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Patented Apr. 16, 1901.

J. SZCZEPANIK.

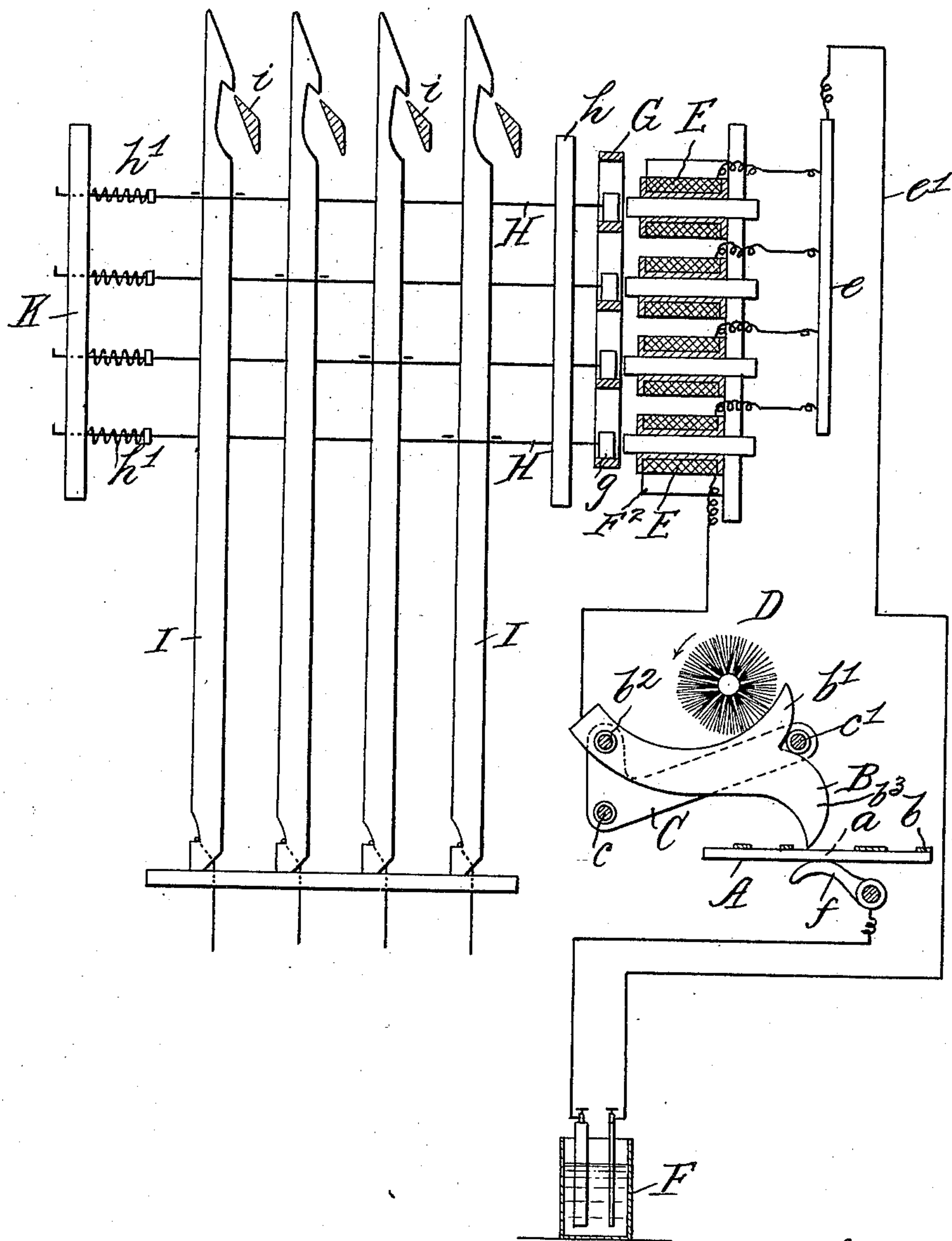
ELECTRICAL CARD PUNCHING APPARATUS FOR THE PRODUCTION OF JACQUARD CARDS.

(No Model.)

(Application filed Feb. 16, 1899.)

3 Sheets—Sheet 1.

Fig. 1.



Witnesses.
Attest
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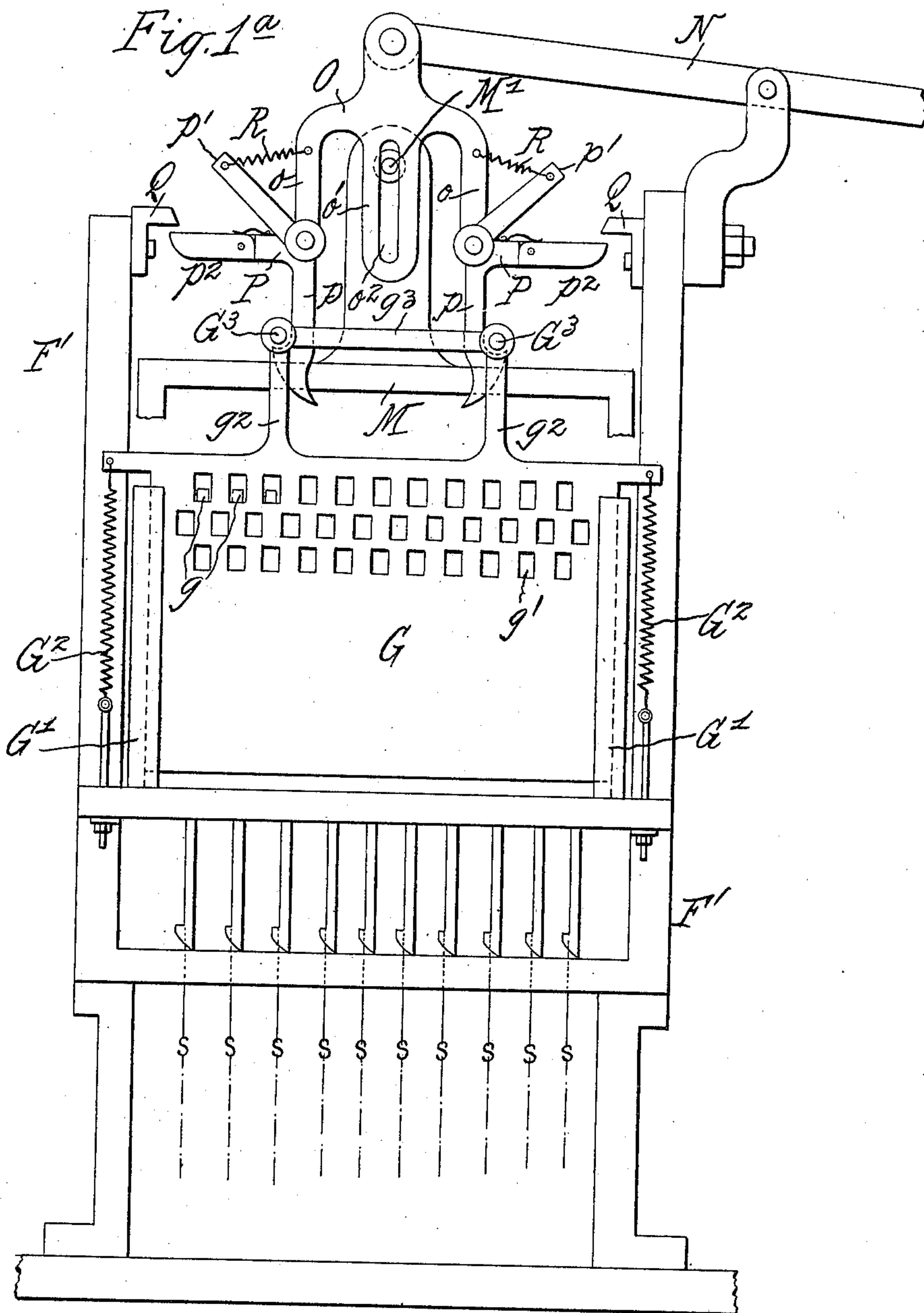
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3 Sheets—Sheet 2.



Witnesses
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3 Sheets—Sheet 3.

Fig. 2.

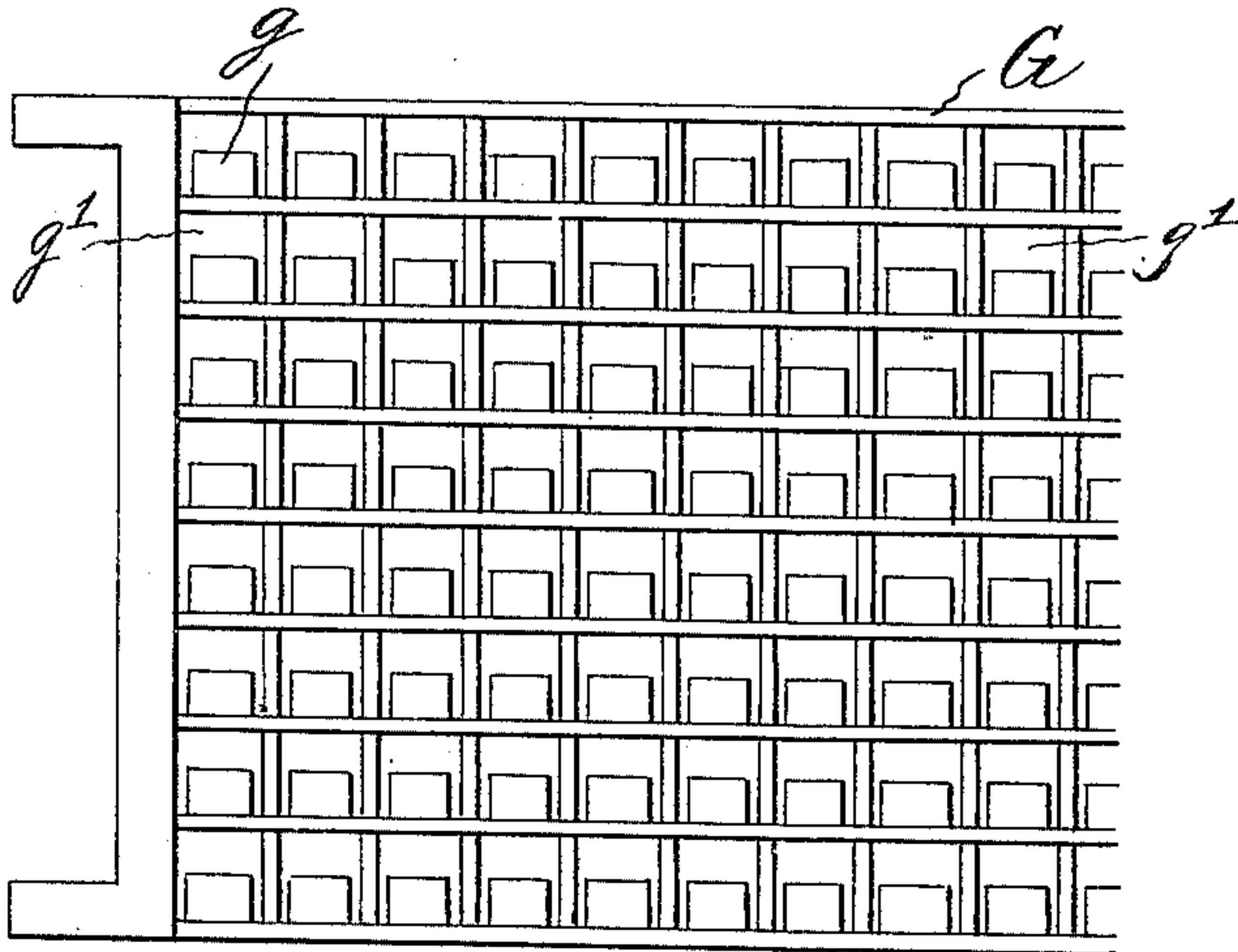
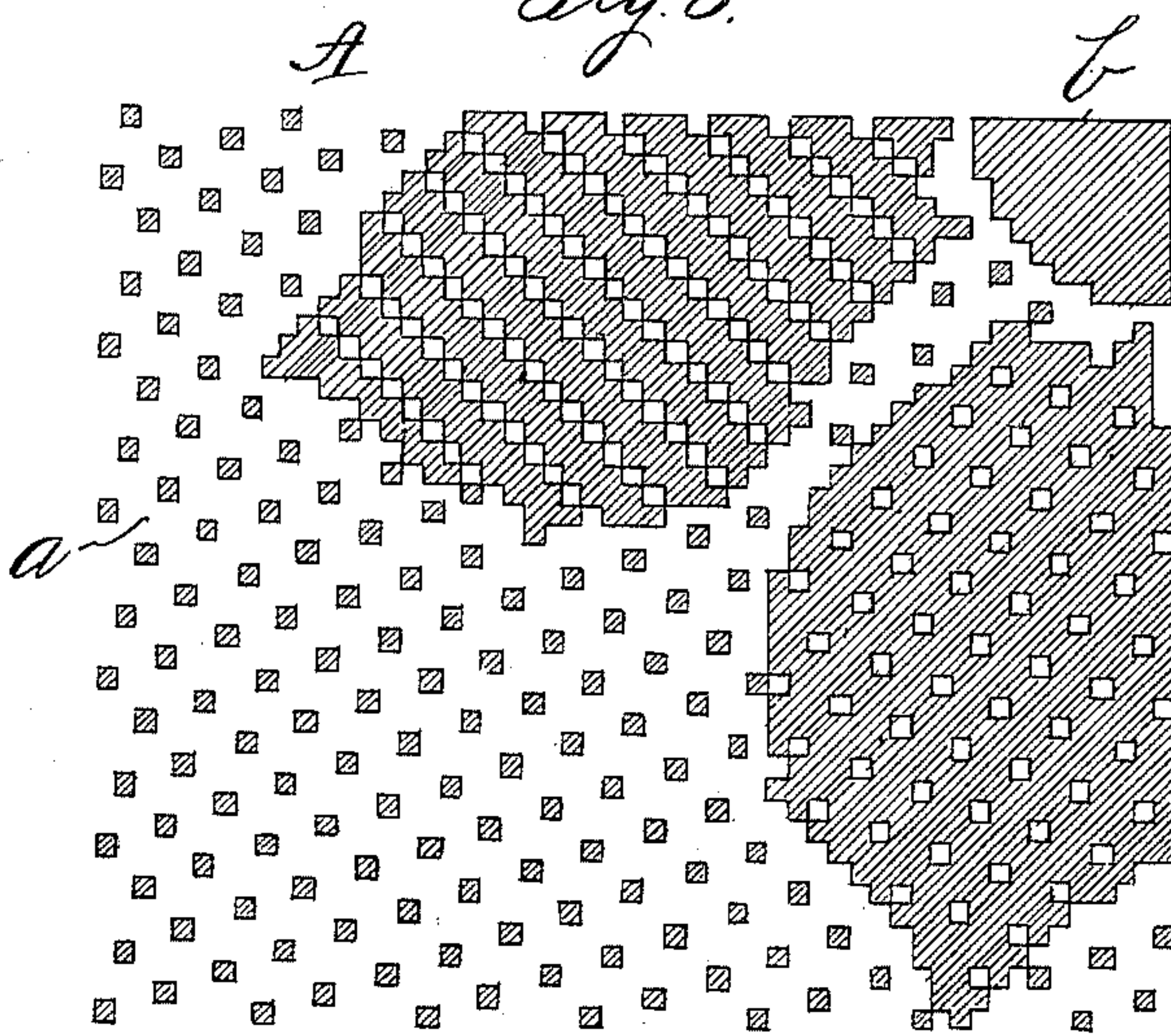


Fig. 3.



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UNITED STATES PATENT OFFICE.

JAN SZCZEPANIK, OF VIENNA, AUSTRIA-HUNGARY.

ELECTRICAL CARD-PUNCHING APPARATUS FOR THE PRODUCTION OF JACQUARD-CARDS.

SPECIFICATION forming part of Letters Patent No. 672,243, dated April 16, 1901.

Application filed February 16, 1899. Serial No. 705,675. (No model.)

To all whom it may concern:

Be it known that I, JAN SZCZEPANIK, a subject of the Emperor of Austria-Hungary, residing at Vienna, in the Province of Lower Austria, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Electrical Card-Punching Apparatus for the Production of Jacquard-Cards; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as 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 letters of reference marked thereon, which form a part of this specification.

My invention has relation to the art of preparing cards for use in Jacquard looms; and it has for its object appliances for controlling the operation of the jacquards of jacquard-operated card punching or perforating machines, whereby cards for Jacquard looms are produced directly from any desired pattern.

The pattern is prepared in a well-known manner by printing the design with a non-conductive pigment, substance, or composition upon a conductive material, whereby conductive and non-conductive fields are formed corresponding with the ground and design of the pattern, while the binding may be produced by alternate conductive and non-conductive fields, the pattern being, as usual, divided or laid out into squares.

One of the main features of my invention consists in the use of a grating or grid which in itself and in conjunction with suitable electric appliances forms a card that controls the operation of the jacquards, which in turn control the operation of the card punching or perforating machine.

Other features of my invention consist in minor details, as will hereinafter appear and as will be specifically set forth in the claims.

That my invention may be fully understood, I will describe the same in detail, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional fragmentary elevation illustrating my invention. Fig. 1^a shows in elevation the mechanism for raising and

lowering the griff and grating. Fig. 2 is an elevation of the grating, and Fig. 3 a specimen pattern provided with bindings from which a card for Jacquard looms can be obtained.

Referring to Fig. 1, B indicates a reader or contact-lever, having its free end bifurcated to form upwardly and downwardly projecting curved branches b' b^3 . In the apparatus there will be as many contact-levers as there are fields or squares in a transverse row of such on the pattern A, said levers being constructed of thin sheet metal and loosely mounted on a common rod b^2 , made of a non-conductive material, and between each two contact-levers B is arranged a thin angular non-conductive spacing-plate C, whose shorter arms are loosely mounted on rod b^2 . The spacing-plates C are furthermore connected together by two rods c c' , passing through the apices of the angles formed by the longer and shorter arms and through the free ends of said longer arms, respectively, said rods c' lying in the fork of the contact-levers B, and as the levers and plates are all loosely mounted on rod b^2 the rod c' tends to hold said contact-levers down upon the pattern-plate A, which, as shown in Fig. 1, is supposed to be movable in a horizontal plane from right to left or toward and under the contact-levers, a common practice in machines for punching cards for Jacquard looms. In view of this I have deemed it unnecessary to illustrate well-known mechanism for moving or feeding the pattern to the contact-levers, especially in view of the fact that the pattern may be mounted on a revoluble cylinder receiving a step-by-step movement through ratchet-and-pawl mechanism, a practice also well known in this art.

By means of the rod c' all the contact-levers B can be simultaneously lifted off the pattern A, and this in practice is effected at predetermined times—say at each revolution of a shaft of the card-punching machine, as the main driving-shaft thereof, said shaft carrying a suitable cam acting upon a lever held in contact with said cam by a spring and acting upon the rod c' to lift the same—so that the pattern A may be fed to the contact-le-

vers step by step—i. e., row by row of fields—and thus avoid injury to the non-conductive material of the fields *b* of said pattern.

To insure proper contact between the levers *B* and the pattern *A*, I preferably employ a brush *D*, of a non-conductive material, revolving in the direction of the arrow, Fig. 1, whereby a resilient pressure device is provided which will not interfere with the lifting of the levers when the pattern *A* receives its feed motion.

On a suitable frame *F*², which in practice is secured to the main frame *F*¹, Fig. 1^a, (which latter is mounted on the main frame of the punching-machine,) are secured small electromagnets or solenoids *E*, one for each contact-lever *B*. Said electromagnets are arranged in a series of vertical rows, one terminal of the electromagnets of a row being connected to a conductor-bar *e*, said bars being connected with one pole of a suitable source of electricity, as a battery *F*, while each contact-lever is electrically connected with the other terminal. In front of the electromagnets and close to the cores projecting therefrom is arranged a movable grating or grid *G*, provided with an opening *g*¹ for each electromagnet *E*, in which opening is loosely placed an armature-block *g*. The openings *g*¹ are slightly wider than the armature-blocks *g* and of such length vertically as to admit a certain vertical movement of the grating without carrying along those armatures which may have been attracted by their respective electromagnets for the time being. The grating *G* may have its openings *g*¹ formed in vertical rows, as shown in Fig. 2, or in alternating vertical rows, as shown in Fig. 1^a, the electromagnets *E* being arranged accordingly.

In front of the grating *G* is arranged a needle-board *h*, such as are used in jacquards, in which are guided needles *H*, connected to hooks *I*, one for each electromagnet, and *K* is a movable board by means of which said needles may be moved away from the grating *G*. Each of said needles has a collar-abutment and a spring *h*¹, mounted on the needle and abutting against said collar, and the board *K* tends to move such needle toward the grating *G* and its hook *I* into the path of the bars *i*, Fig. 1, of the griff *M*, Fig. 1^a. When the grating *G* is in a normal position, the needles *H* abut against their respective armature-blocks *g* and hold their respective hooks *I* out of the path of the griff-bars *i*, Fig. 1. These hooks *I* are connected in a well-known manner to corresponding hooks of a jacquard-controlled punching-machine of any well-known construction, so that the operation of said machine is controlled by the hooks *I* of the described controlling apparatus.

As hereinabove stated, the pattern *A* is made of a conductive material and non-conductive fields and is included in the battery-circuit through a trailing contact at *f*, Fig. 1.

The grating *G* and griff *M* are lowered and

raised as follows, reference being had to Fig. 1^a: The grating is guided in grooved guideways *G*¹ in the frame *F*¹, to the upper end of the side bars of which are secured abutments *Q*, and the said grating is provided with two vertical arms *g*², projecting from its upper edge and united by a cross-bar *g*³. The pins *G*³, which connect the cross-bar *g*³ to the upper ends of arms *g*², project therefrom sufficiently to be normally engaged by the hook-arms *p* of two three-armed levers *P*, fulcrumed to depending arms *o* of a lifting device *O*, provided with an intermediate vertically-slotted arm *o*¹, into the slot *o*² of which projects a pin *M*¹ on a vertical arm of the griff *M*. The arms *p*¹ of levers *P* are connected to the arms *o* of the lifting device by springs *R*, that tend to move the hook-arms *p* outwardly in the direction of the pins *G*³, while the arms *p*² of said levers *P* are made in two parts, hinged together and held in a normal horizontal position by suitable springs, the hinged outer portions of said arms having curved under faces at their outer ends, which normally lie in line with and below the afore-said abutments *Q*. The hook ends of the arms *p* of levers *P* have likewise curved converging outer faces for purposes presently explained.

The operation of the apparatus is as follows: When the parts are in a normal position, the hooks *I* are in their lowermost position, either in or out of the path of their respective griff-bars *i*, and the griff *M* and grating *G* are likewise in their lowermost position, while the needle-board *K* is at the limit of its position toward the left to hold the needles away from grating *G*. All the electromagnets are demagnetized, and in practice I prefer to include in the electric circuit a suitable switch to open and close the battery-circuit, and this switch may be operated by hand or by a moving element of the apparatus or of the punching-machine and the operation of the switch timed to open and close the electric circuit at the proper moment. The pattern *A* being properly positioned under the levers *B*, the grating *G* is raised sufficiently by means of the lever *N* to bring the armature-blocks *g* in line with their respective needles *H*. The needle-board *K* is now moved toward the grating *G*, causing the needles *H* to bear against their respective armature-blocks *g*, thereby placing their springs under compression. The electric circuit is now closed, thereby energizing those electromagnets of those contact-levers in contact with conductive fields of the pattern *A*, the armatures *g* of said electromagnets being attracted. At this moment the grating *G* is released and moved down into its normal position by the springs *G*², carrying along the contact-blocks of the demagnetized electromagnets *E*, and thus allowing the springs *h*¹ of needles *H* to move the latter into the openings in the grating above said contact-blocks, thereby mov-

ing their respective hooks I into the path of their griff-bars i , while those needles having bearing on the armatures of the energized electromagnets are held back. The griff M is
 5 now lifted, thereby lifting the hooks I in the path of certain griff-bars i , and as the hooks I are connected in a well-known manner with the jacquard that controls the punches of the
 10 card-punching machine those punches corresponding with the raised hooks I will be operated to perforate a card.

The devices for lifting the grating G and griff M are so arranged that when said grating is lifted sufficiently to bring the armatures g into line with their respective needles the hinged spring-arms p^2 will strike the abutments Q, thereby swinging lever-arms p inwardly out of engagement with the pins G^3 on said grating, releasing the latter, its
 20 springs G^2 drawing the grating down again to a normal position. At this time the lifting-pin M' on griff M will lie in the lower end of the slot o^2 of arm o' of lifter O, so that by a further depression of lever N the griff M
 25 will be lifted the required distance, the arms p^2 of levers P snapping over the abutments Q, thus allowing the springs R of levers P to tilt said levers and throw their hook-arms p outwardly. On lowering the lifter O the arms
 30 p^2 again come into contact with abutments Q, tilting the levers P so as to swing their arms p inwardly, with the converging faces of the hook ends of said arms in contact with the lifter-pins G^3 on grating G, so that as said
 35 lifter O moves down to a normal position said arms p^2 snap under the abutments Q, while the hook-arms p of levers P snap into engagement with said lifter-pins G^3 , griff-lifter pin M' now lying again in the upper end of slot
 40 o^2 in arm o of lifter O. Before the next row of fields on the pattern-card is moved under the contact-levers the electric circuit is or has been interrupted. The contact-levers are then lifted by the means heretofore described and
 45 lowered again upon the next row of fields, and the above-described operations are repeated.

By means of the described arrangement I am enabled to use electromagnets or solenoids so small that they will neither influence one
 50 another nor neighboring armatures and will occupy the least possible space, while said armatures form practically a card by which the loom-card is produced in the punching-machine by mechanical appliances. I am furthermore enabled to use electric currents so
 55 weak as not to injure the pattern, which is one of the great disadvantages found in many card-punching machines.

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

1. In apparatus such as described, the combination with contact-levers, electromagnets one for each lever, electric connections connecting the magnets and levers in series, an
 65 electric circuit in which said magnets are in-

cluded in parallel, means for closing the circuits through a pattern having conductive and non-conductive fields, a jacquard having a needle for each electromagnet, means for
 70 moving said needles toward and from their respective electromagnets, griff-bars and hooks operated thereby, said hooks moved by the needles into and out of the path of their respective griff-bars; of a movable grating be-
 75 tween the needles and electromagnets having an opening for each of such magnets and an armature-block smaller than and loosely placed in each of said openings, for the purpose set forth. 80

2. In apparatus such as described, the combination with contact-levers arranged in a horizontal row, electromagnets one for each lever, arranged in vertical rows, electric connections connecting the levers and magnets
 85 in series, an electric circuit in which said magnets are included in parallel, means for closing the electric circuit through a pattern having conductive and non-conductive fields, a jacquard having a needle for each electro-
 90 magnet, springs acting to move said needles toward said electromagnets and means for moving said needles in an opposite direction, griff-bars and hooks operated thereby, said hooks moved by their respective needles; of
 95 a vertically-movable grating between the needles and electromagnets having an opening for each magnet and an armature-block smaller than and loosely placed in each of said openings, for the purpose set forth. 100

3. In an apparatus such as described, the combination with a series of electromagnets organized to be selectively energized, armatures for each magnet, a movable frame carrying said armatures, a series of needles movable toward the series of armatures and
 105 means for moving said frame to cause unattracted armatures to move out of the path of their respective needles, substantially as set forth. 110

4. In apparatus such as described, the combination with a series of contact-levers bifurcated at their free end, and a rod on which they are loosely mounted; of angular insulators, one between each two levers, having
 115 one of their arms loosely mounted on said rod, and rods passing respectively through the other arm and through the apices of the angles of said insulators, one of said rods lying in the bifurcation of the levers, for the
 120 purpose set forth.

5. In apparatus such as described, the combination with the contact-levers B of the revoluble brush D acting upon the upper face of said levers, for the purpose set forth. 125

6. In an apparatus such as described, hooks, griffs and needles arranged to be spring-pressed to move the hooks in the path of the griffs, in combination with a fixed electro-
 130 magnet opposite the end of each needle, a grid vertically movable between the needle ends and their magnets, a magnet opposite

each armature in said grid and smaller than
the openings therein, whereby the armatures
that are not held by the magnets are dropped
out of the path of their needles to allow them
5 to enter the openings in said grid and move
their hooks into the path of the griffs, sub-
stantially as set forth.

In testimony that I claim the foregoing as
my invention I have signed my name in pres-
ence of two subscribing witnesses.

JAN SZCZEPANIK.

Witnesses:

ALVESTO S. HOGUE,
AUGUST FUGGER.