

Nov. 17, 1936.

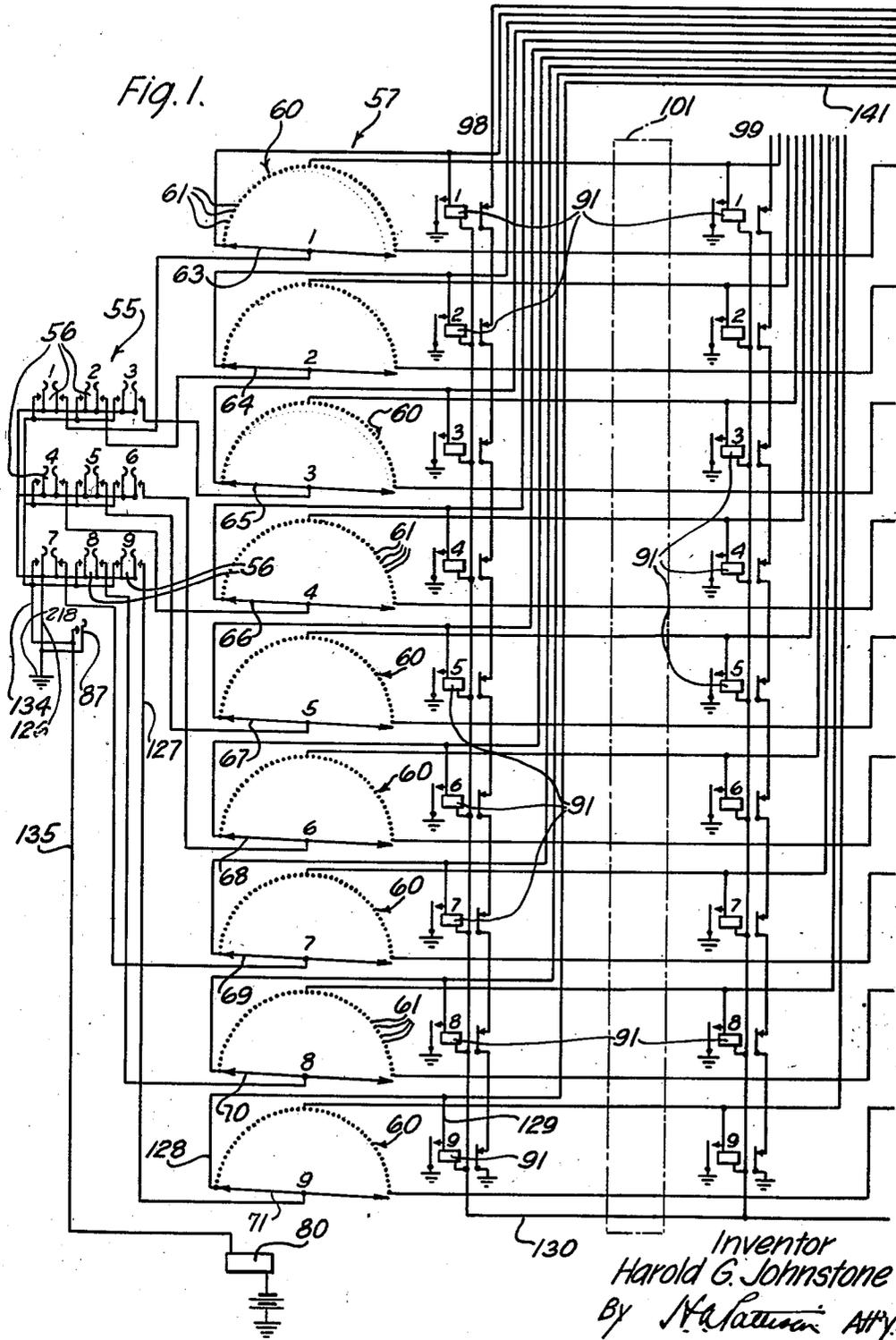
H. G. JOHNSTONE

2,061,277

KEY CONTROLLED APPARATUS

Original Filed Nov. 8, 1928

3 Sheets-Sheet 1



Nov. 17, 1936.

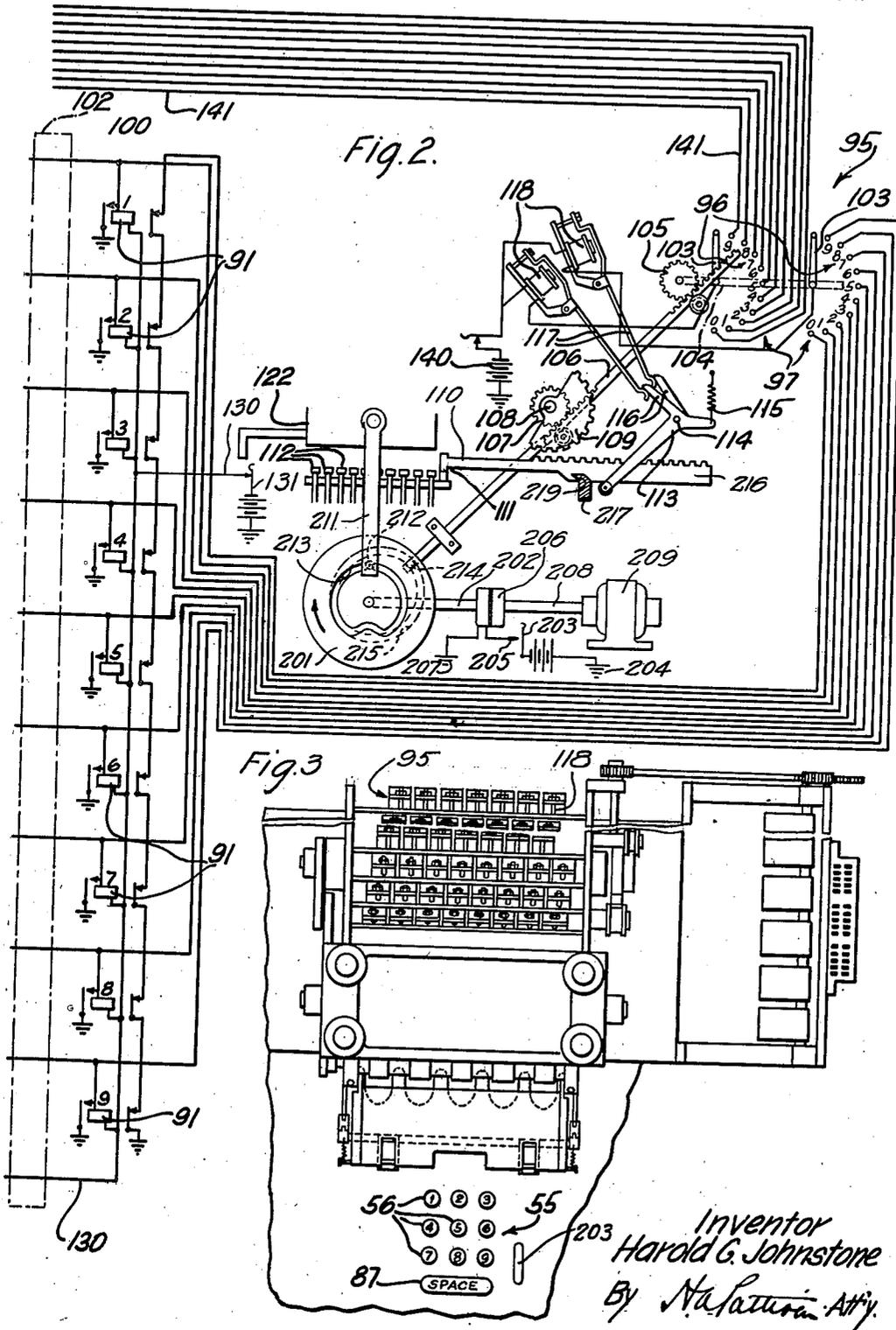
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KEY CONTROLLED APPARATUS

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3 Sheets-Sheet 2



Inventor
Harold G. Johnstone
By *N. S. Larson* Atty.

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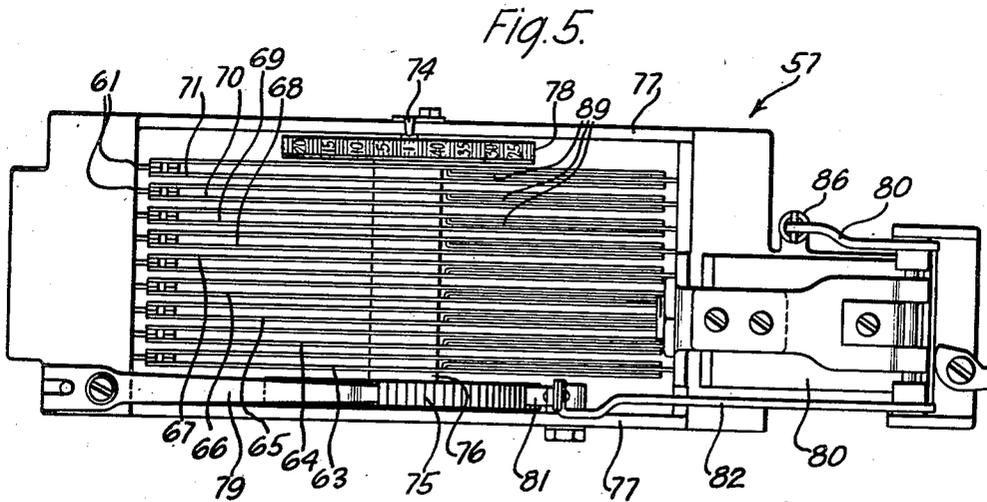
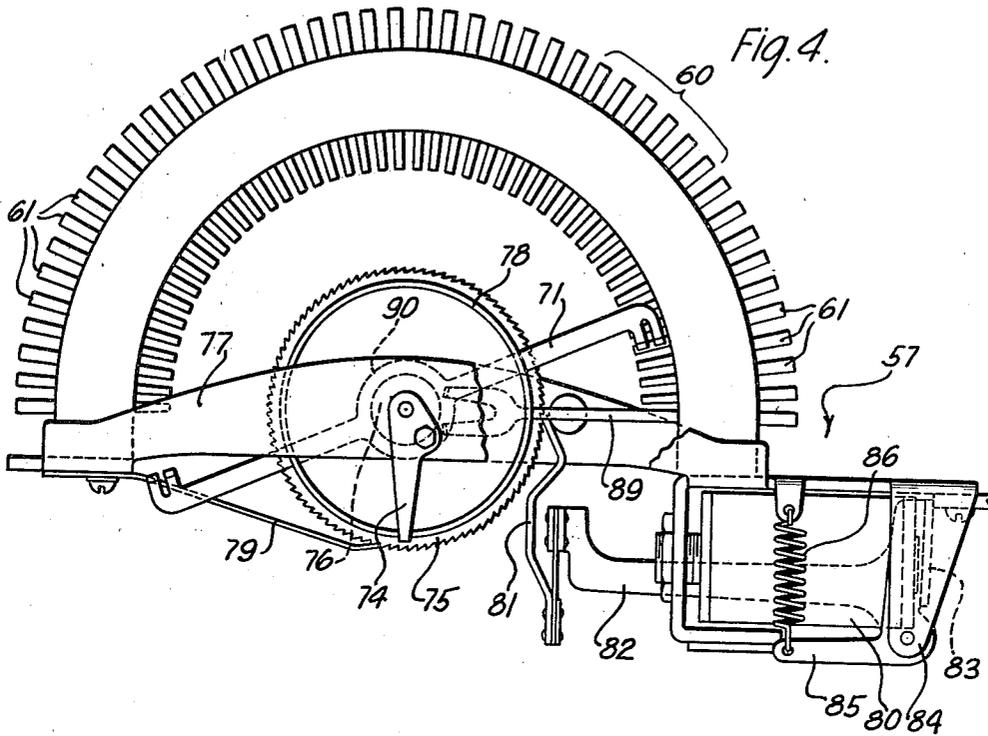
H. G. JOHNSTONE

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KEY CONTROLLED APPARATUS

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Inventor
Harold G. Johnstone
By *N. J. Lutton* Att'y.

UNITED STATES PATENT OFFICE

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KEY CONTROLLED APPARATUS

Harold Glenn Johnstone, Chicago, Ill., assignor to
Western Electric Company, Incorporated, New
York, N. Y., a corporation of New York

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Renewed June 9, 1932

16 Claims. (Cl. 164—113)

This invention relates to a key controlled apparatus, and more particularly to an electrically controlled keyboard for selectively conveying information to a statistical card perforating apparatus.

The primary object of the present invention is the provision of a simplified key controlled apparatus having a number of keys representing characters, each of which may be depressed to selectively indicate that character in any one of a number of predetermined positions.

One embodiment of the invention comprises a keyboard of nine keys representing the digits 1, 2, 3, 4, 5, 6, 7, 8 and 9, respectively. The keys are electrically connected to individual brushes of a switching mechanism, and each brush is associated with an arcuate bank of forty-five stationary contact terminals and mounted on a common shaft which is rotated one step at a time to cause the brushes to contact successively with each of the forty-five contact terminals. Each position of the brushes corresponds to a column in a predetermined location on a statistical record card and connects the keys to a group of digital locking relays which control the indication of the digits in a column. Each relay of the group is arranged, when operated, to effect a perforation in a correspondingly positioned column of a statistical record card. The depression of one of the keys in the unitary keyboard operates and locks the corresponding relay in the group to which it is connected and effects rotation of the common brush shaft one step, thereby disconnecting the keyboard from one group of relays and connecting it to the group or column of next highest order. A space key is also provided for rotating the brush shaft one step at a time without operating a digital key when it is desired that none of the digits be indicated in a particular column.

The above and other features of the present invention will be fully set forth in the following description and appended claims, and will be more readily understood by reference to the accompanying drawings, wherein

Figs. 1 and 2 are circuit diagrams of one embodiment of the invention, which, when viewed collectively with Fig. 2 to the right of Fig. 1, disclose a unitary electrical keyboard in conjunction with a card perforating mechanism;

Fig. 3 is a fragmentary plan view of a perforating apparatus equipped with the electrical keyboard;

Fig. 4 is a front elevational view of the electro-

magnetically operated switching mechanism, and Fig. 5 is a plan view thereof.

Referring now to a keyboard 55 which is shown in Figs. 1 and 3, nine depressible keys 56 representing the digits 1, 2, 3, 4, 5, 6, 7, 8 and 9, respectively, are electrically connected to individual brushes of a switching mechanism designated generally by the numeral 57.

The switching mechanism 57 consists of nine arcuate banks 60 of forty-five stationary contacts 61 representing forty-five columns and nine rotatable brushes 62-71 representing the digits 1-9, each brush being individual to a bank of forty-five contacts. An elongated spring contact 80 is provided in each of the arcuate banks 60 for contacting continuously with a circular portion 90 of the associated brush to connect it to ground. Rotation of the brushes is effected through a ratchet wheel 75 (Figs. 4 and 5) which is secured to a shaft 76 upon which the brushes are insulatively mounted. The shaft 76 is journaled in a frame 77 and carries a dial 78 for indicating rotative positions 1 to 45 inclusive, for each half revolution of the ratchet wheel 75. The rotative positions correspond to the forty-five contacts 61 representing the same number of columns. A pointer 74 secured to the frame 77 and associated with the dial 78 is adapted to indicate the rotative position of the nine brushes at any instant. The frame also has fastened thereto a spring holding pawl 79 and an electromagnet 80 for actuating a ratchet spring 81 attached to an arm 82 of an armature 83. The armature 83 of the electromagnet 80 is pivoted on a depending lug 84 of the frame 77 and has an arm 85 attached to a coil spring 86 having its other end secured to the frame 77.

From the foregoing description it will be readily understood that upon energization of the electromagnet 80 by depressing one of the digital keys 56, its armature 83 will be rocked counterclockwise against the tension of the spring 86, to move the ratchet spring 81 back over one tooth in the ratchet wheel 75. Deenergizing the electromagnet by releasing the depressed digital key permits the tension of the spring 86 to move the armature 83 and its ratchet spring 81 clockwise to rotate the ratchet wheel 75, shaft 76 and the accompanying nine brushes 62-71 through a distance equal to one tooth on the ratchet wheel or one rotative position whereby the brushes are caused to engage the succeeding contacts in the arcuate banks 60. A space key 87 is provided on the keyboard 55 for effecting rotation of the brushes 62-71 one step at a time without operat-

ing a digital key when a zero is to be indicated in a particular column or columns.

The forty-five stationary contacts 61 of the arcuate banks 60 associated with the digital brushes 63-71 represent forty-five correspondingly positioned columns in a record card and consequently are electrically connected to forty-five groups or columns of digital locking relays 91. The groups of relays 91 indicating correspondingly positioned columns of the digits in a record card are in turn electrically connected to a perforating apparatus designated generally by the numeral 95. Each digital relay 91 in a group is connected by a conductor to correspondingly numbered terminals in arcuate banks 96 of individual selecting switches 97 commonly used in telephonic communicating systems. It will be noted that none of the relays has been provided for ciphers, but that the right hand contacts of the digital relays in the columns are connected in series to establish circuits to the zero (0) terminals in the arcuate banks 96 of the selecting switches 97. In case a digital key is depressed in a column the circuit is opened, but if no digital key is depressed then a cipher is automatically indicated in the perforating apparatus for that particular column. A plurality of digits can be indicated in a column by depressing simultaneously a plurality of the digital keys 56 to establish circuits to energize and lock corresponding digital relays 91 in the column designated by the position of the brushes 63-71.

Upon energization of a digital locking relay 91 due to the depression of its associated key 56, which is associated therewith through one of the digital brushes 63 to 71, the relay will remain energized until the locking circuit is broken by the operation of a clear-out switch 131.

In order to avoid an unnecessary duplication and complication of circuits, only two of the selecting switches 97 connected to the first and forty-fifth columns 98 and 100, respectively, of the locking relays are illustrated in the circuit schematically, but it will be understood that similar selecting switches in the perforating apparatus 95 are provided for each of the other columns in the record card. To further simplify the circuit, only the first, twenty-second and forty-fifth columns 98, 99, and 100, respectively, of the digital relays are shown. The positions of the second to the twenty-first columns, inclusive, and the twenty-third to the forty-fourth columns of relays 91 are indicated by the dotted rectangles 101 and 102, respectively, and it is to be understood that these columns or groups of relays are connected in a manner similar to that shown for the first and forty-fifth columns, 98 and 100, to corresponding individual selecting switches 97 in the perforating apparatus 95.

In the perforating apparatus, each brush or switch arm 103 of the plurality of selecting switches 95 is secured to a rotatable shaft 104 which is keyed to a pinion 105 meshing with a rack 106. This rack meshes with a spur gear 107 secured to a shaft 108 which drives a segmental gear 109. The segmental gear, at different points in its rotation, is adapted to engage and drive at predetermined intervals a plurality of selecting bars 110 representing columns in a record card and having enlarged end portions 111 of sufficient size for engaging one at a time a plurality of perforating pins 112 arranged in rows or columns, each perforating pin in a column representing one of the numbers 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9, respectively. The engagement of each selecting bar 110

with the segmental gear 109 is controlled by an individual bell crank lever 113 pivoted on a rod 114 and held in a normal position by a spring 115. An arm 116 of the bell crank lever 113 engages an armature 117 of a selecting electromagnet 118 so that when the selecting electromagnet is energized the armature will swing the bell crank lever clockwise and elevate the particular selecting bar into engagement with the rotating segmental gear 109. The selecting bars 110 which are selected at different points in the rotation of the segmental gear through the operation of the selecting electromagnets 118 are advanced to positions with their enlarged end portions 111 in vertical alignment with the desired perforating pins. At this point in the operation a record card has been properly positioned directly beneath the perforating pins.

Following this selection of the perforating pins, a suitable mechanism is operated to cause the downward movement of a ram 122 common to the perforating pins for positively moving the enlarged end portions 111 and their selected perforating pins to thereby perforate apertures in the record card representing the numbers to be recorded in selected columns. The ram 122 is then moved upwardly and the segmental gear 109 is rotated counter-clockwise to return the selecting bars 110 to their normal retracted position. The mechanism for actuating the ram 122 and oscillating the segmental gear 109 first in a clockwise direction to advance the selector bars 110 into association with the perforating pins and then in a counter-clockwise direction to retract the selector bars to their normal position comprises a cam wheel 201 mounted on a shaft 202 which is adapted to be rotated through one revolution upon the manual actuation of a switch bar 203 positioned on the keyboard 55. The switch bar 203 may be actuated manually after the information to be perforated in a card has been set up by means of the keys 56 and the space bar 87. The switch bar 203, upon being so actuated, connects grounded battery at 204 through a contact 205 to the winding of an electromagnetic clutch 206 and then back to ground at 207. The electromagnetic clutch 206 may be of any suitable known type which, upon actuation, causes the engagement of a driving element with a driven element for one revolution and thereupon automatically disconnects them. In the embodiment shown, the clutch 206 connects the shaft 202 to a continually rotating shaft 208 driven by a motor 209 to cause the cam wheel 201 to move through one complete revolution in the direction indicated by the arrow in Fig. 2.

A link 211 is secured at one end to the ram 122 and at its other end is provided with a cam roller which cooperates with a cam groove 213 in the cam wheel 201 to impart a reciprocatory motion to the ram upon rotation of the cam wheel. An extension of the rack 106 also carries a cam roller 214 which rides in a second cam groove 215 formed in the cam wheel 201 and a reciprocatory motion is imparted to the rack upon rotation of the cam wheel. The reciprocation of the rack 106 and the link 211 and the consequent oscillation of the segmental gear 109 and reciprocation of the ram 122 are so timed by the formation of the cam grooves that the sequence of operation thereof will be as follows: The segmental gear 109 will be rotated in a clockwise direction to advance the selected selector bars 110, the ram 122 will be moved downwardly to drive the selected perforating pins 112 through the card and up-

wardly out of engagement with the pins, whereupon the segmental gear will be rotated in a counter-clockwise direction to retract the advanced selector bars. The selector bars, upon being moved into engagement with the segmental gear, are held in engagement therewith until they are completely retracted due to the fact that they have an enlarged portion 216 which slides over a cross member 217 provided therefor and holds the racks in engagement with the gear until notches 219 formed in the rack are in vertical alignment with the cross member 217 at which time the selector bars will drop down out of engagement with the segmental gear to the position shown in Fig. 2. For a more detailed description of the perforating mechanism, reference should be had to the copending application of H. G. Johnstone et al., Serial No. 302,463, filed August 28, 1928.

It is believed that a clear understanding of the parts of the apparatus described previously will be had from a detailed description of the operation of the various elements embodied in the apparatus. To facilitate the operative description, an explanation will be given of the steps performed in a specific example of perforating the number 9,024 in the first four columns of a record card by means of the simplified electrical keyboard 55.

Assuming that the digital brushes 63-71 of the switching mechanism 57 are in their normal position, engaging contacts 1 of the nine arcuate banks 60, as shown in Fig. 1, the operator depresses the key 56 for the digit 9. The momentary depression of this key closes the right hand and left hand contacts thereof; the closure of the right hand contact establishes a circuit from ground at 218 through the right-hand contact of the key 56, conductor 127, the brush 71, conductors 128 and 129 to the relay 91, and through the relay to a conductor 130 which is connected to grounded battery through a clear-out switch 131, which switch is closed at all times except when the ram 122 is moved downwardly at which time it is momentarily opened to energize and lock the relay 91 representing the digit 9 in the first column 98 corresponding to the column 1 in the record card, and the closure of the left hand contact completes an energizing circuit to the electromagnet 80 whereby upon the key being released, the brushes 63-71 are rotated one step to disconnect the keys 56 from the digital locking relays 91 in the first column and connect them to the digital locking relays in the second column. The energizing circuit for the digit 9 locking relay in the first column is traced from grounded battery through clear-out switch 131 (Fig. 2) for the digital locking relays 91, conductor 130, the winding of the digit 9 locking relay 91 in the first column 98, conductor 129, conductor 128, contact 1 of the associated arcuate bank 60, brush 71 of the switching mechanism 57, conductor 127, right hand contact of the digit 9 key 56, conductor 126 to ground. Energization of this particular digit 9 relay operates it and the resulting closure of its left hand contact establishes a locking circuit for the relay from grounded battery through clear-out switch 131, conductor 130, through the winding of the relay to ground. Thus, upon the digital locking relay 91 being energized, it will maintain ground upon its associated contact 96 until it is deenergized by the operation of the clear-out switch 131. The

circuit for energizing electromagnet 80 to advance the brushes 63-71 one rotative position is established from battery through the winding of the electromagnet 80, conductor 135, conductor 134, left hand contact of the digit 9 key 56, conductor 126 to ground.

There is a short lapse of time between the establishment of a circuit to energize and lock a digital relay and the subsequent advancement of the brushes, since, as has been previously explained, a depressed digital key must first be released to deenergize the stepping electromagnet 80 and thereby permit the resilience of the spring 86 (Fig. 4) to effect the movement of the brushes through one rotative position.

The brushes 63-71 are now engaging contacts 2 in the arcuate bank 60, and since in accordance with the example 9,024, a cipher is to be recorded in the second column, the operator momentarily depresses the space key 87 to complete a circuit from grounded battery through the winding of the electromagnet 80, conductor 135, through the contacts of space key 87 to ground. Electromagnet 80 is thus energized and in a manner previously described advances the brushes 63-71 from the contacts 2 to the contacts 3. As no digital relay 91 in the second column has been energized and locked to open the right hand contact thereof, a circuit from ground is established through the right hand contacts of the relays 91 connected in series, through a conductor to the zero terminal in the arcuate bank 96 of the selecting switch 97 representing the second column.

With the brushes 63-71 of the switching mechanism 57 engaging contacts 3 in the arcuate banks 60, the digit 2 key is depressed whereby a circuit is established in an analogous manner described for the digit 9 to energize and lock the digit 2 relay in the third column of relays 91 and to effect the operation of the electromagnet 80 to advance the brushes 63-71 from contacts 3 to contacts 4. The operator now momentarily depresses the digit 4 key 56 to energize and lock the digit 4 relay 91 in the fourth column and to effect the advancement of the brushes 63-71 into engagement with contacts 5.

The digital locking relays 91 in the desired columns have thus been operated by the keys 56 and as has been previously described to thereby electrically control the selection of the proper perforating pins 112 in the perforating apparatus 95 by connecting ground to their associated contacts 96 so that when the brushes 103 engage the contacts which are connected to ground the selecting electromagnets associated therewith will be momentarily energized. At this point the operator connects the shaft 108 of the perforating apparatus 95 to a suitable driving means as shown and described in detail in the copending application of H. G. Johnstone et al., Serial No. 302,463, filed August 28, 1928, as shown schematically in Fig. 2 and described hereinbefore. Upon rotation of the shaft 108, the segmental gear 109 and the spur gear 107 are rotated; the rotation of the spur gear advances the selector rack 106 and rotates the shaft 104 through the pinion 105 secured thereto to thus effect the clockwise rotation of the brushes 103 of the selecting switches 97. As each brush 103 makes contact with the terminals in the banks 96, which are electrically connected to the corresponding digital relays 91 arranged in columns, and that numbered terminal is designated by the particular locking relay 91 as a digit to be recorded, a cir-

cuit is completed to energize the particular selecting electromagnet 118 and operate its associated bell crank lever 113 to bring the selecting bar 110 representing the particular column into engagement with the rotating segmental gear 109 and thus advance the selecting bar 110 a distance commensurate with the time of its initial actuation. The selector bar 110, upon being moved into engagement with the segmental gear and being moved to the left (Fig. 2) a short distance, cannot be disengaged from the segmental gear until it is retracted to its normal position due to the conformation of the under side of the bar and the cross member 217. The time of actuation of the selecting bar is so synchronized by the movement of the selecting brush 103 to cause the enlarged end portion 111 upon the selecting bar to stop at the end of the clockwise rotation of the segmental gear on the perforating pin representing the digit designated by the corresponding digital locking relay 91.

The time of actuation of the selecting bars 110 in a clockwise rotative cycle of the segmental gear is dependent on the numerical value of the digit to be recorded; that is, the selecting bar to cause the recording of a digit 9 is actuated at the beginning of the rotative cycle, a selecting bar to record a digit 4 is actuated five periods of time later, and a selecting bar to record a zero nine periods of time later. Thus, it will be obvious that in recording the number 9,024, the selecting bar 110 representing the first column will be actuated at the start of the rotative cycle of the segmental gear 109 to have the enlarged end portion upon the selecting bar of the first column stop upon the perforating pin representing the digit 9. As the selecting brushes rotate clockwise (Fig. 2) and contact with the terminals 9, the brush 103 representing the first column effects the energization and operation of the associated selecting electromagnet 118 through the following circuit: From grounded battery 140 through the winding of the electromagnet 118 representing the first column, the brush 103 of the selecting switch 97 representing the first column, terminal 9 in the associated arcuate bank 96, conductor 141, conductor 129, left hand contact of the digit 9 locking relay in the first column 98 to ground. The operation of the selecting electromagnet 118 representing the first column elevates the corresponding selecting bar 110 into engagement with the segmental gear and the selecting bar is advanced to select the digit 9 perforating pin 112 as previously explained.

Five periods of time later as the selecting brushes 103 contact with the terminals 4 of the banks 96, the brush 103 of the selecting switch 97 representing the fourth column completes a similar circuit from grounded battery through the associated relay 118, through the brush of the selecting switch 97 representing the fourth column, the terminal 4 of the arcuate bank 96, through the left hand contact of the digit 4 relay in the fourth column to ground. The operation of the electromagnet 118 for the fourth column causes the associated selecting bar 110 to be actuated and advanced to select a perforating pin representing the digit 4 in the fourth column. In like manner the selecting bars for the third and second columns are actuated by the segmental gear in timed succession in the order named to select perforating pins representing the digit 2 and zero, respectively. At this point the segmental gear 109 stops rotating and the enlarged end portions 111 of the selecting bars in

the proper columns are resting on the perforating pins representing the digits in the number 9,024. The ram 122 is then operated by suitable means hereinbefore described and the perforating pins which are under the enlarged portions 111 of the selecting bars 110 in each column are driven through a record card to perforate the desired information in the columns selected.

As the ram 122 operates, clear-out switch 131 is moved to the right to open the energizing circuit to the digital locking relays 91 and cause their release. Upon the retraction of the ram 122 and the return of the selecting bars 110 and the actuated perforating pins to normal position, the clear-out switch 131 is then moved to the left and the electrical keyboard and perforating apparatus is put in condition to receive and record other information in any of the forty-five columns selected.

Although the invention as herein described and illustrated is particularly well adapted for use in connection with statistical card perforating apparatus, it should be understood that the novel features of the invention are capable of other applications and modifications and should be limited only by the scope of the appended claims.

What is claimed is:

1. In combination, a perforating mechanism having a plurality of groups of perforating members, an element individual to each group for determining the member in that group to be actuated, and means for controlling the movement of said element, a keyboard including keys representing characters, a plurality of electromagnetic means arranged in columns, means for selectively establishing a circuit from a key to a corresponding electromagnetic means to indicate the particular character in a predetermined column, a circuit connecting said electromagnetic means to the means for controlling the movement of the elements associated with the perforating members, and means for actuating the perforating mechanism to perforate a record card in accordance with the electromagnetic means conditioned by the keyboard.
2. In a mechanism for perforating information in a record sheet, a key for each of a plurality of characters, a plurality of groups of electromagnetic means for representing characters, means for successively associating all of the keys with each group of electromagnetic means, and perforating means thereafter controlled by said electromagnetic means comprising a plurality of electromagnets associated with all of the electromagnetic means, a plurality of perforators, means responsive to the actuated electromagnetic means for controlling the time of actuation of the electromagnets to select for actuation the perforators, and means for actuating the selected perforators.
3. In a mechanism for perforating information in a record sheet, a key for each of a plurality of characters, a registering mechanism controlled by the keys comprising a plurality of groups of relays, a plurality of electromagnets each electromagnet associated with a group of relays and operable at a predetermined moment depending upon which relay in its associated group has been operated, a plurality of perforators, means responsive to the actuated relays for controlling the operation of the electromagnets to select a perforator for actuation, and means for actuating the perforators selected.
4. In combination, a perforating mechanism including a plurality of groups of perforators, a

keyboard comprising keys representing characters, relays representative of the characters and associated with the perforators, means for successively associating the keys with said relays representative of the characters, means operative thereafter for causing the representative relays to control electrically the selection of perforators in accordance with the operation of the keyboard, and means for actuating the selected perforators.

5. In a card punching mechanism a plurality of groups of perforators, a perforator selector associated with each group of perforators, control means for each perforator selector, and means for determining the time of actuation of the control means thereby to determine the perforator selected comprising a keyboard having keys representing characters, a plurality of groups of registering means, means for associating the keyboard successively with each group of registering means, and means thereafter operated for selectively operating the control means.

6. In a card perforating mechanism a plurality of perforators arranged in columns, a perforator selector associated with each column, means for actuating selected perforators, means for advancing a perforator selector into position to select a perforator for actuation, and means for electrically controlling the selection of the perforators including a keyboard, a plurality of groups of registering relays, and means for successively associating the keyboard with each group of registering relays.

7. In a mechanism for marking information in a record, a key for each of a plurality of characters, a plurality of groups of digital locking relays, each group successively associated with the keys, a plurality of selecting electromagnets one associated with each of the groups, means responsive to the actuated relay of each group for controlling the time of actuation of the selecting electromagnets, and means selected in accordance with the time of actuation of the electromagnets for marking in a record the characters associated with the actuated keys.

8. In a mechanism for marking information in a record, a plurality of keys, selector switches corresponding in number to the number of keys, a plurality of ordinal elements arranged in denominational columns for marking the record, and means for successively associating all of the keys with each denominational column to select one of said ordinal elements upon the actuation of a key.

9. In a mechanism for recording information on a record, a key for each of a plurality of characters, a plurality of groups of electromagnetic means for representing characters, means for successively associating all of the keys with each group of electromagnetic means, and recording means thereafter controlled by the electromagnetic means comprising a plurality of electromagnets associated with all of the electromagnetic means, a plurality of recording elements, means responsive to the actuated electromagnetic means for controlling the time of actuation of the electromagnets to select for actuation the recording elements, and means for actuating the selected recording elements.

10. In a mechanism for recording information in a record, a plurality of keys equal in number to the number of characters used, each of the keys representing a different character, locking relays controlled by the keys for storing all of the information before recording, a plurality of

recording elements for each character and positioned in predetermined areas, and means electrically controlled by the locking relays for subsequently selecting from a plurality of the recording elements those elements necessary to effect the recording in predetermined areas in accordance with the information stored.

11. In a mechanism for permanently recording information in a record, a plurality of keys equal in number to the number of characters used, each of the keys representing a different character, locking electromagnetic devices controlled by the keys for storing all of the information before recording, a plurality of permanently recording elements for each character and positioned in predetermined areas, means controlled by the electromagnetic locking devices for subsequently selecting from a plurality of the recording elements those elements necessary to effect the recording in predetermined areas in accordance with the information stored and means for simultaneously actuating all of the selected recording elements in a single recording operation.

12. In combination, a perforating mechanism including a plurality of groups of perforators, a keyboard comprising keys representing characters, each key representing a different character, a plurality of electromagnetic devices representative of each of the characters and associated with the perforators, means for successively associating the keys with said electromagnetic devices, means operative thereafter for causing the electromagnetic devices to control the selection of perforators in accordance with the operation of the keyboard, and means for actuating the selected perforators.

13. In a card perforating mechanism, a plurality of perforators arranged in columns, a plurality of perforator selectors, one associated with each column, means for actuating selected perforators, means for advancing a perforator selector into position to select a perforator for actuation, and means for controlling the selection of the perforators including a keyboard, a plurality of groups of registering electromagnetic devices, and means for successively associating the keyboard with each group of registering electromagnetic devices.

14. In an apparatus for making permanent records, a plurality of sets of permanently recording members, electrically controlled selecting means individual to each set of recording members to determine the recording member to be actuated in that set, means individual to and electrically connected to each selecting means for storing digits to be recorded, and a contact making means representing a single set of all of the digits and electrically connected to and common to all of the storing means for selectively determining which of the storing means are to be rendered effective.

15. In an apparatus for making permanent records, a plurality of recording members, selecting elements, means common to all of the selecting elements for advancing them into association with the recording members, means for selectively moving the selecting elements into engagement with the advancing means, means for storing characters to subsequently control the moving means, and means common to all of the storing means for selectively determining which of the storing means are to be rendered effective.

16. In a recording apparatus, a plurality of

recording members representing characters, a plurality of differentially operable elements for selecting the recording members, a plurality of electrical means for selectively conditioning predetermined elements for operation, means representative of characters and common to all of said electrical means for determining the opera-

tion of said electrical means, and means for operating the conditioned elements to effect the selection and operation of the desired recording members to record the selected characters in predetermined positions in a record sheet.

HAROLD GLENN JOHNSTONE.