

No. 626,524.

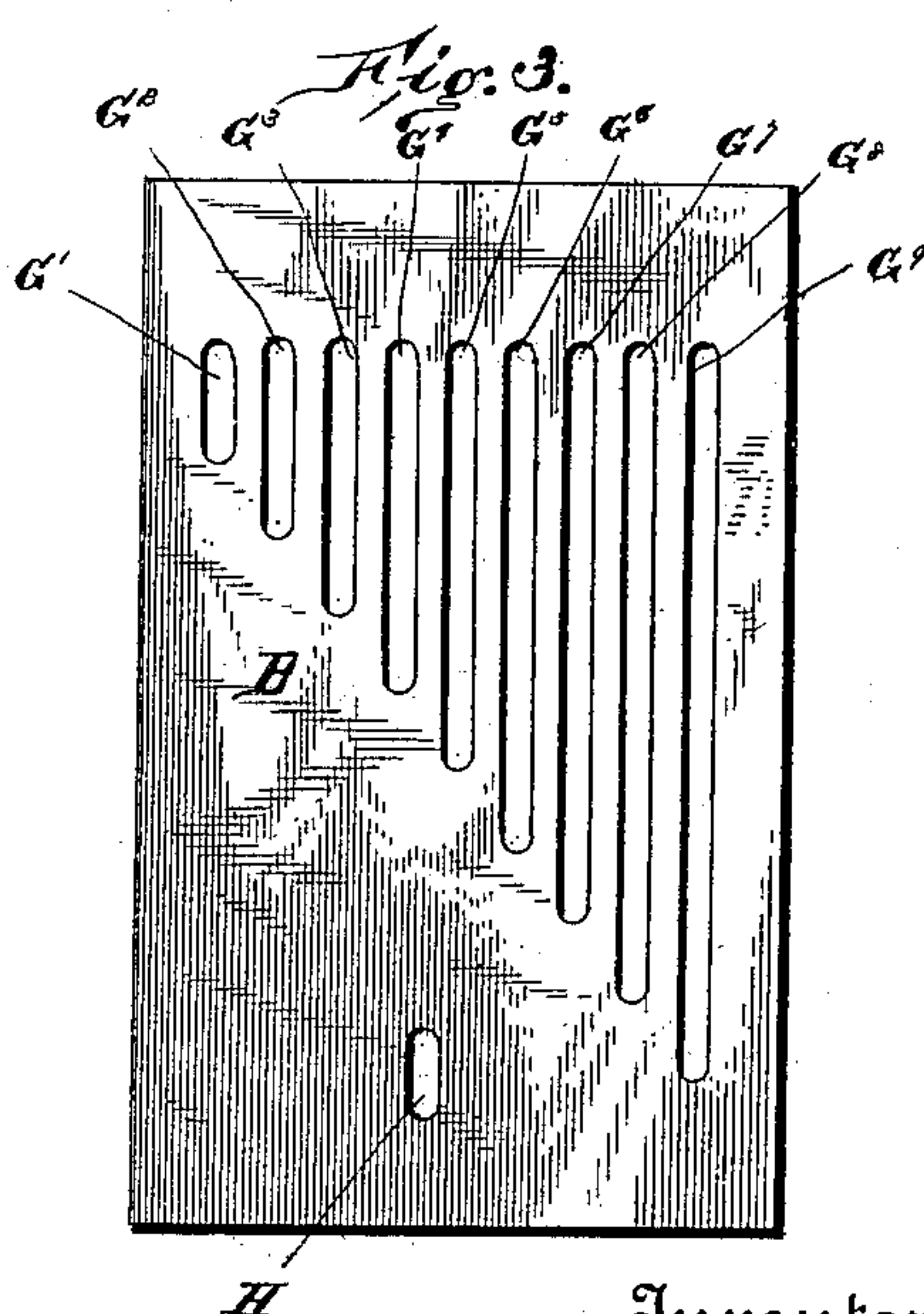
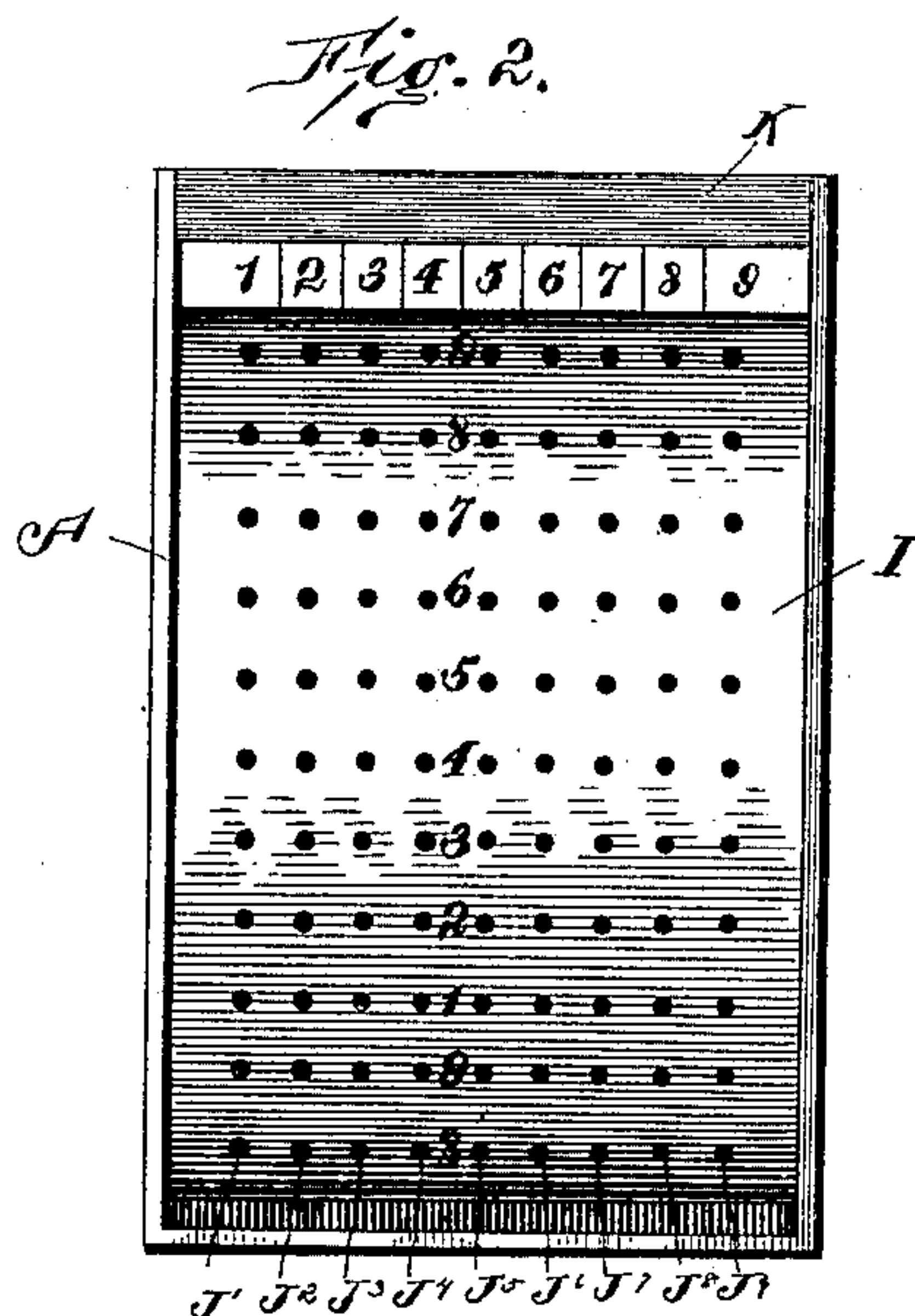
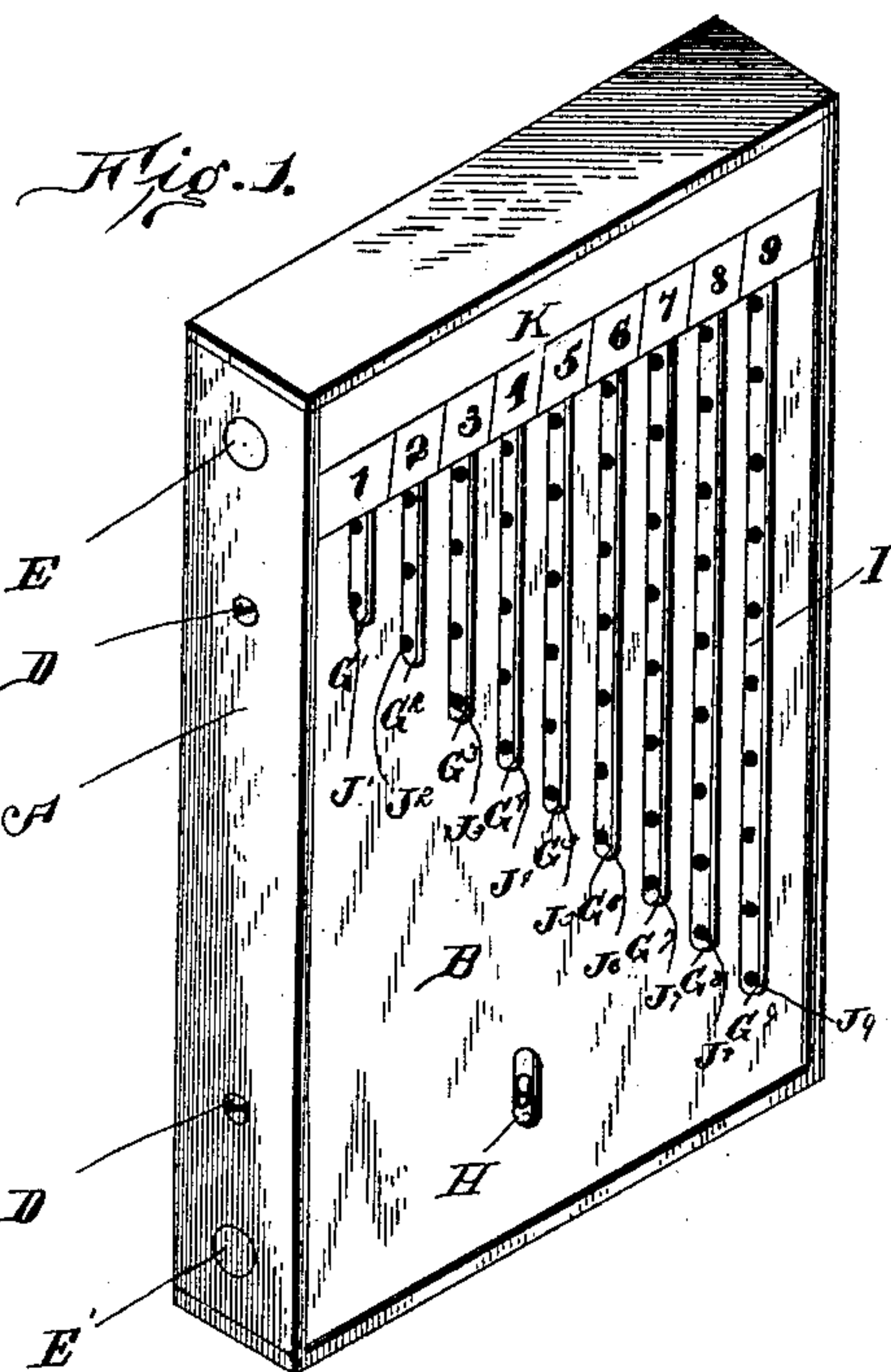
Patented June 6, 1899.

C. H. BOEHL.
DEVICE FOR PROVING ADDITION.

(Application filed July 28, 1898.)

(No Model.)

2 Sheets—Sheet 1.



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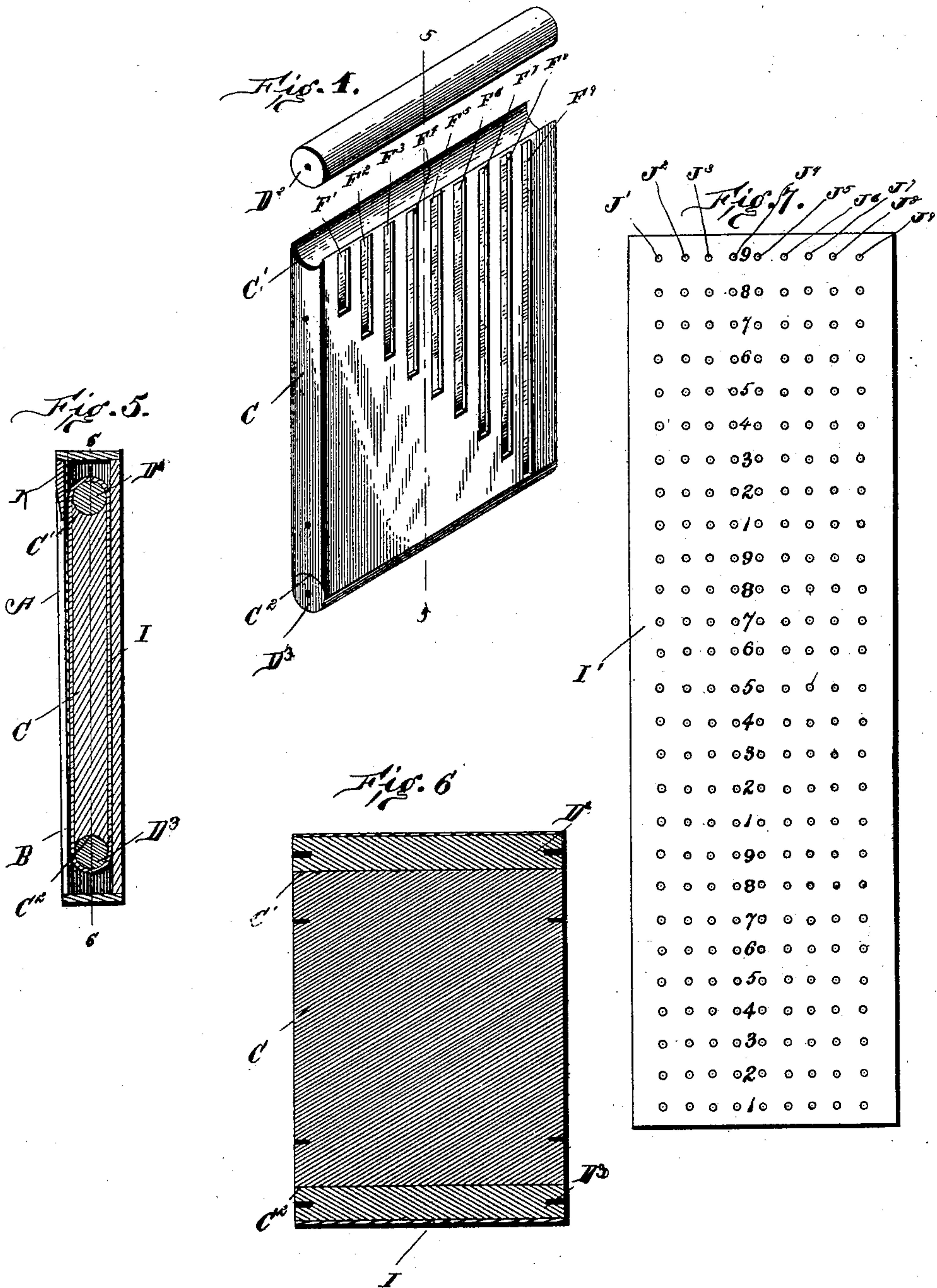
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2 Sheets—Sheet 2.



Witnesses

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UNITED STATES PATENT OFFICE.

CHARLES H. BOEHL, OF GRAND ISLAND, NEBRASKA.

DEVICE FOR PROVING ADDITION.

SPECIFICATION forming part of Letters Patent No. 626,524, dated June 6, 1899.

Application filed July 28, 1898. Serial No. 687,129. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. BOEHL, of Grand Island, in the county of Hall and State of Nebraska, have invented certain new and useful Improvements in Devices for Proving Addition; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

Figure 1 is a perspective view of the device complete. Fig. 2 is a front view of the same with the slotted front plate removed. Fig. 3 is a view of the slotted front plate detached. Fig. 4 is a detail perspective view of inside grooved guide-block and the rollers, one of the rollers being slightly removed from the block. Fig. 5 is a vertical section through the complete device from front to rear on the line 5 5 of Fig. 4. Fig. 6 is a vertical sectional view from side to side on the line 6 6 of Fig. 5. Fig. 7 is a view of the perforated strip before it is made into a belt by sticking its ends together.

Like letters of reference mark the same parts wherever they occur in the various figures of the drawings.

My invention relates to calculating-machines, and has for its object to provide a cheap and simple device whereby the results of adding operations may be mechanically tested by the rule known as "casting out the nines."

With this object in view my invention consists in a machine of this class, the construction, arrangement, and combination of the parts of which will be first fully described hereinafter, the particular points of novelty therein being specifically set forth in the appended claims.

Referring to the drawings by letters of reference, A indicates a box or case rectangular in shape, the top of which is omitted, and instead thereof a plate B, slidable in grooves in the inner surfaces of the sides of the case, serves to cover the interior mechanism.

C indicates a block rectangular in outline, secured centrally in the case by screws D, leaving a space around it at the front, rear, and ends. This block is provided in each end

with a curved bottomed groove, as at C' C², and a roller is seated loosely in each of said grooves, as at D² D³, each roller being pivotally mounted in the sides of the case A on pins E E'.

The block C is provided with a series of nine grooves F' F² F³ F⁴ F⁵ F⁶ F⁷ F⁸ F⁹ in its front face parallel with each other and with the sides of the case, each groove from left to right being longer than its predecessor, the first groove F' being one space in length, the second one F² two spaces, the third F³ three spaces, and so on, increasing one space for each groove to the last one F⁹, which is nine spaces in length.

The sliding plate B is provided with slots G' G² G³ G⁴ G⁵ G⁶ G⁷ G⁸ G⁹, which when the plate is in position correspond in length and register with the grooves in the block C. The plate B is also provided with a slot or opening H, which when the parts are in operative position is in line with the space between two adjacent grooves in the block C and two adjacent slots in the plate B, being shown in this instance as in line with the space between grooves F⁴ and F⁵ and slots G⁴ and G⁵, although it would do equally well in line with the space between any other pair of grooves and slots.

I indicates an endless belt, of paper or other suitable flexible fabric, which is mounted around the block C and rollers D² D³, occupying the space left in the case A around the block and rollers, said belt being formed by securing together the opposite ends of the strip I'. (Shown in Fig. 7.) The belt I and the strip I' before joining the ends is provided with nine longitudinally-arranged rows of perforations, as at J' J² J³ J⁴ J⁵ J⁶ J⁷ J⁸ J⁹, which are parallel with each other and with the edges of the belt and when the parts are all assembled in operative relation are in line with the corresponding numbered grooves of block C and slots of plate B. There are twenty-seven perforations in each row, and in the space between rows J⁴ and J⁵ the perforations are numbered in three series—from "1" to "9" in each series.

Secured between the sides of the case A, at the top, is a front cross-bar K, which partially conceals the plate B and covers the upper ends of the slots therein, such cross-bar being

marked off to correspond with the slots G', &c., in the plate and each division being marked with a number, said numbers ranging consecutively from "1" over slot F' to "9" over slot F⁹, thus indicating the number-spaces in length of each slot.

In proving or testing a problem in addition by casting out the nines the various columns are added and the sum total placed at the bottom. The digits of each number are now added from left to right and the sum of the digits placed in a column to the right. The numbers in this column are divided by nine, and the remainders, if any, are placed in another column to the right—as, for instance,

	2375..17..8
	4682..20..2
	3754..19..1
	9630..18..0
	20441..74..2

In this problem it will be noticed that the result after casting out the nines is as shown in the last column. Much of this operation is done mentally, and the first column to the right is unnecessary, being only given to more clearly illustrate the method. It will be seen that the sum of the digits of the numbers to be added when themselves to be added give seventy-four as a result, which is eight times nine and two remainder, and the operation is proven to be correct, because the sum of the digits of the sum total gives the same remainder (after casting out the nines) as the sum of the digits of the various numbers gives, as in the last column to the right.

This method of proof requires considerable mental effort, and errors are liable to creep in. It is to avoid the possibility of error that my device is intended, and its operation in proving the foregoing operation may be described as follows: The parts being assembled as before described and as illustrated in Fig. 1, with the "9" showing through opening H, the operator takes a pencil or other pointed instrument and places it in the perforation at the top of row J² (indicated by "2" on the cross-board) and moves it downward, carrying the belt along with it two spaces until stopped by the bottom of slot G². This disposes of the digit "2" of the number "2375," and the operation is continued until each of the digits "3," "7," "5," "4," "6," "8," "2," "3," "7," "5," "4," "9," "6," and "3" are similarly disposed of, when he finds that the figure "2," indicating a remainder of two after casting out the nines, will appear through the opening H. As this agrees with the total obtained by adding in the usual way, as before described, and casting out the nines from the total "20441," the addition is proved correct.

Another method of using the machine is as follows: To determine which perforations to begin with, he takes the problem, adds the

digits of the first number mentally, the result being "17," which after casting out nine remains "8." This indicates the first move, and the operator places his point in the upper perforation in row J⁸ (indicated by "8" on the cross-bar) and moves it downward, carrying the belt along eight spaces, until stopped by the bottom of slot G⁸. His next move will be to mentally add the digits of the second number, "4682," the result being "20," which after casting out the nines leaves a remainder "2." He now places his pointer in the top perforation in row J² and moves it down to the bottom of slot G², moving the belt two more spaces. The next number, "3754," subjected to the same mental process leaves a remainder of "1," which requires him to place his pointer in the top perforation of row J' and to move it to bottom of slot G', moving the belt one space. The last number, "9630," leaving no remainder after adding the digits and casting out the nines, requires no operation on the machine. Now by adding the digits in the sum total, "20441," he finds "11," which after casting out the nines leaves a remainder of "2." If this agrees with the number now showing through the opening H, the operation is correct.

While considerable space is necessary to describe these operations, in practice it is very short, simple, and mechanically accurate, the whole operation requiring only the simple mental addition of each number and dividing the sum of the digits by nine and the three simple moves on the machine, and my machine will be found to be a great assistance to persons having many problems in addition to work out.

The machine is extremely simple in construction, cheap to make, and quick, easy, and accurate in operation.

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

1. The combination, with a case and two rollers mounted at the top and bottom thereof, of an endless belt around said rollers provided with nine longitudinally-arranged rows of perforations, the number of perforations in each row being a multiple of nine, and a covering-plate placed over the belt provided with nine slots, each located in line with a row of perforations in the belt and the slots being graduated in length increasing regularly from the first slot which is of the length of one space between the perforations of each row, to the last slot, which is nine spaces in length, substantially as described.

2. The combination, of the case, the block therein grooves at each end and having nine parallel grooves in its front face, the rolls pivoted in the sides of the case at each end of the block, the endless belt having one row of figures and nine longitudinal rows of perforations surrounding the block and rolls, and the plate covering the face of the belt and having

5 the nine slots, in line with the rows of perforations, and provided with the opening for exposing one of the row of figures on the belt, the perforations of each row being one space apart and in number a multiple of nine, and the nine grooves in the block and nine slots in the plate being of graduated length increasing regularly from one space in length for the first on the left, to nine spaces in length

for the last on the right substantially as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

CHARLES H. BOEHL.

Witnesses:

ARTHUR C. MAYER,
A. H. REHDER.