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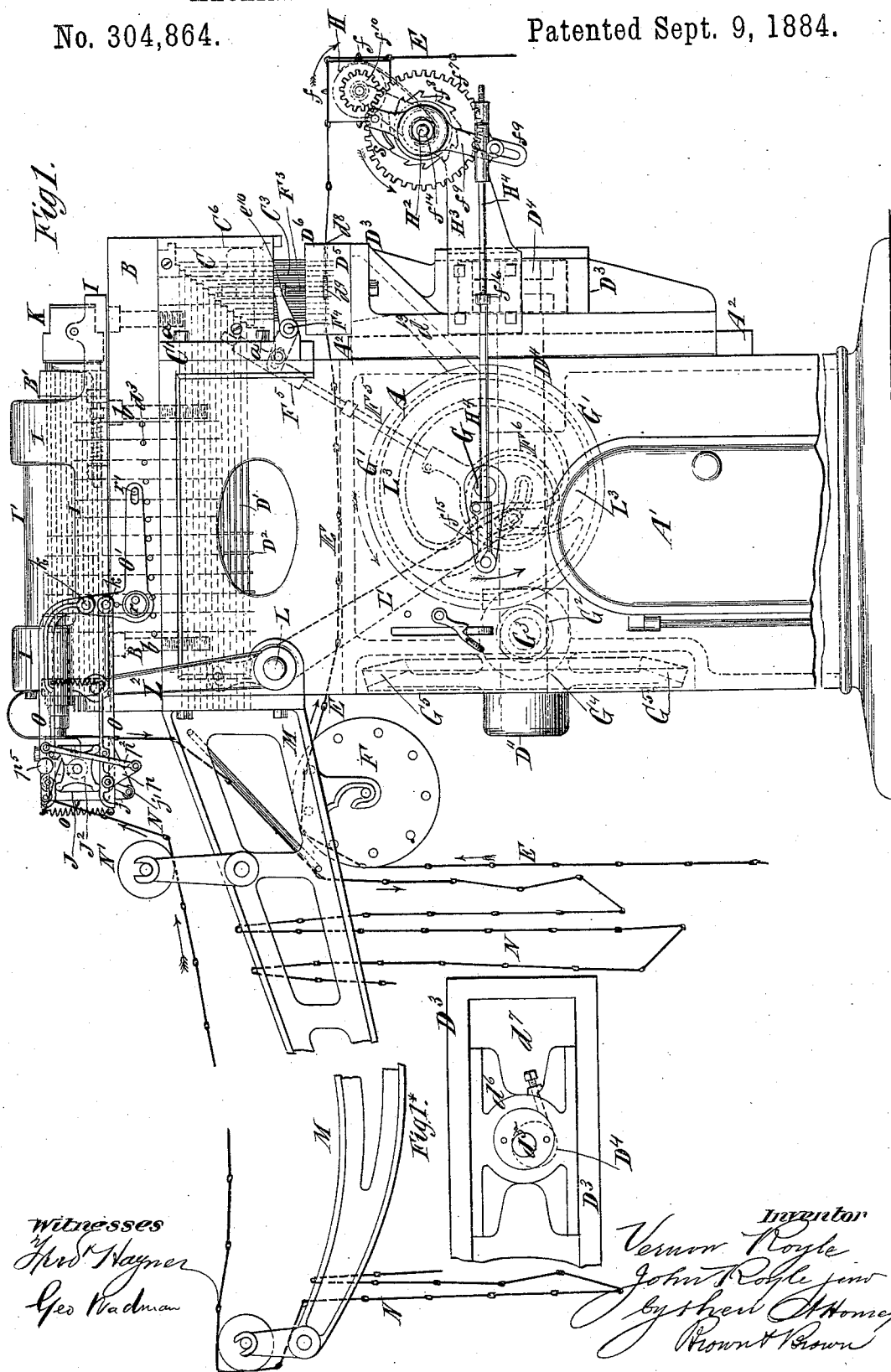
4 Sheets—Sheet 1.

V. ROYLE & J. ROYLE, Jr.

MACHINE FOR REPEATING PATTERN CARDS.

No. 304,864.

Patented Sept. 9, 1884.



Witnesses

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 Mrs. Wagner
 Geo. Wadman

Geo Radman

Inventor

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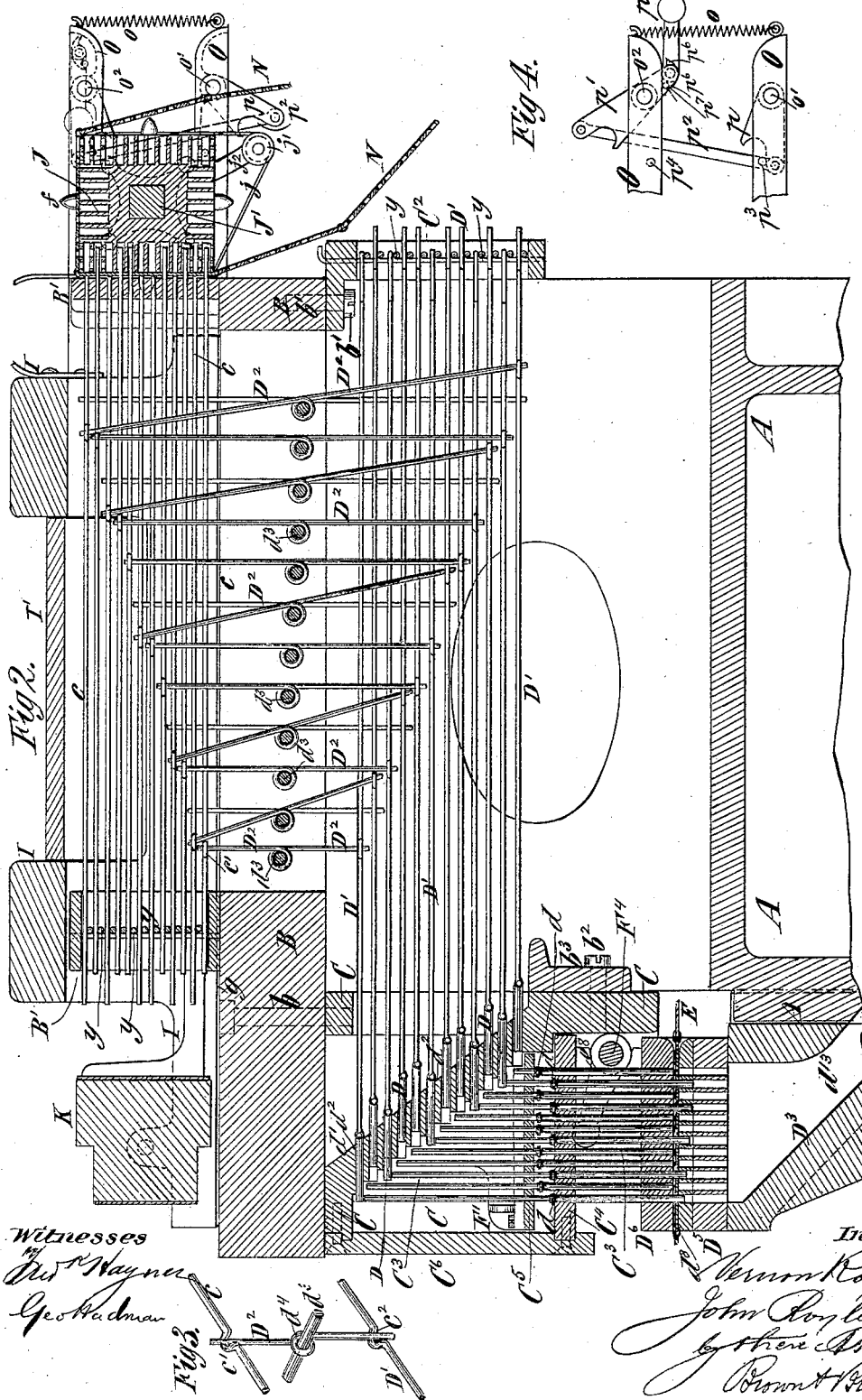
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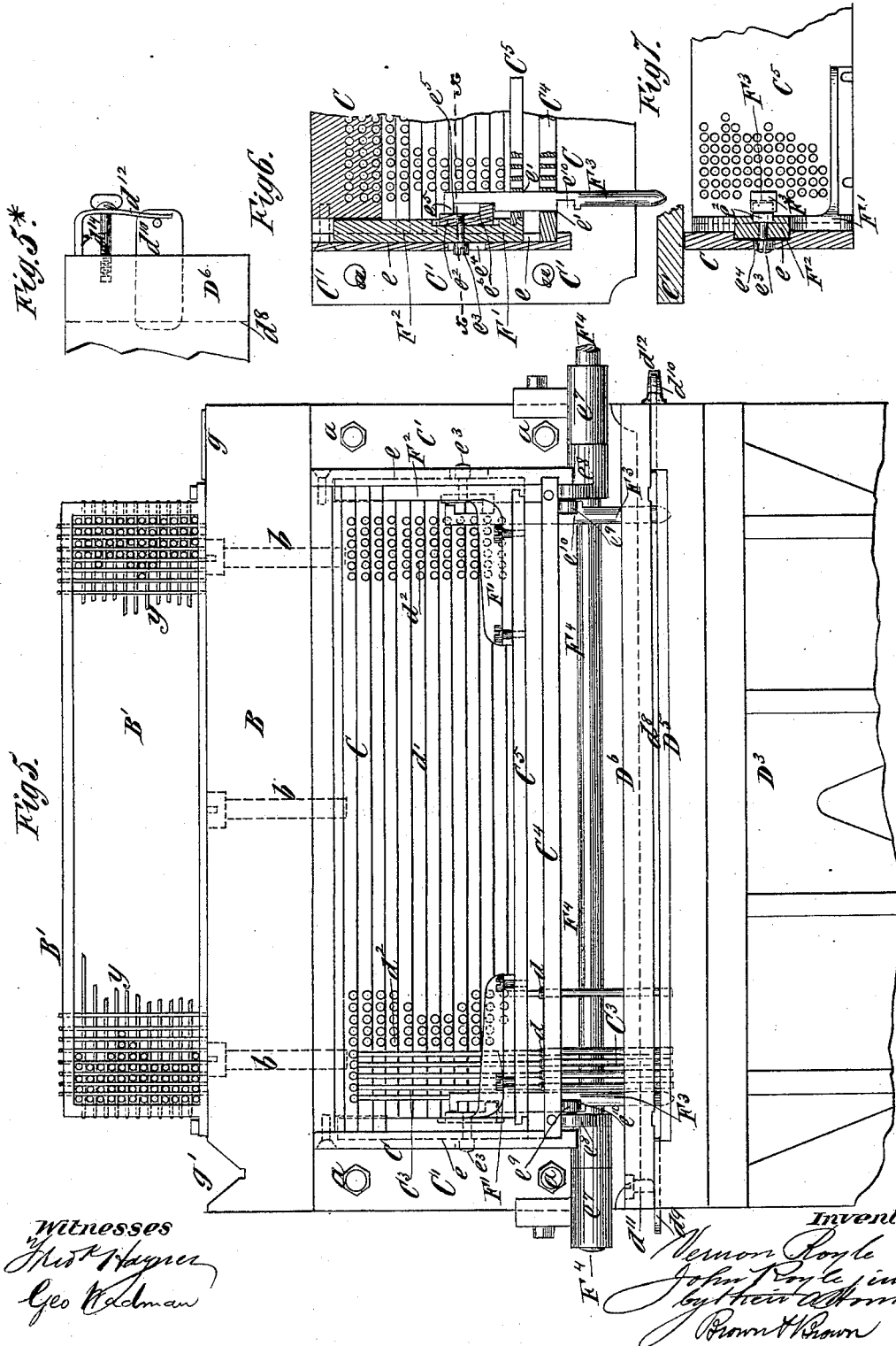
4 Sheets—Sheet 3.

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No. 304,864.

Patented Sept. 9, 1884.



Witnesses
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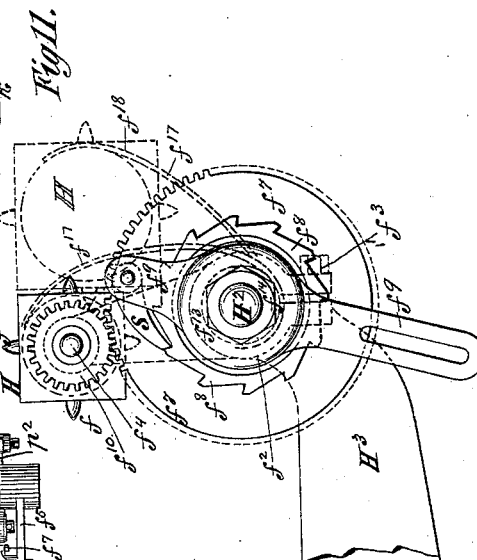
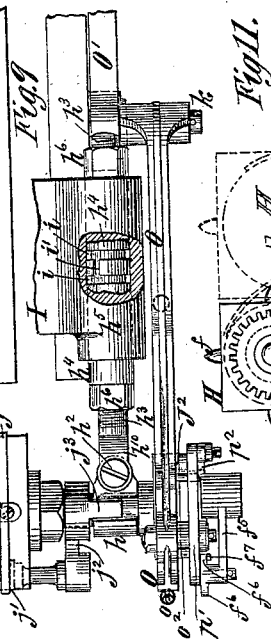
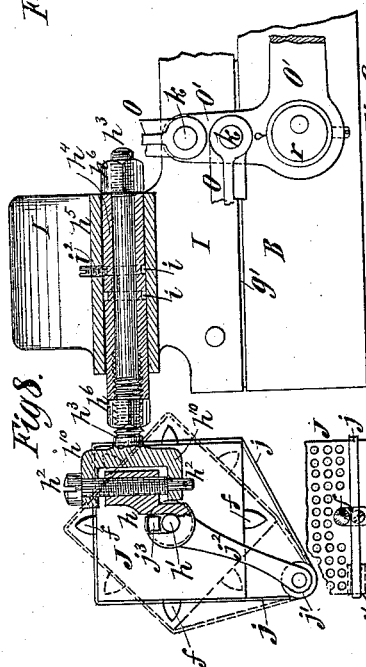
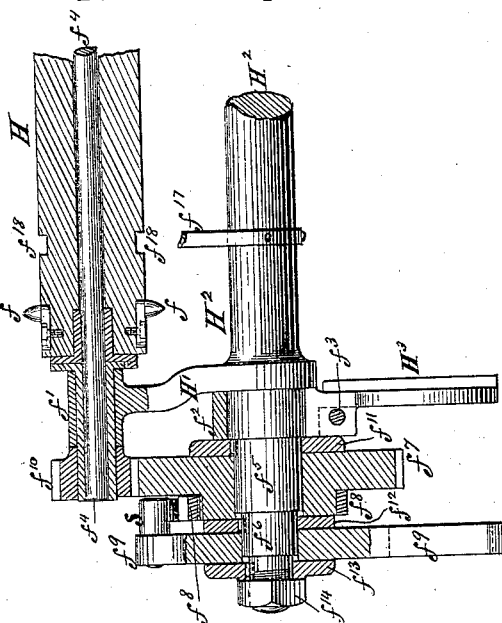
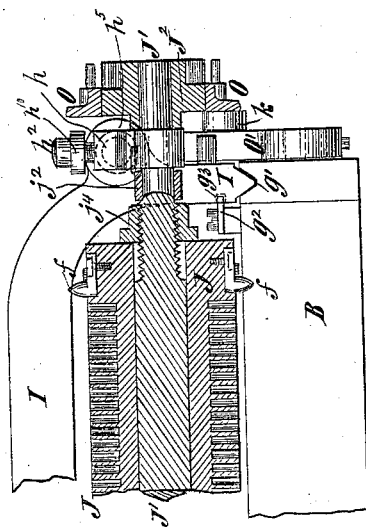
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MACHINE FOR REPEATING PATTERN CARDS.

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UNITED STATES PATENT OFFICE.

VERNON ROYLE AND JOHN ROYLE, JR., OF PATERSON, NEW JERSEY.

MACHINE FOR REPEATING PATTERN-CARDS.

SPECIFICATION forming part of Letters Patent No. 304,864, dated September 9, 1884.

Application filed July 5, 1883. (No model.)

To all whom it may concern:

Be it known that we, VERNON ROYLE and JOHN ROYLE, Jr., both of Paterson, in the county of Passaic and State of New Jersey, have invented an Improvement in Machines for Repeating Pattern-Cards, of which the following is a specification.

Our invention relates to machines for "repeating" pattern-cards for use in Jacquard looms—that is, for producing exact duplicates of any set or chain of pattern-cards desired, so that after one set or chain of cards which are known to be correct have been produced fac-similes thereof may be produced at small cost.

In machines for the purpose above described the chain of pattern-cards is fed or drawn forward by a pattern-cylinder, around or over which it is carried, and a number of "selecting-needles," as they are termed, are arranged in such relation to the pattern-cards and pattern-cylinder that at each movement of the needles or pattern-cylinder the cards are caused to act against the needles, and such needles as are opposite imperforate portions of the cards will be moved longitudinally, while such needles as are opposite the perforations of the cards will not be moved or operated on. The punching of the new or fresh cards is performed by a number of punches, which are controlled in their action by a corresponding number of keys, which are connected with the aforesaid selecting-needles, and are capable of movement thereby, to obtrude the keys in the way of the upper ends of the punches, so that whichever selecting-needles are moved the corresponding keys will be moved into positions to form abutments for the punches, and thus cause them to operate on the cards, while all the other selecting-needles and keys will remain stationary and the corresponding punches will not operate on the cards.

The principal objects of our invention are to provide a very strong and solid machine having the parts which require to be often inspected and most often repaired readily accessible, and which will be as nearly infallible in its operation as is possible.

To these ends our invention consists in novel

combinations of parts, hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of a machine embodying our invention. Fig. 1* is a front elevation of the throat-piece through which the cards to be cut pass, the carriage on which it is supported, and the mechanism employed for imparting a rising and falling motion to said carriage. Fig. 2 is a vertical longitudinal section of the upper portion of the machine. Fig. 3 is a detail perspective view of portions of a selecting-needle and key-wire and a lever connecting them. Fig. 4 is a detail view of the mechanism employed to turn the pattern-cylinder. Fig. 5 is a front view of the upper portion of the machine with a portion of the frame or case removed. Fig. 5* is a detail plan view, hereinafter referred to. Fig. 6 is a sectional elevation of certain of the parts shown in Fig. 5. Fig. 7 is a horizontal section on the dotted line *x x*, Fig. 6. Fig. 8 is an end view of the pattern-cylinder and a side elevation, partly in section, of a part of the carriage by which said cylinder is reciprocated. Fig. 9 is a plan of one end portion of the pattern-cylinder and a partly-sectional plan of a part of the cylinder-carriage and the parts operating in connection with the cylinder. Fig. 10 is a longitudinal section of one end portion of the pattern-cylinder and devices for operating the same. Fig. 11 is an end view of the feed-cylinder and the mechanism for operating it, and Fig. 12 is a longitudinal section through one end portion of the feed-cylinder and its operating mechanism. All the figures following Fig. 1 are on a larger scale.

Similar letters of reference designate corresponding parts in all the figures.

A designates the main or base frame of the machine, here shown as hollow and closed by a door, A', as shown in Fig. 1. The sides of this frame—that is, the side shown in Fig. 1 and that opposite to it—are continued above the ends or the portions at the right and left hand of Fig. 1, and upon these side-portions there rests a top plate, B.

At the front of the machine is a hollow frame or head, C, which we term the "punch-head," and which is provided at the sides with flanges

C', through which are inserted bolts *a*, to secure it to the main or base frame A.

At the back of the machine, and opposite the head, is a frame, C², which fits against the back end of the main or base frame A.

The top plate, B, is secured fast to the head C by means of screws *b*, (shown in Fig. 1, 2, and 5,) and the back frame, C², is likewise secured to the top plate, B, by bolts *b'*, the said parts constituting a top frame. Now, it will be observed that when the bolts *a* are removed the top plate, B, the head C, and the frame C² may all be lifted off as one piece or top frame, leaving the base or main frame A in place, and this is advantageous for a purpose which we will hereinafter describe. The head C may be still further secured in place by means of screws *b''*, inserted through a cross-bar, *b''*, forming part of the base-frame A.

On the top of the top plate, B, are upwardly-extending frames or open projections B', in which are guided a large number of wires, *c*, which are termed "selecting-needles," and which project beyond the frames or projections B'. The said frames or projections are perforated or provided with apertures for the passage of the selecting-needles *c*, and the perforations or apertures form bearings wherein the said needles may slide to and fro. These needles are arranged parallel with each other, and in a horizontal or approximately horizontal position. The bearings B' are provided with perforations or apertures throughout their entire width, although only a small number of perforations are shown in Fig. 5.

Both the frames C² and B' might be cast solid and perforated with numerous holes by drilling for the bearings of the wires D' and needles *c*. I have represented the right-hand projection in Fig. 2 as so formed; but the other frame or projection, B', and the frame C² are fitted with numerous wires or rods, *y*, which are arranged across each other, and form apertures for the bearings of the needles *c* and wires D'. Not only can the bearings be thus formed cheaper than by drilling, but the square apertures offer less frictional resistance to the movement of the needles and wires than would drilled holes.

In the head C are arranged punches C³, equal in number to the selecting-needles *c*, and projecting downward through a hanging plate, C⁴. The punches are furnished with collars *d* above said plate C⁴, and project upward through a movable returning plate, C⁵, which will be hereinafter described, the collars *d* being below the returning plate. The punches C³ are all free to slide vertically in the hanging plate C⁴ and returning plate C⁵, and they are of different lengths, as shown best in Fig. 2, the inner row being shortest and their upper ends having a stepped arrangement. Above the stepped ends of the punches C³ is an inclined top portion, *d'*, of the head C, wherein are sockets or holes *d''*, forming bearings for sliding keys D, which equal in number the

punches C³ and selecting-wires *c*, and to the sliding keys D are connected key-wires D', which are arranged in an approximately horizontal position, and are guided at their rear ends in the frame C².

D² designates Jacquard levers, which severally connect a selecting-needle, *c*, with a key-wire, D', as best shown in Fig. 2. These levers are arranged side by side upon rods *d''*, which form their fulcrums. The levers may be formed of pieces of wire, each coiled to form an eye, *d'*, as best shown in Fig. 3, which fits upon the fulcrum-rod *d''*. The selecting-needles *c* are shown in Fig. 3 as provided with offsets *c'*, which receive the upper ends of the levers D², while their lower ends fit in similar offsets, *c''*, formed in the key-wires D'. Hence when the selecting-needles are slid longitudinally they impart a corresponding movement, but in a reverse direction, to the key-wires and keys. Thus it will be seen that when the needles *c* are moved toward the left hand in Fig. 2 the key-wires D' will be drawn toward the right hand of said figure. When all the selecting-needles *c* are in their extreme right-hand position in Fig. 2, the levers D² will stand vertically, as do most of the levers shown in Fig. 2, and when in such position the keys D will severally project above and across the vertical path of the punches C³, so that if said punches should be moved upward or raised the keys would form abutments against which the punches would strike, and whereby their further upward movement would be precluded. If, on the other hand, the keys are withdrawn into the inclined top or partition *d'*, no obstacle will be offered to the free rising of the punches. In order that the punches, when their own keys are withdrawn, shall not strike the next keys above, and thus be caused to cut the cards when it is not desired, we arrange the keys D and key-wires D' a greater distance apart in their vertical tiers than are the selecting-needles *c*, as is shown in Fig. 2, and this is advantageous for the further reason that it enables us to use larger and stronger keys and to leave a greater thickness of metal between the keys, so that greater strength is gained in a part where it is very advantageous. The placing of the keys wide apart in their vertical tiers also permits us to make the height of the punches varied relatively to their keys, so that when the cards are pushed up against the punches the several punches, which are caused to cut by their keys, will not strike the keys all at the same time, but at intervals or successively, and hence the power required and the shock to the machine will be less than if the punches all cut at the same instant. It is desirable, however, that the arms of the levers D² should all be of the same relative length, and hence, because of the key-wires D' being arranged wider apart in their vertical tiers than the selecting-wires *c*, it becomes necessary to arrange the fulcrum-rods *d''* in an inclined plane, as shown in Figs. 1 and 2, so

that the arms of each lever D^2 will be of equal length.

At the front end of the machine is a dove-tailed or gibbed guide, A^2 , on the base-frame A , and upon this is fitted a carriage, D^3 , which is capable of movement upward and downward.

Through the base-frame A , from front to rear, there extends a shaft, D^4 , on the front end of which there is an eccentric-pin, d^5 , which is fitted to a block, d^6 , adapted to slide horizontally in a slideway or opening, d^7 , in the carriage D^3 , as shown in Fig. 1*. By means of this eccentric pin or crank d^5 and sliding block d^6 an upward and downward reciprocating movement is transmitted to the carriage D^3 . Upon the carriage D^3 is supported a throat-piece, consisting of a lower die-plate, D^5 , and an upper guide-plate, D^6 , forming between them an opening or throat, d^8 , through which the chain of cards E to be punched or cut is drawn. These cards E , although they may be intended to be of uniform width, may vary slightly, and we therefore provide in the sides of the throat d^8 guides or guide-pieces d^9 d^{10} , which are shown in Fig. 5. The piece d^9 may be adjusted so as to project more or less into the throat, and may then be secured in fixed position by a set-screw, d^{11} . The piece d^{10} is, however, pressed inward by a spring, d^{12} , arranged as shown in Fig. 5*, or otherwise, and is thus held against the edges of the cards with a yielding pressure. The pressure of the spring d^{12} may be adjusted by a screw, d^{14} . These guides or guide-pieces may have rounded ends, as shown in Fig. 5*, against which the cards bear.

In the die-plate D^5 and guide-plate D^6 are coincident holes in line with the punches C^3 , and into these holes the lower ends of the punches project, and the guide-plate is of such depth that it is never carried below the ends of the punches by the downward movement of the carriage D^3 . Hence it will be seen that the said guide-plate and the hanging plate C^4 properly guide the punches.

At the front of the punch-head C is a removable front plate, C^6 , which may be removed to afford access to the punches. This plate is shown in Fig. 2 and is removed in Fig. 5.

The cards E to be cut are drawn over a reel or idler, F , at the back of the machine, and thence pass through openings in the base-frame A to the front of the machine, where they pass through the throat d^8 . By the rising movement of the carriage D^3 , which takes place as soon as the intermittent feed of the cards has ceased, the card which is in the throat is carried up against the lower ends of the punches C^3 , and is cut or perforated by all such punches as have their upward movement prevented by the keys D , while such punches as are not arrested by the keys are carried upward, and do not puncture the card. The pieces of card cut off fall through a throat or opening, d^{13} , in the carriage D^3 into the hol-

low base-frame A , and may be taken out at the door A^1 .

We will now describe how the returning plate C^5 is operated, referring particularly to Figs. 5, 6, and 7, as well as Figs. 1 and 2.

The returning plate C^5 is attached at its ends to brackets F^7 , which slide upon the inner faces of the side portions of the head C , and these brackets comprise upright bars or portions F^8 , sliding in grooves or ways e in the sides of the head C .

F^3 designate upright rods or pieces, which slide in openings e in the hanging and returning plates C^4 C^5 , and engage at their upper ends with blocks or lugs e^2 , attached to the inner sides of the upright bars F^8 by screws e^3 , which are accessible through slots e^4 in the sides of the head C . The rods F^3 have shoulders e^5 , which, when the rods are drawn down, strike upon shoulders e^6 on the blocks or lugs e^2 . The rods F^3 can move downward through holes in the guide and die plates D^6 D^5 , and are intended to enter the peg-holes in the cards, and thereby to properly register the cards before they are raised against the punches C^3 . The lower ends of the rods F^3 , which constitute guides for the cards, are pointed, so as to readily enter the peg-holes in the cards.

F^4 designates a rock-shaft extending across the back of the machine, below the head C , and carried in bearings e^7 . Upon this shaft are arms e^8 , carrying rollers e^9 , which engage with notches e^{10} in the sides of the guides F^3 , and upon the end of said shaft is another arm, to which is connected a rod, F^5 . (Shown dotted in Fig. 1.)

Upon a shaft, G , is an eccentric, F^6 , (shown dotted in Fig. 1,) which operates the rod F^5 , and through it imparts an oscillating motion to the shaft F^4 , and thereby raises and lowers the guides F^3 . As soon as a card has been brought into the throat d^8 , the guides F^3 are lowered to register the card, and they move alone until the shoulders e^5 on said guides strike the shoulders e^6 on the blocks or lugs e^2 , whereupon the said guides move the returning plate C^5 downward, and the latter, acting on the collars d of the punches C^3 , depresses the punches, so that the keys D may move forward over them before the punching operation takes place.

Upon the shaft G is a large spur-wheel, (designated by the dotted line G' in Fig. 1,) which engages with a pinion, G^2 , on a driving-shaft, G^3 , and upon said driving-shaft is likewise secured a bevel-pinion, G^4 , which engages with a large bevel-wheel, G^5 , on the shaft D^4 . We have not thought it necessary to show this driving mechanism more in detail, as it forms no part of our invention, and no claim is laid thereto. The driving-shaft G^3 is provided with pulleys (not here shown) for a driving-belt.

We will now describe the mechanism for producing the feed of the chain of cards E to be cut, referring to Figs. 1, 11, and 12.

In front of the machine, and beyond the die and guide plates $D^5 D^6$, is a feed-cylinder, H , which is rotated one-fourth of a revolution at a time, and is so operated that at the termination of each movement one of its faces will be horizontal and approximately in the same plane as the throat d^6 . The cylinder is provided with the usual guide-pegs, f , and is adapted to turn in bearings f^7 , which are formed on arms H' , formed integral with or rigidly secured to a bar or shaft, H^2 . This shaft or bar is mounted in bearings, consisting of split eyes or collars f^2 , which, by means of bolts f^3 , may be clamped so as to hold the bar or shaft in any position to which it is turned, and these clamps are carried by brackets H^3 , extending from the frame of the machine. The cylinder H is fixed to its journals by a central rod, f^4 , passing through both journals and the cylinder, and when it is desired to substitute a larger or smaller feed-cylinder for larger or smaller cards, this rod may be withdrawn, the cylinder removed, and another cylinder substituted for it and secured by the said rod f^4 . The bar or shaft H^2 has portions $f^5 f^6$ of different diameters, which receive a spur-wheel, f^7 , having upon its hub a ratchet rim or wheel, f^8 , and a ratchet-lever, f^9 , which carries a pawl, s , engaging with the ratchet-wheel f^8 . The wheel f^7 engages with a pinion, f^{10} , on the journal of the cylinder H , and so rotates the latter. The wheel f^7 bears against a collar or washer, f^{11} . A second collar or washer, f^{12} , is placed between the said wheel and the ratchet-lever f^9 , and outside said lever is a third collar or washer, f^{13} , and a nut, f^{14} . The washers $f^{11} f^{12} f^{13}$ are all made fast to the shaft or bar H^2 by feathers or otherwise, so that they may not turn, and the wheel f^7 and lever f^9 operate between them. By screwing up the nut f^{14} all the described parts may be clamped together and on the shaft or bar H^2 . The several fixed collars or washers are rendered necessary, because the shaft or bar H^2 is fixed, and the wheel f^7 might turn back as the ratchet-lever f^9 is moved back by its frictional contact with the said lever.

Upon the end of the shaft G is a crank, f^{15} , which, through a rod, H^4 , oscillates the ratchet-lever f^9 .

It will be readily understood that the distance from the guides F^3 , which register the cards E in the throat d^6 , to the pegs f of the feed-cylinder H , should be equal to the exact length of a certain number of cards, three as here shown, so that after the chain has been drawn forward by the pegs of the feed-cylinder and comes to a state of rest the peg-holes of the card in the throat will be in position to receive the guides F^3 . Some cards are, however, laced tighter than others, and hence means should be provided for varying the distance from the guides F^3 to the pegs f of the feed-cylinder H with great exactness. This we do by making the rod H^4 extensible or variable in length, and to this end it is composed of

two sections united by a screw-connection, f^{16} . When cards of larger size are to be cut, a larger feed-cylinder H must be substituted, and it must of course be carried farther away from the punches.

Fig. 11 shows in full lines the position occupied by a small cylinder, and in dotted lines the position which would be occupied by a larger cylinder. In order to adjust the larger cylinder into proper position, we loosen the clamps f^2 and turn the shaft or bar H^2 to carry the cylinder farther forward, after which the clamps are again tightened upon it. This adjustment of the cylinder in the arc of a circle serves also to bring it into such position that the face which is uppermost is in the same plane as the throat d^6 .

In order to detach the completed cards E from the feed-cylinder H and prevent them from being carried round thereby, we attach springs or pieces f^{17} to the fixed bar or shaft H^2 , which lie in grooves f^{18} in the cylinder and act as strippers to detach the cards from the cylinder.

We will now describe the mechanism for operating the pattern-cards and the devices which are acted upon by said cards to control the operation of the punches C^3 , referring more particularly to Figs. 1, 2, 8, 9, and 10.

I designates a carriage mounted upon the top plate, B , and constructed so as to straddle the bearings B' of the selecting-needles c . It is provided with a hood, I' , which entirely covers the selecting-needles, and which may be removed to permit access to the said needles for inspection. The carriage I may be reciprocated along guides or ways $g g'$, (shown in Fig. 5,) and one of which may be V-shaped, while the other is flat. The carriage may be held down in any suitable way—as, for example, by means of a fixed tongue, g^2 , entering a groove, g^3 , in the carriage, as shown in Fig. 10. When the tongue g^2 is removed, the carriage I may be lifted directly off the top plate, B . Opposite the front ends of the selecting-needles c the carriage I carries a pattern-cylinder, J , and at the opposite or rear ends of said needles is an evening-piece or evenner, K , also attached to the carriage. Both the pattern-cylinder and evenner are reciprocated in unison by the movement of the carriage.

L designates a rock-shaft extending through the frame A , and having secured to it two arms, $L^1 L^2$, the former of which engages with a grooved cam, L^3 , on the shaft G , while the latter is connected with the carriage I . The cam L^3 is shown dotted in Fig. 1. By this or any other suitable mechanism the carriage is reciprocated.

From the back of the machine there extend brackets M , which support the chain of pattern-cards N , and from these brackets the cards are drawn forward by the pegs f of the pattern-cylinder J , which is provided with holes corresponding in position to the selecting-needles c .

N' is a guard roller or bar, which prevents the pattern-cards N from being thrown outward and upward by the quick turning of the cylinder J . The bearings of the cylinder J are best shown in Figs. 8 and 9, the same construction being employed at each end of the cylinder. The bearing itself, h , is open at the top, so as to receive the journals h' of the cylinder, and this bearing is pivoted or secured by a vertical screw, h^2 , in a yoke, h^0 , formed upon the end of a long stem or rod, h^3 . By adjusting the screws h^2 at both ends of the cylinder, the latter may be raised or lowered to the exact degree required to cause its holes to exactly register with the selecting-needles c . The stem or rod h^3 fits within a sleeve, h^5 , in the carriage I . At each end of the sleeve h^4 are nuts h^6 , applied to said stem or rod, and by turning or adjusting the sleeve and nuts on the stem or rod the latter may be adjusted outward or inward, so as to adjust the cylinder into a position exactly square with the plane of the ends of the selecting-needles c . To provide for such adjustment the stem h^3 is externally threaded and fitted to an internal thread in the sleeve h^4 , and the nuts h^6 serve as lock-nuts. In the exterior of the sleeve h^4 are two circumferential grooves, i , and a connecting or lengthwise groove, i' , and in the socket is placed a set-screw, i^2 . The system of grooves i is clearly shown in Fig. 9, and as there and in Fig. 8 shown said sleeve is adjusted to adapt the bearings for a large size cylinder. If it is desired to employ a smaller cylinder, the set-screw i^2 is loosened and the sleeve turned so as to bring the connecting-groove i' opposite the point of the screw, whereupon the sleeve is slid in the groove i , traversing the point of the screw, and is then turned to engage the other circumferential groove i with the point of the screw. A like adjustment is then effected at the other end of the cylinder.

It is obvious that the sleeve h^4 might be dispensed with and the grooves i formed in the stem or rod h^3 , which in such case would fit snugly in the socket h^5 ; but in such a construction there would be no provision for a slight adjustment of the cylinder, such as is afforded by the screw-thread in the sleeve h^4 and the nuts h^6 .

In order to strip the cards N from the back side of the pattern-cylinder J and prevent their being carried around by the cylinder, we have represented a band, j , which surrounds the cylinder, and passes over an idler-pulley, j' , carried at some distance below the cylinder by an arm, j^2 , which is loosely fitted on the journal h' of the cylinder, and is held against displacement by a tooth or lug, j^3 , on the hub of the arm entering the opening in the top of the bearing, as shown in Figs. 8 and 9. By the bands j , one being used at each end of the cylinder, the cards N are stripped off and are prevented being carried around the under side of the cylinder. As here represented, the jour-

nals h' of the cylinder are formed on a shaft, J' . The shaft is square and the cylinder is held in place thereon by a nut, j^4 , at each end thereof, as shown in Fig. 10.

At the end of the cylinder J , and fixed to the journal h' outside the bearing h , is a square plate or piece, J^2 , with corner-lugs, with which engage the devices for turning the cylinder, and this plate rides or moves between guide-bars O , which are pivoted at k to a support, O' , made in the form of a bell-crank lever. The guide-bars O are held together by a spring, o , and as the plate J^2 moves back and forth between the guide-bars the faces of the cylinder are kept perpendicular and horizontal, and the face adjacent to the ends of the selecting-needles c will be maintained parallel with the plane of the ends as the cylinder is moved back and forth by the reciprocating carriage I . To the two guide-bars O are pivoted at o' two pawls, p p' , which are connected by a rod, p^2 , and the upward and downward movements of which are purposely limited by stop-pins p^3 p^4 , as best shown in Fig. 4. The pawl p' is prolonged beyond its fulcrum o' , and to the extending end is pivoted a weighted counter-balance-arm, p^5 , having horns or projections p^6 , which may either of them be caused to act on the pin p^7 on the pawl p' . When the counter-balance is in the position shown in Fig. 4, the pawls are both raised and the lower one, p , is brought into operation; but when the counter-balance is thrown over or reversed the two pawls will be depressed and the upper pawl, p' , brought into action. As the cylinder J is carried away from the selecting-needles, the corner-lugs on the square plate J^2 come in contact with the pawl p' , which is the one shown in Figs. 1 and 2 as in an operative position, and the cylinder is thereby turned a quarter of a turn and the pattern-cards N advanced. If the counterbalance-arm p^5 be thrown over so as to bring the pawl p into an operative position, as shown in Fig. 4, the cylinder will be rotated reversely.

We have before described how the cylinder-bearings h are moved inward and outward for cylinders of different sizes by shifting the sleeves h^4 ; but obviously, if the cylinder is shifted, the turning-pawls p p' will no longer be in position to turn the cylinder at the proper time. To provide for this difference in the position of the cylinder, we carry the support O' by means of an eccentric-hub, r , which has a throw equal to the distance between the circumferential notches i in the sleeve h^4 , and by turning this hub the support and its bars O , with their pawls p p' , may be moved a distance equal to the movement of the cylinder. The support O is further carried by a pin, r' , in the top plate, B , which engages with a slot in the lever. When the carriage I moves toward the right hand of Fig. 2, the cylinder J is turned to produce the feed of the pattern-cards N , while the evener K is brought up against the left-hand

ends of the selecting-needles *c*, and they are all pushed in, so as to cause all the keys *D* to protrude over the punches *C*³. When, however, the said carriage moves toward the left hand, the pattern-card is brought against the ends of all the needles *c*, and those needles which are opposite holes in the card are not moved, but those needles which are opposite imperforate portions of the card are moved, and through the corresponding lever *D*² the key-wires *D'* are moved toward the right, and the keys drawn back out of the way of such punches as it is not desired should cut.

It will be readily understood that when the pattern-cylinder *J* is changed for one larger or smaller the position of the evener *K* will be correspondingly changed, and therefore we have represented it in Fig. 2 as having the opposite faces of different projection, and as pivoted, so that it may be turned to present an opposite face when the cylinder is changed for one of a different size. By this means the cards *E* punched will be perfect fac-similes of the pattern-cards *N*.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The combination of the horizontally-arranged selecting-needles *c*, the keys and key-wires *D D'*, arranged horizontally below and parallel with said needles *c*, the keys and key-wires being farther apart in their vertical tiers than said needles, Jacquard levers *D*², connecting the several needles and key-wires, and having their fulcrums in an inclined plane between the said needles and key-wires, punches *C*³, controlled by said keys, and means, substantially such as described, for feeding pattern-cards to act upon the selecting-needles and cards to be cut or punched, all substantially as and for the purpose herein set forth.

2. The combination, with the selecting-needles, punches, keys, key-wires, and Jacquard levers connecting said needles and key-wires, of a frame wherein said parts are supported and movable, provided on its top with tracks or ways, a carriage fitted to said tracks or ways, movable upon the top of said frame, and capable of being removed upwardly from the frame, a pattern-cylinder, and an evener arranged at opposite ends of the carriage, and means, substantially such as described, for reciprocating said carriage, and for feeding the pattern-cards and the cards to be cut, substantially as set forth.

3. The combination, with the selecting-needles, punches, keys, key-wires, and Jacquard levers, of a frame supporting said parts, a carriage movable on the top of said frame, a removable pattern-cylinder carried at one end of the carriage, and an evener having faces of different degrees of projection secured at the opposite end of the carriage, so as to be capable of adjustment to bring one or other of its faces opposite the selecting-needles, and means, substantially such as described, for re-

ciprocating said carriage and for feeding cards to be cut, substantially as set forth.

4. The combination, with the base-frame *A* and a top frame detachably secured thereon, of parallel selecting-needles *c*, keys *D*, and key-wires *D'*, Jacquard levers *D*², connecting said needles and key-wires, and punches *C*³, controlled by said keys, said needles, keys, key-wires, levers, and punches being all supported and arranged for operation in said top frame and removable therewith from said base-frame, and means, substantially such as described, for feeding pattern-cards and cards to be cut, substantially as set forth.

5. The combination, with the reciprocating carriage and a pattern-cylinder supported in bearings thereon, of guides independent of said bearings and acting directly upon the cylinder, whereby the canting of the cylinder is prevented, and turning-pawls attached to said guides, substantially as set forth.

6. The combination, with a movable carriage, of a pattern-cylinder, bearings projecting from the carriage and adjustable to suit cylinders of different sizes, guides for preventing the canting of said cylinder, and which are capable of adjustment corresponding to the bearing of the cylinder, and turning-pawls attached to said guides, substantially as described.

7. The combination, with the reciprocating carriage and a pattern-cylinder supported in bearings thereon, of guides independent of said bearings for preventing canting of the cylinder, turning-pawls attached to the upper and lower guides and connected together, so that when one is operative the other will be inoperative, and a counterbalance spring or weight for holding said pawls in either of their positions, substantially as described.

8. The combination of the carriage *I*, the cylinder *J*, the guides *O*, and turning-pawls *p p'*, the support *O'*, and the eccentric-hub *r*, which may be turned to adjust the support *O'*, substantially as described.

9. The combination, with the selecting-needles, carriage, and pattern-cylinder, of forks attached to the carriage, bearings for the cylinder, and vertical screws securing the bearings in said forks, and adapted to be turned to adjust the cylinder relatively to said needles, substantially as described.

10. The combination, with the selecting-needles, carriage, and pattern-cylinder, of rods longitudinally movable in said carriage, and provided with forks, bearings for said cylinder, and screws, whereby said bearings are secured in the fork, so that they may be adjusted vertically to bring the cylinder into proper relations to the needles, substantially as described.

11. The combination of the carriage *I*, the cylinder *J*, rods supporting bearings for the cylinder, the sleeves *h'*, fitting the said rods, and provided with grooves *iii'*, and the screws

or projections i^2 , engaging with said grooves, substantially as described.

12. The combination, with the pattern-cylinder and its bearings, of an arm extending therefrom to a point below the cylinder, a pulley on said arm, and a band surrounding said cylinder and pulley, and serving as a stripper for cards, substantially as described.

13. The combination, with a carriage and mechanism, substantially such as described, for moving it vertically, of a throat-piece mounted thereon, through which cards to be cut may pass, punches the lower ends of which enter holes in said throat-piece, and which are provided with collars, a fixed or hanging plate supporting the punches, a returning plate capable of vertical movement to act upon the collars of the punches, and vertically-movable rods for lowering the returning plate, the lower ends of said rods entering the throat-piece, and being adapted to engage with holes in the cards to be cut, whereby said rods are caused to properly center the cards, substantially as herein described.

14. The combination, with the returning plate C^5 , of the brackets to which said plate is fixed, guides for said brackets, guides adapted to engage with the peg-holes in cards to be cut, having a sliding movement, and adapted to engage with said brackets and lower said plate during the latter portion of their downward movement, and mechanism, substantially such as described, for operating said guides, substantially as set forth.

15. The combination of the returning plate C^5 , brackets F' F^2 , guides e , the lugs e^2 , adjustable on said brackets and provided with shoulders e^3 , the sliding guides F^3 , provided with shoulders e^3 , and mechanism, substantially such as described, for raising and lowering said guides, substantially as set forth.

16. The combination, in a machine for repeating cards, with a throat-piece wherein the cards are punched, guides working through the throat to engage with the peg-holes in said cards, and means, substantially such as described, for operating said guides, of a feed-cylinder for drawing the cards through the throat, a ratchet feed-motion for said cylinder, and a rod capable of being varied in length for operating the ratchet-lever of said feed-motion, substantially as herein set forth.

17. The combination, in a machine for repeating cards, of a feed-cylinder for the cards to be cut, having a step-by-step rotary motion, a shaft or bar, and rigid arms projecting therefrom and carrying bearings for said cylinder, and bearings in which said shaft or bar may be turned and clamped in different positions, substantially as described.

18. The combination of the cylinder H , the bar or shaft H^2 , provided with arms supporting the cylinder, the spur-wheel f^7 , ratchet-wheel f^8 , oscillating ratchet-lever f^9 , and pawl s , washers f^{11} f^{12} f^{13} , locked to said bar or shaft, and holding between them the spur-wheel and ratchet-lever, and the nut f^{14} , for clamping said parts on said bar or shaft, substantially as described.

19. The combination, with the feed-cylinder having a step-by-step rotary motion, of a shaft or bar provided with arms wherein the cylinder is journaled, and the bands or strips f^{17} , secured to said shaft or bar, and serving as strippers for the cylinder, substantially as described.

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Witnesses:

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