the square marked "8" in the same row of section a' and will then move downward two rows to the square indicating "38," from which he will move six spaces to the right, reaching the result, forty-four. Tens are added in the initial column of section a'. Should this operation carry the pupil beyond the bottom of the table, as when four tens (forty) are to be added to forty-seven tens, (four hundred and seventy,) the pupil will pass to the top of the column to the uppermost square of the fourth color from the square "470," (which in this case would be the unnumbered top square,) will then move down two squares, (to "10,") which will yield the result; but it will be understood that each time the pupil thus passes from the bottom to the top of the tens-column he must carry five hundred, which is done by moving down five spaces in the hundreds-section. The adding of hundreds is so simple that I shall not particularly explain it.

To add three columns at a time, the pupil will use two pencils or a finger of left hand and a finger of his right hand and will proceed as follows to add, say, three hundred and twenty-seven, two hundred and forty-five, and eight hundred and ninety-one: As the words "three hundred" are pronounced he moves down three spaces in the hundreds-column with his left hand, at "twenty" he moves his right hand two spaces down in the initial column of section a', and at "seven" he moves his right hand seven spaces to the right. Thus the left hand will be dropped as many spaces as there are hundreds, the right hand as many spaces as there are tens, and the right hand will be moved to the right as many spaces as there are units, of course observing the rules above given as often as the right-hand end or the bottom of the table is reached. In the example above given the pupil's fingers at the end of the operation will rest on the space "13" of the hundreds-column and on the space "163" of section b'. By carrying the "1" into the hundreds-column the result can be read as fourteen hundred and sixty-three.

The table shown in Fig. 9 is identical with that represented in Fig. 8 except that the squares are simply light and dark, like those of a chess-board, instead of being of a plurality of colors running in diagonal lines, as in Fig. 8. The groups of three columns are in Fig. 9 formed successively by a continuous heavy vertical line, a heavy broken vertical line, and a continuous thin vertical line. The groups of three rows are formed by continuous heavy horizontal lines, heavy broken horizontal lines, and horizontal lines marked by dots and plus signs. Of course these signs are arbitrary. This table is used in the same manner as that shown in Fig. 8, but lacks the distinctive features (the very easy location of squares) due to the use of different colors.

The table shown in Fig. 10 has a series of squares arranged in chess-board fashion and intersecting horizontal and vertical lines inclosing between them spaces containing four squares. The squares of the first row are numbered from "0" to "11" and those of the first column from "0" to "17." This table is particularly adapted for calculations according to the duodecimal system, as in adding inches or English pence. Every line corresponds to a distance of two squares, and the pupil therefore knows that counting the lines will be simpler than counting the squares. Moreover, when an even number is to be added or subtracted the result will be on a square of the same color or shade, and when an odd number is added or subtracted the result is found on a square of unlike color or shade. The numbers in the first column designate units of the higher denomination, as feet or shillings.

The device shown in Fig. 11 is simply a row of squares containing the figures from "0" to "9" in double repetition with every fourth square of the same color. This device is used simply by moving to the right (for adding) or to the left (for subtracting) as many spaces as the number indicates, and whenever one end of the row is reached the calculation is continued at the other end, as if the end squares ("0" and "9") were contiguous, as they would be if the row was bent into the shape of a continuous ring. Every time a zero-square is passed the pupil notes to carry one, if the movement is to the right, (addition,) or to "borrow" one, if the movement is to the left, (subtraction.)

I have hereinbefore described tables consisting of a plurality of sections in which one of two adjacent sections is raised the distance of one row relatively to the other section. This principle I have described as applied to sections having five columns, Figs. 1, 2, and 4, or ten columns, Figs. 8 and 9. The principle is, however, capable of a general application, and the same advantage may be secured with any number of columns in one section as long as the sections are displaced or out of alinement one with respect to its neighbor by one row, so that, say, the fifth row of one section contains the same numbers as the fourth row of the section on one side of it and as the sixth row of the section on the other side. Thus in Fig. 15 (where the squares are indicated as green, white, and red in diagonal series) each section a^2 b^2 c^2 comprises three columns, and the first rows of the sections b^2 c^2, respectively, bear the same numbers as the second and third rows of the section a^2. This table will be used in substantially the same manner as the one shown in Fig. 1, the movements to be performed in adding the several digits differing of course in part, as indicated by the diagrams, Fig. 16.

The use of my improved tables for adding and subtracting will be obvious from the foregoing explanations. The tables are, however, adapted to other uses also. Thus they will demonstrate various laws and facts of arithmetic in a readily-intelligible manner. Fig. 1, for instance, will show the multiples of five in the initial column of each section and the other forms of arithmetical series with the constant difference five in the other columns. Reading from left to right, the vertical lines separating the columns into groups of three will indicate the multiples of three and other arithmetical series with the constant difference three. The horizontal lines dividing the rows into groups of three can be utilized for the same purpose. Figures in a diagonal of the same color (for instance, the yellow diagonal from "0" to "84") will form an arithmetical series with the constant difference six. Figures in any diagonal running in the opposite direction (as from "0" of section b to "20" of section a) form an arithmetical series with the constant difference four. All odd numbers are either on green or on red squares and all even numbers on either white or yellow squares. A line drawn from any zero-square to any other square (as "7" or "11") will pass, if extended, at even distances through squares bearing the multiples of the number appearing on such square, ("7" or "11.") Other properties of the table will be readily discovered. The tables also gives the pupil a concrete idea of the value of a sum or number, Thus to make the pupil understand the value of ten units make him go over the squares numbered from "1" to "10" in section b of Fig. 1, (these squares are shown separately in Fig. 12,) and owing to the different coloring of the squares the pupil will form a correct idea not only of the absolute value of the sum, but of its size relatively to a unit. Then, as a step further, a piece of cardboard of the same size but without a division into squares, Fig. 13, may be submitted to the pupil to emphasize the conception of ten as the unit of a higher denomination. Similarly the value of one hundred may be deduced from the table, (see Fig. 14,) and the pupil will at the same time be prepared for instruction in geometry, as he will form an idea of the relative sizes of geometrical figures.

While the number-spaces of my table have been shown as squares, it will be understood that their shape is not material, and the term "square" as used in the claims is to be interpreted to mean a space or geometrical figure of any appropriate shape.

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

1. A table for teaching arithmetic, comprising a series of consecutive spaces which increase or decrease in value in fixed ratio and are distinguishable by contrasting colors.

2. A table for teaching arithmetic, comprising consecutive spaces disposed in columns and rows and subdivided into sections, the spaces of the consecutive sections being of higher value than those in the preceding section or sections.

3. A table for teaching arithmetic, comprising rows and columns of consecutive spaces disposed in parallel and intersecting order, said spaces being distinguishable by contrasting colors and the spaces being grouped into consecutive sections, the spaces of said consecutive sections being of higher value than the spaces of the preceding section or sections.

4. A table for teaching arithmetic, comprising a series of consecutive squares or spaces distinguishable by contrasting colors, the initial space of which bears the indication "0."

5. A table for teaching arithmetic, comprising consecutive number squares or spaces disposed in a plurality of intersecting series of parallel lines, said squares being of at least three colors or shades alternating in regular succession.

6. A table for teaching arithmetic, comprising consecutive number squares or spaces disposed in a plurality of intersecting series of parallel sets, and parallel lines separating sundry of the said sets at regular intervals, said lines being distinguished from each other in regular succession.

7. A table for teaching arithmetic, comprising a plurality of similar sections each having squares or spaces disposed in parallel series, the series of the sections alining with each other, or being located one in the continuation of the other, and each series of one section bearing the same numbers as that series of the adjacent section which is adjoining to the alining series of said section.

8. A table for teaching arithmetic, comprising a plurality of similar sections each having squares or spaces disposed in rows and columns, the rows of the sections alining with each other, and each row of one section bearing the same numbers as the next row above of an adjacent section.

9. A table for teaching arithmetic, comprising a plurality of similar sections each having consecutively-numbered squares or spaces disposed in rows and columns, the rows of the sections alining with each other, and each row of one section bearing the same numbers as the next row above of an adjacent section.

10. A table for teaching arithmetic, comprising a plurality of similar sections each having squares or spaces disposed in rows and columns, and of at least three colors and shades alternating in regular succession, the squares of the same color alining diagonally, the rows of the sections alining with each other and each row of one section bearing the same numbers as the next row above of an adjacent section.

11. A table for teaching arithmetic, comprising a plurality of similar sections each having squares or spaces disposed in rows and columns, and of at least three colors and shades alternating in regular succession, the squares of the same color alining diagonally, the rows of the sections alining with each other and each row of one section bearing the same numbers as the next row above of an adjacent section, and lines arranged at regular intervals and separating the said rows and columns into groups, said lines being distinguished from each other in regular succession.

12. A table for teaching arithmetic, comprising a plurality of similar sections each having squares or spaces disposed in rows and columns, the rows of the sections alining with each other, and each row of one section bearing the same numbers as the next row above of an adjacent section, in combination with an auxiliary table consisting of a series of squares arranged like those of the initial column of one of the sections, and another series of squares bearing in regular repetition from a central starting-point, the same numbers as the initial row of one of the sections.

13. A table for teaching arithmetic, comprising a plurality of similar sections each having squares or spaces disposed in rows and columns, and of at least three colors or shades alternating in regular succession, the squares of the same color alining diagonally, the rows of the sections alining with each other and each row of one section bearing the same numbers as the next row above of an adjacent section, in combination with an auxiliary table consisting of a series of differently-colored

squares arranged like those of the initial column of one of the sections, and another series of squares of different colors in regular succession and bearing in regular repetition in both directions from a central starting-point, the same numbers as the initial row of one of the sections.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOSÉ JOAQUIN TERRAZAS.

Witnesses:

JUAN DE M. NAVARRO,
TITO GASCAY ROJO,