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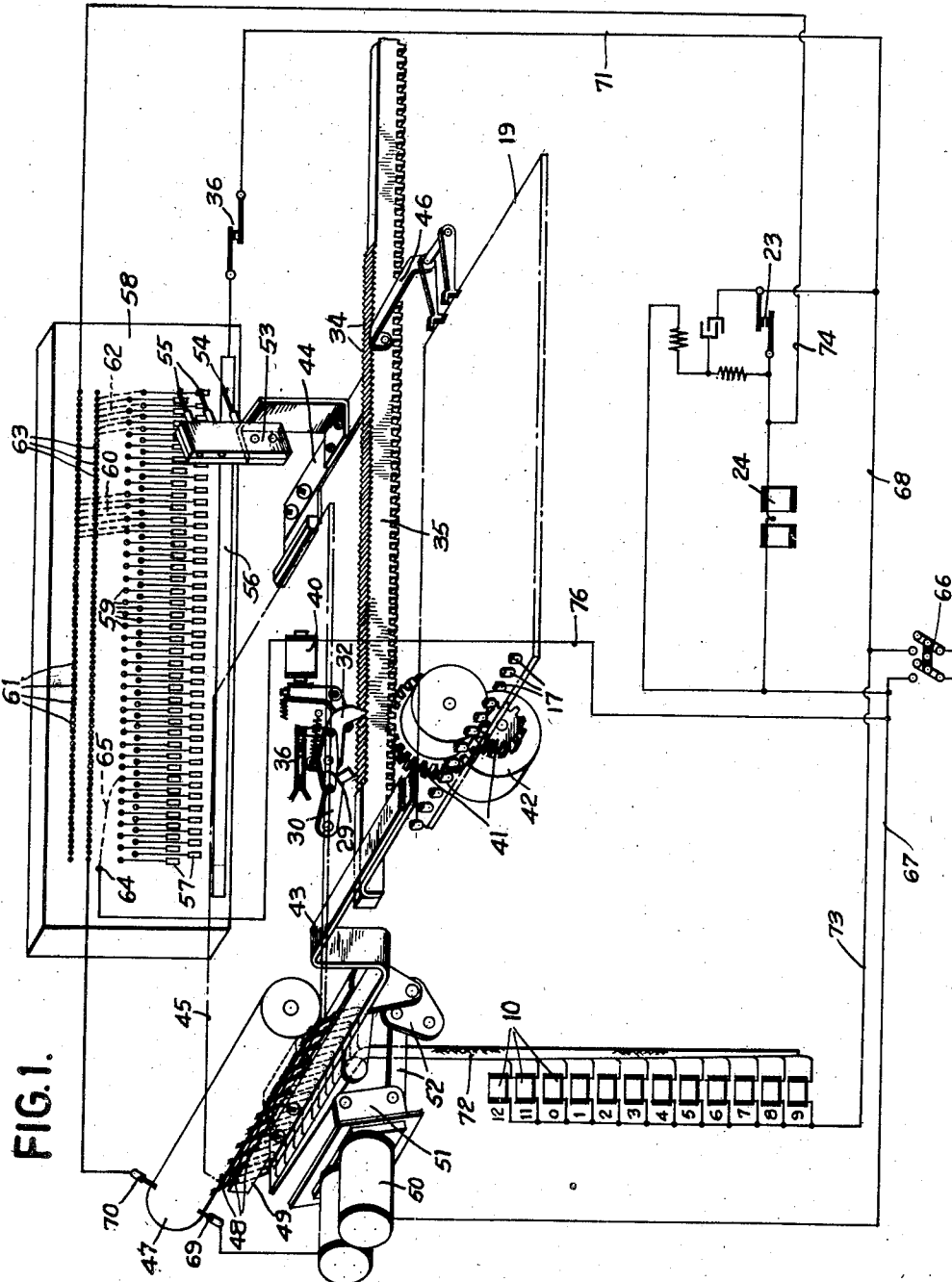
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2,016,686

PUNCH

Filed Oct. 4, 1932

3 Sheets-Sheet 1



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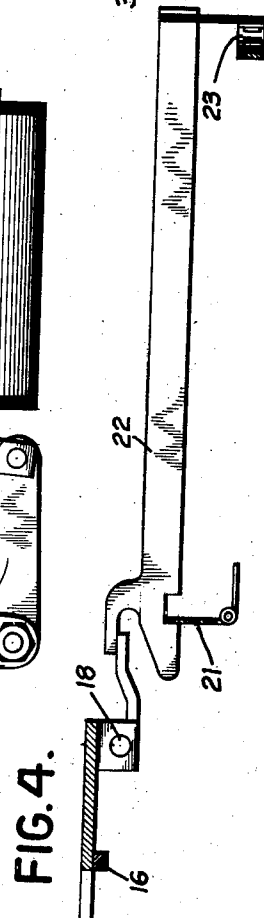
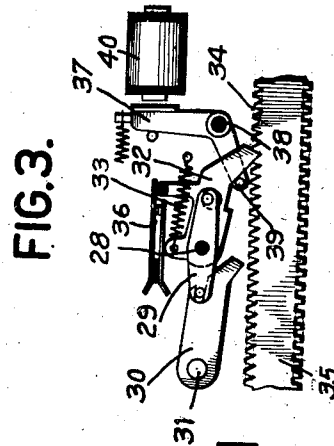
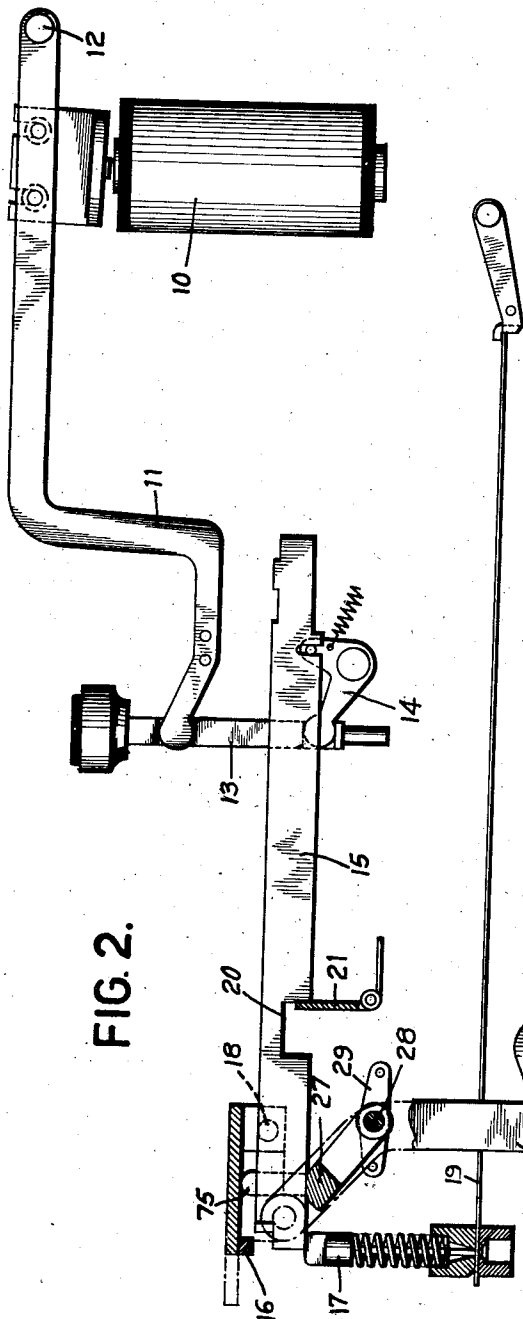
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PUNCH.

Filed Oct. 4, 1932

3 Sheets-Sheet 2



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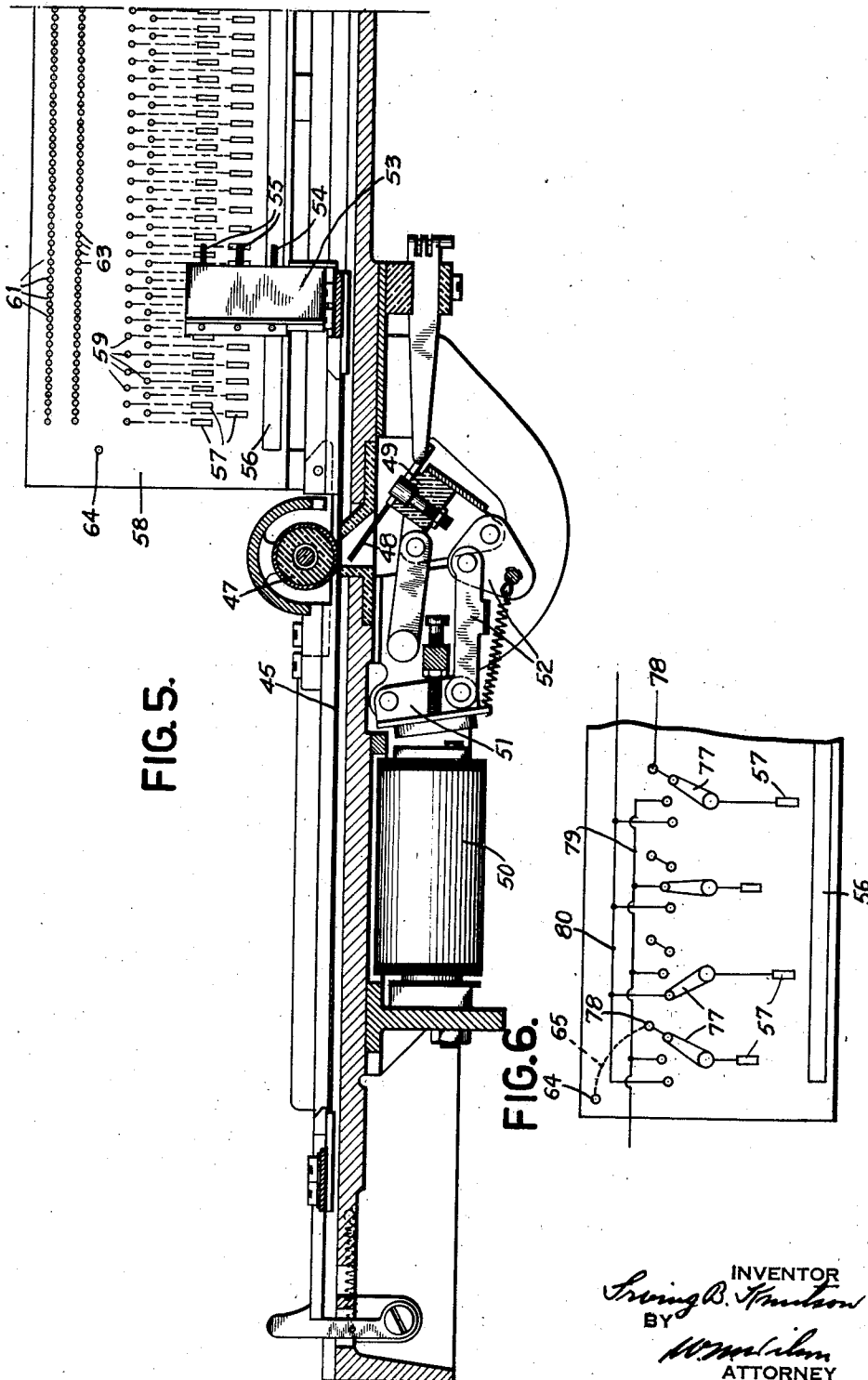
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PUNCH

Filed Oct. 4, 1932

3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

2,016,686

PUNCH

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Application October 4, 1932, Serial No. 636,129

10 Claims. (Cl. 164-115)

This invention relates to punching or perforat-
ing machines and more particularly to machines
of the type in which the punching may be con-
trolled either manually or by a previously punched
5 card.

A general object of the invention is to provide
an improved and simplified machine of the type
specified.

Heretofore in machines of this character, so-
called column cut-out bars have been provided
with notches along one edge thereof located in
accordance with the columns of the controlling
record which it is desired to reproduce. A so-
called skip bar has also been customarily provided
15 with notches along one edge thereof arranged
in accordance with the columns of the blank card
which it is desired to skip. These column cut-
out bars and skip bars have a permanent con-
figuration which is in accordance with the ar-
20 rangement of data on the associated record cards
and it has been necessary to provide a set of such
bars for each different arrangement of data
on the cards which may be used in the machine.

The main object of the present invention is to
25 obviate the necessity for these mechanical bars
and to provide a flexible electrically controlled
device which may be pre-set to cause duplicating
or spacing operations to occur automatically in
any desired columns of the record cards.

A flexible plugging arrangement is provided
30 whereby the duplicating and spacing positions in
the machine may be readily altered to conform
to any desired arrangement of data on the record
cards.

A modification of the invention provides for a
35 plurality of switches of which there is one pro-
vided for each column of the record card. A
switch associated with any column of the card,
when in one position may cause data to be dupli-
cated or punched in that column; when in a
40 second position, may cause the column to be
automatically skipped; and when in a third posi-
tion, may permit the manual punching of data
in that column.

Various other objects and advantages of the
invention will be obvious from the following par-
ticular description of one form of mechanism
embodying the invention or from an inspection
50 of the accompanying drawings; and the invention
also constitutes certain new and novel features of
construction and combination of parts herein-
after set forth and claimed.

In the drawings:

55 Fig. 1 represents a circuit diagram of the elec-

tric circuits of the punch including the card
carrying mechanism in perspective outline.

Fig. 2 is a section of the essential operating
mechanism of the punch.

Fig. 3 is a detail of the punch carriage escape-
ment mechanism. 5

Fig. 4 is a detail of a punch magnet operating
contact mechanism.

Fig. 5 is a sectional view of the analyzing mech-
anism for analyzing the master or pattern card. 10

Fig. 6 is a detail of a modified form of switch
controlled contact device.

The punching machine is generally of the form
shown in the Lee and Phillips Patent No. 1,772,186,
granted August 5, 1930 and the description there-
of will be limited to the features essential to an
15 understanding of the present invention.

In Fig. 2, punch selecting magnets 10 are pro-
vided, there being one for each index point posi-
tion of the record card. Energization of magnet 20
10 will attract its armature to rock an arm 11 in
a counterclockwise direction about its pivot 12,
thus moving key 13 downwardly to rock a bell
crank 14 which has connection with an inter-
poser 15 which is suitably mounted for horizontal
25 reciprocation. The forward end of interposer 15
is suitably guided between an operating bar 16
and the upper end of a punch 17.

Forward movement of the interposer will posi-
tion its widest portion between bar 16 and punch
30 17 so that subsequent counterclockwise rocking
of bar 16 about pivot 18 will move the interposer
and punch downwardly to perforate the record
card 19. A notch 20 in the interposer cooper-
ates with a bail 21 to rock the same in a counter-
35 clockwise direction when the interposer is moved
toward the left. Rocking of bail 21 in such man-
ner will draw a hook-shaped member 22 (see
Fig. 4) toward the left to close a pair of con-
tacts 23. As will be explained in connection with
40 the circuit diagram, contacts 23 complete a cir-
cuit through the punch magnet 24 causing it to
attract its armature 25 and through linkage,
generally designated 26, draw downwardly on the
bar 16 to cause depression of the selected punch. 45
Depression of key 13 may, of course, be effected
independently of the operation of the magnet
10 for the purpose of manually controlling
punching operations.

Disposed beneath the interposers 15 is a bail 50
27 which is carried by rod 28 upon one end of
which is secured an arm 29 (see Fig. 3) for op-
erating the escapement mechanism. The es-
capement mechanism comprises a holding pawl
30 pivoted at 31 to the frame of the machine 55

and a stepping pawl 32 loosely pivoted on rod 28 and normally urged by a spring 33 into engagement with the teeth 34 on the upper edge of the carriage rack 35. Rocking of rod 28 in a counter clockwise direction under action of rocking bar 16 on an interposer 15 will lower pawl 30 into engagement with a tooth 34 to hold the rack 35 in position while punching is being effected. This action at the same time raises pawl 32 out of engagement with teeth 34 and by virtue of its loose connection with rod 28 it will move slightly toward the right in readiness to intercept the next tooth 34 when the rod 28 is returned to its original position.

A pair of contacts 36 is provided which is so associated with the pawl 32 that the contacts are open when the pawl is in its raised position and closed when it is in engagement with a notch or tooth 34.

A bell crank 37 pivoted at 38 to the frame of the machine carries a pin 39 underlying pawl 32. Energization of a magnet 40 will rock the bell crank in a clockwise direction whereby pin 39 will raise pawl 32 out of notch 34 to release the bar 35 from control of the escapement mechanism, thus permitting it to move rapidly toward the left with a continuous motion.

Referring to Fig. 1, the rack 35 is suitably mounted for horizontal movement in the frame of the machine and may be manually moved toward the right to the position shown wherein a record card 19 is placed in position with the first column thereof in line with the punches 17. Gear teeth cut on the underside of the rack cooperate with suitable gearing 41 which is connected to the usual spring barrel 42 which tends to move the rack toward the left and which effects such movement under control of the escapement mechanism just described.

Rack 35 is provided with extensions 43 and 44 between which a pattern or master card 45 is positioned and which is adapted to be moved back and forth with the rack. An arm 46 carried by the rack 35 is provided for cooperation with the card 19 to move it column by column past the punches 17. Positioned above the pattern card 45 is a contact roller 47 (see also Fig. 5) which is insulated from the frame of the machine. Directly below the roller 47 is a row of brushes 48 carried by a bar 49 which is normally in the position shown in Fig. 5 holding the brushes down out of engagement with the card 45. A magnet 50, upon energization, will attract its armature 51, actuating linkage 52 to cause upward movement of brushes 48 into engagement with the record card. This brush operating structure is fully shown and described in the copending application of Lee and Daly, Serial No. 391,874, filed September 11, 1929, now Patent No. 1,976,618, to which reference may be had for further details of construction.

Upon arm 44 is mounted a brush carrier 53 provided with electrically connected brushes 54 and 55, brush 54 being designed to cooperate with a common conducting strip 56 and the brushes 55 being designed to cooperate with individual conducting blocks 57. The strip 56 and blocks 57 are mounted in a block of insulating material 58 which is suitably secured to the frame of the machine. One block 57 is provided for each card column of the record card and one of the brushes 55 is in contact with one of the blocks 57 corresponding to the column of the record card under the punches 17 or in cooperation with the brushes 48. Each block 57 is electrically connected to a

plug socket 59 and suitable plug connections 60 may be inserted between plug sockets 59 and a row of sockets 61 in those columns in which it is desired to effect automatic spacing operations. By means of other plug connections 62 the sockets 59 may be connected to a row of sockets 63 for those columns in which it is desired to control the punching of data under control of the master card 45.

A special socket 64 is provided which, when connected to one of the sockets 59 by a suitable connection 65, will cause release of the card carriage for uninterrupted movement thereof toward the left.

The complete operation of the machine will now be traced with particular reference to Fig. 1. In those columns in which it is desired to reproduce data under control of the pattern card 45, plug connections 62 are made between the plugs 59 of the selected columns and a corresponding number of sockets 63, and in those columns in which automatic spacing is desired, connections 60 are made between sockets 59 and a corresponding number of sockets 61. If it is desired to leave a considerable number of columns at the right end of the record card unpunched, plug connection 65 is made between socket 64 and the socket 59 of the column following the last column in which punching is to be effected.

After cards 19 and 45 have been placed in position in the machine and the rack 35 moved toward the right to bring the first column of the card into registration with the punches, as in Fig. 1, switch 66 is closed to supply current to lines 67 and 68. With a plug connection 62 inserted in the first plug socket as shown, a circuit will immediately be completed from line 67, magnet 50, brush 69, contact roller 47, brush 70, to plug sockets 63, thence through connection 62 to the first socket 59, brush 55, brush 54, strip 56, contact 36, wire 71 to other side of line 68. Magnet 50 is thereby energized to elevate the brushes 48 into contact with the pattern card 45, following which the usual circuit or circuits will be completed through the punch selecting magnets to duplicate the data perforated in column 1 of the pattern card on the same column of the blank card 19. These circuits may be traced from line 67, magnet 50, brush 69, common roller 47, perforations in the pattern card, corresponding brushes 48, cable 72, punch selecting magnets 10, wire 73, to other side of line 68.

As explained above, energization of a magnet 10 will advance the corresponding interposer and will cause closure of the contact 23 which will complete the circuit to the punch magnet 24 from line 67, magnet 24, contact 23 to the other side of line 68. This causes operation of the punches in the usual manner and permits the rack 35 to escape one column toward the left to present the next column to the punches and will at the same time move the brushes 54 and 55 into cooperation with the second block 57.

The aforescribed duplicating operation will be repeated for as many columns as there are plug connections 62, contact 36 acting as a circuit breaker between columns.

In columns in which no plug connections are made, manual punching may be effected by the usual manual operation of the keys 13. In columns in which connections 60 are made for automatic spacing, a circuit will be completed upon arrival of each such column in punching position which may be traced as follows: From line 67, 75

punch magnet 24, wire 74, plug socket 61, connection 60, socket 59 and block 57, brushes 55 and 54, common strip 56, contact 36, wire 71, back to other side of line 68. This circuit energizes the punch magnet independently of the operation of contacts 23 and permits the operation of the punching bar 16 without operating any of the punches 17 but, through an extension 75 on the bail 27 the latter is actuated to cause spacing of the record cards. During such spacing operation the operation of pawl 32 will cause opening of contact 36 to break the circuit to the punch magnet which will be again initiated if the next following column is provided with a plug connection 60.

Upon arrival of the brushes 55, 54 at the column in which plug connection 65 has been made, a circuit will be completed from line 67, wire 76, release magnet 40, socket 64, connection 65, socket 59, segment 57, brushes 55, 54, common strip 56, contact 36, wire 71, to the other side of line 68.

As explained above, energization of magnet 40 will raise the pawl 32 out of engagement with the teeth 34 of rack 35 and the rack will thereupon be urged rapidly toward the left under the influence of the spring barrel 42. This movement is sufficiently rapid to prevent the dropping of pawl 32 into engagement with teeth 34 until the rack 35 has reached the extremity of its movement toward the left. The residual magnetism of magnet 40 will effect a delaying action upon bell crank 37, thus affording assurance that the rack will reach the extremity of its movement toward the left before pawl 32 again drops into engagement therewith.

In Fig. 6 is shown a modified form of setting arrangement in which each of the segments 57 is connected to the arm of a switch 77 which, when set in the position indicated in the first order toward the right, connects the segment 57 to a socket 78. When switch 77 is moved to its central position as indicated in the second column from the right, segment 57 is connected to a line 79 which corresponds to the common connection of the duplicating sockets 63. When the switch 77 is positioned as indicated by the third column from the right, connection is made to the segment 57 and a line 80, which corresponds to the common connection 74, of the space sockets 61. The socket 78 may be connected to the socket 64 by the plug connection 65 for operation of the carriage release mechanism. With this arrangement of switches it is simply necessary to move the switch 77 to its central position in those columns of the card 19 in which it is desired to effect perforations under control of the pattern card 45 and to move switch 77 to the left in those columns in which it is desired to effect automatic spacing without punching in such columns. In those columns in which it is desired to effect manual punching, the switch 77 is moved to its farthest clockwise position and when it is desired to release the carriage, plug connection 65 is inserted between sockets 64 and 78 in appropriate column in which it is also necessary to position switch 77 as shown.

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.

What is claimed is:

1. In apparatus for punching cards to record data successively in different card fields, punches, duplicating means to control the punching in accordance with a pattern, means for moving said pattern step by step to successive positions, means comprising selectively settable switching devices positionable to effect duplicating punching operations in certain fields and further means also comprising selectively settable switching devices positionable to cause automatic skipping of fields in which no punching is to be effected.

2. A punching machine including a carriage adapted to carry a card transversely with respect to a set of punches for punching in card columns successively, electrically operated spacing mechanism for said carriage and means including selectively adjustable switches and circuits controlled thereby for causing operation of said spacing mechanism to automatically skip selected positions upon said card in which positions no punching is to be effected.

3. In a machine for punching cards column by column, spacing mechanism, punching mechanism, switches and circuits to control said mechanisms, said switches being settable in one position to cause successive operation of said punching and spacing mechanisms in preselected card columns, and settable in another position to automatically cause spacing operations only, to effect skipping in preselected card columns in which no punching is to be effected.

4. In a punching machine, a column of punches, a carriage adapted to move a record card past said column of punches, punch operating mechanism, escapement mechanism for controlling the advance of said carriage step by step as an incident to each punch operation, and means controlled by the movement of said carriage for repeatedly and directly actuating said escapement mechanism independently of said punch operating mechanism to cause a succession of steps of movement of said carriage.

5. In a machine of the class described, a card carriage, punching mechanism, an escapement mechanism adapted to advance said carriage a predetermined increment for each actuation of said punching mechanism and means controlled by the movement of said carriage for directly causing a series of operations of said actuating mechanism independently of said punching mechanism to automatically advance the carriage by successive increments.

6. In a card punching machine, a column of punches, a carriage adapted to move a card past said column of punches column by column, means for advancing said carriage step by step and means controlled by the movement of the carriage for directly causing said moving means to effect a series of step by step advances of said carriage whereby a plurality of columns of the card will pass the column of punches in succession without being operated upon by the punches.

7. In a punching machine, a carriage adapted to carry a card transversely with respect to a column of punches, means for causing punching in card columns successively, spacing mechanism for said carriage, operative as an incident to each punching operation and means controlled by the movement of the carriage for directly causing a series of repeated operations of said 75

spacing mechanism independently of the operation of said punching means.

8. In a punching machine, a carriage adapted to carry a card transversely with respect to a column of punches for punching in card columns successively, means for advancing said carriage, escapement mechanism for controlling said advancing means to effect step by step movement of said carriage, means controlled by the movement of said carriage for causing said advancing means to effect an uninterrupted advance of said carriage a distance greater than a step by step movement and means controlled by said last named means for disabling said escapement mechanism during said interrupted advance.

9. In a card punching machine, a card carriage punching mechanism, electrically operated escapement mechanism operable as an incident to each operation of said punching mechanism, a

circuit closing device carried by the carriage and means controlled thereby for repeatedly and directly operating said escapement mechanism independently of said punching mechanism to effect a series of escapement controlled movements of said carriage.

10. In a punching machine, punching means including a row of punches, a carriage for advancing a card past said punches, escapement mechanism therefor operable as an incident to the operation of said punching means, a stationary commutator bar including contact blocks positioned in a line parallel to the path of movement of said carriage and means carried by said carriage and adapted to cooperate with said contact blocks to directly control the operation of said escapement mechanism independently of said punching means.

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