

No. 696,708.

Patented Apr. 1, 1902.

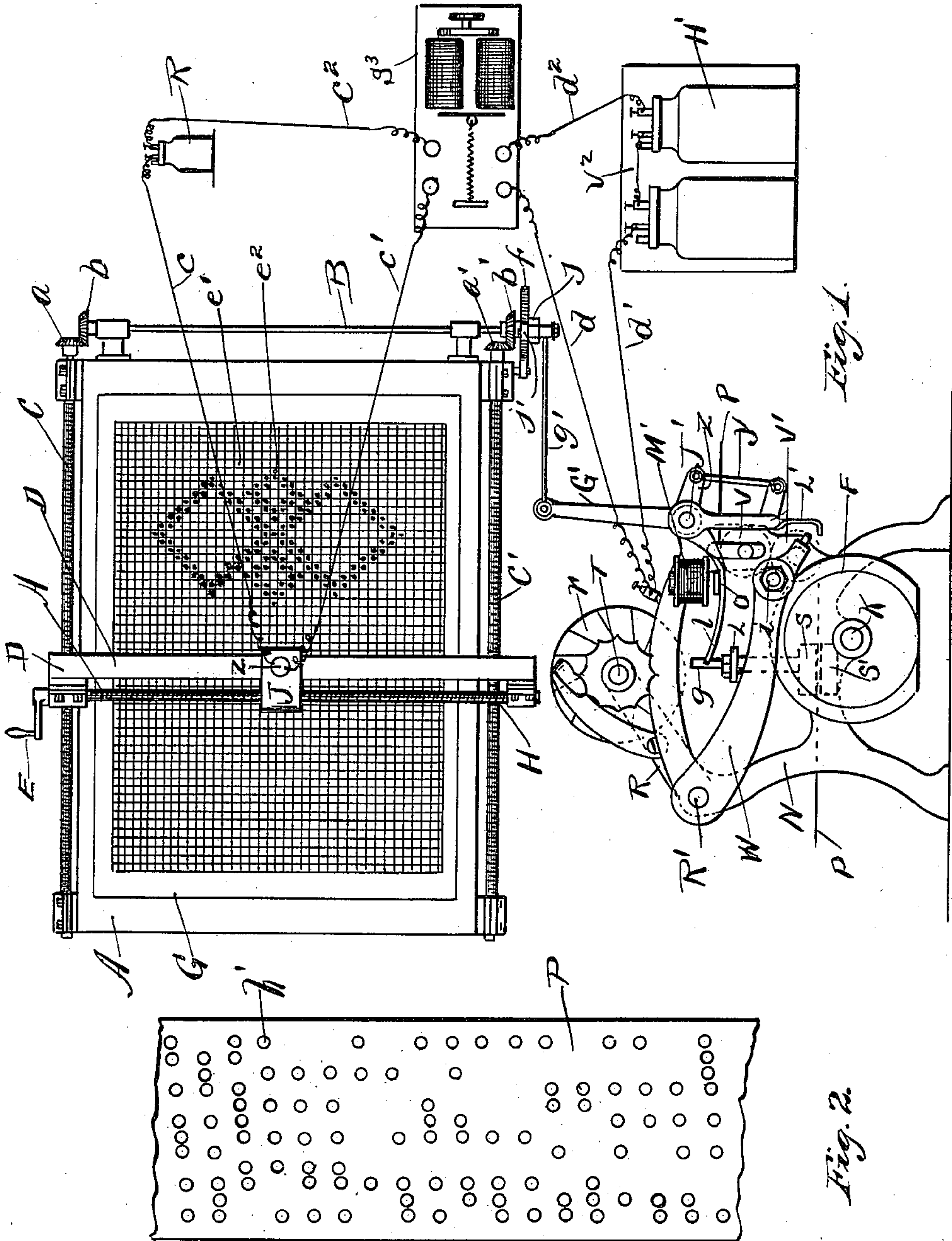
J. T. BOLTON.

MACHINE FOR COPYING PATTERNS FOR JACQUARD CARDS.

(Application filed Jan. 8, 1902.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses.

F. A. Small.

M. L. Hazard

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(Application filed Jan. 6, 1902.)

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2 Sheets—Sheet 2.

Fig. 3.

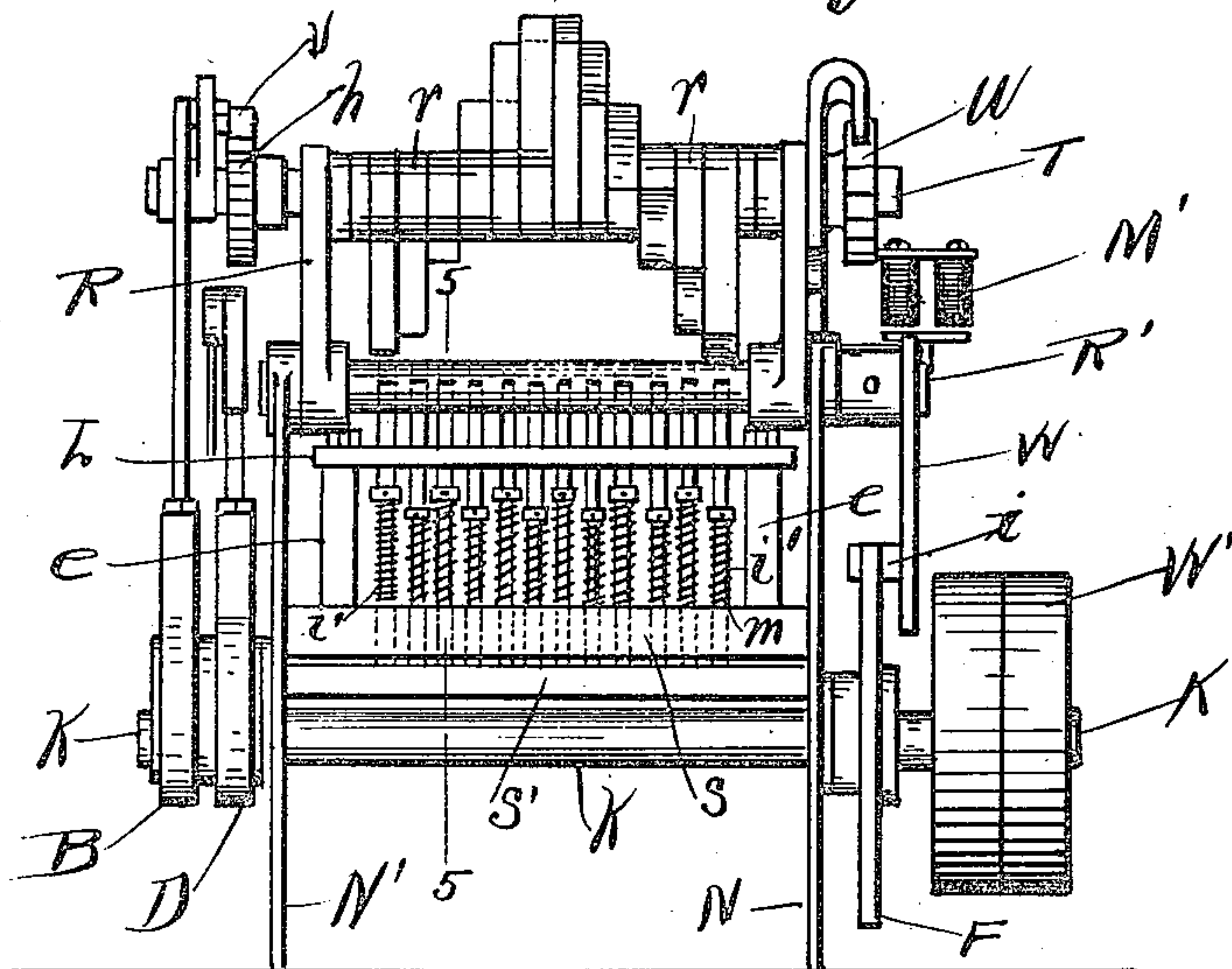


Fig. 4.

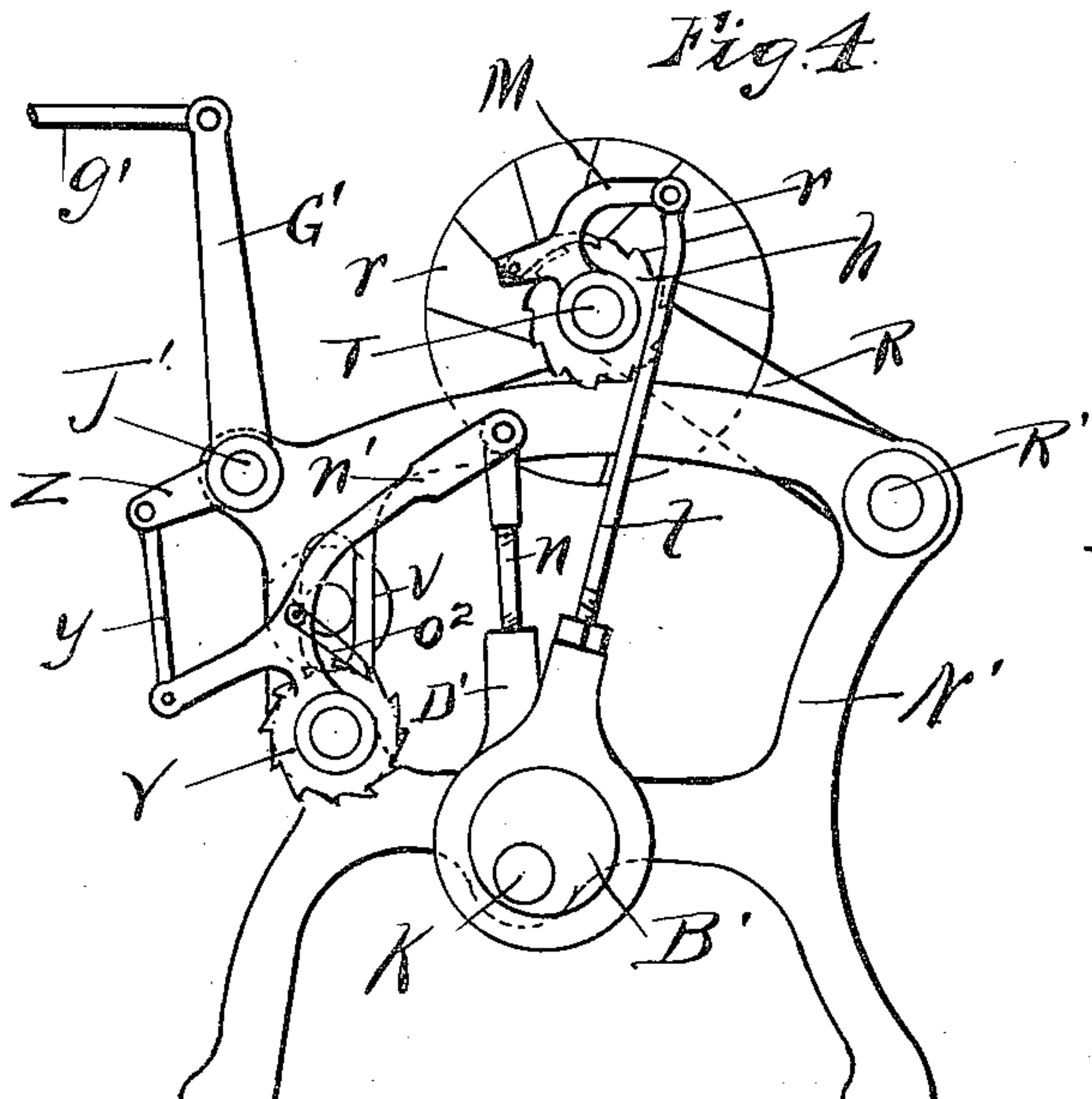
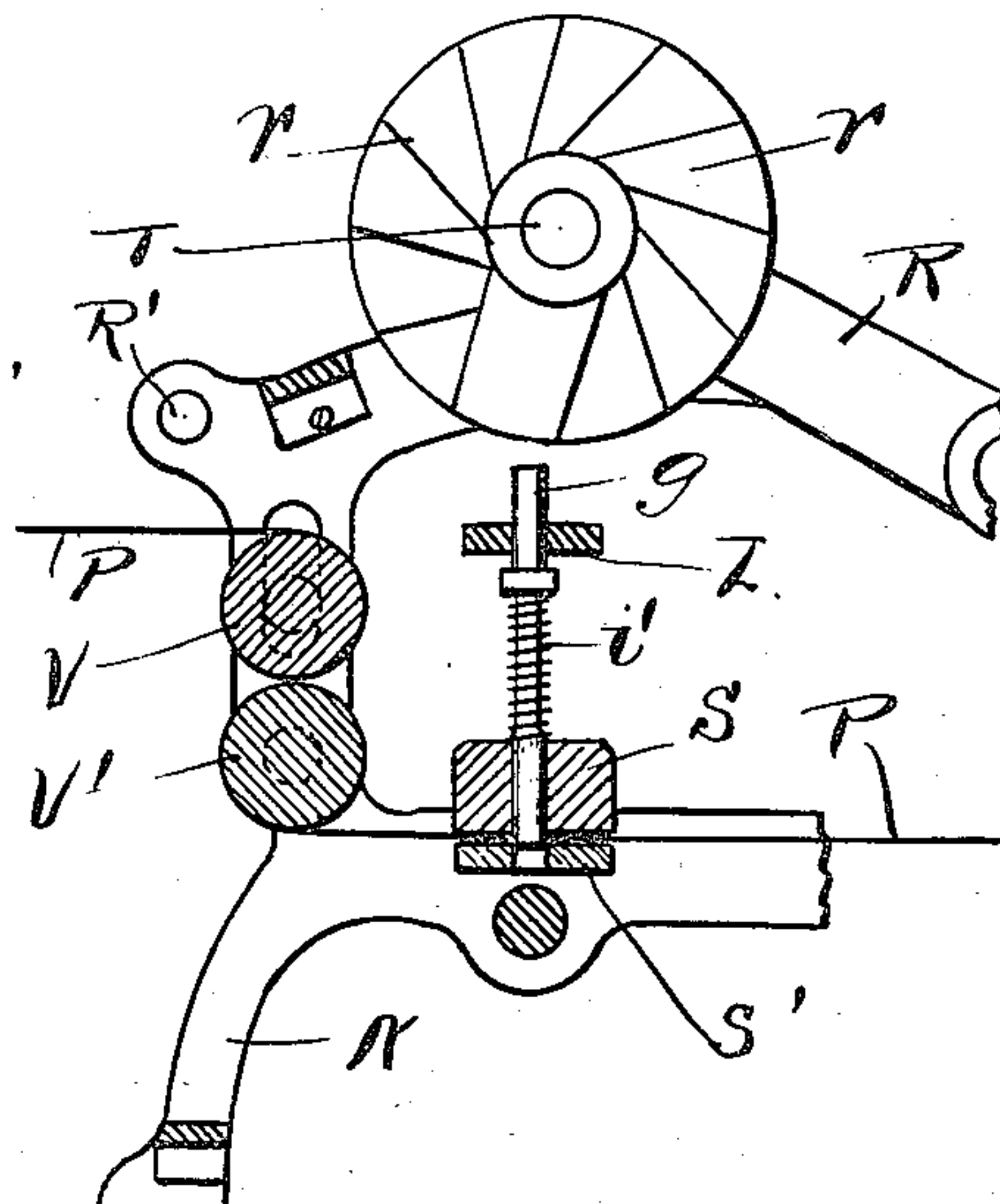


Fig. 5.



Witnesses.

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# UNITED STATES PATENT OFFICE.

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## MACHINE FOR COPYING PATTERNS FOR JACQUARD-CARDS.

SPECIFICATION forming part of Letters Patent No. 696,708, dated April 1, 1902.

Application filed January 6, 1902. Serial No. 88,558. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN T. BOLTON, a resident of Fall River, in the county of Bristol and State of Massachusetts, have invented certain new and useful Improvements in Machines for Copying Patterns for Jacquard-Cards; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to the mechanism for making cards for use in Jacquard motions for looms; and it consists of a combination of devices for making a copy of a pattern by means of mechanical and electrical appliances combined by which handwork is dispensed with and the work done almost entirely automatically. It is fully described and illustrated in this specification and the annexed drawings.

Figure 1 represents an elevation of the pattern-board with its mechanical devices, with an end view of the punching mechanism and a diagram of the electrical members and their connection with the moving devices of the pattern-board and the punching mechanism. Fig. 2 represents a piece of the paper that has been through the punch apparatus. Fig. 3 is a front elevation of the punching apparatus. Fig. 4 is an elevation of the opposite end of the punching apparatus to that shown in Fig. 1. Fig. 5 is a vertical section of punching devices, taken on line 5 5 in Fig. 3.

The design of the invention is to produce automatically by mechanism a punched copy of thin paper in a continuous roll of a design set out in the usual way of jacquard-patterns to be used in a machine for automatically punching the thick cards used on the loom.

The construction and mode of operation of the apparatus are as follows:

A represents a board on which a design-pattern G is laid out in squares representing the threads in the warp in the usual way, having the design in color on a white ground. Horizontal screw-threaded shafts C C' are placed one at the top and the other at the bottom of the board A in bearings attached to the board, and cross-shaft B, held in bearings attached

to the end of the board, is connected by a pair of bevel-gears *a b* to the top screw C and by a like pair of bevel-gears *a' b'*, connecting the lower end of the shaft B and the lower screw-shaft C'. A bar D is placed across the board A vertically, having screw-threaded bearings on the shafts C C' at its ends, so that when the shafts C C' are turned by the shaft B the bar D will advance laterally across the board, maintaining its vertical position. A screw-shaft H is held in bearings at each end fast on the bar D, and a case J is arranged to slide up and down on the bar across the board A by means of a screw-nut fitted on the screw-shaft H and attached to the case J. A crank E is attached to the upper end of the shafts H, by which it can be turned to move the case across the board A vertically, and by means of the joint action of the screw-shafts C C' and H the case J is made to pass over every square of the pattern G.

The punching apparatus, shown below the pattern-board in Fig. 1, consists of two end frames N N', (see Fig. 3,) connected together by girths and having bearings for the main or driving shaft K, also bearings near their front for the shaft R', that holds the arms that carry the shaft T and the punch-dogs *r r r*, and bearings at the back for the two feed-rolls V V'.

A frame for holding the punches *g g g*, that consists of an upper bar L and a lower bar S and studs *e e* at the ends, is bolted at each end to the end frames N N', near the middle of the frames. A row of holes are made vertically through the upper and lower bars of this frame to receive a set of punches *g g*, twelve in number, as represented. These punches *g* slide freely in the holes in the bars and have their lower ends fitted to pass into a set of holes in a steel bar S', placed a little below the lower bar S' and which serves as a die in punching the holes in the paper strip P as it passes between the bars S and S'.

The punches are operated by a set of dogs *r r*, held on a shaft T, which has bearings at each end in the arms R R, held on a shaft R' at the front of the machine. The dogs *r r* agree in number with the punches *g g* and are arranged spirally around the shaft T, so



as to make a complete circuit of the shaft, with a dog directly over each punch, so that every time the shaft T is allowed to descend one of the dogs *r* will depress one of the punches and make a hole in the strip of paper P. The dogs are held up clear of the punches by an arm W, fast on the end of the shaft T, (see Fig. 1,) that has a friction-roll *i* at its free end resting on a cam F, fast on the shaft K. A depression in this cam allows the arm W to drop down once in each revolution of the shaft K, and the dog series that is on the under side of the shaft T will depress the punch *g*, that is under it and make a hole in the strip of paper P. The paper P is drawn from a roll (not shown) through between the lower bar S and the die-bar S' by means of the feed-rolls V V' at the back of the machine a certain space at every revolution of the shaft K by means of an eccentric D', (see Fig. 4,) fast on that shaft and connected by a rod *n* to an arm *n'*, that is held loosely on the end of the shaft of the lower feed-roll V' and carries a pawl *o*, that catches in a ratchet-wheel Y, fast on the shaft of said feed-roll, and turns it a notch at each revolution of the shaft K, the paper P passing under the roll V', up between the rolls, and over the roll V. (See Fig. 5.)

The dog-shaft T receives a motion of one-twelfth of a turn, according to the number of dogs, at each revolution of the shaft K by means of an eccentric B', fast on that shaft and connected by a rod *t* (see Fig. 4) to an arm M, hung on the shaft T and carrying a pawl *v*, that catches in a ratchet-wheel *h*, fast on the shaft T, and turns the shaft one tooth or the space of one of the dogs *r* at each turn of the shaft K. In this way a row of holes is punched diagonally across the strip of paper P, always beginning a new row on the other side at the next turn of the shaft K after finishing a row, so the rows are a continuous record of a row of squares across the design-pattern on the board A, Fig. 1. The means for leaving a blank instead of making a hole in the paper whenever the pattern requires it are devices for holding up the shaft T with the dogs *r*, so that no one of the punches *g* will be depressed at that revolution of the shaft K, the punches *g* being normally held up by the springs *z'*. The devices provided for holding up the dogs consist of an arm L', (see Fig. 1,) that is held on a rod J' at the back of the machine, which arm has a hook at its lower end that swings in and catches under the end of the arm W and prevents it and the dogs *r* from dropping and punching a hole whenever the magnets M', attached to the frame N, are energized by the battery H' so as to attract the armature *o*, attached to the arm L, connected with the arm L'.

The connections whereby the energizing of the magnets M' are controlled by the design-pattern on the board A are as follows: The bar D is moved over one square of the figure laterally at each revolution of the shaft K by an arm G', held free to swing on the rod J' at

the back of the machine, which arm is connected by a rod *g'* to an arm *j*, held loose on the lower end of the shaft B on the board A. The arm *j* has a pawl *j'* on it that catches in a ratchet-wheel *f*, that is fast on the shaft B. The arm G' is moved by a connecting-rod *y* (see Fig. 4) to the rear end of the arm *n'*, that moves the feed-rolls, so that at each motion of the rolls to draw the paper along one space the arm G' will cause the bar D and case J to move one square of the design-pattern G. The case J on the bar D (see Fig. 1) contains a selenium-cell *z*, which is entirely closed to the light, excepting a pin-hole in the face of the case arranged to come at each motion of the bar D directly over the center of one of the squares of the design. This selenium-cell *z* is included in an electric circuit from the battery R or other sources of electricity through the wires *c'* and the magnets of the relay S<sup>3</sup> and by the wire *c<sup>2</sup>* back to the battery R. This electric current is constant and when not impeded is strong enough to energize the magnets of the relay and close the circuit of the battery H' through the wire *d'* to the punching-machine and the wires *d* and *d<sup>2</sup>*, which circuit is normally held open by the relay. The strength of the current of electricity from the battery R to the relay is governed by the selenium-cell *z*, through which it passes, and the conductivity of this cell is affected by light. The light transmitted to the cell through the pin-hole in the case J when it is over a white square *e'* of the pattern does not impede the current, so the relay closes the circuit of the battery H', which energizes the magnets M' and holds up the dogs *r*, and no hole is punched in the paper; but when the selenium-cell passes over a colored square *e<sup>2</sup>* of the pattern the light that passes in at the pin-hole on to the cell increases the resistance to the current so much that it is not strong enough to operate the relay, and consequently the dogs *r* are allowed to drop and operate one of the punches *g* and punch a hole in the paper P. Consequently when the case J has passed across the pattern G the paper that has passed through the punching-machine will have a record of the light and dark squares, the latter being punched out and the other not punched, as is seen in Fig. 2, which represents a piece of the strip P. More than one case J with a selenium-cell J may be used at one time on the bar D, each case having its batteries and punching-machine, and thereby do the work of copying in proportionably less time.

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

1. The combination of a board to hold a design-pattern, having screw-shafts held in bearings attached to the upper and lower edges, a vertical shaft held in bearings at the side of the board and connected by bevel-gears with said screw-shafts, a vertical bar held at its ends on screw-threaded bearings



on said screw-shafts, a case to slide on said bar, a selenium-cell held on said case, a screw held in bearings on said bar, a nut on said screw attached to the case, a relay-battery, 5 electrical connection between said case and the relay-battery, substantially as described.

2. The combination of a pattern, a case to pass over said pattern, mechanism to move said case over the pattern, a punching-machine operated by said mechanism synchronously with said case, a relay-battery to designate what punches shall be operated by said mechanism, a selenium-cell to control said relay-battery, substantially as described. 15

3. The combination of a selenium-cell, a design-pattern, mechanism for passing said cell over the design-pattern, a relay-battery, wires to connect said selenium-cell and relay-battery, a punching-machine connected by 20 said wires to the relay-battery, means for connecting said punching-machine with the

mechanism that moves the selenium-cell over the design-pattern, substantially as described.

4. The combination of two end frames, a series of punches and dies, feed-rolls, a series 25 of dogs held spirally on a shaft over said punches, a main shaft, means for turning and raising and lowering said dogs, an electromagnet to control the dropping of the punches, a relay-battery to energize the electromag- 30 nets, a board to hold a design-pattern, mechanism connected with said board to control the relay-battery according to the design-pattern, substantially as described.

In testimony whereof I have hereunto set 35 my hand this 28th day of December, A. D. 1901.

JOHN T. BOLTON.

In presence of—

BENJ. ARNOLD,  
JAMES ARNOLD.