

April 13, 1937.

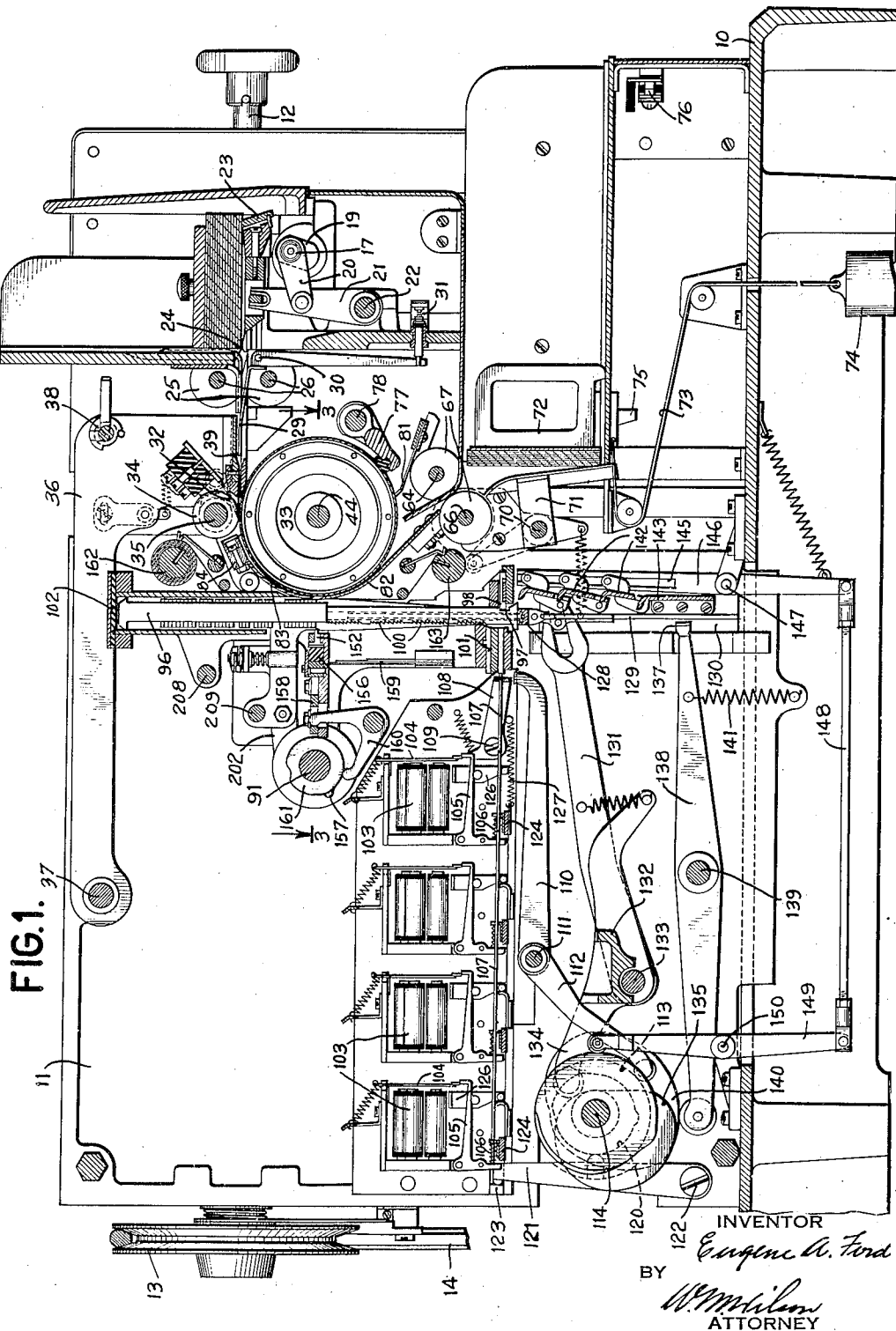
E. A. FORD

2,076,713

PERFORATED CARD INTERPRETER

Filed Oct. 25, 1935

9 Sheets-Sheet 1



April 13, 1937.

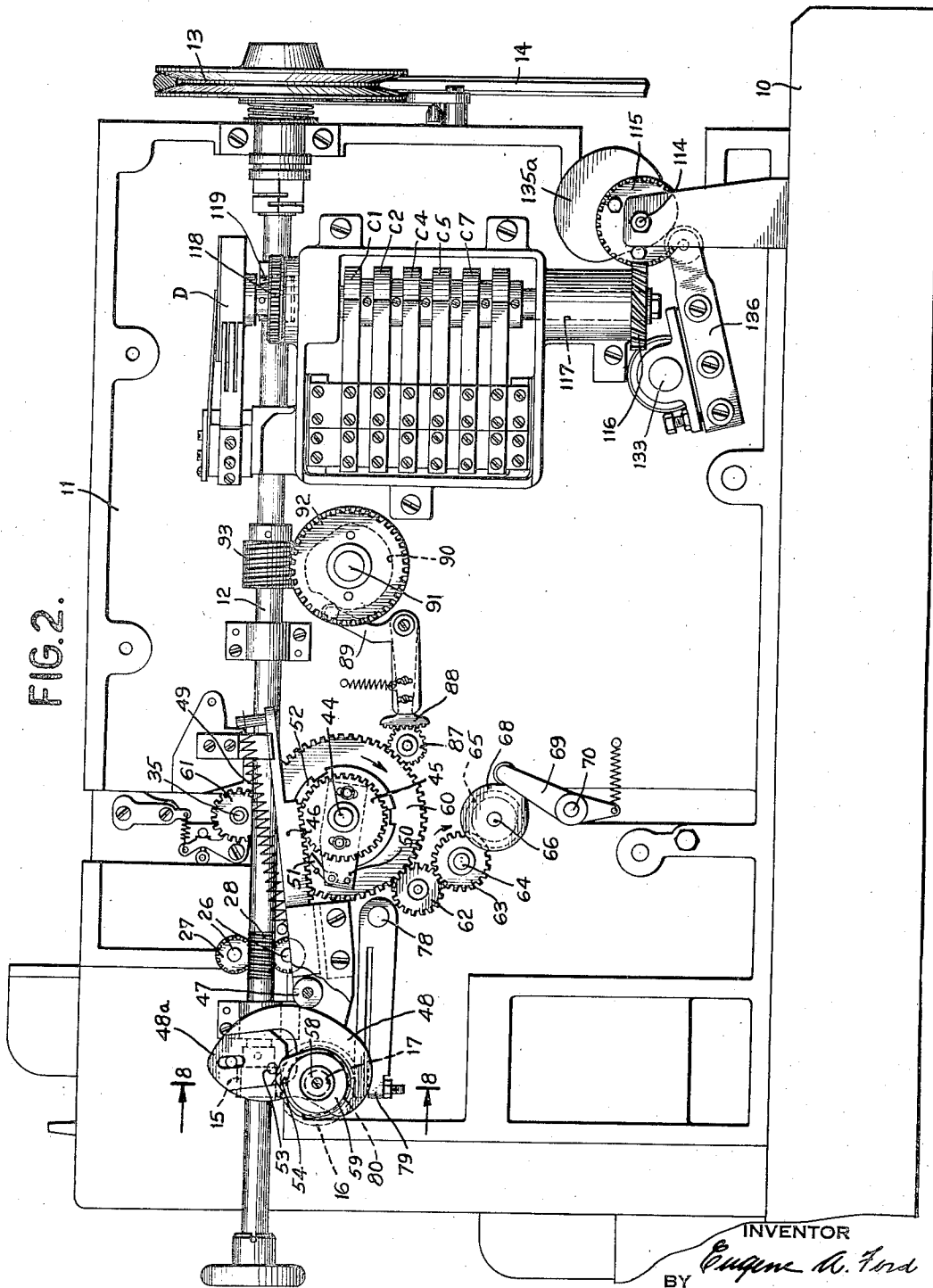
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PERFORATED CARD INTERPRETER

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9 Sheets-Sheet 2



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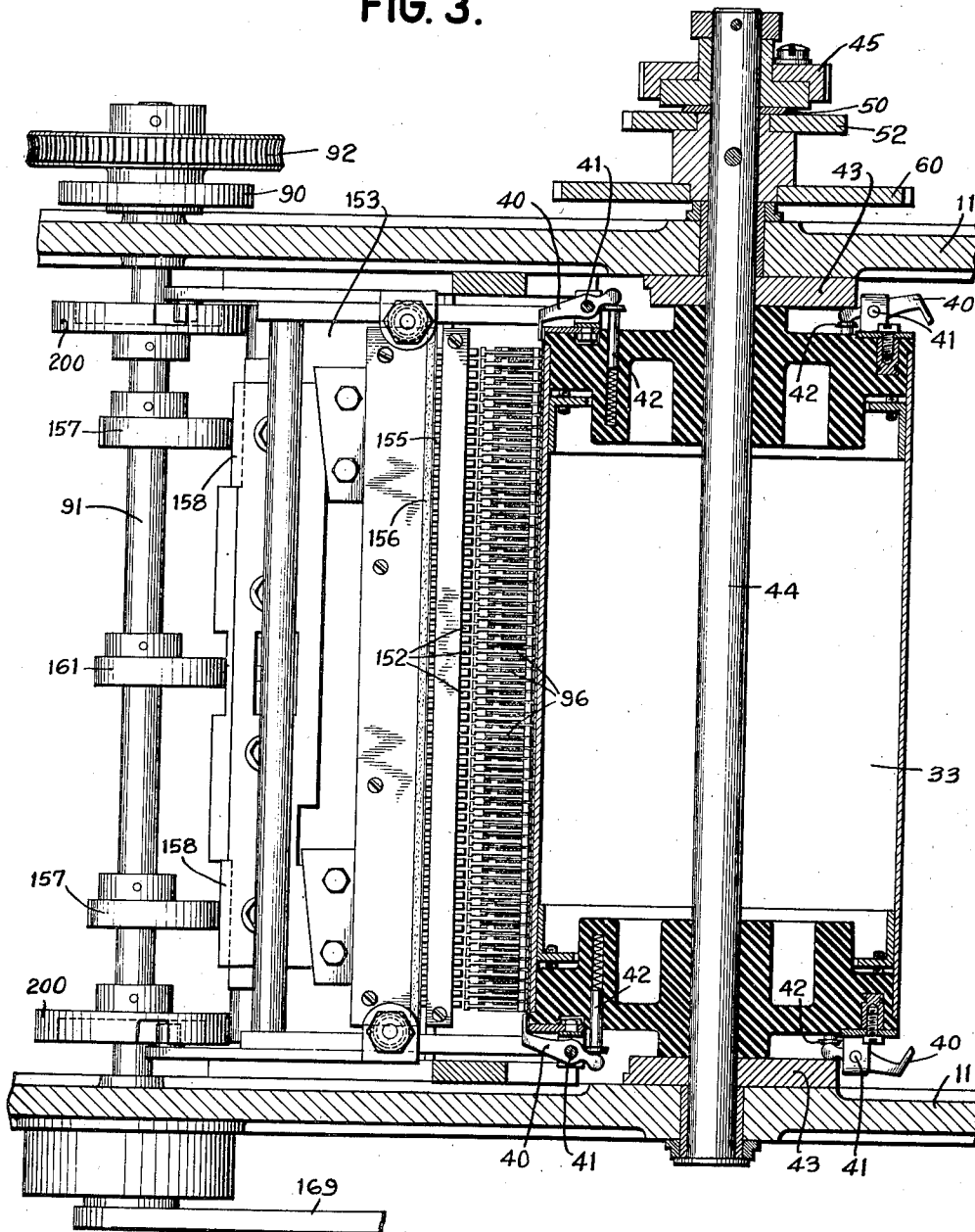
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PERFORATED CARD INTERPRETER

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FIG. 3.



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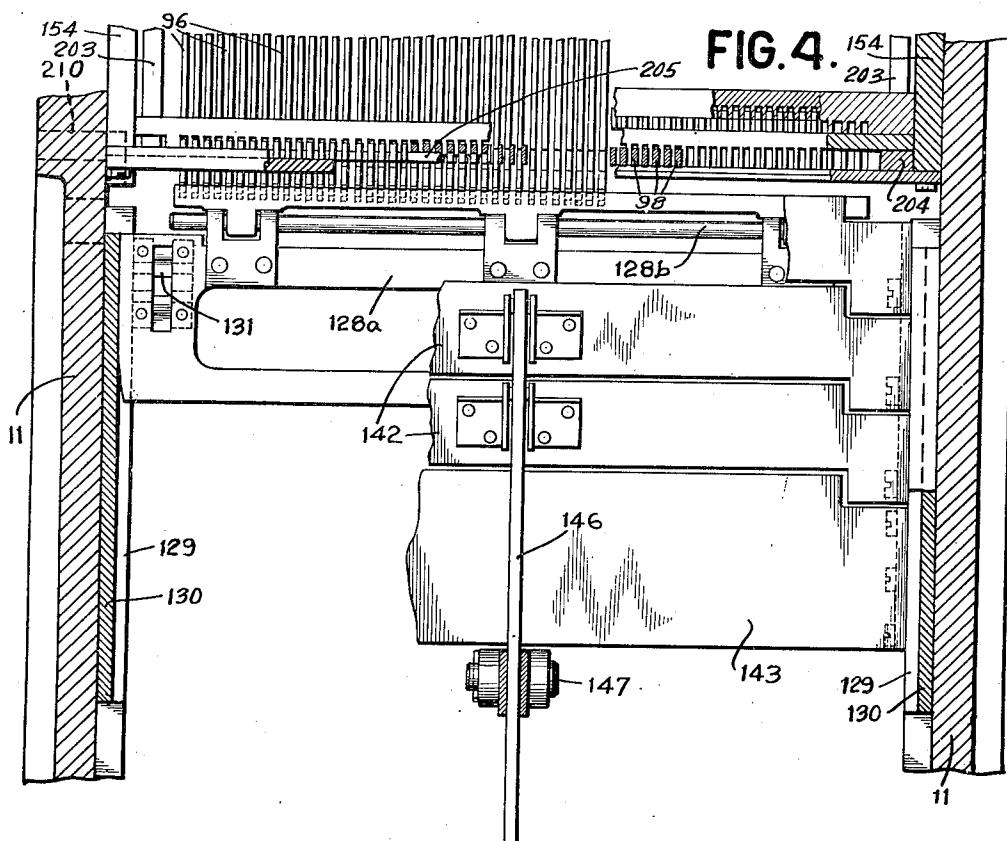
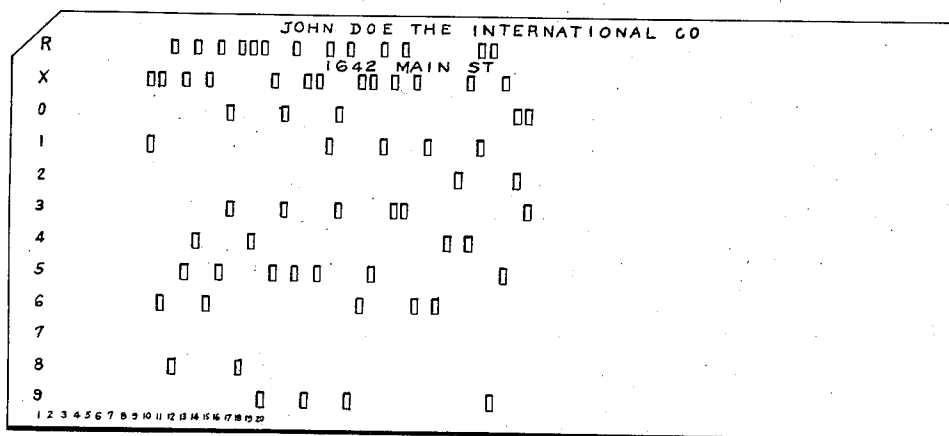


FIG. 5.



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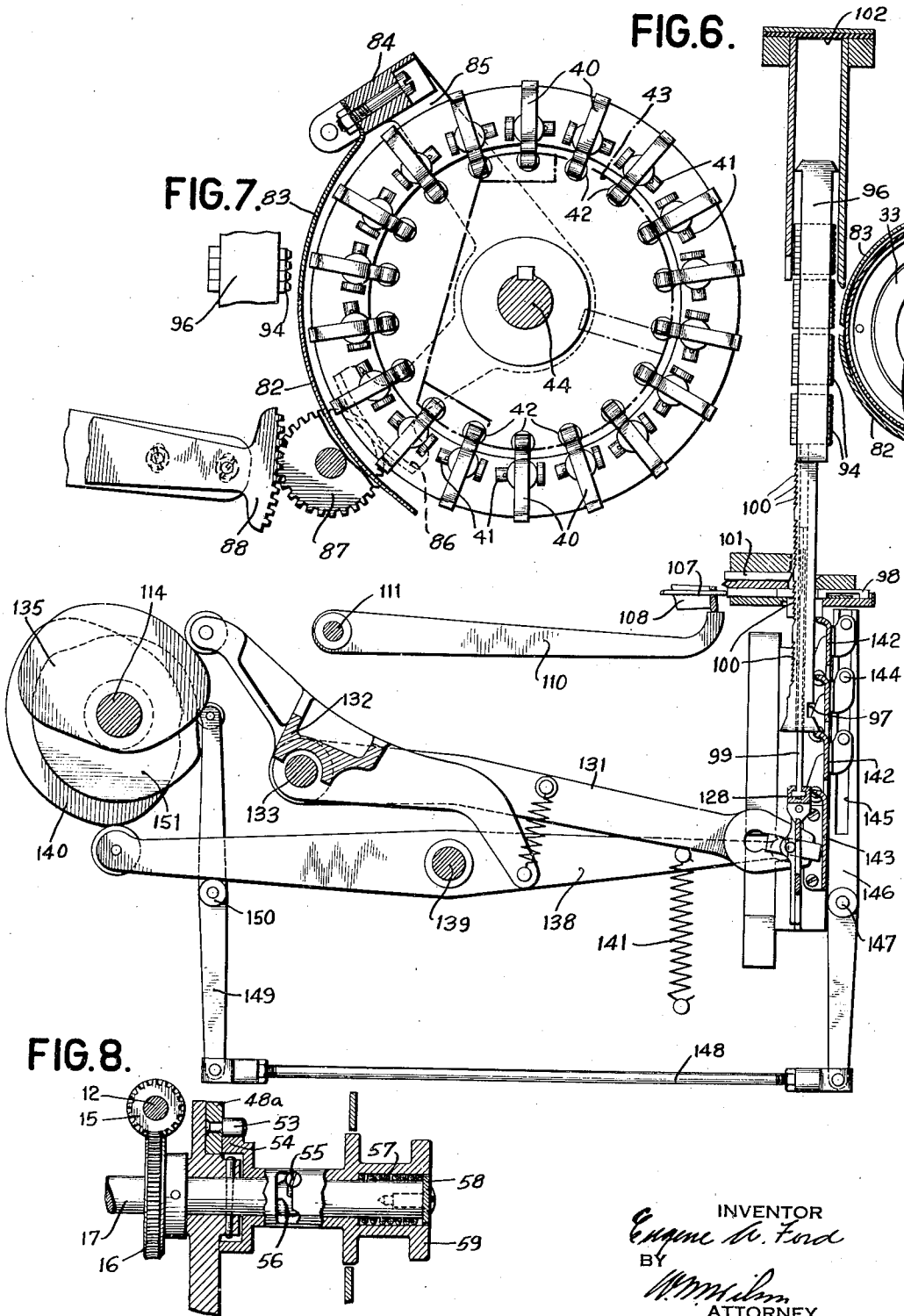
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9 Sheets-Sheet 5



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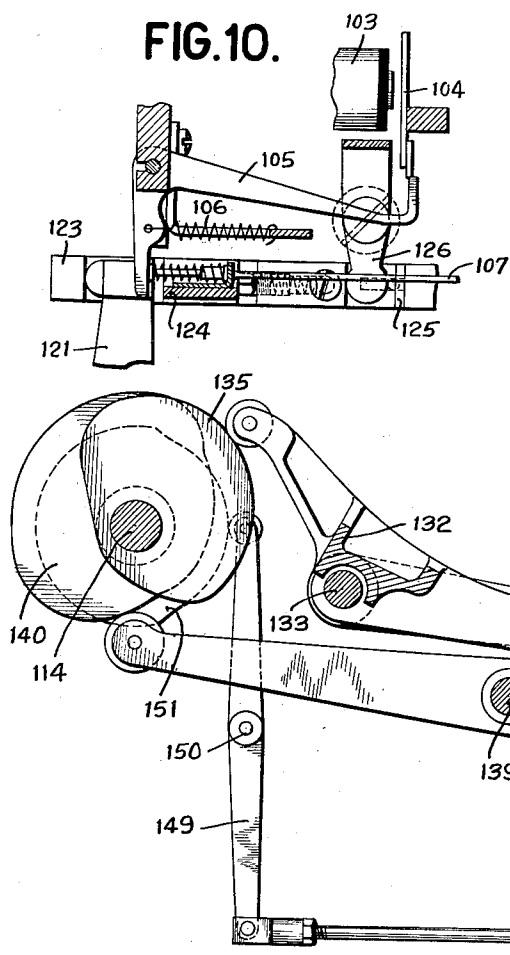
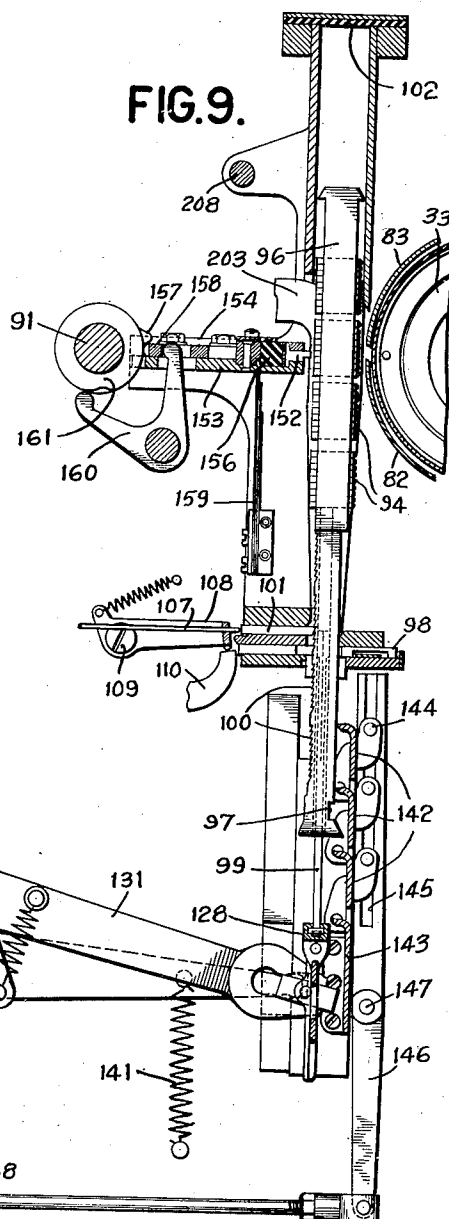
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PERFORATED CARD INTERPRETER

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PERFORATED CARD INTERPRETER

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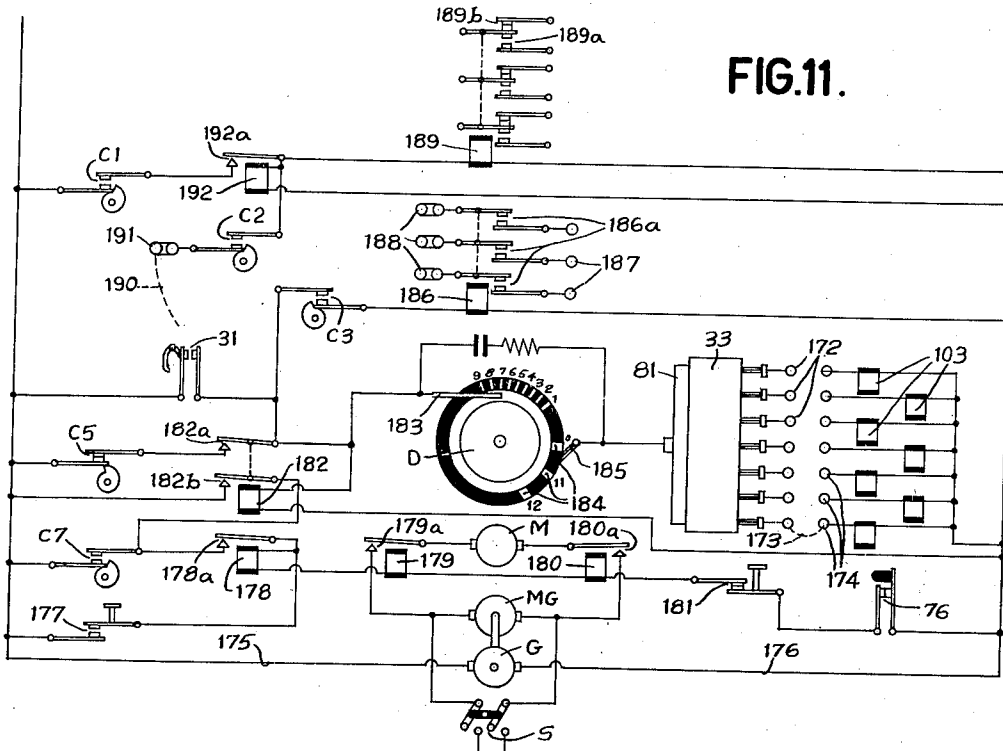


FIG. 11.

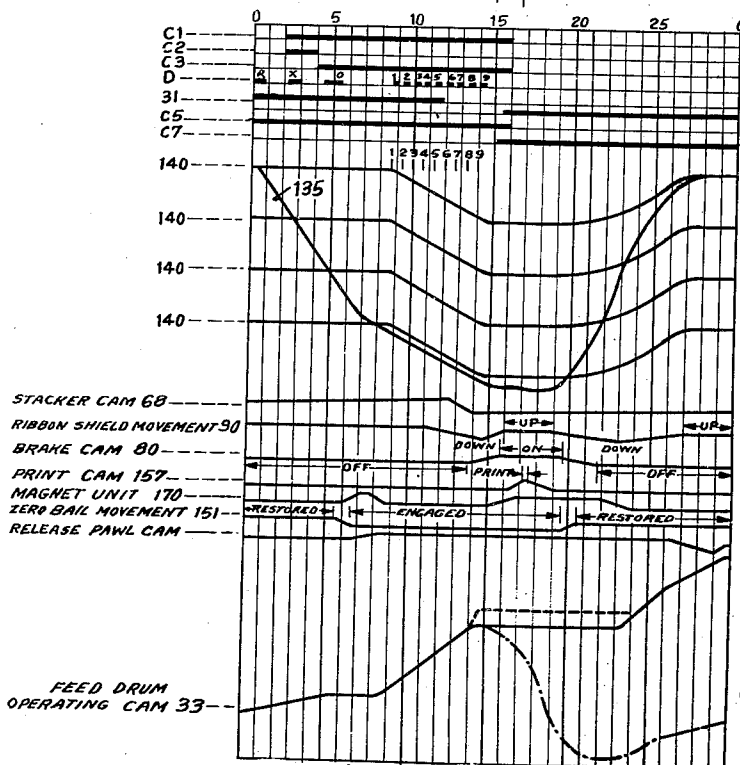


FIG. 12.

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FIG.14.

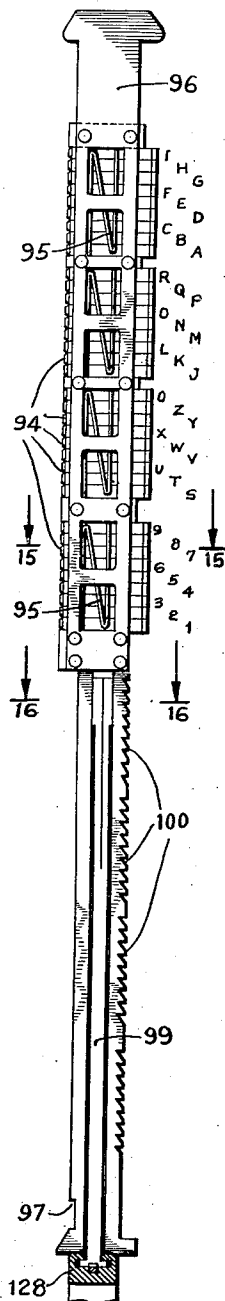


FIG.15.

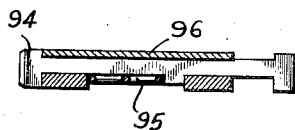


FIG.16.

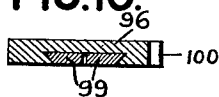
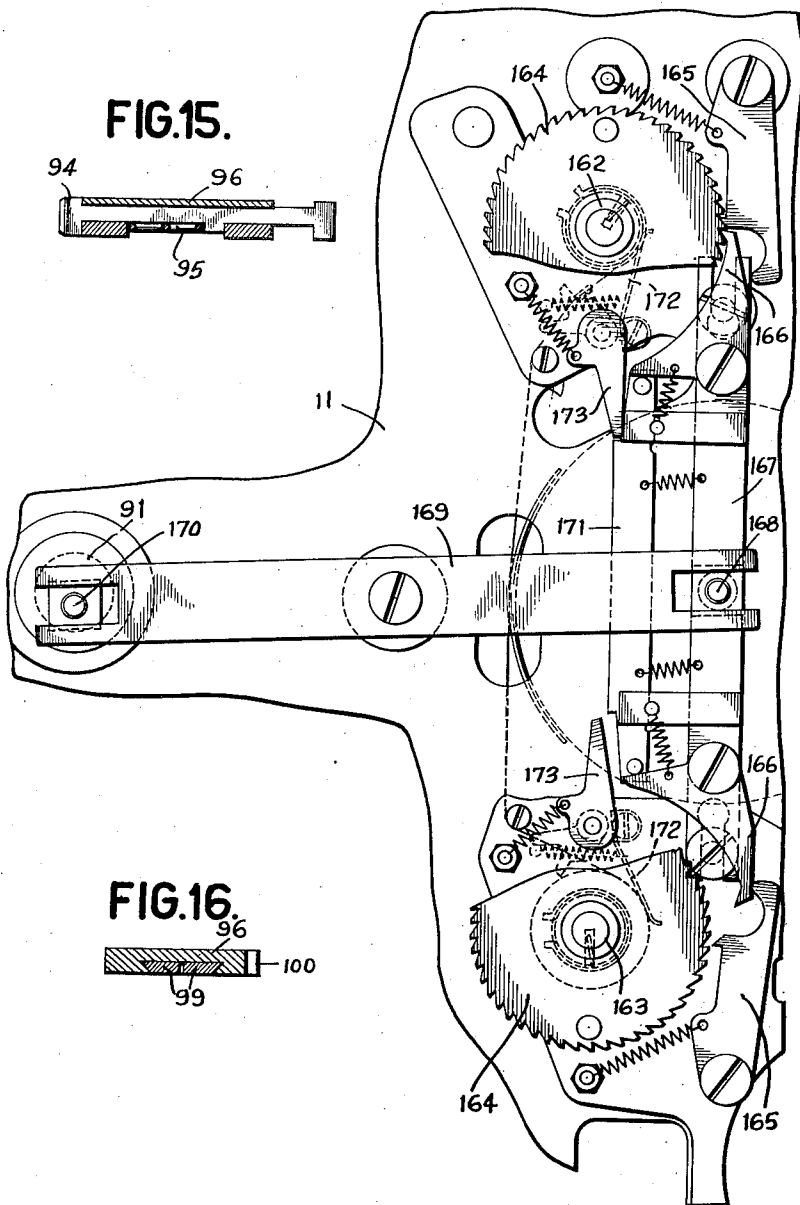


FIG.13.



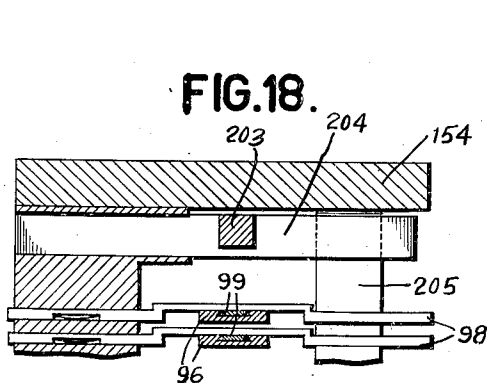
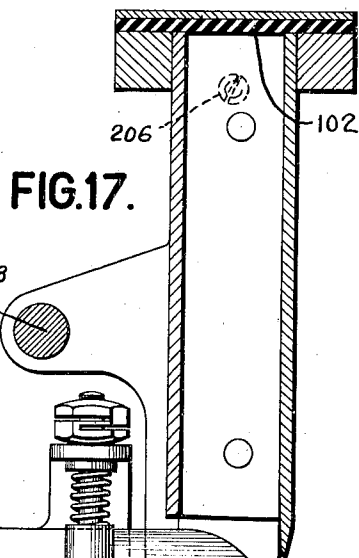
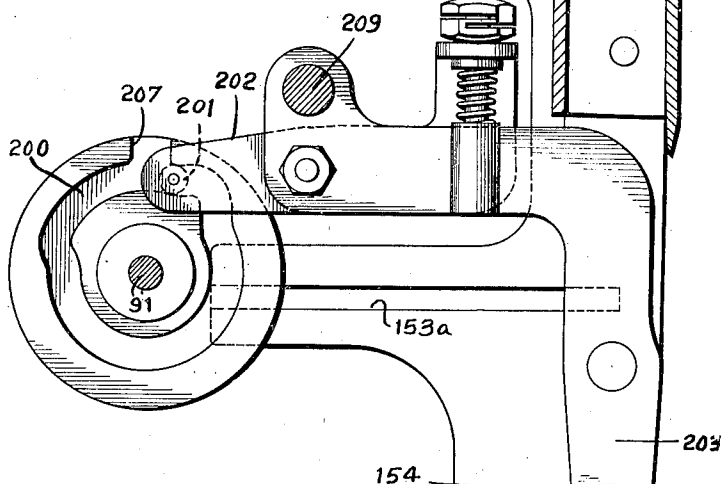
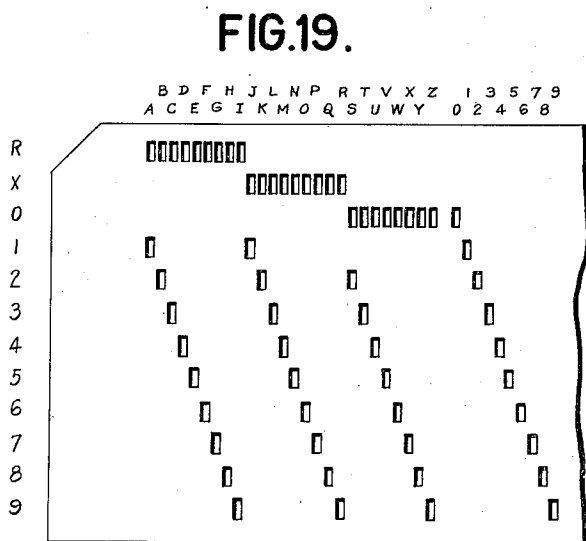
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UNITED STATES PATENT OFFICE

2,076,713

PERFORATED CARD INTERPRETER

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Application October 25, 1935, Serial No. 46,773

17 Claims. (Cl. 101-93)

This invention relates to printing mechanisms and more particularly as applied to types of machines known as interpreters in which character representing perforations on record cards are analyzed and the characters represented thereby are printed back on the controlling record cards.

The principal object of the present invention is to provide an interpreter for interpreting alphabetic designations represented by combinational hole perforations in record card columns.

An object of the invention is to provide a printing mechanism for such machines in which a high rate of speed may be attained. Record cards as perforated to represent alphabetic designations contain twelve index point positions, nine of which represent digits, and the remaining three are known as zone perforations. The zone perforations are analyzed in advance of the digit perforations to preselect the zone, after which the digit perforations are analyzed to select a type within the zone. Briefly, a single set of analyzing brushes is utilized to successively analyze both the zone and digit perforations. A single set of printing magnets is utilized to first position the type bars to select a zone and then to effect further selection, to select a particular type within the zone. In carrying out the objects of the invention, the type bars are arranged for frictional connection with an invariably reciprocated crosshead and as the zone perforations are analyzed, the type bars are permitted to travel with the crosshead in displaced relationship according to the zone selected so that as the digit positions are analyzed, the selected zones will be passing printing position. The sensing of a digit perforation at such time will interrupt further advance of the type bar and it will accordingly be positioned to present the character corresponding to the combination represented by the zone and digit perforations sensed.

Various other objects and advantages of the invention 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 useful features of construction and combination of parts hereinafter set forth and claimed.

In the drawings:

Fig. 1 is a central section of the complete machine.

Fig. 2 is an outside view of the machine looking from the rear.

Fig. 3 is a plan section taken substantially along the lines 3-3 of Fig. 1.

Fig. 4 is a side elevation of the type bar controlling mechanism.

Fig. 5 is a view of a record card showing the arrangement of punching and printing.

Fig. 6 is a detailed position view of a type bar and its controlling mechanism.

Fig. 7 is an end view of the card feeding drum.

Fig. 8 is a detail taken substantially along line 8-8 of Fig. 2.

Fig. 9 is a further detailed position view of the type bar and its controlling mechanism.

Fig. 10 is a detail view of the printing magnet knock-off mechanism.

Fig. 11 is a wiring diagram of the electric circuits of the machine.

Fig. 12 is a timing chart of the electrical and certain of the mechanical devices.

Fig. 13 is a detail view of the ribbon spacing mechanisms.

Fig. 14 is an enlarged detail of one of the type bars.

Fig. 15 is a section taken along lines 15-15 of Fig. 14.

Fig. 16 is a section on line 16-16 of Fig. 14.

Fig. 17 is a detail of the type bar stop restoring mechanism.

Fig. 18 is a section taken on the lines 18-18 of Fig. 17.

Fig. 19 is a diagram showing the coding arrangement for the various characters.

In the drawings, 10 represents the base of the machine upon which is mounted a pair of side frames 11 (Figs. 1 and 2). Supported on the rear frame 11 is a drive shaft 12, to one end of which is secured a pulley 13 which has connection through a belt 14 to a suitable driving motor (not shown) which is located beneath the base of the machine. The shaft 12 carries a worm 15 which meshes with a worm wheel 16 mounted upon a shaft 17 (see also Fig. 8). The shaft 17 extends through the rear frame 11 and at its inner extremity carries a crank arm 19 which has connection through a link 20 with an arm 21 pivoted at 22. The upper end of arm 21 has pin and slot connection with the horizontally reciprocable card picker 23 which for each revolution of shaft 17 will advance the record card from the bottom of the stack of cards through the throat 24 and into engagement with a pair of constantly running feed rollers 25 carried by shafts 26. As shown in Fig. 2, these shafts carry gears 27 at their extremities which mesh with threaded section 28 of the main drive shaft 12.

As the record card is advanced by the rollers 25, the leading edge thereof engages and rocks card lever 29 which is pivoted at 30 and under the influence of a record card will rock in a counterclockwise direction to close a pair of card lever contacts 31.

As the card continues its advance, it will pass between a set of analyzing brushes 32 and a contact drum generally designated 33. A set of feed rollers 34 carried on rod 35 cooperate with the drum 33 to effect further advance of the record

card. The rod 35 and brushes 32 are carried by a pair of L-shaped side plates 36 pivoted at 37 and locked in position by a rod 38. Rocking of rod 38 in a counterclockwise direction through an angle of ninety degrees will permit the plates 36 to be swung counterclockwise carrying therewith the rollers 34, analyzing brushes 32, and the guide plate 39, thus providing access to the cylinder 33 for inspection purposes. The drum 33 is provided with a plurality of gripping fingers 40 (see Figs. 3 and 7). These fingers 40 are carried by pins 41 and are urged into card gripping position by spring-pressed plungers 42. Fixed face cams 43 are secured to the side frames 44 and cooperate with the fingers 40 to effect their opening and closing at the proper time. The timing of the fingers is such that the record card is gripped as it passes the analyzing position and held securely to the drum as it rotates to further advance the card.

The manner in which the drum is rotated will now be set forth.

The drum 33 is secured upon a shaft 44 (Figs. 2 and 3) which has loosely mounted thereon a gear 45. Meshing with gear 45 is a rack 46, one end of which carries a roller 47 which cooperates with a cam 48 secured upon the shaft 44. The rack 46 is suitably supported for reciprocation and is normally urged against the cam 48 by a spring 49. As the cam 48 rotates, the rack 46 is urged toward the right as viewed in Fig. 2, causing gear 45 to rotate clockwise. Secured to the gear 45 is an arm 50 upon which is mounted a spring-pressed pawl 51 which, as the arm rotates in a clockwise direction, will engage one of the three notches in the disk 52, which disk is secured to the shaft 44. The movement thus imparted to the shaft 44 will rotate the drum 33 and with it the record card to a position where the leading margin of the record card is in printing position. This printing line is indicated in Fig. 5 as the uppermost line on which printing is shown.

Where it is desired to effect printing on the second line as indicated in Fig. 5, the rack 46 is given a slight additional movement to rotate the drum 33 an additional amount sufficient to present the second printing line to position. For this purpose the cam 48 (Fig. 2) is provided with a slidable portion 48a which carries a pin 53 which cooperates with a stationary cam 54. With the cam in the position shown in Fig. 2, the slide 48a is moved outwardly as the pin 53 engages the high portion of the cam 54. As the cam 48 continues to rotate in a clockwise direction, however, the slide 48a will be free to move inwardly again, and the roller 47 will be controlled by the contour of the main cam 48.

The cam 54 may be positioned about ninety degrees in a clockwise direction, in which position the slide 48a will be forced outwardly as the camming portion thereof passes the roller 47 and will accordingly impart additional movement thereto. In Fig. 8 is shown the arrangement whereby the cam 54 may be shifted. A pin 55 is secured in the shaft 44 and engages a U-shaped slot 56 in the supporting sleeve of cam 54. The sleeve is normally urged against cam 48 by a spring 57 pressing against a collar 58 on the end of the shaft. The sleeve is provided with a hand wheel 59 which may be engaged to draw the cam toward the right as viewed in Fig. 8, then turned and released to assume its new position.

The shaft 44 has secured thereto a gear 60 which meshes with a gear 61 secured to the shaft 35. The gear 60 also meshes with a gear 62 which

meshes with a gear 63 on shaft 64. The gear 63 in turn meshes with a gear 65 on the shaft 66. As shown in Fig. 1, the shafts 64 and 66 carry rollers 67 which receive the card from the drum 33 after printing has been effected and advance it to the discharge magazine. Mounted on shaft 66 is a cam 68 which cooperates with a spring-pressed follower arm 69 which is carried on a shaft 70. Mounted on the arm 70 is a pusher plate 71 (Fig. 1) which is oscillated by the cam 68 to urge the record cards toward the right in the discharge stack. The backing plate 72 of the discharge stacker has a projection extending downwardly through a suitable slot in the bottom of the stacker to which is secured a wire 73 suitably guided around pulleys as shown and has a weight 74 attached to the opposite end to urge the plate against the cards.

As cards accumulate in the stacker, the plate will be urged toward the right and when the stacker is full, a lug 75 will engage and cause opening of a normally closed pair of stacker contacts 76 whose function will be explained in connection with the circuit diagram.

The drum 33 has associated therewith a brake arm 77 (Fig. 1) which is carried by a shaft 78. In Fig. 2 the shaft 78 carries an arm 79 which cooperates with a suitable cam 80. The purpose of the brake arm is to assist in stopping the forward movement of the drum and prevent any overthrow due to the inertia of the parts. Also cooperating with the drum 33 is a contact blade 81 (Fig. 1) which extends across the cylinder and in addition to supplying current thereto, serves as a scraper to remove dust and lint which may accumulate on the surface of the drum.

Positioned between the drum and the type bars is a shield 82 which is supported on a suitable cross member (see Fig. 7). A further shield 83 is provided which is carried by a cross bar 84 supported at its opposite ends by bell crank members 85. Integral with one of the members 85 is a gear sector 86 meshing with a gear 87 with which a second sector 88 also meshes. The sector 88 is integral with a cam follower arm 89 whose roller engages a cam 90 carried by a shaft 91. The shaft 91 carries a worm wheel 92 meshing with a worm 93 secured to the main drive shaft 12. The operation of the movable shield 83 is such that as the record card moves into printing position and passes the upper edge of the fixed shield 82, the movable shield will have moved into position as in Fig. 7 to guide the leading edge of the card past the upper edge of the fixed shield to prevent any possible interference with the movement of the card. Thereafter the shield 83 moves upwardly again to form an opening for the type elements.

The machine is provided with a plurality of type bars 96 as shown in Fig. 14 with four groups of type elements 94 for each of which groups there is a spring 95, one end of which engages a portion of the type bar and the other engages shoulders on the element 94 (see also Fig. 15). Each of the type bars is provided with a notch 97 which is normally engaged by a slide 98 and which serves to hold the type bar in its upper position as shown in Fig. 1. The lower portion of each of the type bars is provided with an undercut slot (as shown in Fig. 16) within which a draw link 99 is mounted. The upper end of this link 99 is split as shown in Fig. 14 and the spring tension therein causes it to press firmly against the sides of the slot. As will be explained, the link 99 is drawn downwardly and its upper end

exerts a frictional pull on the type bar which, if the bar is released by slide 98, will cause the bar to descend. Each of the type bars 96 is also provided with four sets of teeth 100 which cooperate with stop slides 101 after the type bar has been released for downward movement with the draw link 99. If, as the type bar moves downwardly, its stop slide 101 is advanced, the further movement of the type bar will be interrupted and the link 99 will continue without accompanying movement of the type bar. Upon return or upward movement of the link 99, the type bar 96 will be urged upwardly therewith until its head strikes a cushion 102, after which the link 99 will slide upwardly within the type bar slot.

The operation of the slides 98 and 101 is controlled by magnets 103. Each magnet 103, when energized, will draw its armature 104 toward the left, as viewed in Figs. 1 and 10, thereby releasing a spring-pressed bell crank 105 for counterclockwise rotation under the influence of its spring 106. The depending arm of the bell crank engages the extremity of a rod 107 and urges the same to the right. The free end of the rod 107 passes through a suitable opening in the end of a bail 108 which is pivoted at 109 and may be rocked from the position shown in Fig. 1 to that of Fig. 9. The means for rocking the bail comprises an arm 110 secured to a rod 111 which rod carries a follower arm 112 cooperating with a cam 113 secured upon a shaft 114.

In Fig. 2, the shaft 114 carries a gear 115 meshing with a gear 116 on a vertical shaft 117, the upper end of which carries a worm wheel 118 meshing with a worm 119 on the main shaft 12. The parts are normally in the position shown in Fig. 1 and energization of magnet 103 with the parts in this position will cause movement of rod 107 toward the right to move the slide 98 out of engagement with the notch 97 of the type bar so the latter may commence its descent. Thereafter, the bail 108 is rocked to the position of Fig. 9 and a further energization of the magnet 103 will move the rod 107 toward the right to operate the stop slide 101.

Intermediate the successive energizations of magnet 103, it is necessary to restore the armature 104 and bell crank 105. This is effected by means of a cam 120 (Fig. 1) carried by shaft 114, which cam cooperates with an arm 121 pivoted at 122 and having its upper extremity in engagement with a bar 123 (Fig. 10) which bar is suitably mounted for horizontal reciprocation.

As the bar is shifted toward the right, as viewed in Fig. 10, the cross bar 124 carried thereby will engage the depending arm of bell crank 105 and rock the same clockwise. Immediately thereafter a lateral extension 125 will engage a pivoted arm 126 to rock the latter and cause its upper end to engage and restore the armature 104. A spring 127 (Fig. 1) is provided to restore bar 123 toward the right.

The draw links 99 have their lower ends seated within a crosshead 128 secured to a frame 128a by a rod 128b (see Fig. 4) which frame is adapted to reciprocate within a slot 129 in a member 130 which itself is suitably guided for vertical reciprocation. An arm 131 having a bifurcated end engages a suitable pin in each end of the frame 128a to reciprocate the latter. The arm 131 has safety spring connection with a frame 132 mounted on a rod 133. An arm 134 of the frame 132 has a follower roller cooperating with a cam 135 under control of which the crosshead 128 is moved downwardly. Rod 133 also carries

an arm 136 (Fig. 2) cooperating with a cam 135a to rock the frame 132 counterclockwise to elevate the crosshead 128. The frame 130 is provided with a notch 137 into which the free end of a lever 138 extends. The lever 138 is pivoted at 139 and carries a follower roller in engagement with a cam 140. A spring 141 serves to rock lever 138 to lower the frame 130 under control of the cam 140. Carried by the frame 130 are three pivoted bails 142 and a fixed plate 143. Each of the bails 142 has an extension provided with a pin 144 which extends into a slot 145 in a lever 146 pivoted at 147.

The lower end of the lever 146 has a link connection 148 with an arm 149 pivoted at 150. This lever carries a follower roller which cooperates with a cam 151 on the shaft 114. This cam serves to rock the bail 142 from the position shown in Fig. 1 to that of Figs. 6 and 9 at a definite time in the cycle of operation, after which the bails move downwardly with the plate 130 in their displaced position. The timing of the various operations will be explained hereinafter in connection with the circuit diagram, in connection with which the coordination of the entire mechanism will be explained.

Adjacent to each of the type bars 96 is a printing plunger 152 (see Figs. 3 and 9) each of which is mounted on a plate 153 horizontally reciprocable in a slot 153a in a frame 154. Extending across all of the plungers 152 is a thin flexible metallic strip 155 separating the plungers from a rubber cushion 156. After the type bars have been positioned for printing, the cams 157 carried by shaft 91 engage an adjustable bearing plate 158 secured to the plate 153 to urge the same toward the right so that the plungers 152 may press selected type elements against the drum 33 to effect an impression on the record card. Suitable leaf springs 159 are provided for effecting retraction of the plate 153. For purposes of safety, a bell crank 160 is provided which cooperates with a cam 161 and will positively retract the plate 153, if for any reason the springs 159 fail to do so.

The inking ribbon extends across the type bar and is carried on spools 162 and 163 (Fig. 1). The feeding mechanism for the spools is shown in Fig. 13 wherein the spools are provided with ratchets 164 cooperating with holding pawls 165 and stepping pawls 166. The pawls 166 are pivoted upon the bar 167 which has operating connection 168 with a lever 169 whose other extremity has connection with an eccentric pin 170 carried in the extremity of the shaft 91. Thus, as the shaft 91 rotates, the lever 169 is oscillated and with the parts in the position shown in Fig. 13, the upper ratchet 164 will be rotated counterclockwise to wind the ribbon on spool 162. The pawls 166 are maintained in their relative positions on bar 167 by a detent bar 171 which is slidably carried by the bar 167. The operation is such that as the ribbon is unwound from the spool 163, a member 172 is permitted to rock clockwise as viewed in Fig. 13 to interpose a finger 173 in the path of bar 171. The downward movement of the bar 171 will thereupon be prevented and the further movement of bar 167 will cause a relative displacement of the two bars with the result that the upper pawl 166 is rocked out of engagement with the bar 167 and the lower pawl is permitted to engage, thus effecting a reversal of the ribbon feeding operation. The ribbon feeding mechanism has been but briefly described as the de-

tails thereof do not per se form part of the present invention.

In Fig. 2 the vertical shaft 117 carries a number of contact operating cams designated C1, C2, C4, C5, and C7 and a distributing commutator designated D. The timing and functioning of these devices will be set forth in connection with the explanation of the circuit diagram.

Referring now to Fig. 11, the analyzing brushes 32 are shown as terminating in plug sockets 172 from which plug connections 173 may be made to plug sockets 174 which are wired to the type bar controlling magnets 103. Closure of the main starting switch S will supply current to the motor generator MG which drives the generator end G to supply current to lines 175 and 176. Closure of start key contacts 177 will establish a circuit from line 175, through relay magnet 178, relays 179, 180, stop key contacts 181, discharge hopper contact 76 to line 176. Energization of relays 179 and 180 will close their respective contacts 179a and 180a to supply current to the driving motor M, thus placing the machine proper in operation. As a card is fed from the stacker, the card lever contacts 31 close, establishing a circuit from line 175, through contacts 31, relay magnet 182, to line 176. Relay 182 closes its contacts 182a to provide a holding circuit for the relay through cam contacts C5 and the contacts 182b complete a circuit from line 175 to contacts 182b, contacts 178a, relay 178, through the motor relays 179 and 180 to line 176 as before. Cam contacts C7 serve to provide a further holding circuit through the relay 178. As long as cards continue to feed in succession, the card lever contacts 31 will remain closed and the relay magnets 182 and 178 will remain constantly energized. The function of contacts C5 and C7 is to maintain these circuits for a short period after the last card has passed the card lever to insure that the perforations thereon are properly sensed.

The card lever contacts 31 also supply current to the brush 183 of the distributor D which is provided with contact segments 184 positioned to engage brush 185 as the index point positions of the record card traverses the analyzing brushes 32. For example, if, when the "12" index point position of a record card is at the brushes 32, a perforation in such position will complete a circuit traceable from line 175, contacts 31, brush 183, common ring of the distributor, "12" segment 184, brush 185, wiper 81, contact cylinder 33, perforation in the "12" position, brush 32, plug socket 172, connection 173, to a selected socket 174, magnet 103, to line 176. If the same record column contains a further perforation in one of the digit recording positions "1" to "9" the circuit will be repeated to again energize the magnet 103 when the segment 184 corresponding to the value of the perforations is at the brush 185.

Frequently in perforating record cards perforations are made in the so-called "X" or "R" positions which are for the purpose of designating the classification of certain data. For example, a column may be perforated in the "6" position to indicate the value "6" and the same column may be perforated in the "X" position to indicate that this "6" is a negative quantity. When this column is sensed in the present machine, the combination "6" and "X", if both positions were sensed, would record the letter "O", such being the combination for this letter. In order to properly interpret the "6", it is neces-

sary to disable the sensing of the "X" and "R" perforations in these special columns. For this purpose, a relay magnet 186 is provided with cooperating contacts 186a which terminate in plug sockets 187 and 188.

Plug connections are made between socket 172 and 174 of the selected column to sockets 187 and 188 respectively, so that no circuit can be completed to the associated magnet 103 until the contacts 186a close. The cam contact C3, which controls the energization of magnet 186, is timed as indicated in Fig. 12 to remain open during the passage of the "R" and "X" positions by the brushes and to close thereafter. Thus, in such selected columns, only the second perforation will be sensed to properly record the value of that perforation. A further so-called class selection relay magnet 189 is also provided which controls contacts 189a, 189b. A plug connection, indicated at 190, may be made from one of the plug sockets 172 to the plug socket 191. The cam contacts C2 are timed to close as the "X" index point position of the card is analyzed and the perforation present will complete a circuit from the brush 32 of the plug socket 172, connection 190, to socket 191, contacts C2, relay magnets 192 and 189, to line 176. Shortly thereafter cam contacts C1 close and maintain the circuit through the relays through the contacts 192a, the circuit being maintained throughout the analysis of the record card. In this manner the contacts 189a, 189b are shifted from their position as shown upon the occurrence of an "X" perforation in a selected card column and the terminals of these contacts may be plug connected between the sockets 172 and 174 to control the connections in accordance with the presence of the "X" perforation.

Referring now to Fig. 12, the sequence of operations will be set forth in detail. The electrical devices are shown in the upper part of the figure and the timing of the distributor D indicates a greater interval between the analysis of the "R", "X", and "O" position than between the later analyzed digit positions. This is brought about by controlling the card feed to cause the so-called zoning positions, that is, the "R", "X" and "O" positions, to pass the analyzing brushes at a slower rate of speed. The movement of the card advancing drum is indicated at 33 where it is seen that the drum moves at a constant rate through the "R", "X" and "O" positions and after this movement there is a dwell indicated by a short horizontal line and following this there is a more rapid, uniform, movement as the digit positions pass the analyzing brushes and this is followed by a longer horizontal line, indicating the period during which the drum 33 and the card thereon remain at rest. The dotted horizontal line indicates the advanced position of the drum when set to present the second printing line to printing position. The dot and dash line diverging from the horizontal indicates the return movement of the rack and pawl mechanism which advanced the drum. The line 80 indicates the timing of the brake cam and shows the cam operating the brake as the drum comes to rest, thereby preventing any overthrow. The brake remains in gripping engagement with the cylinder during the printing operation, whose timing is indicated along the line 157. The line 135 indicates the operation of the crosshead controlling cam indicating that the drop of the crosshead is rapid as the zoning holes are analyzed.

If a hole is sensed in the "R" position, the type bar is immediately released for downward movement with the crosshead and will follow the same at the same rate of speed. If the column contains an "X" perforation, the crosshead will have advanced ten steps, as indicated on the scale at the left of the diagram, before the type bar is released for movement, and if a "O" hole is sensed, the crosshead will have moved twenty steps before the type bar is released for movement with the crosshead. Following this differential releasing of the type bars under control of perforations, the release pawl cam 200 (Fig. 17) will mechanically release the remaining bars, this taking place after thirty steps of movement of the crosshead. Shortly thereafter the cam 151 rocks the several bails 142 into the path of the type bars and the further movement of the crosshead will seat the lower ends of the type bars in the bails. The bars which were released in response to an "R" perforation will cooperate with bail 143. Those controlled under release of the "X" perforation will cooperate with the lowermost bail 142. Those released in response to the "O" perforation will cooperate with the central bail 142, and those having no zone perforation will cooperate with the uppermost bail 142. These bails and their supporting slide now move downwardly under control of the cam 140 in synchronism with the passage of the digit representing positions by the analyzing brushes and as perforations are now sensed, the type bars will be differentially interrupted with a selected type element in printing position.

Referring now to Fig. 17, the cam 200 carried by shaft 91, cooperates with a roller 201 carried by an arm 202, spring connected to bell crank 203 whose lower extremity fits within a notch in a bar 204 (see Fig. 18). Fitted in a further notch in bar 204 is a transverse bar 205 which extends across the type bar stops 98 (Fig. 6). The configuration of cam 200 is such that all stops 98 which are not withdrawn in response to "R", "X" or "O" perforations are mechanically withdrawn by movement of bar 205 to the right after the "O" positions have been sensed. After the type bars have restored upwardly, the cam 200 returns bar 205 to the left to reengage all stops 98 with the notches 97 in the type bars.

Provision is made for permitting ready removal of the type bar unit from the machine for replacement or repair. To do so, rod 128b (Fig. 4) is withdrawn through a suitable opening in the side frame 11 and screws 206 (Fig. 17) which extend through the side frames 11 into frame 204 are removed. Cam 200 is rotated to bring its slot 207 above roller 201. The operator then grips cross rods 208 and 209 to draw them together thus causing rocking of bell crank 203 and advancement of stops 98 into notches 97. The frame 204 and the type bars carried thereby may be raised vertically out of the machine and lifted off its supporting pins 210 (Figs. 4 and 17).

The sequence of operations in connection with a particular character will be reviewed in connection with Figs. 6 and 9 to illustrate the manner in which the character "M" is selected for printing. As seen in Fig. 19, the character "M" is designated by perforations in the "X" and "4" positions. As the record card passes the analyzing brushes, the crosshead 128 descends while the type bar 96 remains locked by the slide 98. At the time the "X" position has arrived at the brushes, the crosshead 128 will have advanced the ten steps indicated on the timing chart and

the release of the type bar at this time will permit the latter to follow at the ten step interval which will bring the bottom of the type bar slightly above the lowermost bail 142 at the time when the bails are rocked from the position of Fig. 1 to that of Fig. 6. The crosshead 128 has a slight additional movement to seat the type bars on their respective bails and to make allowance for any slight slippage between the draw link 99 and the type bars. From this point on, the type bar follows under control of the bail 142 and the crosshead 128, whose rates of motion are the same for the subsequent period of downward movement. As the bar continues downwardly, the record card continues its advance past the brushes and when the "4" point is sensed, the second circuit is completed to energize the magnet 103 and cause shifting of the stop slide 101 whose operating rod 107 shifted from the position of Fig. 6 to that of Fig. 9. The type bar is accordingly arrested with the "M" type element in printing position.

Generally summarizing the type selecting operation, the crosshead 128 moves downward rapidly and the type bars follow with a differential displacement with respect to the crosshead. If an "R" hole is sensed, the bar and crosshead move down without any relative displacement. If an "X" hole is present, the displacement is a distance corresponding to the "1" zone. If a "O" hole is present, the displacement is twice as great, and if no zone hole is present, the displacement is three times as great. The bails 142 and 143 are for the purpose of securing an accurate adjustment between the displaced type bars and the crosshead before further descent and before the digit perforations are analyzed.

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 as follows:

1. A printing mechanism having a reciprocable type carrier provided with a plurality of type elements, an invariably reciprocable crosshead, a frictional connection between said crosshead and carrier, means for moving said crosshead, means normally locking said type carrier against movement with the crosshead and means for releasing said locking means whereupon said type carrier will travel with said crosshead under the influence of said frictional connection.

2. A printing mechanism having a reciprocable type carrier provided with a plurality of type elements, an invariably reciprocable crosshead, a frictional connection between said crosshead and carrier, means for reciprocating said crosshead, means normally locking said type carrier against movement and means for releasing said locking means during the movement of said crosshead in one direction whereupon said carrier will travel with said crosshead in said direction, said frictional connection being effective to restore the carrier when the crosshead moves in the opposite direction.

3. A printing mechanism having a type carrier provided with a plurality of type elements, a crosshead, a frictional connection between said

crosshead and carrier, means for moving said crosshead, means normally locking said carrier against movement with said crosshead, and means for releasing said locking means whereupon said carrier will travel with said crosshead under the influence of said frictional connection.

4. The invention set forth in claim 3 in which means is provided for effecting a definite relative positioning between said carrier and crosshead during the concurrent movement of the two.

5. In a printing mechanism, a type carrier, a crosshead, moving means therefor and means connecting said carrier to said crosshead including a link secured at one end to the crosshead and having slidable frictional connection with the carrier to frictionally urge the carrier in the direction of movement of the crosshead.

6. In a printing mechanism, a type bar, a crosshead having an invariable extent of movement, means for frictionally connecting said bar and crosshead for movement of the bar with the crosshead and means effective during the concurrent movement of the two for adjusting the relative positioning of the bar and crosshead while they continue their movement together.

7. In a printing mechanism, a type carrier, a crosshead, moving means therefor, a frictional connection between said carrier and crosshead, means normally locking said carrier against movement with said crosshead, record controlled means for releasing said locking means to permit the carrier to follow the crosshead under the influence of said frictional connection, at differential times during the movement of the crosshead and further cam controlled means for releasing said locking means at a predetermined time during the movement of the crosshead.

8. In a printing mechanism having a type bar provided with a plurality of groups of type elements, record analyzing means, means for moving the index point positions of a record card to pass said analyzing means in succession, and means for causing an entire group of type elements to pass the printing position during the analysis of one of said index point positions and to cause only a single type element to pass the printing position during the analysis of another index point position.

9. In a machine of the class described, record analyzing means, means for feeding a record card having zone designating index point positions and type designating positions to cause the zone designating index point positions to pass said analyzing means at a greater time interval than the type designating positions, a type bar having groups of type elements and means for causing one of said groups to pass printing position during the zone designating index position analyzing interval and a type element of a zone during the type designating index position analyzing interval.

10. In a machine of the class described, record analyzing means, means for feeding a record card to pass said analyzing means so that one section of the card passes at a slower rate than the remainder, a type bar and means for causing said bar to pass printing position at one rate while the card is passing the analyzing means at its slower rate and at another rate while the said remainder of the card is passing the analyzing means.

11. In a machine of the class described, record

analyzing means, means for feeding a record card to pass said analyzing means so that one section of the card passes at a slower rate than the remainder, a type bar and means for causing said bar to pass printing position at a greater rate of speed while the card is traveling at its slower rate and at a slower rate while the said remainder of the card is passing the analyzing means at its greater rate of speed.

12. In a printing mechanism, a plurality of type bars, means for positioning said bars, a plurality of type actuating plungers, one for each type bar, a resilient member for pressing said plungers against said bars and a flexible non-resilient strip interposed between said resilient member and said plungers.

13. In a printing mechanism, a plurality of type bars, means for positioning said bars, an impression member, means for positively urging said member against said bars to take an impression therefrom, resilient means for retracting said member, and auxiliary means for effecting positive retraction of said member if said resilient means becomes ineffective.

14. In a printing mechanism, a type bar, a crosshead having an invariable extent of movement, means for frictionally connecting said bar and crosshead for movement of the bar with the crosshead, and invariably operated means for retarding said bar after it is connected to the crosshead and without stopping the movement thereof.

15. In a printing mechanism, means for successively analyzing a plurality of index point positions in a column of a record card, a type bar having a plurality of type elements, a crosshead, means for moving the same, a frictional connection between said bar and crosshead, means normally locking said bar against movement with the crosshead, a magnet controlled by said analyzing means to cause said unlocking means to release said bar for movement with the cross head and further means controlled by said magnet for subsequently restraining said bar against continued movement with the crosshead.

16. In a machine of the class described, means for feeding a record card through the machine including a drum and fingers carried by the drum to secure said card thereto, a line of sensing brushes engaging said card along a line parallel to the axis of rotation of the drum, printing devices controlled by said sensing brushes and arranged to print said card along another line parallel to the axis of rotation of the drum, means for rotating said drum a predetermined amount to cause the card to pass said sensing brushes and come to rest between said printing devices and the drum, and means for causing said devices to print upon said card.

17. In a machine of the class described, means for feeding a succession of cards through the machine, including a drum and a cam and roller device for rotating said drum to feed the cards, means for sensing perforations in the cards while the latter are in motion, said cam and roller device being arranged to temporarily interrupt the rotation of the drum to permit printing on the cards, means controlled by the sensing means for printing data upon the cards while they are temporarily at rest and means for adjusting the contour of said cam whereby printing will be effected in another position on the cards.

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