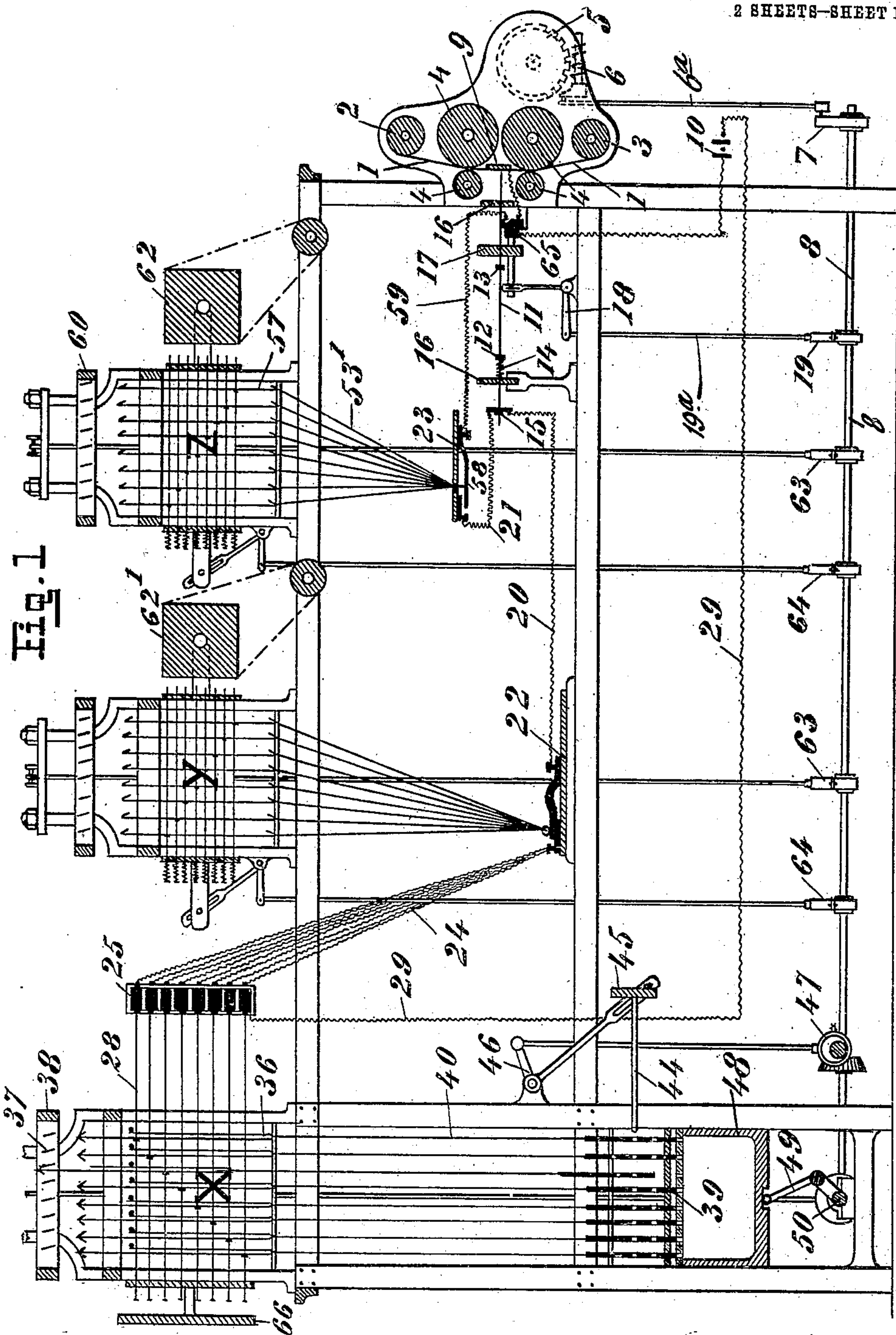


R. T. CARBONELL.
MACHINE FOR THE PRODUCTION OF JACQUARD CARDS,
APPLICATION FILED MAR. 13, 1909.

979,128.

Patented Dec. 20, 1910.

2 SHEETS-SHEET 1.



Witnesses
A. Hadden
R. Hadden

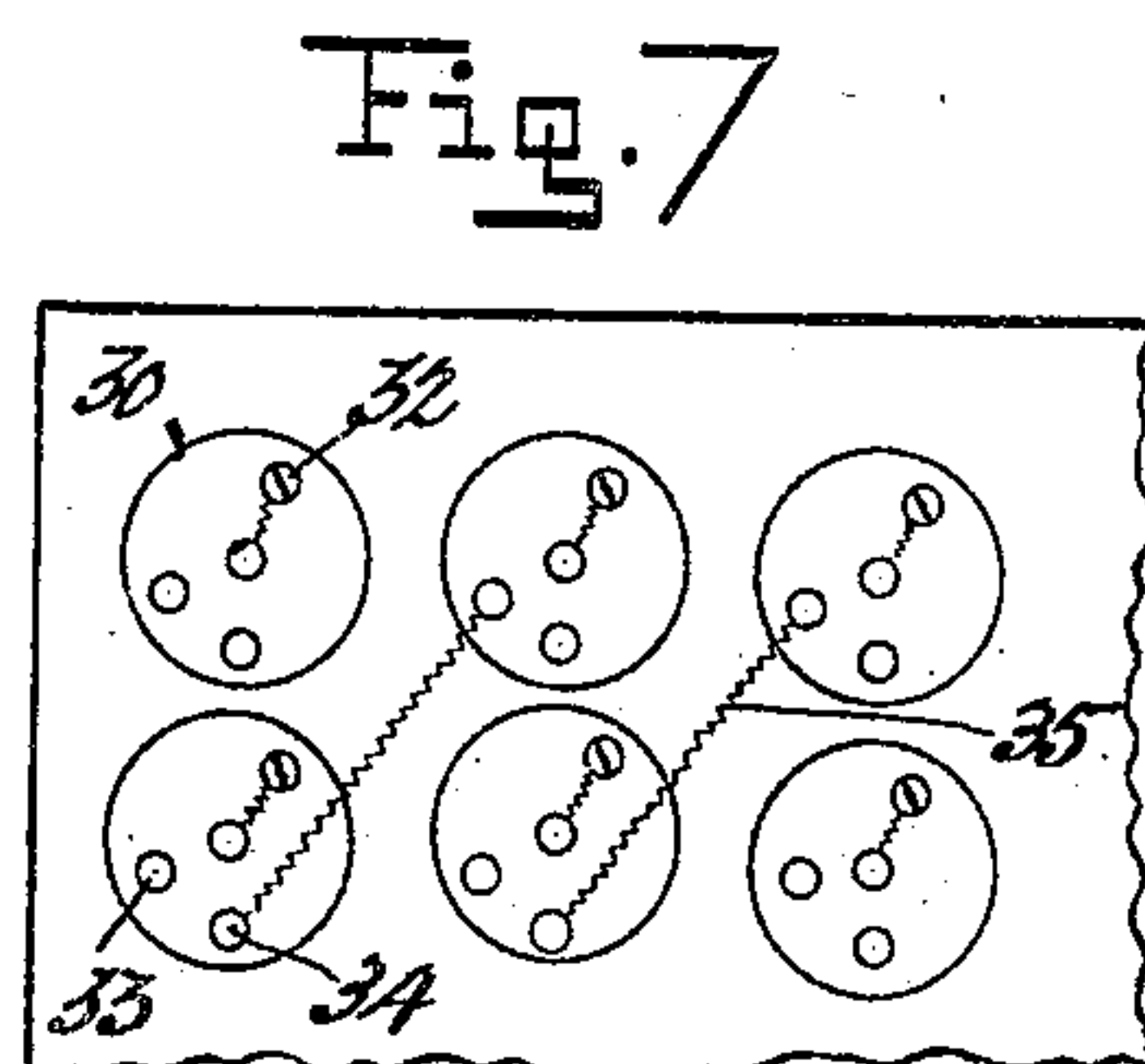
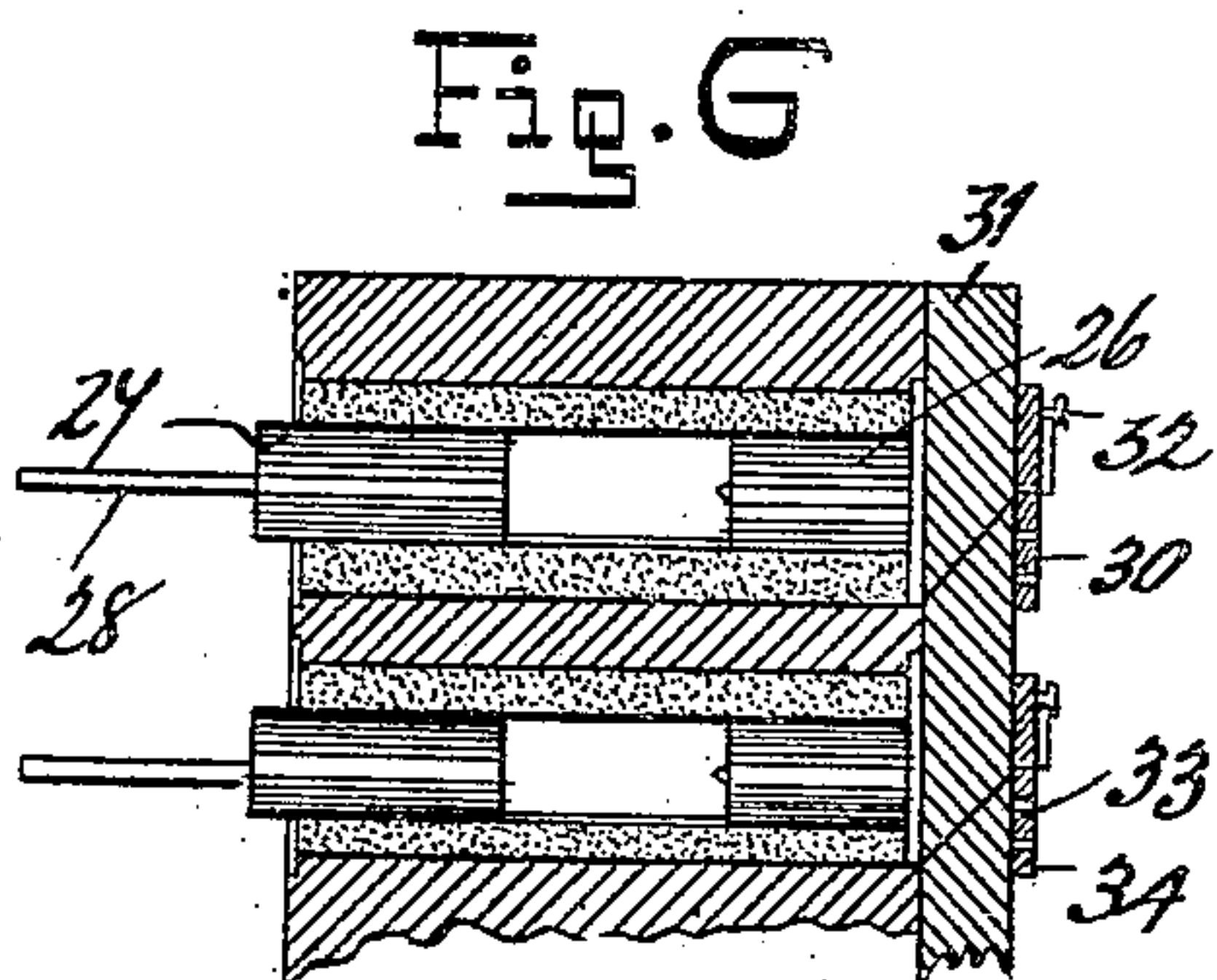
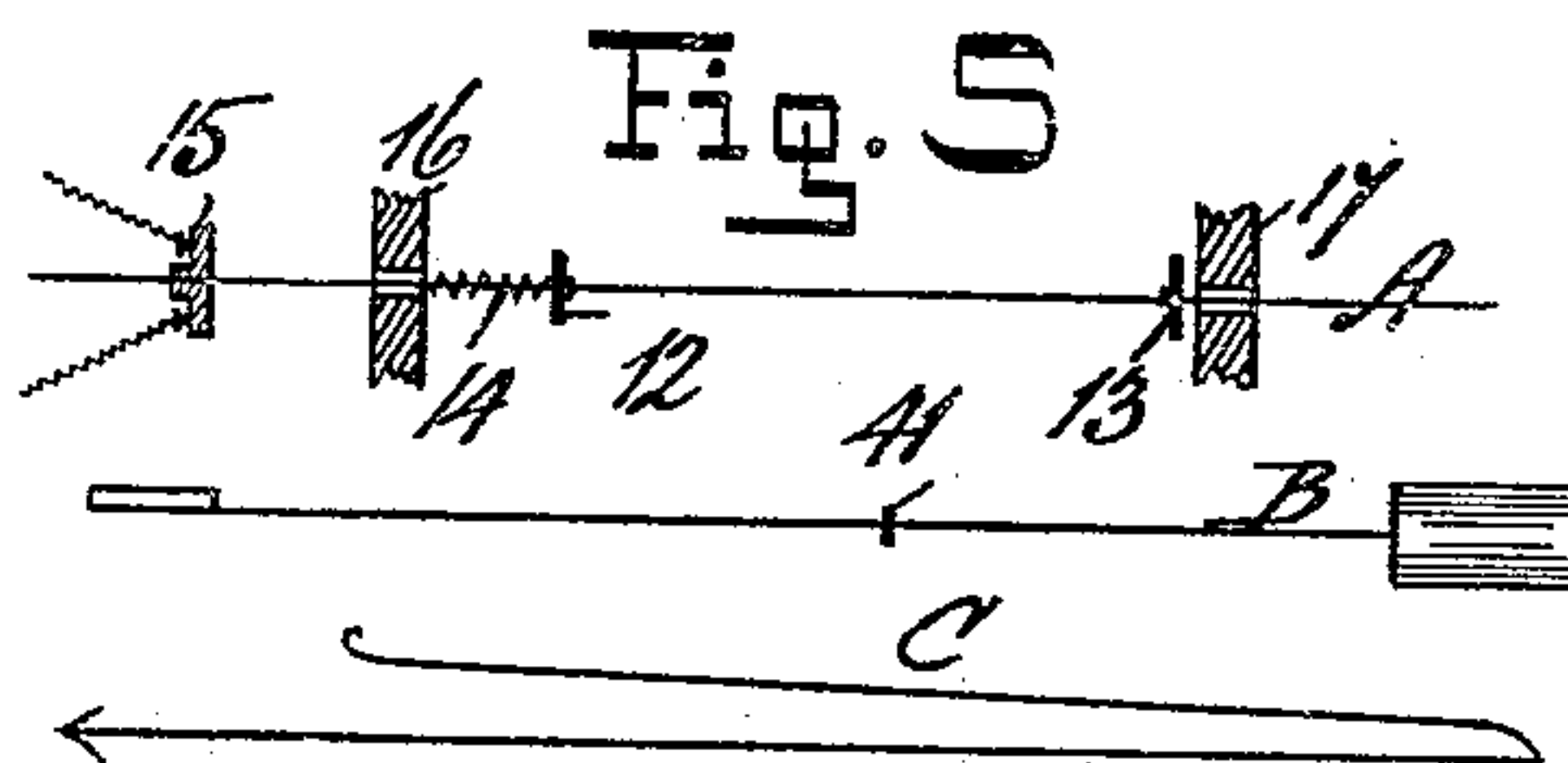
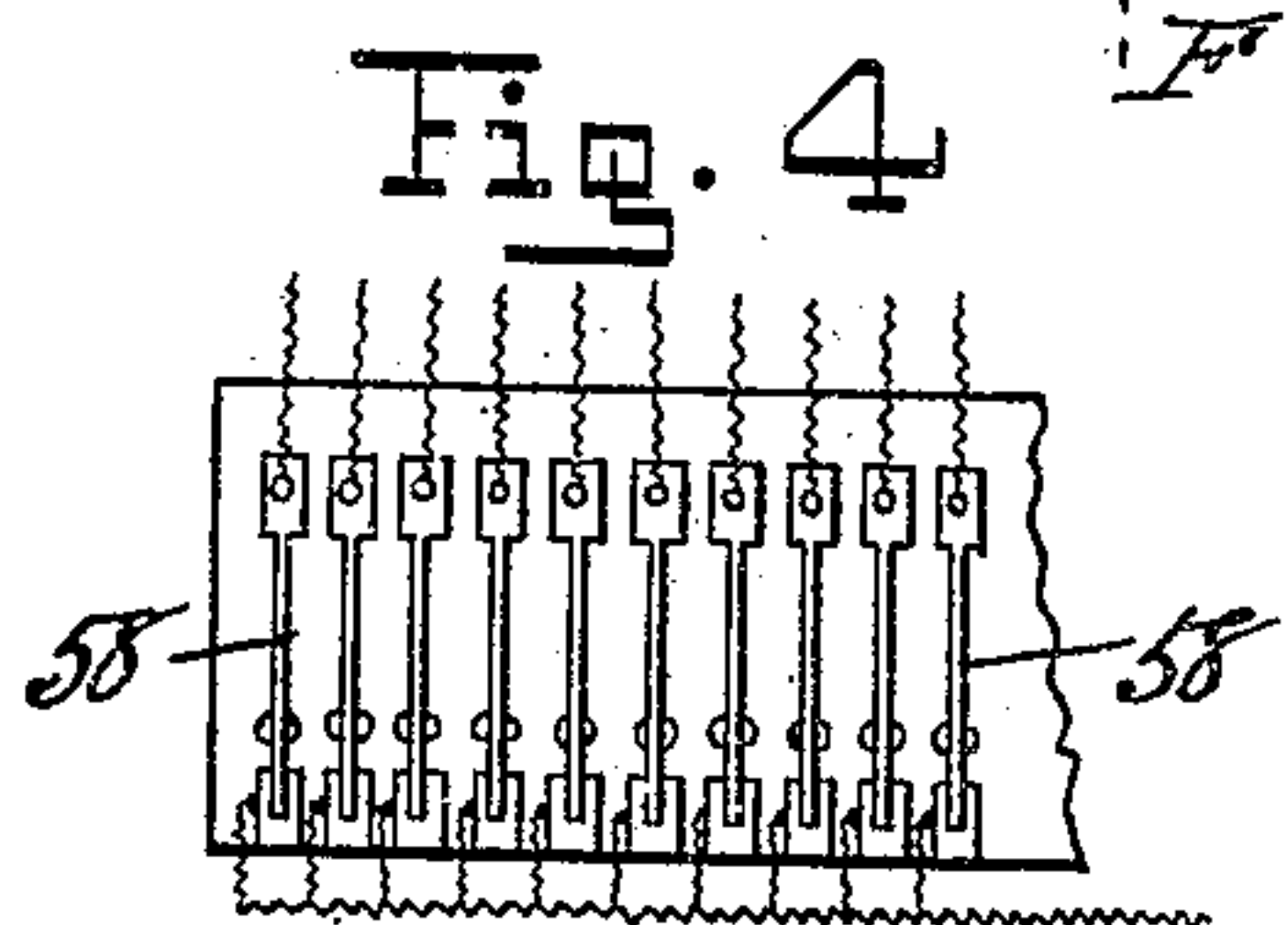
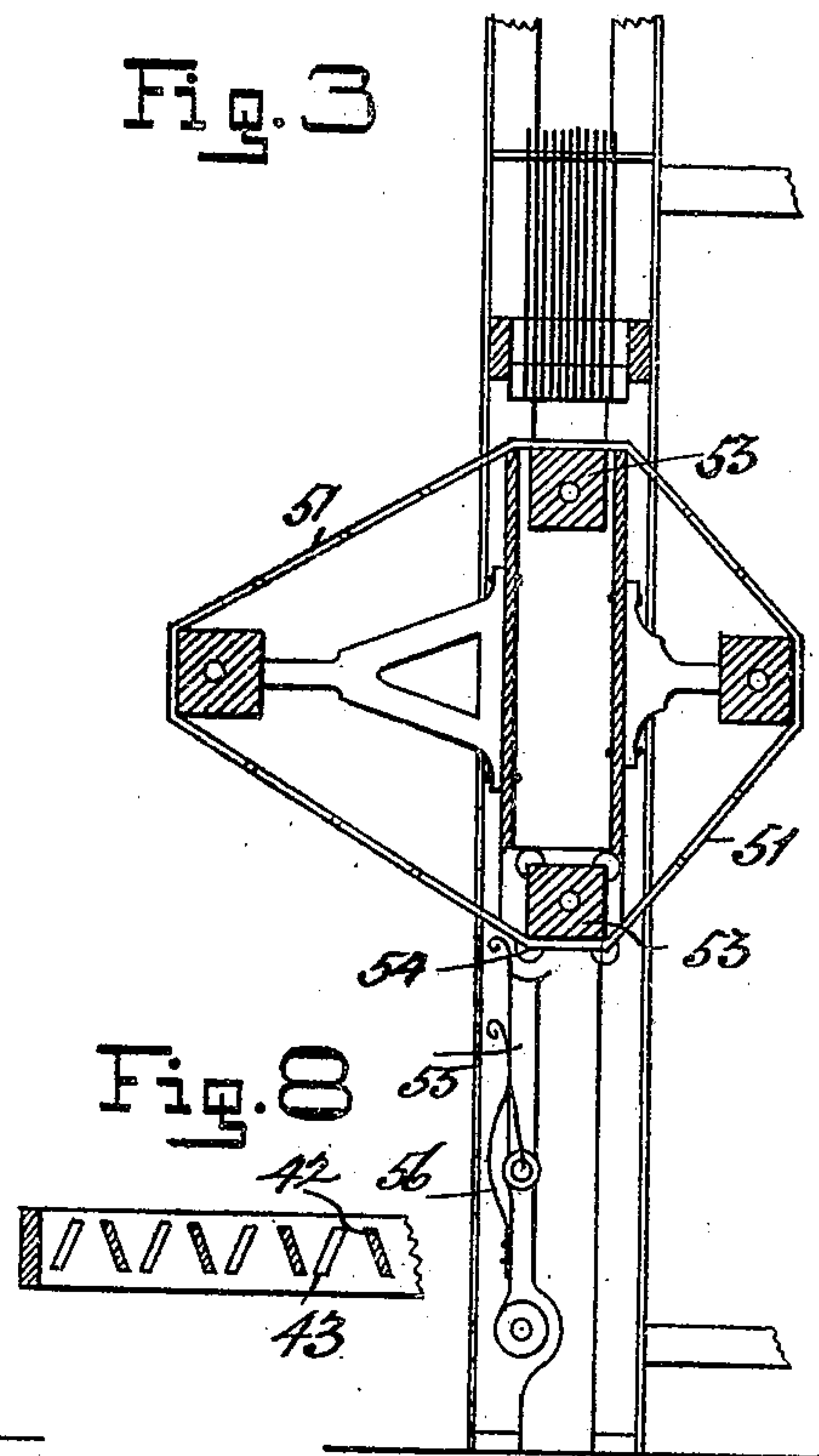
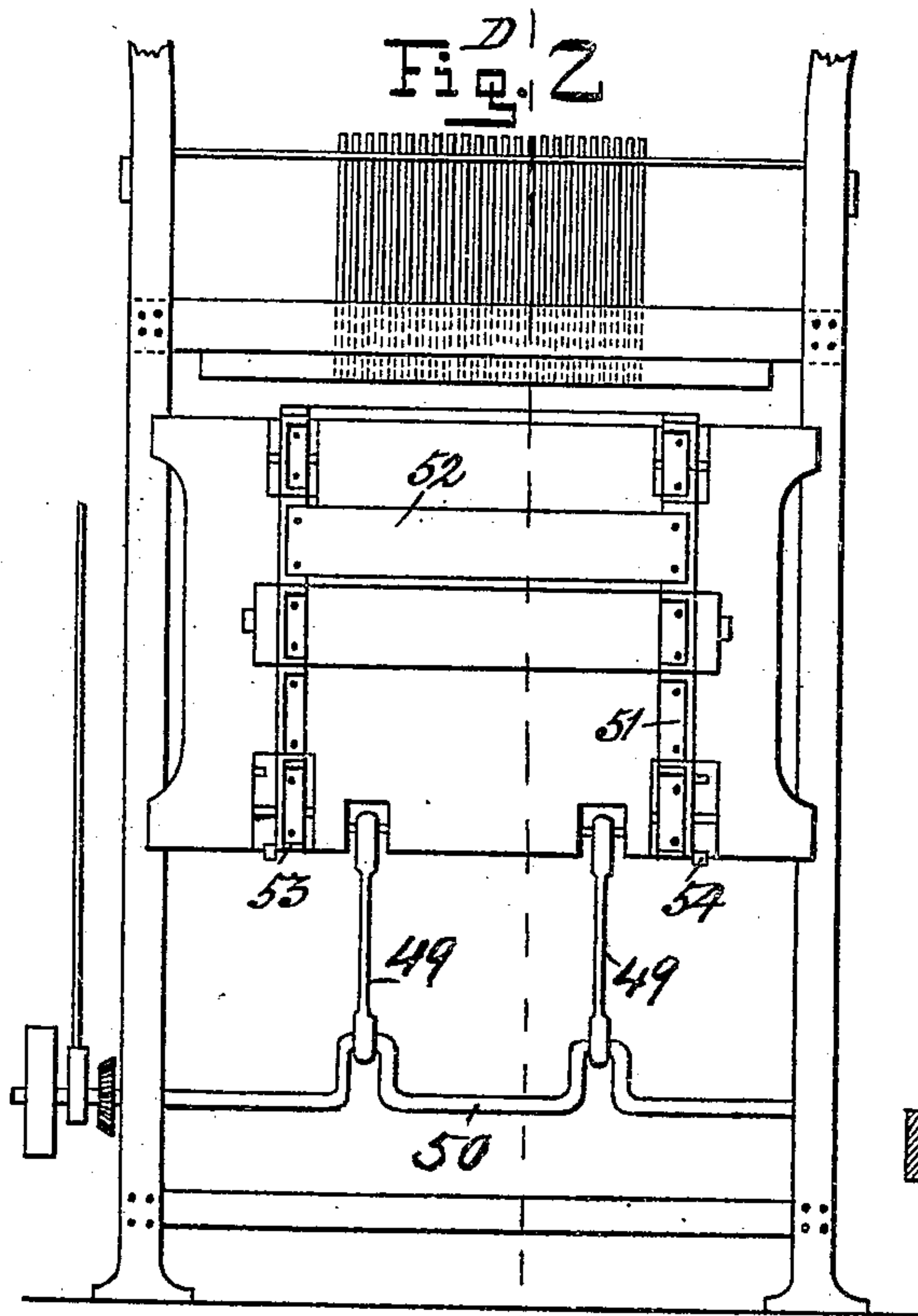
Inventor
Ramon Turné Carbonell
by his Attorney R. Hadden

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2 SHEETS—SHEET 2.



Witnesses
A. Haddan
A. Haddan

Inventor
Ramón Turó Carbonell
by his Attorney R. Haddan

UNITED STATES PATENT OFFICE.

RAMÓN TURNÉ CARBONELL, OF BARCELONA, SPAIN.

MACHINE FOR THE PRODUCTION OF JACQUARD-CARDS.

979,128.

Specification of Letters Patent.

Patented Dec. 20, 1910.

Application filed March 13, 1909. Serial No. 483,278.

To all whom it may concern:

Be it known that I, RAMÓN TURNÉ CARBONELL, a subject of the King of Spain, residing at Barcelona, in Spain, have invented certain new and useful Improvements in Machines for the Production of Jacquard-Cards, of which the following is a specification.

The present invention relates to a machine for the "reading" and automatic punching of complete cards for Jacquard looms in an electro-mechanical manner.

The invention is primarily characterized by a jacquard mechanism actuating the punches and provided with hooks of a special form, combined with other or secondary jacquard mechanisms, the hooks of which are connected to switches interposed in the circuit which connects the "reading" needles to the electromagnets which actuate the needles of the first mentioned jacquard mechanism, in order to establish or interrupt the contact between a design-sheet in said first mentioned jacquard mechanism, and the electromagnets according to indications of pattern cards in the secondary jacquard mechanisms, and simultaneously control the actuation of the punches to perforate complete cards for the most complicated designs, all the above operations being effected with the use of a single design-sheet without the necessity of drawing on said sheet the designs of the different cards used in the secondary jacquards.

The machine is constructed in such a manner that the actuation of the punches for punching the cards can be effected by the first mentioned jacquard mechanism, according to the electric indication of the card or reverse, and this is obtained by the particular construction of the hooks which are provided at their ends with two hooks disposed in opposite directions and by varying the inclination of the frame blades of the jacquard mechanism so that said frame can engage the hooks at the one or other side, according to requirement.

To prevent the formation of sparks either at the points of contact of the "reading" needles with the card or by the opening and closing of the switches, a device is used, the object of which is to break or make the circuit just before the reading needles come in contact with the card or leave this contact in order to avoid damage to the card, needles and switches.

An embodiment of the invention is repre-

sented in the accompanying drawings in which—

Figure 1 shows a longitudinal section of the machine, showing only a small number of hooks, circuits and punches for the sake of clearness of illustration. Fig. 2 is an end elevation of the lower part of the machine, showing the punches. Fig. 3 is a section on the line D—F of Fig. 2. Fig. 4 is a detail view of a contact plate hereinafter referred to. Fig. 5 represents detail views of certain needles and hooks hereinafter described. Figs. 6 and 7 are respectively a partial transverse section of a group of electromagnets and a front view thereof. Fig. 8 is a detail view indicating the two positions assumed by certain blades, hereinafter referred to.

In said drawings, 1 is the metal plate on which is represented the design to be reproduced in the card. This metallic sheet, which is preferably made of zinc, is quadrilled by lithographic impression or other means, and on its surface the design to be reproduced is painted by means of a colored insulating pigment. This slip is similar to that hitherto known effected by hand by the pattern draftsmen, except that the card is metallic and instead of using ordinary color, an insulating color or pigment is used with which the necessary squares are filled.

For imparting to the design sheet the vertical movement necessary for "reading" the successive rows of squares, the sheet is caused to unwind from the roller 2 and be rewound on the roller 3, by the action of two pairs of rollers 4, between which it passes and which are driven by the toothed wheel 5 operated by the worm 6, rod 6^a and crank 7, the latter mounted on the driving shaft 8. Behind the sheet 1 and between the rollers 4, a metal plate 9 is located of the same size as the design. This plate is for the purpose of affording resistance to the design sheet at the part where it is subjected to the action of the needles, and it further serves as a conductor from the electric battery 10.

Opposite the plate 9 a series of needles is arranged all placed in the same horizontal plane; the number of such needles corresponding to the number of punches with which the machine is provided, and the points of said needles exactly correspond to the center of each square of the design. The said needles, represented on an enlarged

scale at A, Fig. 5, comprise thin, metal stems provided with fixed buttons or stops 12 and 13 and a spring 14 located between the button 12 and one of the wooden cross bars 16 which serve as guides for the needles, said springs causing the needles to return to their original positions, immediately the means which operate them have ceased to act. A ring 15 mounted on one end of the needle and provided with two small screws, serves to place the needle in communication with the respective contact or switch and electro-magnet.

The series of horizontal needles 11 is supported and guided by the two fixed wooden plates 16 (Fig. 1). A third plate 17 of wood, also traversed by the needles, is given a horizontal alternate forward and backward movement by an eccentric 19, on the shaft 8, through a rod 19^a and a bell crank lever 18. The plate 17 on movement toward the left carries with it the whole series of needles 11 by contact of said plate with the buttons 13, and in this movement comprises the springs 14, which on expanding when the plate 17 moves back again to the right, forces the needles back again to their original positions. In the first case, all the needles 11 are withdrawn from the design sheet 1, while in the second case, they move in contact with same. At their opposite ends the needles 11 communicate by means of the conducting wires 20 and 21 with the contacts or switches 22 and 23, the purpose of which will be hereinafter explained. The contacts 22 being closed, the needles 11 are in communication by means of the conductors 20 and 24 with a group of electro-magnets 25. These electromagnets comprise a metal tube (Fig. 6) on which is wound fine wire and which is provided internally with a core of soft iron, one half 26 of which is fixed while the other 27 is movable, and adapted to freely slide along the interior of the tube. A small button of bronze is placed at the ends of the fixed core or the movable core if desired to prevent absolute contact between the ends of the two cores, without however preventing the attractive action between them. The movable cores of electromagnets are directly connected to the needles 28 of a jacquard mechanism X (Fig. 1) designed for the actuation of the punches 39. These needles 28 are shown at B in Fig. 5. The reduced dimensions of the electromagnets allow of connecting them directly to the needles 28 and attracting them sufficiently to actuate the hooks 36 and consecutively the punches 39. This was not possible in the known processes, owing to the large dimensions required for the electromagnets. All the magnets are in communication on one side with the needles 11 by means of the conductors 24 and 20, each magnet corre-

sponding to its respective needle. On the other side all the magnets are in communication by means of the conductor 29 with the pole of the battery 10 of opposite sign to that connected to the pattern sheet 1.

The connection of the conductors 24 with the magnets 25 is produced by means of a metal plate or disk 30 (Figs. 6 and 7), placed opposite the fixed core of each magnet from which it is insulated by means of a wooden board 31. Each of the metal plates or disks 30 is provided with a central orifice, through which passes the magnet coil to the binding screw 32. Other orifices 33 and 34 receive the ends of other contact wires 35, which establish connection between certain of the magnets.

The horizontal needles 28 belong to an apparatus X, similar to some extent to jacquard apparatus. In this machine the said needles 28 are adapted to move to the right and left, being actuated by the movable cores of the magnets 25 or by the spring action of vertical hooks 36. These hooks terminate at their upper part in two small oppositely directed points and at their lower part, they are bent around in the form of springs as in the Vincenzi machines. They can be raised vertically by means of the blades 37 in the frame 38, and re-descend to their original positions by the weight of the punches 39. For this purpose they are connected to said punches by means of wires 40 attached to their lower parts.

The needles 28 and the hooks 36 are represented at B C in Fig. 5. The said needles 28 carry the fixed rings 41, by means of which movement toward the right causes the vertical hooks 36 to bend and consequently each of the needles 28 which is attracted by the movable core of its corresponding magnet will cause its respective hook 36 to bend. If at this moment the frame 38 is raised during the general operation of the machine, the blades 42 will engage and lift all the hooks 36 which are bent to the right as shown in Fig. 1 by one of the hooks. These hooks on rising carry with them the punches 39 of the perforating apparatus and the others remain disengaged. The latter punches are those which act to perforate the cards which are placed below. If, instead of raising the hooks 36 corresponding to the needles 28 which are attracted by their magnets, the contrary is desired, it will be sufficient to change the position of the blades as shown in Fig. 8. The blades 42 will be changed by moving them into the position 43, shown in this figure. By this movement, when the frame 38 rises, the blades will only engage the points on the left hand side of the hooks 36. The group of punches for perforating the cards is arranged similarly to the known machine and a further description thereof is considered unnecessary.

It should be noted that on each passage of the pattern sheet from row to row of squares the punches 39 are secured by means of a series of horizontal keys 44 fixed to a board 45 put in horizontal movement by a set of levers 46 and an eccentric 47. At each pass the said keys engage into the notches or perforations in the punches. In this manner the punches are held during the perforating operation in the positions, in which the keys find them, that is to say, that the latter hold down the punches which were not moved by the hooks 36 and support in a raised position those which have been moved by said hooks.

The cards to be perforated are placed on the upper surface of a platform 48, which is caused to rise and descend at each pass, by means of the connecting rod 49 operated by the crank shaft 50. Each time the platform rises the upper part thereof on which the card is placed is applied with pressure against the ends of the punches, which are held down, the perforation of the card being thus produced.

In the machines for perforating jacquard cards hitherto known the cards are placed by hand on the platform 48 and the machine has to be stopped during the changing of the cards.

A further object of the present invention is to avoid the repeated stopping of the machine at each change of card by means of a device represented in Figs. 2 and 3. As shown in these figures, two endless parallel chains 51, formed by rectangular links, on which rest the ends of each card, as shown at 52, are guided by quadrangular blocks 53 adapted to rotate on their axes and which are mounted on all four sides of the platform 48. The actuation of these chains is effected by means of the block 53 at the lower part of the platform, said block carrying at its angles four small cylinders 54, each of which when the platform descends makes contact with the abutment 55 thus causing the block 53 to axially rotate for a distance equal to one of its surfaces and replacing the roller 54 by another following one. The abutment 55 is thus caused to bend to the left, and allow the next roller 54 to pass; the abutment afterward reassuming its vertical position by the action of the spring 56. By means of this device only one operative is required to place the cards on the chains in the position represented by 52, so that without stopping the machine, the latter successively perforates the cards and discharges them at the opposite side owing to the considerable inclination which the chains present at this side.

In the operation of the machine above described assuming that a design is painted on the metal sheet or on metallized paper or further on a divided, pierced sheet, the

movable plate or driver 17 advances toward and away from the design in its forward and backward movement and the needles 11 by the expansion of their springs 14 move in a forward direction until their points are in contact with the card. An electric current is then established in the needles, which not having found color or varnish on the corresponding squares enter into contact with the metal plate of the design (which in the case of a perforated sheet will be the plate 9) while the other needles will remain out of action owing to the color or varnish preventing the passage of the current. The first mentioned needles correspond to the threads which have to be "left" and the second to those which have to be taken.

The electric current, which passes through the needles in contact with the metal sheet 1 is transmitted by the conductors 20 to the contact plate 22. As the contacts are closed the current is directed by the conductors 24 to the respective electromagnets 25. The movable cores of said magnets attract the horizontal needles 28 of the apparatus X which needles in turn cause the bending of the hooks 36 as previously described, while their points on the right are placed in position to be engaged by the blades 37 of the frame 38. At this moment the frame rises and in raising the hooks 36, which are bent, it raises the punches 39, corresponding to said raised hooks leaving the others below. The keys 44 then traverse the punches and rest in the notches or apertures of the latter. The punches which remain lowered, are those which perforate the cards, for which purpose the platform 48, which carries the card, is raised and is forced against the punches so that the perforation of the card occurs. The said raising of the platform is effected by means of the connecting rods 49 operated by the crank shaft 50. This first operation finished, the platform 48 descends, the chain 51 carrying the cards is moved through the desired distance and the group of keys 44 returns, finally assuming the position, represented in Fig. 1. During these movements the driving plate 17 will be displaced to the left, carrying in the same direction the needles 11 by means of the buttons 13, the electric circuit through the needles being thus broken. The corresponding electromagnets 25 thus become demagnetized and the movable cores 27 move to the left and the hooks 36 are released. Simultaneously the frame 38 descends, the hooks 36 will return to their original position, due to the weight of the punches 39, which were lifted and which in turn also drop to their initial position. During this second sequence of movements, the design sheet 1 will move through the distance of a "pass" row of squares and by repeating the movements previously described the machine will

"read" a new portion of the pattern, and simultaneously punch a new card. This will be continued until the "reading" of the design is finished.

5 It is clear that the machine so far described is only adapted to "read" and punch cards with patterns which are not complicated, but since the present machine is adapted for punching pattern cards of large
10 dimensions and of very complicated design it has other advantages, which permit of producing all combinations of regular designs which could enter into the most complicated fabrics without the necessity of
15 painting them on the card. These advantages are obtained by using two additional apparatus Y and Z, exactly similar to the Jacquard or Vincenzi apparatus usually used in looms and which need not be more
20 particularly described.

The apparatus Z is placed at the upper part of the machine and is adapted for punching the cards, its hooks 57 being attached at their lower ends by means of wires
25 53¹, to a series of contacts or switches 58, located on the plate 23 illustrated separately in Fig. 4. Upon this plate there are mounted as many contacts as there are hooks 57 in the apparatus Z and if desired they could
30 be arranged in a plurality of series instead of in a single series as illustrated. The said contacts are each formed of a single metal strip 58, which forms a spring fixed at one end to the plate and adapted to contact at
35 the other end with small metal plates, also fixed to the plate 23. Each contact is connected on one end with one pole of the battery 10 by means of the conductor 59 and at the other end with the general circuit by the
40 conductor 21. These contacts are normally open, as shown in Fig. 1 so that no passage of current takes place but when the hooks 57 of the apparatus Z are raised by the frame 60 in a similar manner as described
45 with reference to the frame 38 contact plates are also raised by the wires 53¹, which connect them to the hooks, the contact is produced and the circuit closed. When therefore the blocks 62 of the apparatus Z render
50 it necessary the hooks 57 will rise and close the contacts and current will pass from the battery through the conductors 59, 21, 20 and 24 to the magnets 25, in such a way that certain punches 39 are caused to rise, the
55 blocks 62 will raise their respective hooks 57 and consequently close the corresponding contacts. The electric current will traverse said contacts although it has not passed through the needles 11 and the punches 39
60 will rise although the design sheet has not controlled same.

The apparatus Y works in the similar manner to the apparatus Z, although its object is just the contrary of that of said latter
65 apparatus. While in the apparatus Z the

contacts corresponding to the needles and hooks indicating the blocks 62 are caused to close, in the apparatus Y the contacts of plate 22 are caused to open, when the blocks 62¹ of this apparatus operate it. The contacts of plate 22 are normally closed and will consequently only break the circuit when they are raised by the needles and hooks of the apparatus Y. Thus, although the design sheet 1 or the block 62 will determine that certain punches 39 are to be raised, they will remain in their lower positions if the block 62¹ of the apparatus Y is operated to open the contacts on plate 22. By the use of the said apparatus Y and Z, it is possible with the entire machine to punch cards for all kinds of complicated designs without the necessity of painting the blocks with the pattern.

It frequently occurs that in a design sheet one half of the design or only a part thereof is painted, since the painted part is repeated one or more times over the whole width of the design. In the latter case, if the number of the needles 11 is for instance 400 and if on the design sheet only half the pattern has been painted it will be found that only 200 needles would be capable of "reading". This inconvenience is removed by effecting communication of certain magnets between the needles owing to the orifices 33 and 34 in the plates 30 previously mentioned with reference to Figs. 6 and 7. Assuming a design of 400 needles, in which only half the pattern is represented it will be sufficient, by means of the conducting wires 35, to connect the first magnet with 201, the second with 202 and so on until the magnet 200 is connected to 400. Thus, each needle will actuate two magnets and consequently the 200 needles will actuate the 400 magnets. The same result can be obtained with only a third of the drawing represented, each needle being caused to actuate three magnets.

The movements of the different parts of the machine can be produced by suitable mechanisms adapted to produce the desired effect. Thus for example, the movements of the frames of the apparatus X, Y and Z can be produced by the eccentrics 63 and the movement of the horizontal needles of these apparatus by the eccentrics 64. Other known mechanisms may, however, be used and these mechanisms form no part of the present invention.

The metallic plate 1 is in communication with one of the poles of a source of electricity 10. Instead of directly connecting the source of electricity 10 to the metal pattern sheet 1 it is preferable to insert a contact 65 between these parts of the system, in order to prevent sparking which might occur when the points of the needles 11 are separated from the metal surface of the pattern, which sparking would destroy

or damage the paper. For this purpose, the contact 65 is formed of two metal members, one of which is fixed and the other movable. The latter member is connected or fixed to the movable plate 17 and consequently participates in its forward and backward movements, being arranged in such a manner that it is separated from the other fixed member slightly before the plate 17 abuts against the buttons 13 on the needles 11. The passage of the current from the battery to the needles is thus interrupted before they break contact with the pattern sheet.

In order to reduce as much as possible the work of the magnets 25, a plate 66, placed opposite the needles 28 of the apparatus X, engages said needles at each movement and causes them to approach as far as possible to the fixed cores of the magnets, thereby relieving the work of the magnets.

It is evident that by the improvements described, the "reading" of the designs and the punching of the cards will be automatically effected, thus dispensing with the manual labor hitherto necessary.

What I claim as my invention and desire to secure by Letters Patent of the United States is:—

1. In a machine for punching jacquard cards, the combination of a pattern sheet provided with conductive and insulated surfaces, a series of needles disposed in a horizontal plane, means for imparting longitudinal reciprocating movement to said needles, to move certain of same in contact with the insulated surfaces and others in contact with the conductive surfaces of said pattern, a series of electro-magnets, connections between the latter and the needles, a source of electricity, connections between one pole of the latter and the pattern sheet, connections between the other pole of the source of electricity and the electro-magnets, a series of punches, hooks connected to the latter, means operated by the electro-magnets in connection with the needles in contact with the conductive surfaces of the pattern sheet for displacing certain of said hooks, means for raising the displaced hooks and punches connected thereto, a support for the cards and means for moving said support whereby the card thereon is perforated by the unraised punches.

2. In a machine for punching jacquard cards the combination of a pattern sheet provided with conductive and insulated surfaces, a series of needles disposed in a horizontal plane, means for imparting longitudinal reciprocating movement to said needles, to move certain of same in contact with the insulated surfaces and others in contact with the conductive surfaces of said pattern, a series of electro-magnets, connections between the latter and the needles, a source

of electricity, connections between one pole of the latter and the pattern sheet, connections between the other pole of the source of electricity and the electro-magnets, a series of punches, hooks connected to the latter, provided at their upper ends with upwardly directed points, means operated by the electro-magnets in connection with the needles contacting with the conductive surfaces of the pattern sheet for displacing certain of said hooks, means for raising the displaced hooks and punches connected thereto comprising a frame, and reversible blades carried thereby adapted to engage the aforesaid points on the hooks, a support for the card and means for moving said support whereby the unraised punches are caused to perforate said cards.

3. In a machine for punching jacquard cards the combination of a pattern sheet provided with conductive and insulated surfaces, a series of needles, means for imparting longitudinal reciprocating movement to said needles to move same against and away from the surfaces of said sheet, a series of electro-magnets, a source of electricity, connections between one pole of the latter and the pattern sheet, connections between the other pole of the source of electricity and the electro-magnets, connections between the needles and said electro-magnets, a series of punches, means operated by the electro-magnets for raising certain of said punches, a support for the cards, means for moving said support whereby the card thereon is perforated by the unmoved punches, an auxiliary jacquard mechanism comprising hooks, means for displacing said hooks, means for raising the displaced hooks, and a series of normally open contacts connected to said hooks said contacts being disposed in the connections between the needles and electro-magnets aforesaid.

4. In a machine for punching jacquard cards the combination of a pattern sheet provided with conductive and insulated surfaces, a series of needles, means for imparting longitudinal reciprocating movement to said needles to move same against and away from the surfaces of said sheet, a series of electro-magnets, a source of electricity, connections between one pole of the latter and the pattern sheet, connections between the other pole of the source of electricity and the electro-magnets, connections between the needles and said electro-magnets, a series of punches, means operated by the electro-magnets for raising certain of said punches, a support for the cards, means for moving said support whereby the card thereon is perforated by the unmoved punches, an auxiliary jacquard mechanism comprising hooks, means for displacing said hooks, means for raising the displaced hooks and a series of normally open contacts connected to said

hooks said contacts being disposed in the connections between the needles and electromagnets aforesaid, a second auxiliary jacquard mechanism comprising hooks, means for displacing the latter, means for raising the displaced hooks, and a series of normally closed contacts connected to said hooks, said latter contacts being disposed in the connections between the needles and electromagnets aforesaid.

5. In a machine for punching jacquard cards, the combination of a pattern sheet provided with conductive and insulated surfaces, a series of needles, means for imparting longitudinal reciprocating movement to said needles to move same against and away from the surfaces of said sheet, a series of card punches, a jacquard mechanism having hooks connected to said punches, a series of electromagnets controlling said hooks, electric connections between the electromagnets and the aforesaid needles, secondary jacquard mechanisms, hooks for the latter, switches in the aforesaid electric connections, and connections between said switches and the hooks of the secondary jacquard mechanisms, substantially as described.

6. In a machine for punching jacquard cards, the combination of a pattern sheet provided with conductive and insulated surfaces, a series of needles, means for imparting longitudinal reciprocating movement to said needles to move same against and away from the surfaces of said sheet, a series of card punches, a jacquard mechanism having hooks connected to said punches, a series of electromagnets controlling said hooks, each of said electromagnets comprising a bipartite core, one part being movable and connected to the jacquard hooks and the other part stationary and connected to the aforesaid needles, a series of contacts to permit interconnection between the various electromagnets, secondary jacquard mechanisms, hooks for the latter, switches in the aforesaid electric connections, and connections between said switches and the hooks of the secondary jacquard mechanisms, substantially as described.

7. In a machine for punching jacquard cards, the combination of a pattern sheet provided with conductive and insulated surfaces, a series of needles, means for imparting longitudinal reciprocating movement to said needles to move same against and away from the surfaces of said sheet, a series of card punches, a jacquard mechanism, double hooks for the latter having points disposed

in opposite directions, frames having blades co-acting with said hooks and capable of movement to change the positions of the blades, connections between said hooks and punches, a series of electromagnets controlling said hooks, electric connections between the electromagnets and the aforesaid needles, secondary jacquard mechanisms, hooks for the latter, switches in the aforesaid electric connections, and connections between said switches and the hooks of the secondary jacquard mechanisms, substantially as described.

8. In a machine for punching jacquard cards, the combination of a pattern sheet provided with conductive and insulated surfaces, a series of needles, means for imparting longitudinal reciprocating movement to said needles to move same against and away from the surfaces of said sheet, a series of card punches, a jacquard mechanism having hooks connected to said punches, a series of electromagnets controlling said hooks, electric connections between the electromagnets and the aforesaid needles, switches in said connections, secondary jacquard mechanisms, pattern cards for the latter, a series of hooks actuated by said pattern cards, and connections between said hooks and switches whereby the circuit is made or broken according to the indications of the pattern cards, substantially as described.

9. In a machine for punching jacquard cards, the combination of a pattern sheet provided with conductive and insulated surfaces, a series of needles, means for imparting longitudinal reciprocating movement to said needles to move same against and away from the surfaces of said sheet, means for preventing formation of sparks between the points of said needles and the pattern sheet, a series of card punches, a jacquard mechanism having hooks connected to said punches, a series of electromagnets controlling said hooks, electric connections between the electromagnets and the aforesaid needles, secondary jacquard mechanisms, hooks for the latter, switches in the aforesaid electric connections, and connections between said switches and the hooks of the secondary jacquard mechanisms, substantially as described.

In witness whereof I have signed this specification in the presence of two witnesses.

RAMÓN TURNÉ CARBONELL.

Witnesses:

LUIS DE SÚGOLA,

BERNARDO PICORNELL.