Sept. 20, 1932. F. L. LEE 1,878,935

DUPLICATING PUNCHING MACHINE

Filed Sept. 24, 1928 5 Sheets-Sheet 1

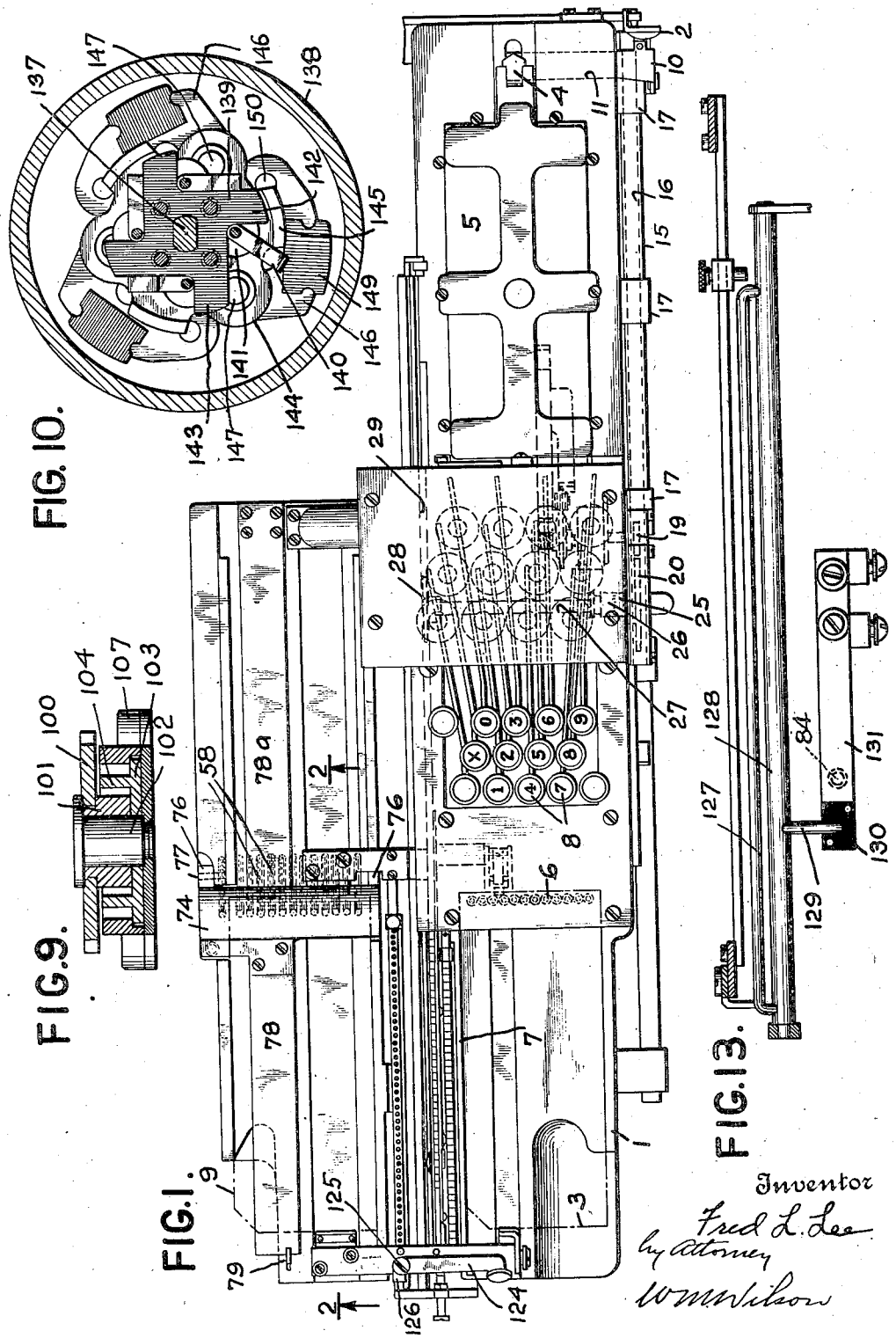


FIG. 10.

FIG. 9.

FIG. 1.

FIG. 13.

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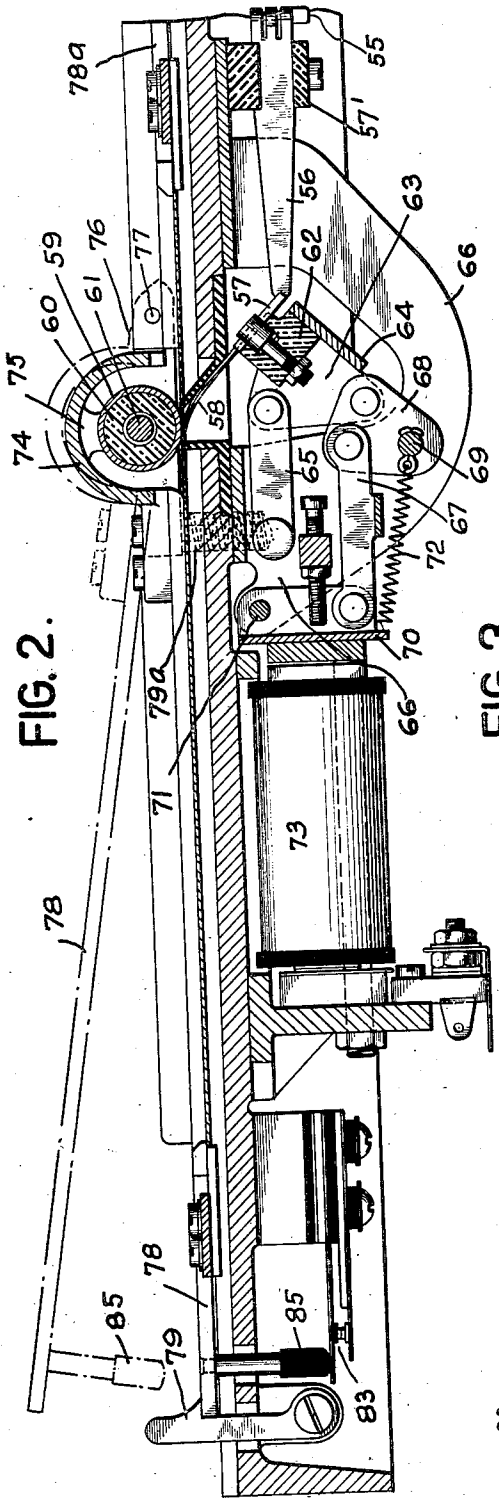


FIG. 2.

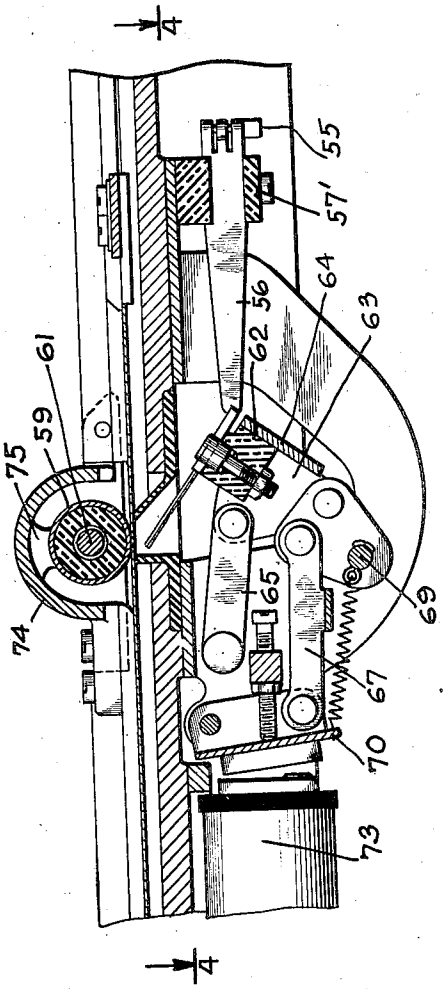


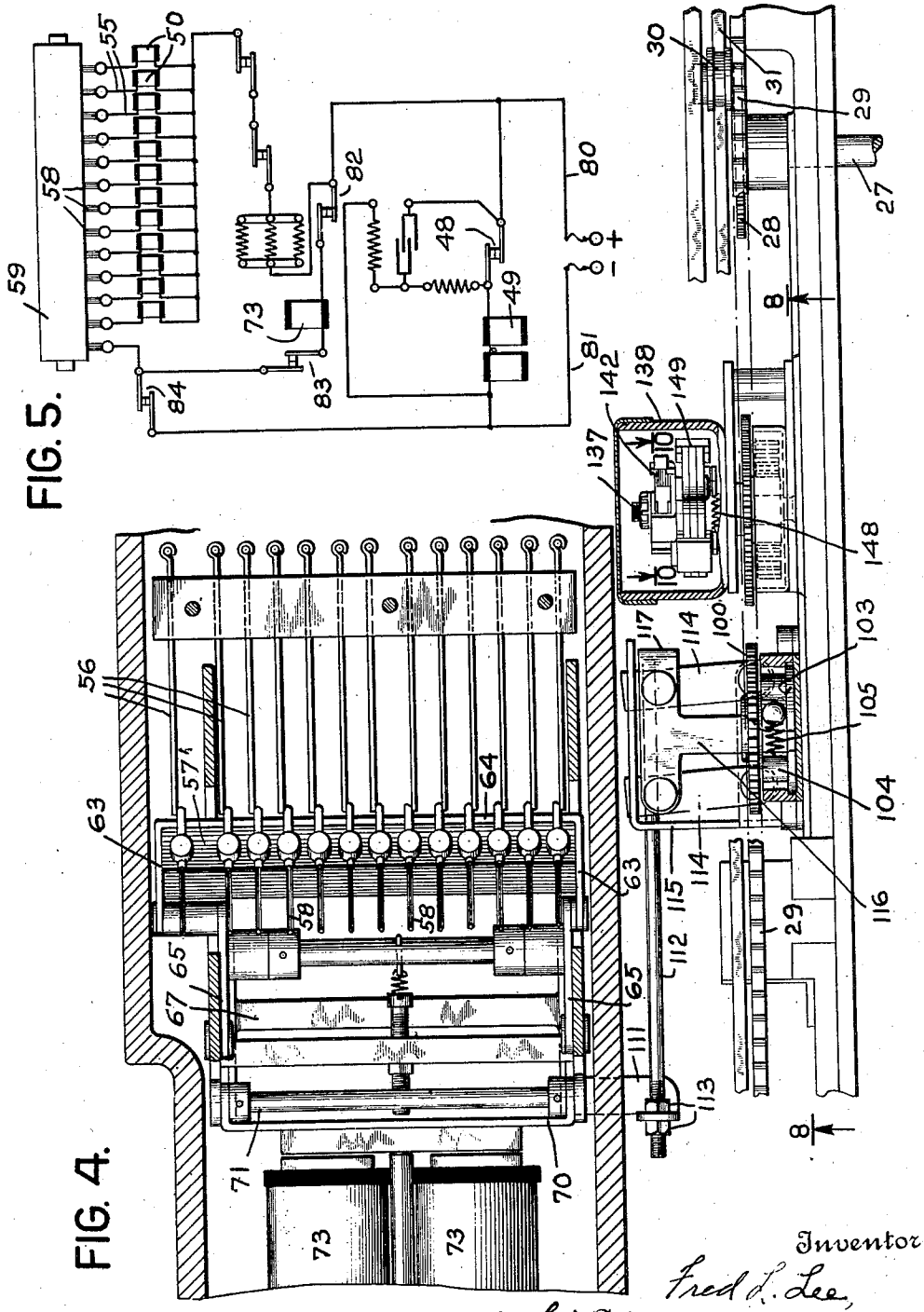
FIG. 3.

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DUPLICATING PUNCHING MACHINE

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DUPLICATING PUNCHING MACHINE

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FIG. 6.

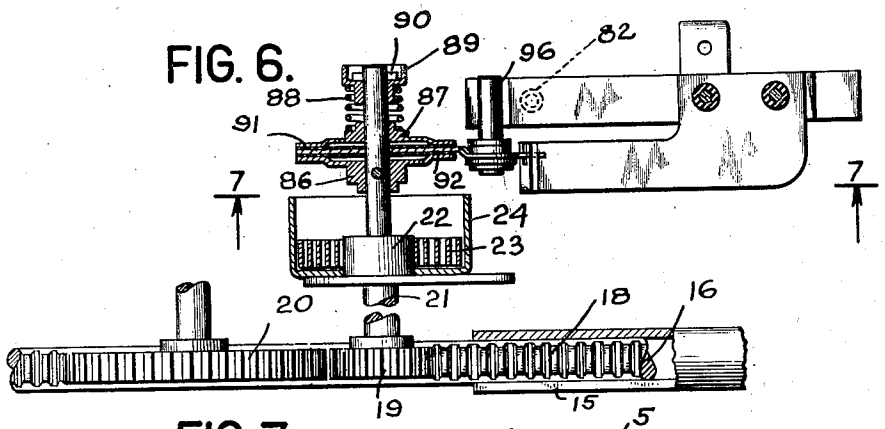


FIG. 7.

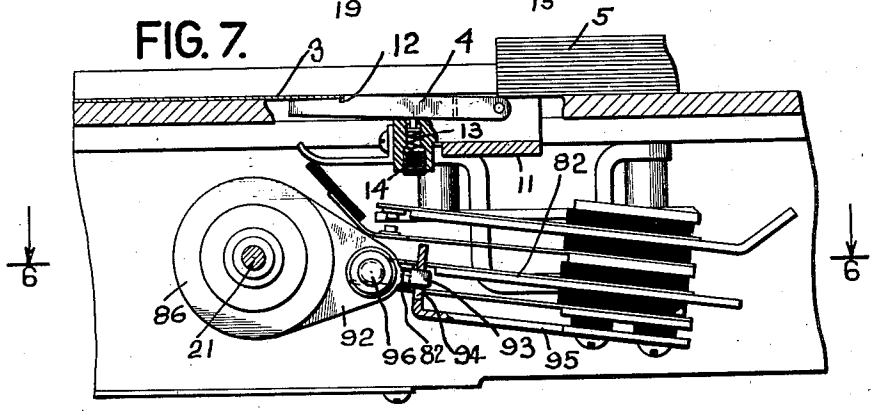
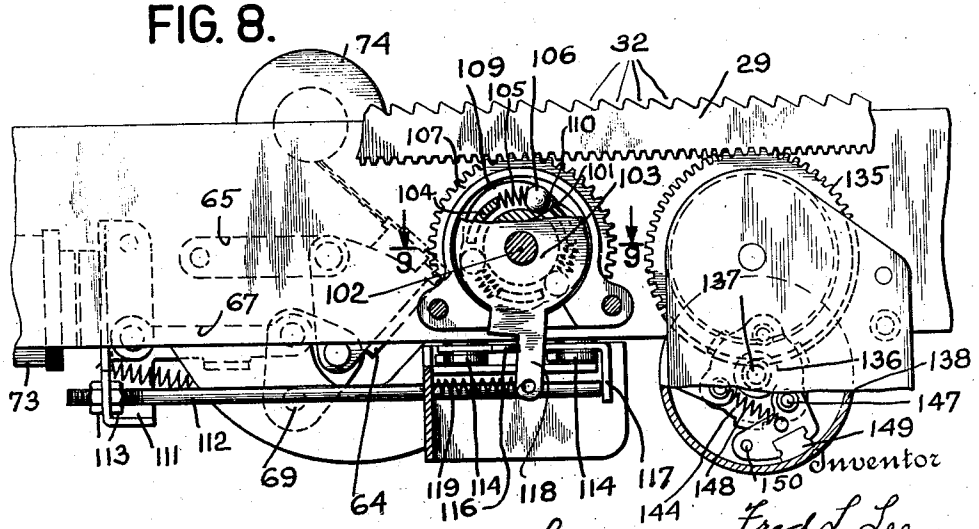


FIG. 8.



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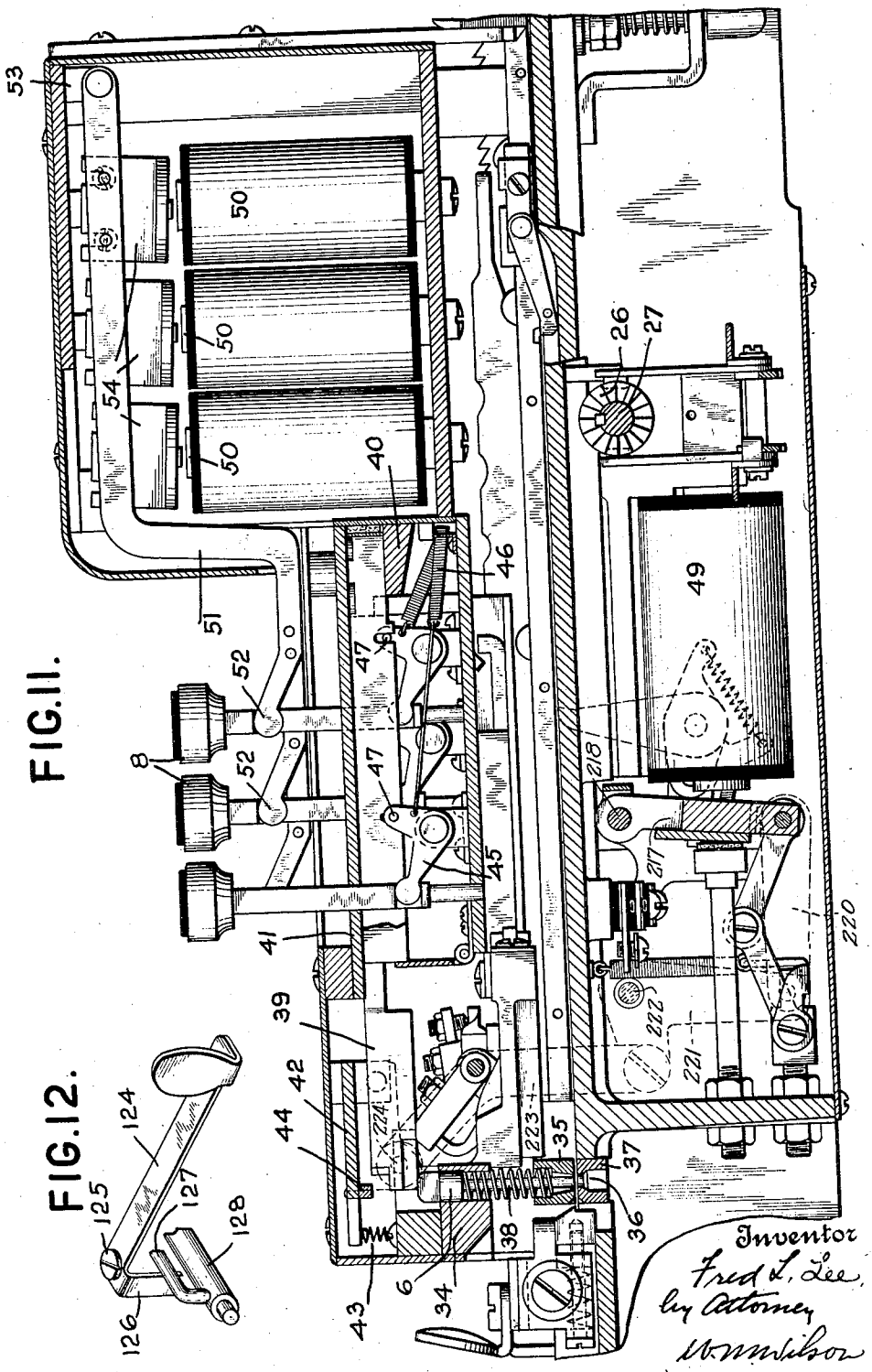


FIG. 11.

FIG. 12.

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UNITED STATES PATENT OFFICE

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DUPLICATING PUNCHING MACHINE

Application filed September 24, 1928. Serial No. 307,819.

This invention relates to punching or perforating machines and more particularly to machines of the type in which the punching may be controlled manually or by a previously punched card.

The present application is directed to improvements in the type of machine disclosed in the application of Lee and Phillips, Serial No. 34,516, filed June 3, 1925 (now Patent No. 1,772,186) but it is to be understood that the present improvements may be applied to other forms of machines with equally beneficial results and that the present showing is to be considered illustrative rather than restrictive.

The main object of the present invention is to provide a new form of brush contracting or analyzing mechanism which is adapted to sense the perforations of a master or pattern card to control the actuation of the punching mechanism. Flexible wire brushes are substituted for the brush contacting devices shown in the prior application above referred to, and coordinated with the improved brush contacting devices are certain precautionary devices. In order to insure positive contact between the brushes and the contact roll through the perforations the wire brushes are preferably disposed at an angle with respect to the plane determined by travel of the master card and the free ends generally terminate above the plane. The above arrangement renders a possible damage to the brushes by the perforations engaging therewith when the master card is manually positioned on the card carriage or when the latter with the card is manually positioned to the punch controlling starting point. To this end electrically controlled devices are provided for bodily shifting the brushes to a position where such interference is prevented when the carriage is shifted to a starting point, the devices above referred to being automatically effective to cause the brushes to again be positioned to engage the contact roll when the master card is at its normal starting position.

It will be further apparent that an interference between the brushes and master card perforations would occur if the card carriage was shifted backwardly to its normal starting position, either accidentally or intentionally. However, since a back spacing movement is desired occasionally to rectify an error when the usual punch keys are employed for punching a card, a manipulative device is employed. This is in the form of a lever carried by the card carriage and when operated causes the brushes to be shifted to a non-interfering position and disables the device which prevents a normal back spacing movement of the carriage.

In the type of machine to which the improvements are applied it is usually desirable to skip the punching of cards in certain columns, for example, when such information is not available at the time punching is effected, and for this purpose devices are employed to permit the carriage to jump a certain field or fields. The heavy moving carriage, urged by the usual return spring, may cause damage to the machine when suddenly stopped, it is desirable to control the speed at which the carriage moves. To this end a novel form of governor is employed, which permits an initial starting of the carriage without the imposition of an extraneous starting load, but at the time the carriage acquires an undesirable high speed the governor is effective to immediately check or dampen its movement.

Summarizing, it is the main object to provide flexible wire brushes for analyzing master card perforations; devices automatically effective upon movement of a casing under which a master card is disposed for causing said brushes to be shifted to a non-interfering position; means effective upon movement of the carriage to its initial starting position to cause said brushes to be retained in their non-interfering positions until said carriage reaches its starting position, means for preventing retrograde movement of said carriage when stepped from its initial starting position and lever operated means effective to disable the normal retrograde preventing means and to cause the shifting of the brushes to a non-interfering position whereby said carriage may be back spaced at will.

A further important feature is the provision of a governor for preventing the carriage from obtaining undesirable high speeds during column "skips".

Other objects and advantages will be obvious from the following particular description of one form of mechanism embodying the invention or from an inspection of the accompanying drawings; and the invention also constitutes certain new and novel features of construction and combination of parts hereinafter set forth and claimed.

In the appended drawings:

Fig. 1 is a top plan view of the complete punching and duplicating machine embodying the present invention.

Fig. 2 is a section taken on the line 2—2 of Fig. 1.

Fig. 3 is a view similar to Fig. 2 but showing the brushes out of contact with the associated contact roll.

Fig. 4 is a section along the line 4—4 of Fig. 3.

Fig. 5 is a wiring diagram of the circuits employed.

Fig. 6 is a view of the carriage controlled contact devices.

Fig. 7 is a section along the line 7—7 of Fig. 6.

Fig. 8 is a section along the line 8—8 of Fig. 4.

Fig. 9 is a section taken on the line 9—9 of Fig. 8.

Fig. 10 is a section taken on the line 10—10 of Fig. 4.

Fig. 11 is a cross sectional view of a part of the punching mechanism of the machine.

Fig. 12 is a perspective detail view of the manual means for breaking the brush magnet circuit.

Fig. 13 is a detail view of the means for breaking the brush magnet circuit when the carriage is stepped backwardly.

The machine comprises a main frame 1 and is arranged for convenient right hand operation by a finger piece or handle 2 (Fig. 1) having a normal position at the right hand end of the machine and being mounted for leftward movement along the side of the machine. However, when the handle 2 is moved to the left in this manner a statistical card 3 is withdrawn by a picker 4 from the bottom of a stack in the magazine 5 (Fig. 7) and advanced to be operated upon by a punching mechanism comprising punches 6 (Fig. 1). Such leftward actuation of the handle 2 also serves to move a card carriage 7 to the right to a position to receive the card 3 when the picker 4 reaches the end of its leftward movement. The card is then punched column by column, as required, and the card carriage 7 moves step by step to the left. When the punching of the card is completed and the carriage has reached the end of its movement the punched card may be removed and the operation repeated.

The punches 6 may be operated normally by means of numeral keys 8 (Fig. 1) or may be controlled by a duplicator in accordance with the perforations of a pattern member which may be a previously punched master card 9. Such master card is also supported by the card carriage 7 and is moved through the duplicator concomitantly with the movement of a card through the punching mechanism.

The handle 2 is mounted at its left end on a bracket 10 (Fig. 1) and at the right of the bracket the handle is offset to provide a finger engaging portion. Bracket 10 has a rearward extension having secured thereto at its upper face a block 11 (Fig. 7) slidable on the frame of the machine. Pivoted on the block 11 is the previously mentioned picker 4 having an inclined end which extends beneath the adjacent end of the card magazine when the picker is in retracted position and a shoulder 12 projecting upwardly to a sufficient extent to remove cards 3 singly from the bottom of the pack in the magazine 5.

The picker 4 is normally urged upwardly by a spring 13 (Fig. 7) so that when there are cards in the magazine the inclined portion of the picker 4 will be yieldingly pressed against the lowermost card to insure engagement of the shoulder 12 with the adjacent end of the lowest card when the picker is advanced from its retracted position. The adjustment of the tension of the spring 13 can be varied by means of an adjustable screw 14.

The handle 2 may also be used to actuate the card carriage 7. To this end the bracket 10 is turned to extend through a longitudinal slot in a tube 15 (Figs. 1 and 6) and is secured to a rod 16 slidable in said tube. As shown in Fig. 1 the tube 15 is supported on the main frame by slotted brackets 17. Adjacent the extreme leftward position of the handle 2 the tube 15 is cut away at the top to permit teeth 18 on the upper side of the rod to mesh with the teeth of a pinion 19 and gear 20. The pinion 19 is mounted on a shaft 21 (Fig. 6) on which is fixed a hub 22 connected by a spiral spring 23 with a cup 24 secured to the frame 1. As the handle 2 is moved to the left the spring 23 is placed under tension and upon the release of the handle 2 acts to return it to its normal position.

The gear 20 is suitably supported for rotation and is fixed to one member 25 (Fig. 1) of a clutch whereby motion may be transmitted to the card carriage 7 when the handle 2 is moved to the left. Opposed to the member 25 is another clutch member 26 (Fig. 1) having a driving connection with a shaft 27 and slidable thereon into and out of engagement with the member 25. At its other end the shaft 27 is provided with a gear 28 (Fig. 4) fixed thereon and meshing with the teeth on

the underside of a rack 29 (Fig. 8) which may be considered as forming a part of the card carriage 7. The clutch members 25 and 26 are normally in disestablished operative relationship and in order to effect an engagement between the members of the clutch suitable control devices, more particularly shown and described in the application of Lee and Phillips, Serial No. 34,516, filed June 3, 1925, (now Patent 1,772,186) are provided.

Since this particular mechanism forms no part of the present invention it will not be described in detail and it will suffice to state that upon an initiation of the handle 2 to the left the clutch member 25 is shifted into engagement with the clutch member 26 thus connecting gears 20 and 28. In this connection it should also be noted that the teeth of the clutch members 25 and 26 are so inclined that when in operative relationship a leftward movement of the handle 2 will transmit through means including the clutch, power to move the card carriage 7 to the right to receive the card 3 positioned by the picker 4 in the punching mechanism 6. If, however, the handle 2 is moved to the right, the teeth of the clutch members 25 and 26 will ride over each other and force the clutch members apart.

Due to the engagement of the rod 16 with the lower side of the gear 20 (Fig. 6) and of rack 29 with the upper side of gear 28, movement of the picker 4 to the left with a card for presentation to the punching mechanism 6 will be accompanied by a rightward movement of the card carriage 7 into a position to receive the card from the picker 4. As indicated in Fig. 4 the rack 29 is carried by means of grooved rollers 30 running on a rail 31 mounted in the main frame. Thus it will be clear that a leftward movement of the finger piece 2 and rod 18 will effect a movement of the rack 29 and carriage 7 in the opposite direction to a position to receive the card from the picker 4, the card passing to a position to be engaged operatively by the punching mechanism 6.

The top of the rack 29, observing Fig. 8, is also provided with rack teeth 32 inclining towards the left end of the machine which are provided for the purpose of controlling the stepping of the carriage by increments to provide for successively punching the card in the multiple columns. The escapement mechanism just referred to is of the same general nature as that disclosed in the patent to Schaaff Patent No. 1,426,223, granted August 15, 1922 and since it forms no part of the present invention further description of the mechanism will not be given. The escapement mechanism referred to is adapted to hold the carriage 7 when it has reached its limit of movement and at this time the first column of the card to be punched will lie beneath a row of punches 6 (Fig. 11) which have enlarged upper ends guided in a member 34 and lower ends extending through openings in a guide or stripper member 35 and immediately above openings 36 in a die plate 37.

The punches 6 are of the general form disclosed in the patent to Lee and Phillips, 1,772,186 and are normally held in raised position by springs 38 interposed between the enlarged heads thereof and the stripper member which is provided with openings to receive the lower ends of said springs. As more fully disclosed in the patent just referred to, resting on the upper ends of said punches are interposers 39 supported at their rear ends on a cross member 40 and resting against the lower face of an overlying plate 41 so that they prevent further upward movement of said punches. The interposers 39 are so notched at their forward ends that when they are in their normal positions depression of a depressor plate 42 against a spring 43 will move a portion 44 of the depresser plate 42 into such notches.

However, when any numeral key 8 is depressed it will actuate a bell crank 45 against the tension of a spring 46, the forward arm of each bell crank having a rounded head fitting into a notch in the shank of the key and the upright end having a pin 47 in a slot in the lower edge of the corresponding interposer 39. Such interposer will then be advanced to such a position that depression of the member 44 will effect depression of the interposer and consequently of the corresponding punch.

Upon movement of any of the interposers 39 a pair of contacts 48 (Fig. 5) are adapted to be closed thereby closing the circuit to a punch magnet 49. Upon energization of the punch magnet 49 the armature 217 will be swung about its pivot 218 and through the link 220 (shown in dotted lines in Fig. 11) will rock the bell crank 221 about the pivot 222 to draw downward a link 223 connected at 224 to the depressor plate 42 and rock the same to actuate the selected punch.

Subsequently the circuit of the magnet 49 will be broken allowing the return of the depressed interposer to normal position. At this time the escapement mechanism will be effective and the rack 29 and card carriage will advance one tooth to permit punching in the next column of the card. The operation of the punches 6 may also be controlled by means of the duplicator which causes the usual selector magnets 50 (Fig. 5 and 11) to be actuated in accordance with the perforations of a pattern or previously punched master card 9 which is arranged for punching in forty-five different columns. The selector magnets are twelve in number and operate the ten numeral keys and two auxiliary keys, one being marked X and the other being blank, arranged to operate the two punches at the end of the row farthest from the operator.

Such operation of the keys controlled by the selector magnets 50 may be effected by means of levers 51 (Fig. 11), having at their ends in one direction rounded heads 52 extending into slots in the shanks of the keys to be controlled thereby, and extending in the other direction substantially horizontally into a casing for the selector magnets above the cores of the magnets 50. The levers 51 are pivoted to brackets 53 spaced apart and attached to the main frame. Adjustably attached to each of the levers 51 is an armature 54 for cooperation with the corresponding magnet.

Extending from one end of each magnet coil 50 is a wire 55 (Fig. 5) which is connected to a related spring contact plate 56 (Figs. 2 and 4) the series of which are carried by a block 57 of insulating material. Each spring 56 is adapted to provide a sliding continuous electrical contact with an associated brush holder 57′ which carries its particular analyzing brush 58. The series of brushes 58, of which there are thirteen are adapted to bear against a metal cylinder or roller 59 mounted on a non-conducting roller 60 which is carried by a shaft 61. The brushes 58 are carried by an insulating brush holder 62 secured between the side plates 63 (see Fig. 4) of a yoke or bail-shaped member designated generally by reference character 64. Each side plate 63 of the yoke-shaped frame 64 is suspended or supported at its upper end by a link 65 pivoted to a frame portion 66 and at its lower end the plates 63 are supported by means of a parallel link 67, and intermediate each plate 63 and related link 67 is a toggle plate linkage member 68 which is pivoted upon a spring stud 69 securely fastened to the frame member 66. The end of the link 67 distant from its connecting point to the toggle plate 68 is pivotally secured to an armature structure 70, the latter being pivoted at 71 to the frame member 66. The armature structure 70 is attracted against the tension of a spring 72, when a magnet 73 is energized at which time the counterclockwise rocking movement of the toggle plate 68 about its pivotal point 69 will be effective to elevate the frame 64 in a straight line resulting in the contact of the individual analyzing brushes 58 with the contact roll 59. The shifting of the brushes in a straight line provides distinct advantages over movements in other paths. As the brushes are shifted upwardly from the position shown in Fig. 3 to Fig. 2 in a straight line, the tip of the brushes passes through the card perforations and contacts the roller 59. A further and increased shifting of the brushes upwardly results in flexing or bending the brushes (as shown in Fig. 2) without appreciably shifting the tip of the brushes to cause a change of the initial point of contact which would result in damaging the card in the absence of a perforation. Hence interference with the edges of the card perforations is avoided and the desirable flexing of the brushes for proper electrical contact secured. The brushes, of course, do not interfere with the sides of the perforations when they are shifted downwardly out of contact with cylinder or roller 59.

If brushes are moved in any other path and placed under pressure they will mutilate the card whether there is a hole punched or not, and will also injure the fine wires of which the brushes are composed if they catch in the card.

The brush holder 62 and the analyzing brushes 58 extend completely across the duplicator and when a pattern or master card 9 is in the duplicator it will pass between the roller 59 and all of the brushes 58 except the one to the left of Fig. 5 which is in continuous contact with the contact roll 59 when the latter is in lowered position. It will be evident that when there are no perforations in the portion of the pattern card between the contact roll 59 and the brushes 58 none of the selector magnets 50 will be energized. When, however, a perforation in the pattern card 9 comes into position over one of the analyzing brushes 58 the circuit of one of the selector magnets 50 will be energized and the corresponding punch 6 operated.

The shaft 61 is mounted in opposite sides of a frame or casing 74 which has at its opposite ends ears 75 which form the journal support for the shaft 61. The casing 74 has also at its right end (Figs. 1 and 2) ears 76 or the like pivoted to the table of the duplicator by suitable means such as screws 77. Extending to the left from the casing 74 is a resilient plate 78 (see Fig. 1) which may be held down by a latch 79 during normal operation against the action of a spring 79*a*, (Fig. 2).

When the card carriage 7 is in the position shown in Fig. 1 the latch 79 may be moved to ineffective position thereby allowing the frame 74 to be swung from the position shown in full lines in Fig. 2 to the dotted line position. The pattern or master card 9 may then be conveniently placed upon the card carriage by placing the right hand thereof beneath the elevated contact roll and the left end of a plate 78*a* (Fig. 1). Preparatory to starting the punching, the frame 74 and plate 78 may then be swung downwardly to the positions shown in full lines in Fig. 2 and are retained by the latch 79 followed by a movement of the card carriage 7 to the right which may be effected by the previously mentioned handle 2.

Referring to the circuit diagram (Fig. 5) it will be observed that current to the electrical instrumentalities is supplied by line wires 80 and 81. With respect to the circuit for the brush magnet 73 it will be observed

that current to the magnet is supplied when all of the pairs of contacts 82, 83 and 84 are closed. The function of each of these pairs of contacts will hereinafter be explained.

Each of the pairs of contacts are normally closed causing the brushes 58 to be placed in operative contact with the contact roller 59, but in order to avoid bending or damaging the brushes by an interference between the perforations of a pattern card with the brushes 58 as the card is manually shifted along the top of the stationary carriage to be placed in a predetermined position, contacts 83 are employed. Referring to Fig. 2, attached to the plate 78 is a contact operating member 85 adapted to engage and close contacts 83 when the casing 74 is closed. When the latter is unlatched and elevated to permit placing of a master card, removal of contact operating member 85 will permit contacts 83 to open, thus deenergizing magnet 73 whereupon spring 72 will shift the brushes 58 to their lowermost position (see Fig. 3). After the master card has been placed it will be recalled that it is positioned to the extreme right end of the machine preparatory to being reversely stepped by increments as it controls duplicate punching of the blank card. As a similar interference between brushes 58 and the perforations of the master card would result as the master card is shifted to its punch-controlling position certain mechanisms come into play to automatically shift the brush holder 62 at the proper times. The preferred form of control is described as follows: Mounted on the stub shaft 21 (Fig. 6) is a pair of disks 86 and 87 the former of which is pinned to the shaft but the latter is spring urged along the shaft by a spring 88, one end of which bears against the disk 87 and the other end is held by a collar 89 keyed to shaft 21 by a key 90.

Spring 88 urges facings 91 attached to the disks 86 and 87 to bear against a plate 92 loosely mounted on shaft 21. As shaft 21 is rotated, plate 92 is frictionally rotated but the amount of movement imparted thereto is limited in either direction by the engagement of an integral projection 93 with a closed slot 94 in a bent-up plate 95. A clockwise movement of plate 92 which is synchronous with a rightward movement of the carriage 7 to position a master card, is sufficient to cause a stud 96 attached to plate 92 and engaging the lowermost contact plate of the set of contacts 82, to separate the latter. Opening of contacts 82 will, therefore, cause the deenergization of magnet 73 resulting in lowering of brushes 58. The master card may then be freely moved to its punch controlling position and held there by the usual escapement mechanism but as finger piece 2 automatically returns under control of the return coil spring 23 (Fig. 6) shaft 21 will be reversely rocked, thus shifting plate 92, permitting contacts 82 to close whereupon brushes 58 reengage the contact roller 59.

Additional precautionary devices are provided to prevent a back spacing movement of the carriage 7 carrying the master card when the master card has been stepped along for controlling the punches in accordance with the column perforations therein. This effectively prevents damaging or bending the brushes 58 by the column perforations since the brushes are at this time in immediate contact with the roller 59.

In continuous mesh with the teeth on the underside of the rack member 29 (Fig. 8) is a gear 100 staked to an arbor 101 (see also Fig. 9) loosely mounted on a fixed stud 102. Loosely mounted on the stud 102 is a controlling plate 103 having a plurality of segmental projections 104. Springs 105 urge locking members, such as balls 106 against the adjacent segmental projections 104. The balls are confined in a slot formed by the periphery of the arbor 101 and the internal periphery of a cylindrical shaped plate or housing 107. The slot may be described as having portions 109 greater than the diameter of the balls, in which portion the balls freely rotate, and reduced or diverging locking portions 110, which provide a locking or wedging action between the housing 107, and the arbor 101. In the position of the plate 103 shown, it will be observed that the segmental projections 104 are so positioned that the springs 105 may freely move the balls 106 to occupy the locking portions 110 of the slot. As the gear 100 rotates counterclockwise by the stepped rack 29, which is coincident with a step-by-step movement of the carriage for controlling the punches by the master card column perforations, no locking action will ensue but any attempt to move the carriage reversely will result in driving gear 100 clockwise as viewed in Fig. 8. As the arbor 101 turns similarly it will rotate the balls 106 and force them to occupy the reduced portion 110 of the slot firmly wedging them between the housing 107 and the arbor 101, effectively locking the carriage against any accidental or intentional backward movement. Since at this particular time the brushes 58 are in immediate contact with the contact roll 59 the perforations of the master card cannot damage the brushes by a reverse movement of the carriage because it is locked against any such movement.

The locking means described is, however, rendered ineffective whenever the finger piece 2 is actuated to position the pattern card for controlling the punches. To this end the armature structure 70 has an integral extension 111 (Fig. 4) suitably bent up to receive the end of a rod 112 locked thereto by locking nuts 113. Pivoted to a pair of links 114 which are (Fig. 4) pivoted on a bracket 115 is a T-shaped plate 116 having a lug 117 bearing against the free end of rod 112. The low-

er end 118 (Fig. 8) of plate 103 is urged by a spring 119 to engage a portion of the plate 116 it being clear that spring 119 is effective to cause the plates 103 and 116 to follow the positioning of rod 112.

It will be recalled that when the carriage is shifted to the right to position the master card, the brushes 58 are shifted away from the contact roll, and since magnet 73 is deenergized at this time the armature structure thereof will move rod 112 to the right as viewed in Fig. 4, thus shifting plate 116 similarly and rocking plate 103 counterclockwise. This will result in causing the segmental projections 104 to shift the balls 106 so that they occupy the non-locking portions 109 of the slot, thus allowing the carriage to be freely positioned. Energization of magnet 73, which is coincident with the beginning of the step-by-step movement of the carriage, will shift plate 103 so that the locking balls again occupy the locking portions 110 of the slot.

If it is desired to move the master card backwardly after it has passed by the analyzing brushes a lever 124 (Figs. 1 and 12) is actuated. This lever is mounted on a pivot 125 at the left end of the carriage 7 and has a downwardly extending lug 126. When the lever 124 is actuated to move the card carriage 7 to the right or backwardly, the lug 126 presses against a bail 127 (Fig. 13) and rocks a shaft 128 on which the bail is mounted and inasmuch as the shaft and bail extend along the path of the movement of the card carriage, the shaft 128 and bail 127 will be held in operated positions as long as the handle 124 is pressed to the right.

Projecting downwardly from the shaft 128 is a finger 129 which upon turning the shaft as just described engages an insulating member 130 on a spring 131 and by flexing the spring disengages the contacts 84 (Fig. 5) thereby opening the brush magnet circuit. The brushes will thereupon be moved out of contact with the contact roll, and deenergization of magnet 73, as premised heretofore, will result in moving the locking balls 106 (Fig. 8) to a non-locking position, permitting a free backward movement of rack 29 and the card carriage 7. When the carriage has been positioned at the desired point, the lever 124 is released, resulting in the energization of magnet 73, the elevation of the brushes 58 and rendering the locking mechanism active.

As more fully explained in the Lee and Phillips Patent 1,772,186 and copending application of J. T. Schaaff, Serial No. 731,980 now Patent 1,821,078 the machine has provisions for cutting out punching in certain predetermined columns or fields, the escapement mechanism being fully shown and described in the latter patent and the patent to J. T. Schaaff, 1,426,223 and is temporarily rendered inoperative to permit the carriage to skip the desired column or field. The particular devices for accomplishing the above are well known and constitute no part of the present invention, it being merely observed that since the gap may be of considerable length, the heavy moving carriage and parts carried thereby urged by the usual return spring may possess considerable momentum, and when suddenly stopped may impart a shock or strain to the parts with a consequent damage to the machine. To effectively prevent the above, the machine has provisions in the form of a governor for preventing the carriage from acquiring a predetermined and undesirable speed during jumps or "skips".

The form of governor provided is illustrated in Fig. 10 wherein it will be observed that in continuous mesh with the lower rack teeth of rack member 29 is a gear 135 (Fig. 8) in continuous mesh with a pinion 136 attached to one end of a shaft 137 which is journalled in a cylindrical housing 138. Shaft 137 is flattened at one end, as shown in Fig. 10, to receive an irregular shaped rotatable member 139 to which is pivoted a plurality of arms 140.

Each of said arms is pivoted in recessed flattened portions 141 of the member 139 but is adapted to contact the side edges of adjacent projections 142 and 143 which are in the form of extending arms. It will be obvious that a counterclockwise rotation of shaft 137 at a low speed will cause the plurality of arms 140 to assume the positions indicated in Fig. 10, but as the counterclockwise speed of shaft 137 is increased, which is coincident with a positioning of the master card to control punching, said arms will fly out and at a definite increased speed they will assume radial positions, similar to the spokes of a wheel.

Loosely mounted upon a circular portion of shaft 137 is a clutch or brake member 144 which has at equi-angular distances lugs 145 in the plane of the arms 140. It will be clear that at low speeds of shaft 137, the lowermost arm 140 will engage one of the lugs 145 and drag over the same as shaft 137 rotates counterclockwise, then assume sequentially, a vertical, horizontal, then vertical position, until it rocks about its pivot to again engage a lug 145. This permits the shaft 137 being brought to a definite speed without imposing any starting load. But as the carriage containing the master card is skipped to jump a field, or several fields, the speed of shaft 137 will be increased, and arms 140 will fly out radially, striking the extremities of the lugs 145 with considerable force to impart rotation to the braking member 144, arms 140 dragging over the lugs until both the shaft 137 and braking member 144 rotate synchronously.

At equi-angular distances brake shoe carrying arms 146 are pivoted at pivotal points

147 to the braking member 144 and are each normally held by a spring 148 so that brake shoe members 149 are out of contact with the inside of the cylindrical brake housing 138, inward movement of the brake arms 146 being limited by the coaction of a stud 150 with a portion of the member 144.

When the shaft 137 rotates at an undesirable speed, member 144 will be rotated similarly and will result in throwing arms 146 outwardly by centrifugal force causing brake shoes 149 to engage the inner surface of the housing 138. Since this reduces the speed of member 144 the lugs 145 will act as obstructions to the arms 140 to cause the speed of shaft 137 to be reduced and when the proper speed has been reached shaft 137 may continue to rotate as before and without any additional load being imposed upon it.

It should also be pointed out that when shaft 137 is rotated clockwise by manually positioning the carriage with the master card to its initial starting position that one of the arms 140 will contact with the extremities of one of the lugs 145 to thereby turn the brake member 144 in the same direction. As this manual operation does not usually create such a high speed of shaft 137 as by "skip" operations it will be clear that the brake will be ineffective, but if the operator should intentionally shift the carriage violently and quickly the brake will be immediately effective to dampen the manual movement thereby eliminating any chance of damaging the parts of the machine.

While there has been shown and described and pointed out the fundamental novel features of the invention as applied to a single modification it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention therefore to be limited only as indicated by the scope of the following claims.

I claim:

1. In a card punching machine, a conductor beneath which a master card carried by a movable carriage passes, a row of selector contacts in the form of brushes comprising a duplicator separable from the conductor by intact portions of the master card, and means automatically operable as an incident to shifting the card carriage for shifting said brushes out of contact with said card.

2. In a card punching machine, a conductor beneath which a master card carried by a movable carriage passes, a row of selector contacts in the form of brushes comprising a duplicator separable from the conductor by intact portions of the master card, and means effective during a movement of the master card carriage for shifting said brushes.

3. In a card punching machine, a conductor beneath which a master card carried by a movable carriage passes, a row of selector contacts in the form of brushes comprising a duplicator separable from the conductor by intact portions of the master card, and means for shifting said brushes out of contact with the card during a manual movement of said master card carriage.

4. In a card punching machine, a conductor beneath which a master card passes, a casing carrying said conductor common to a row of flexible brush contacts comprising a duplicator separable from the conductor by intact portions of the master card, means for mounting said casing to permit a shifting movement of said casing to effect a relative separation between said contacts and conductor whereby said master card may be manually positioned between said brush contacts and the conductor and means controlled by said casing for shifting said brushes.

5. In a card punching machine, a conductor beneath which a master card passes, a casing carrying said conductor, a row of selector contacts comprising a duplicator separable from the conductor by intact portions of the master card, means for mounting said casing whereby said master card may be manually positioned between said selector contacts and the conductor and means controlled by a movement of said casing for shifting said selector contacts.

6. In a card punching machine having a plurality of punches and selector magnets for actuating the same, a conductor, a duplicator comprising a plurality of aligned selector contacts corresponding to the selector magnets, separable from the conductor by intact portions of a master card, and means for automatically shifting said selector contacts from normal contacting position with said conductor during a manual positioning of said master card.

7. In a card punching machine having a plurality of punches and selector magnets for actuating the same, a conductor, a duplicator comprising a plurality of aligned selector contacts corresponding to the selector magnets, separable from the conductor by intact portions of a master card, a carriage adapted to hold said master card, and separate controlling means for shifting said contacts during a manual positioning of the master card on said carriage and during a subsequent movement of said carriage.

8. In a card punching machine having a plurality of punches and selector magnets for actuating the same, a conductor, a duplicator comprising a plurality of aligned selector contacts corresponding to the selector magnets separable from the conductor by intact portions of a master card, a swingable frame carrying said conductor, and means con-

trolled by said frame for shifting said contacts.

9. In a card punching machine having a plurality of punches and selector magnets for actuating the same, a conductor, a duplicator comprising a plurality of aligned selector contacts corresponding to the selector magnets separable from the conductor by intact portions of a master card, a swingable frame carrying said conductor, means controlled by said frame for shifting said contacts, a carriage adapted to hold said master card, and means for shifting said contacts during a manual positioning of the master card on said carriage and during a subsequent movement of said carriage.

10. A card punching machine including a duplicator comprising analyzing contacts for controlling duplicating punches, a cover, a normally covered table over which the master card is manually positioned prior to the movement of the table with said master card for controlling the duplicating punches, and means controlled by the cover for shifting said analyzing contacts when the table is uncovered to permit the manual positioning of the master card on the table.

11. A card punching machine including a duplicator comprising analyzing contacts for controlling a card punching machine, a table over which the master card is manually positioned prior to the movement of the table with said master card for controlling the duplicator, means controlled by the table for shifting said analyzing contacts to permit the manual positioning of the master card in the table with provisions for maintaining said contacts shifted during the positioning of the table with said master card.

12. In a card punching machine, a table over which a master card is positioned, a duplicator comprising analyzing brushes, means for causing a movement of said table and master card in increments to successively control punches by the duplicator, and means for preventing a retrograde movement of said table towards its initial starting position whereby damaging of the brushes is prevented.

13. In a card punching machine, a duplicator comprising analyzing brushes, a table over which a master card is positioned, manual means for positioning said table whereby said card through the duplicator controls the punches of the punching mechanism during its step by step movement from its initial starting position, means for preventing a retrograde movement of said table, and a lever adapted to shift said table and render said retrograde preventing means ineffective.

14. In a card punching machine, a punching mechanism, a table over which a master card is positioned, means whereby said table and master card are stepped in increments to successively control the punching mechanism, selector contacts coordinated with said card, and means for preventing a retrograde movement of the table when said selector contacts are in contact with the master card.

15. In a card punching machine, a table over which a master card is positioned, means whereby said table and master card are stepped in increments, selector contacts comprising a duplicator coordinated with said card, means for preventing a retrograde movement of the table when said selector contacts are in contact with the master card and a manual means adapted to cause said contacts to be shifted out of contact with the master card and disable the retrograde table movement preventing means.

16. In a card punching machine, means for controlling punches by a master card when successively stepped from an initial starting position, selector contacts comprising a duplicator adapted to cooperate with said master card to select the punches, and means for preventing a retrograde movement of said card when said selector contacts are in cooperation therewith.

17. In a card punching machine, a punching mechanism means for controlling the punches of the punching mechanism by a master card carried by a table when successively stepped from an initial starting position, means for governing the linear speed of the movement of said table, selector contacts comprising a duplicator adapted to cooperate with said master card, and means for preventing a retrograde movement of said card when said selector contacts are in cooperation therewith.

18. In a duplicating machine, comprising in combination with a traveling carriage carrying a master card, manually operable means carried by the carriage for moving the latter in one direction, a locking means adapted to prevent movement of said carriage, and means controlled by the manually operable means for automatically rendering the locking mechanism ineffective.

19. In a card punching machine, a punching mechanism, a conductor beneath which a master card passes, a duplicator comprising a row of brushes contacting with the conductor through perforations in the master card, a card carriage, and automatic means controlled by the carriage for shifting said brushes out of contact with the card and conductor.

20. In a card punching machine, a punching mechanism, a duplicator comprising a row of contacts in the form of brushes arranged to analyze perforations in a master card and to control the punching mechanism, a master card carrying element, and means controlled by the master card carrying element for causing said brushes to be automatically shifted when the card is shifted in a certain direction.

21. In a card punching machine, a punching mechanism, a row of brushes comprising a duplicator for controlling the punching mechanism in accordance with perforations of a master card, and a device operable when the master card is shifted reversely from a punching position for causing an automatic shifting of the brushes out of contact therewith.

22. In a card punching machine, a punching mechanism, a duplicator comprising flexible wire brushes correlated with a master card for determining the selection of punches, a master card carriage power driven in increments for the successive duplicating operations, and means for causing the automatic withdrawal of the brushes prior to manual retraction of the card carriage.

23. In a card punching machine, a duplicator comprising flexible wire brushes for analyzing perforations of a master card, a manually retractable master card carriage, automatically operated means for shifting said brushes, and means manually operated to permit the retraction of said carriage and to cause the automatic operation of the brush shifting means.

24. In a card punching machine, a master card carriage, a duplicator comprising flexible brushes for analyzing perforations of a master card but capable of being damaged by retraction of the card while on the carriage, manual means for retracting said carriage, and means for causing the automatic shifting of said brushes from contact with the master card when the manual means is operated.

25. In a punching machine, a master card capable of being shifted in one direction to control a duplicator and manually retractable in the other direction, brushes comprising said duplicator capable of being damaged by perforations in said card when manually retracted, and manually controlled means for insuring the automatic withdrawal of the brushes from contact with the card before the latter is manually retracted.

26. In a card punching machine having a carriage carrying a master card controlling a duplicating device, and manually retractable to an initial starting position, means for cutting out the duplicator for successive card columns of the master card, a governor for controlling the linear speed of movement at which the carriage is jumped to skip certain card columns and its speed of retraction, means for preventing retraction of the card carriage, and manually operable means for disabling said means whereby said carriage may be manually retractable at a speed controlled by said governor.

27. In a card punching machine, comprising in combination, a carriage carrying a master card manually retractable to an initial starting position and power driven in increments for controlling successive duplicating operations, a duplicating device controlled by the master card for determining punching in successive card columns, means for omitting the duplicating operation for a plurality of successive card columns wherein the card carriage is power driven to jump such columns, and a governor for regulating the speed of the carriage during such operations the governor having provisions whereby the speed at which the carriage is manually retracted is also controlled.

28. In a punching machine comprising in combination, a contact element, a set of analyzing brushes for effecting an electrical contact with the contact element through perforations of a master card, and means for shifting said brushes relative to said contact element on a straight line and transversely with respect to the plane of the card.

29. In a punching machine comprising in combination a contact element and a set of analyzing brushes arranged to be shifted in contact with said element through perforations of a card, a bar carrying said set of brushes, and means for shifting said bar in substantially a straight line.

30. In a punching machine comprising in combination a contact element, a set of brushes of flexible wires comprising analyzing elements for a perforated record, and means for initially shifting said brushes to contact the element and by an additional movement cause said brushes to be flexed without appreciably changing the initial point of contact.

31. In a punching machine including flexible wire brushes comprising analyzing elements for a perforated card, punches controlled thereby, and a mechanism for causing said brushes to be shifted in a straight line and transversely with respect to the plane of the card.

In testimony whereof I hereto affix my signature.

FRED L. LEE.