

H. HOLLERITH.

APPARATUS FOR PERFORATING RECORD CARDS.

(Application filed May 17, 1901.)

(No Model.)

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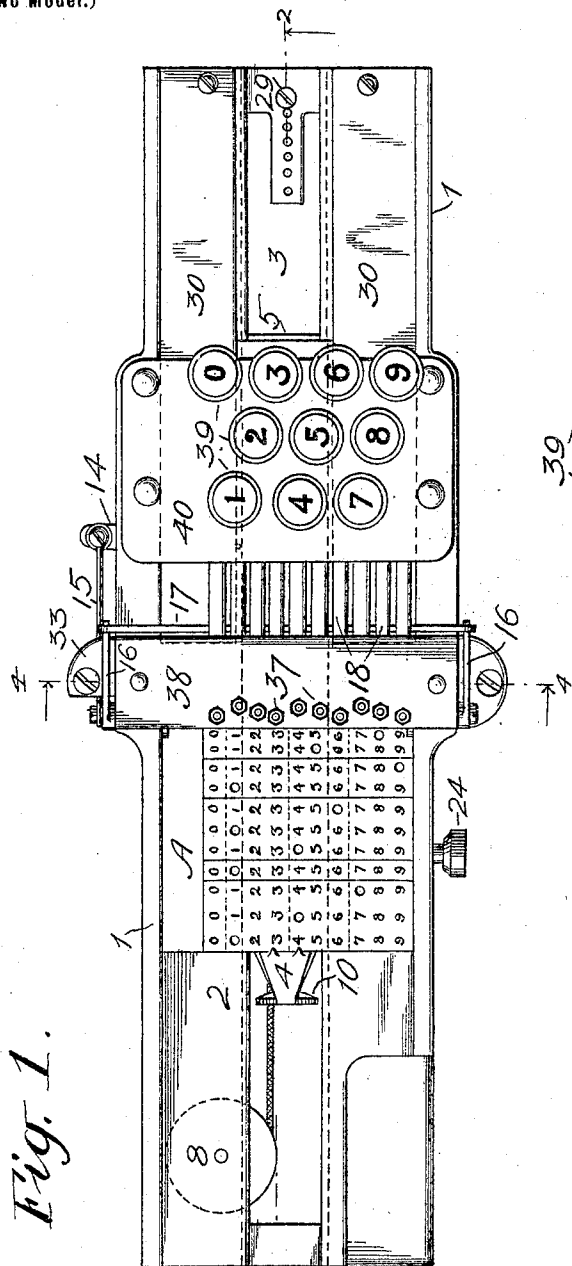


Fig. 1.

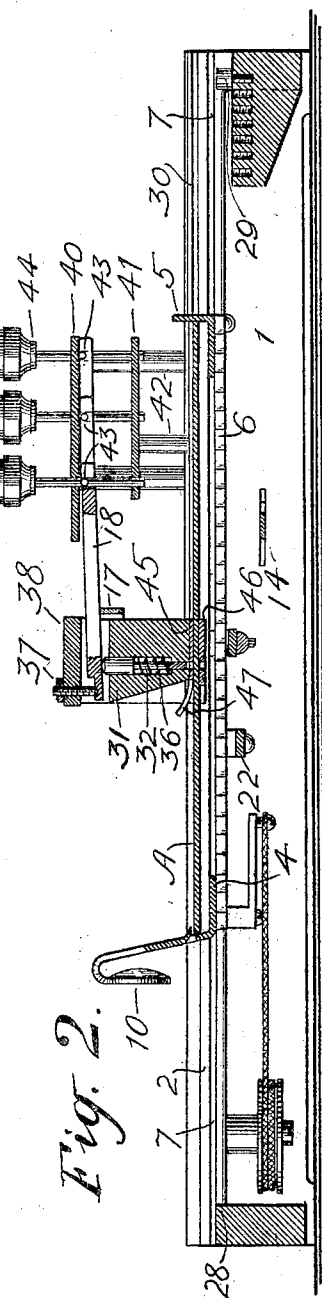
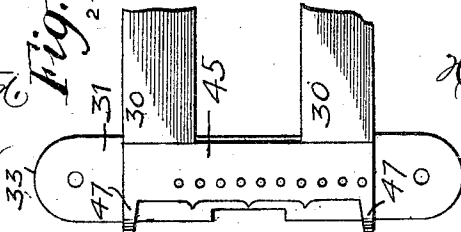


Fig. 2.

Fig. 6.



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2 Sheets—Sheet 2.

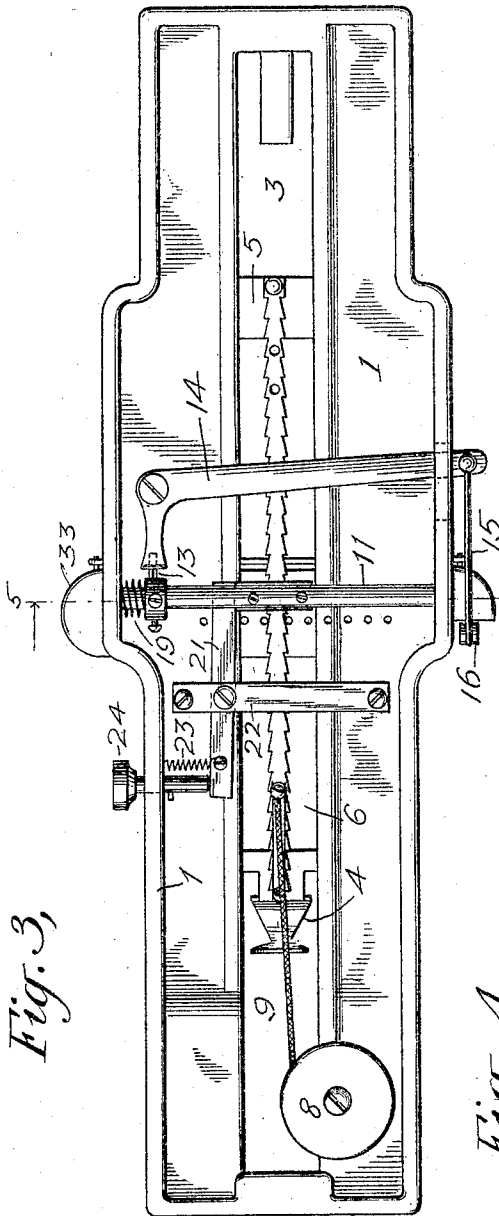
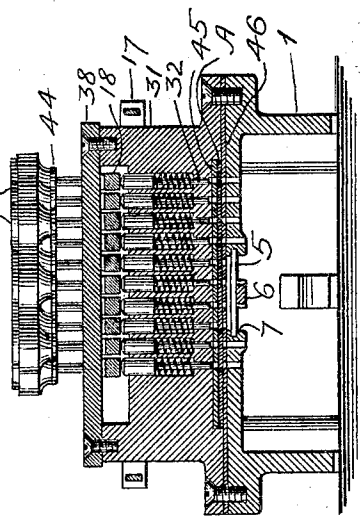
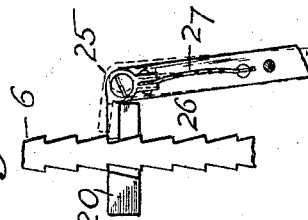
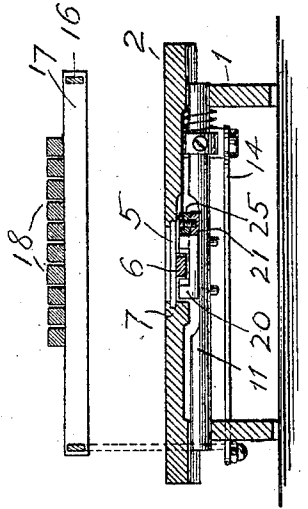


Fig. 3.

Fig. 4

Fig. 5.

Fig. 8.



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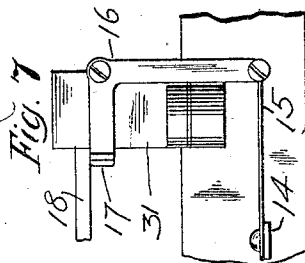


Fig. 7

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR PERFORATING RECORD-CARDS.

SPECIFICATION forming part of Letters Patent No. 682,197, dated September 10, 1901.

Application filed May 17, 1901. Serial No. 60,752. (No model.)

To all whom it may concern:

Be it known that I, HERMAN HOLLERITH, a citizen of the United States, and a resident of Washington, District of Columbia, have invented certain new and useful Improvements in Apparatus for Perforating Record-Cards, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to apparatus for perforating record-cards; and the object thereof is the provision of such an apparatus by which the record-cards used by me in the tabulation of statistics according to the Hollerith tabulating system may be prepared for the operation of the tabulating apparatus employed in such system and the items comprising the data to be tabulated may be rapidly and accurately transferred to the cards. The cards generally employed are rectangular in shape and are provided with figures or characters arranged in groups, each consisting of one or more vertical rows comprising a cipher and the nine digits, so that the digits of the same value will be in the same horizontal row. In perforating the cards it is essential that there shall be one punch for each of the nine digits and the cipher, so that any figure in each vertical row may be punched out at will. It is also essential that in each card there shall be punched only one figure in each vertical row and that the card should be fed automatically exactly the distance between the vertical lines of figures when a punch is operated and that the operator should be able to instantly adjust the card in position to commence the punching in any group and also to feed the card from an intermediate position at which the punching may end to its removable position by a single operation without operating the punches, thus avoiding the waste of time which would occur if under such circumstances it were necessary to move the card step by step for any considerable portion of its length.

My invention, in which the objects above mentioned are attained, comprises a traveling carrier for the card, a series of key-operated punches arranged at right angles to the path in which the carriage moves, so that in any position of the card either the cipher

or any of the nine digits may be punched by the operation of the proper key, mechanism by which the carrier is fed to bring the next row of figures under the punches when any one of the punch-keys is operated, thus preventing the accidental punching of two figures in the same row, means for permitting the starting of the carrier from any intermediate position, and mechanism for moving the carrier to the end of its travel without actuating the punch-keys, so as to avoid the necessity of feeding the carrier step by step from an intermediate position. It also comprises other features and details hereinafter referred to, and pointed out more specifically in the claims.

In the accompanying drawings, Figure 1 is a plan view of the apparatus. Fig. 2 is a longitudinal section on the line 2 2, Fig. 1. Fig. 3 is a view of the under side of the apparatus. Fig. 4 is a transverse section on the line 4 4, Fig. 1. Fig. 5 is a transverse section on the line 5 5, Fig. 3. Fig. 6 is a plan of the under surface of the stripper-plate through which the punches operate. Fig. 7 is a detail of the levers by which motion is transmitted from the key-levers to the escapement device, and Fig. 8 is a detail of the escapement.

Similar reference characters are employed to designate corresponding parts in all the views.

The frame 1 is in general outline rectangular in shape and supports the bed-plate 2, which is formed with a slot 3, in which the card-carrier travels, extending substantially from end to end of the frame. The card-carrier comprises the two end pieces 4 and 5, connected by the toothed bar 6, which constitutes a rack with which the feeding devices coöperate. The distance between the end pieces 4 and 5 is exactly the length of a card A, and the end pieces project into the longitudinally-extending side slots 7, formed in the frame 1 below the bed, as shown in Figs. 2 and 4. The end piece 4 is connected with the motor or spring drum 8 by a cord 9 or other flexible connection and is also provided with a handle 10, by which the carrier may be readily moved from its initial into any intermediate position. The movement of the card-carrier under the action of the spring-

drum 8 is controlled by engaging devices connected with and actuated by the punch-keys and coöperating with the toothed rack 6. This engaging device comprises a movable bar 11, mounted in guide-apertures in the sides of the frame. Upon the bar 11 is secured a collar 12, provided with a stud 13, which enters a slot in the upturned end of the short arm of the bell-crank 14. The long arm of the bell-crank projects through a slot in the side of the frame and is connected by the rod 15 with the lower end of the vertical arm of the bell-crank lever 16. The horizontal arm of the lever 16 carries the universal bar 17, which is depressed when any one of the punch-levers 18 is actuated by its key. The collar 12 is adjustable on the bar 11, and a coil-spring 19 is carried on the bar under compression between the collar and the side of the frame. The bar 11 also carries a dog 20, which by the reciprocation of said bar is moved into and out of engagement with the teeth on one side of the bar 6. A lever 21 is pivoted to the support 22, secured to the under side of the frame. One end of the lever 21 is by the spring 23 held against the key 24 in the side of the frame. To the opposite end of the lever 21 is pivoted a pawl 25. The lever 21 is held against the projecting end of the dog 20 by the spring 23, so that the dog and pawl will reciprocate together when the bar 11 is actuated. The rack 6 is normally engaged and held by the pawl 25, the movement of which is limited by the stop 26. When, however, the bar 11 is reciprocated to bring the dog 20 into engagement with the rack, the pawl 25 is released and under the action of spring 27 swings past the tooth-line into position to engage the next tooth and arrest the movement of the rack when the dog is withdrawn. By pressing the key 24 inwardly the lever 21 will be swung to withdraw the pawl 25 from engagement with the rack without reciprocating the bar 11. In this manner the card-carrier may be released from the control of the engaging devices at any intermediate position and under the action of the drum 8 will return to its initial position without the necessity of manipulating the keys to move it slowly step by step to that point. A stop 28 is provided to arrest the card-carrier at the end of its travel, and at the opposite end of the frame is the adjustable stop 29, by which the initial position of the card under the punches at the commencement of the punching operation may be regulated. A plate 30 is secured to each side of the frame slightly more than the thickness of a card above the bed-plate. These plates extend from the frame 31, which carries the punches, to the end of the bed-plate and serve to guide the cards and prevent them from buckling. The end piece 5 may be made adjustable on the rack 6, if desired, to provide for cards of different lengths.

The frame 31, which carries the punches 32, is secured above the bed-plate by screws

which enter lugs 33, formed on the punch-frame and on the side of the bed-plate. The punches 32 are arranged in a line which extends across the line of travel of the card. The punches are formed with heads which constitute bearings for the punch-levers 18 and compression-springs 36, which bear against the under side of the heads of the punches, hold them up against the punch-levers, and serve to lift the punches and levers after they have been depressed by the operator. Each punch-lever 18 is provided with an adjustable fulcrum 37, carried by the plate 38, which bridges the recess formed in the top of the punch-frame to receive the punch-levers. In order to secure a compact construction and at the same time allow sufficient room between the punch-keys 39 for convenient operation, I arrange the keys in three rows, as shown, each row thus necessarily being at a different distance from the punches. It is important in this character of work, where the apparatus to be commercial must be operated rapidly and for long periods consecutively, that all the punch-keys should have the same stroke—that is, the same amount of motion—and in the same direction, preferably in a right line. To secure this, I mount the punch-keys upon a platform which consists of two guide-plates 40 and 41, apertured to receive the key-shanks and supported upon posts 42, secured to the frame of the machine. The end of each punch-lever is forked to embrace the shank of its key, and a pin 43 rests loosely therein, forming a positive engagement between the lever and the key on their downward movement, with sufficient lost motion to allow for the depression of the lever until arrested by the contact of the key with the guide-plate 40. Washers 44, of any suitable resilient material, are secured to the shanks below the keys to reduce the noise and shock of the impact. Each key is numbered to correspond with the figure which its punch will perforate in the card.

The under surface of the punch-frame 31 is recessed to receive the stripper-plate 45 and also to provide the necessary space between the latter and the lower guide-plate 46 for the passage of the card, as shown in Fig. 4. Curved fingers 47 are formed on the stripper-plate 45 to facilitate the passage of the end of the card under the punches when it is being inserted in the carrier.

In operating the apparatus, the carrier being in its initial position at the left of the machine, a card is inserted therein by passing the end of the card under the punches until it contacts with the end pieces 5. It will then drop into place, resting on the bed-plate 2 and just fitting in between the ends of the carrier. The carrier is then pushed toward the other end of the bed-plate until the end contacts with the stop 29, the pawl 25 swinging on its pivot slightly and permitting the rack-teeth to pass on this backward movement of the carrier. The punch-key bear-

ing the number which it is desired to perforate in the first row of figures at the left of the card will then be depressed and that figure will be punched out of the card. The downward movement of the punch-lever will operate the universal bar 17, and the bell-cranks 16 and 14 will be actuated to carry the dog 20 into engagement with the rack 6, releasing the pawl 25 from such engagement. The latter will then swing past that tooth on the rack, and when the bar 11 is retracted by the action of the spring 19 the dog 20 will be drawn out of engagement with the rack and the latter will advance one tooth until arrested by engaging with the pawl 25. This will feed the carrier forward one space and bring the next vertical row of figures under the punches, when the above operation will be repeated. It will thus be observed that it is impossible by the regular operation of the machine to punch more than one hole in any one vertical row of figures. When the perforation on the card is completed, the carrier will have reached its initial position, and the card is removed and another one inserted and perforated as before.

I have illustrated and described a preferred form of apparatus embodying my invention; but it is to be understood that in selecting such apparatus for this purpose I have not intended to limit my invention in any way.

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

1. In a record-perforating apparatus the combination of a reciprocating card-carrier, a plurality of punches arranged in a row extending across the path of movement of the card, a key connected with each punch for imparting movement thereto, a motor connected with the carrier to move it in one direction, an engaging device for holding the carrier in position under the punches and connections between each key and the engaging device by which the operation of any punch will actuate the latter to release the card-carrier and permit it to move under the action of the motor to the next predetermined position, substantially as shown and described.

2. In an apparatus for perforating record-cards the combination of a reciprocating card-carrier, a plurality of punches arranged in a row extending across the path of movement of the card, a key connected with each punch for imparting movement thereto, a motor connected with the carrier for moving it in one direction, an engaging device for holding the carrier in position under the punches, connections between each key and the engaging device by which the operation of any punch will actuate the latter to release the card-carrier and permit it to move under the action of the motor to the next predetermined position and a key operating independently of the punches for releasing the carrier from

the control of the engaging device, substantially as shown and described.

3. In an apparatus for perforating record-cards the combination of a bed-plate for supporting the card, a reciprocating carrier by which the card is moved along the bed-plate, a series of punches and operating-keys, a motor connected with the carrier for moving it in one direction, feeding devices actuated by the punch-keys and comprising a yielding-supported member by which the feeding of the carrier is controlled in such direction and which is movable by the carrier out of locking engagement therewith when it is moved in the reverse direction, whereby the carrier may be instantly moved to commence the punching at any intermediate position, substantially as shown and described.

4. In a record-perforating apparatus the combination of a reciprocating card-carrier, a plurality of punches arranged in a single row, a lever for each punch, a plurality of keys, one for each punch, arranged in groups at different distances from the punches, guides for confining the keys to a rectilinear movement in the same direction, connections between each key and its lever and a stop for limiting the operating movement of each key, substantially as shown and described.

5. In a record-perforating apparatus the combination of a bed-plate upon which the card is supported, a plurality of punches arranged in a single line near the center of the bed-plate, keys for actuating the same, a slot in the bed-plate on each side of the punches, a card-carrier comprising pieces which engage the card at each end, guide-plates for the card overlapping one end of the bed-plate, a tension device connected with the carrier and means actuated by the keys for feeding the carrier a predetermined distance each time a punch is operated, substantially as shown and described.

6. In apparatus for perforating record-cards the combination of a bed-plate for supporting the card, a punch-frame mounted transversely above the bed-plate near its center, a plurality of spring-supported punches arranged in said punch-frame, a lever for each punch, a plurality of keys, one for each punch-lever, supported above the bed-plate, a slot in the bed-plate extending longitudinally on both sides of the punch-frame, a card-carrier comprising card-engaging end pieces which travel in the slot, a tension device connected with the carrier and feeding devices for the carrier connected with and actuated by the punch-keys, substantially as shown and described.

7. In apparatus for perforating record-cards the combination of a bed-plate for supporting the card, a punch-frame mounted transversely above the bed-plate near its center, a plurality of spring-supported punches arranged in said frame, a lever supported by each punch and fulcrumed in said punch-

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frame, a plurality of keys, one for each punch-lever, supported above the bed-plate and a universal bar supported by the punch-frame with which the punch-levers all engage, a
5 card-carrier, tension and feeding devices therefor and connections between the universal bar and the feeding devices, substantially as shown and described.

8. In apparatus for punching record-cards
10 the combination of a bed-plate for supporting the card, a carrier for moving the card on the bed-plate, a punch-frame mounted transversely above the bed-plate near its center,

a plurality of spring-supported punches arranged in said punch-frame, a lever for each 15 punch, an adjustable fulcrum for each lever supported by the punch-frame, keys for said levers, feeding devices for the carrier and operating connections between the keys and the levers, substantially as shown and de- 20 scribed.

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Witnesses:

OTTO E. BRAITMAYER,
EDWIN P. REA.