March 8, 1927. 1,620,068

J. W. BRYCE

TABULATING CARD PRINTER DEVICE

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Fig. 1.

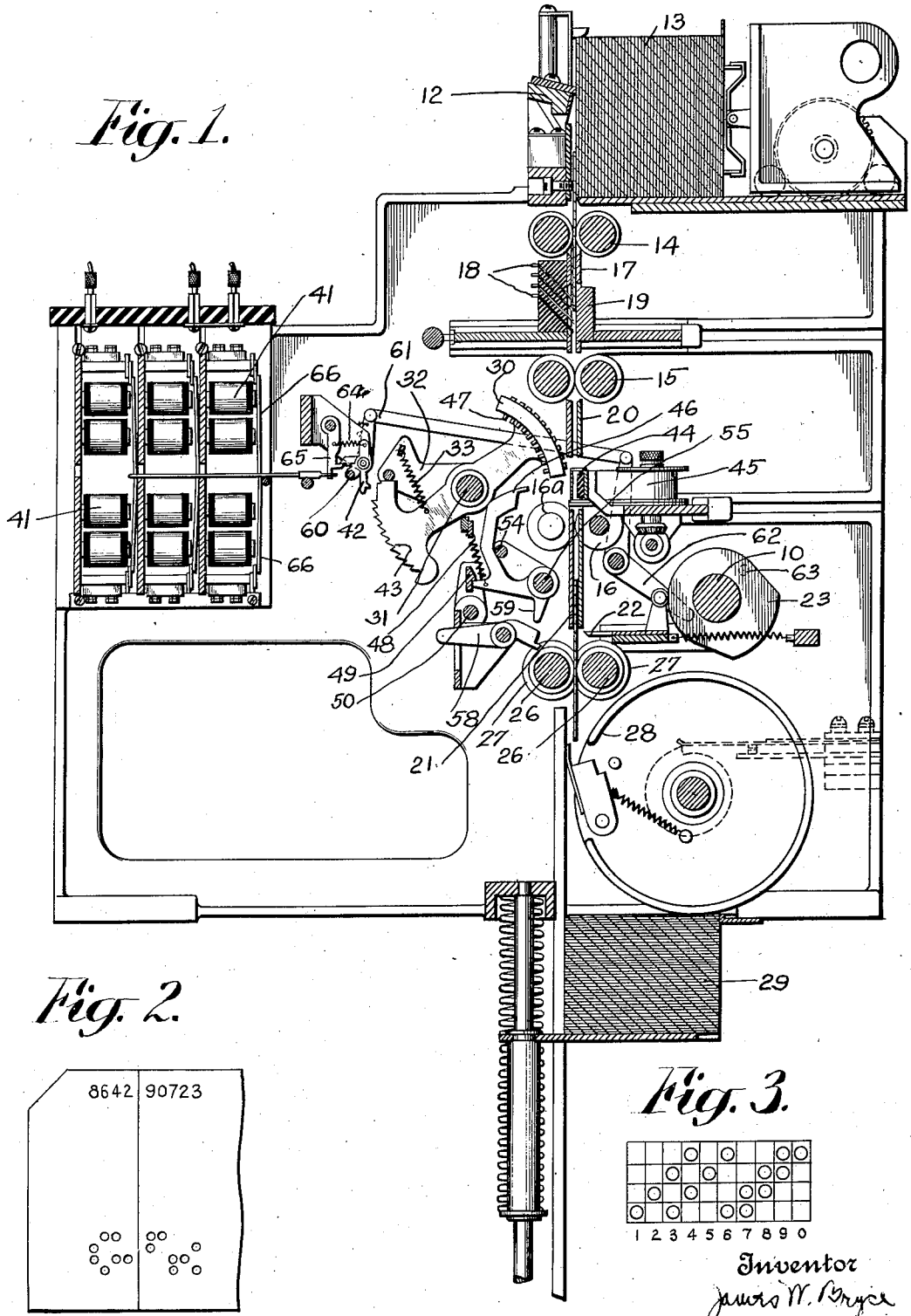


Fig. 2.

Fig. 3.

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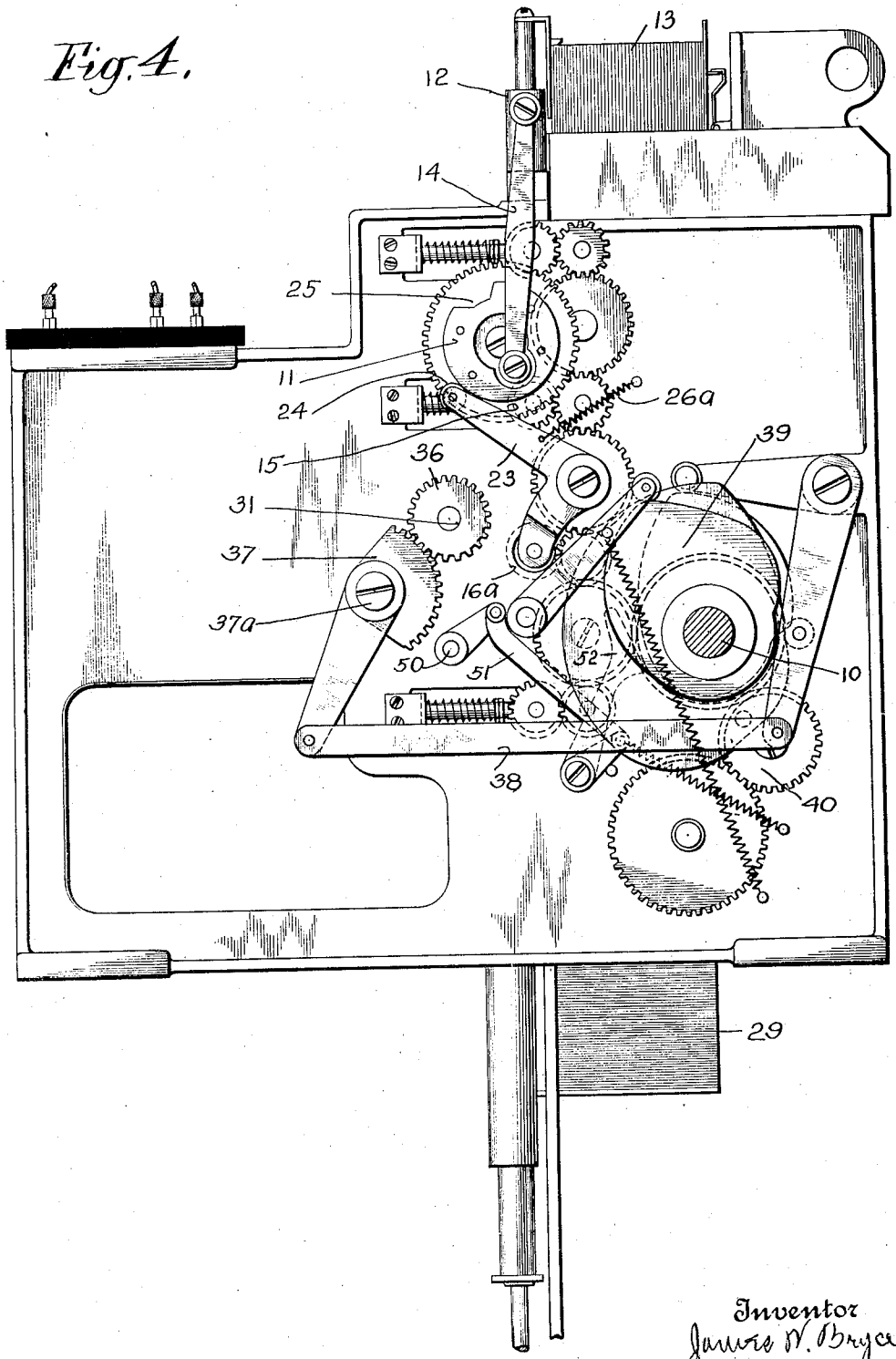
By his Attorneys
Cooper, Kerr & Dunham

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Fig. 4.



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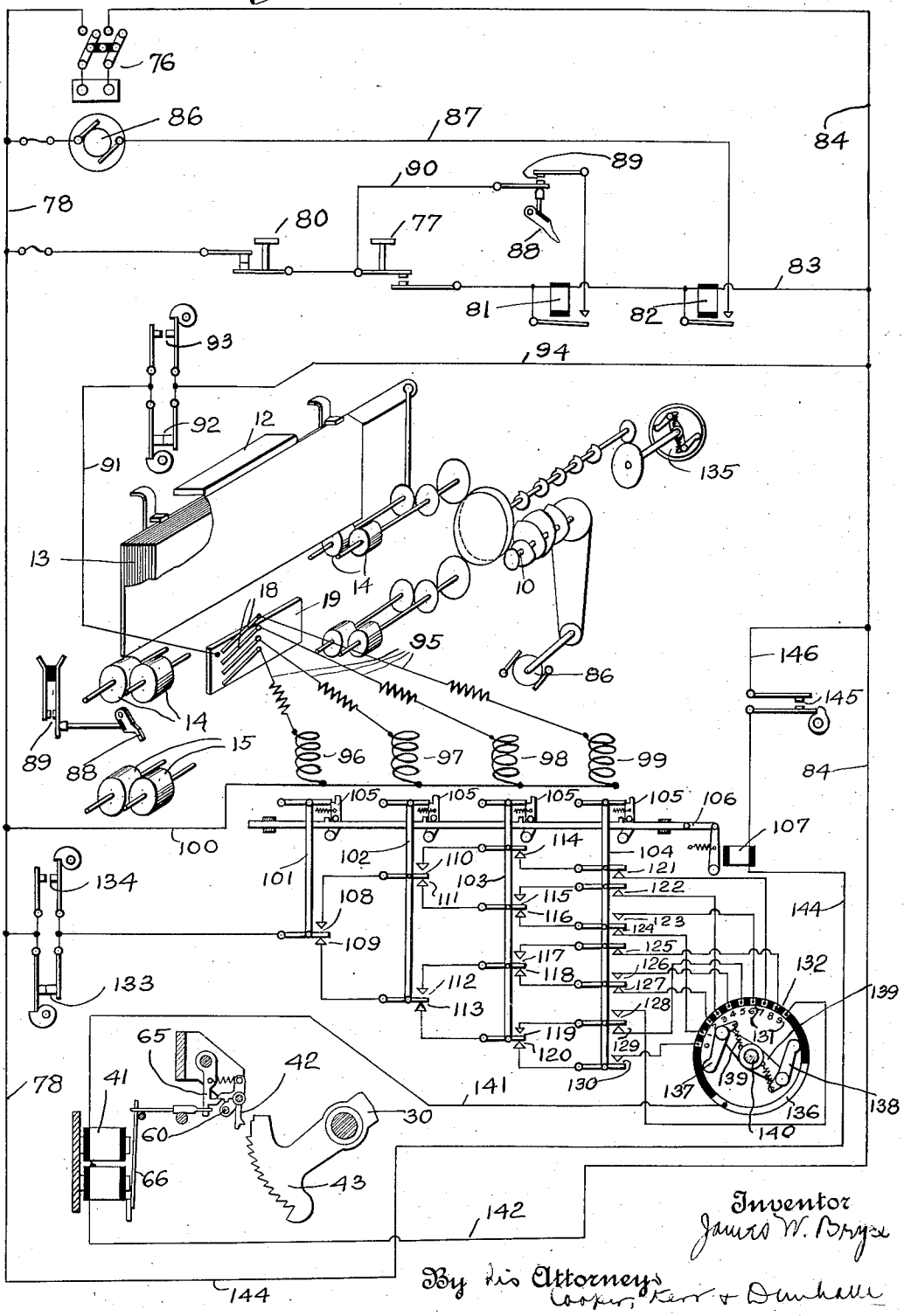
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Fig. 5.



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UNITED STATES PATENT OFFICE.

JAMES W. BRYCE, OF BLOOMFIELD, NEW JERSEY, ASSIGNOR TO THE TABULATING MACHINE COMPANY, OF ENDICOTT, NEW YORK, A CORPORATION OF NEW JERSEY.

TABULATING CARD-PRINTER DEVICE.

Application filed March 19, 1925. Serial No. 16,624.

This invention relates to card controlled machines, and is directed more particularly to provisions for analyzing combinational hole record cards and imprinting on each card an interpretation of the meaning of the perforations in that card.

For use with tabulating machines there are two general systems of perforated cards. One is the Hollerith digit system in which a single hole is punched in a card column, the location of the single hole governing its meaning or value. The other system, known generally as the Peirce, utilizes combinations of holes variously arranged in a certain zone on the card, the number and particular locations of the holes governing their meaning or value.

My co-pending application, Serial 714,918 discloses a machine, which, when perforated Hollerith cards are passed through it, prints on each card an interpretation or translation of such portion of the perforated data on that card as may be desired. My present invention is a machine which performs the same function on Peirce, or combinational hole, cards.

In my present invention the Peirce cards are fed through an electric analyzing device in which a plurality of contact brushes make contacts through the holes in the card and thereby set up circuits through a rectifying device by which the meaning of the particular combination of holes then under the brushes is interpreted, and by which the printing device is controlled to print on that same card the meaning of the perforations.

The card feeding and printing mechanism of this present invention is very similar to the corresponding mechanism of the invention above referred to, and my present invention pertains more particularly to the combination with said feeding and printing mechanism of electric analyzing and control devices suitable for first translating the combinational holes of Peirce record cards and causing the printing of that translation on the card itself.

In the drawings,

Fig. 1 is a vertical cross section showing printing and feeding devices, and stacker.

Fig. 2 is a portion of a typical Peirce record card after passing through the machine, showing across the top of the cards the printed translation of the perforations at the bottom of the card.

Fig. 3 is the Peirce code.

Fig. 4 is a side exterior elevation of my machine.

Fig. 5 is a circuit diagram.

The main drive shaft of the machine is designated 10. This may be driven in any suitable manner, as by an electric motor. From shaft 10 a suitable driving train shown in Fig. 4 is provided which drives disc 11 and actuates the picker mechanism 12. This reciprocating picker is adapted to feed one card at a time from the stack or supply magazine 13. The gears shown in Fig. 4 also drive the feed, or conveyor, rolls 14, 15, 16, and 16ª. The card which is advanced by the picker passes into the bight of the feed rolls 14, and subsequently advances between guides 17 to the analyzing devices, comprising contact brushes 18 and their corresponding contact blocks 19. These brushes and contact blocks are of conventional construction such as is commonly used in electrically controlled tabulating machines, except that I use a plurality of brushes instead of a single brush, as will be explained later.

After passing the analyzing brushes the cards pass into control of feed rolls 15, which advance the cards between the guides 20. The cards are subsequently advanced by feed rolls 16 and 16ª, down between guides 21. Just before the lower edge of a card reaches the guides 21 a card stop or abutment 22 is advanced by cam 23 into the path of the card (Fig. 1). This cam is on shaft 10. The card stop 22 arrests the advancing card, and during the time it is arrested for receiving the printed impression means are provided for withdrawing feed rolls 16ª from contact with the card, thus suspending all forward driving effort on the card until the stop is withdrawn. The means for thus suspending the operation of rolls 16ª comprises a bell crank member 23 (Fig. 4), carrying on its short arm the rolls 16ª. The upper arm of bell crank 23 carries a roller 24 which rolls on the periphery of disc 11, and at the proper time in the cycle of the machine is drawn into the notch 25 in the disc, by spring 26ª. In this way the rolls 16ª are rocked to the left from the position shown in Fig. 1, out of contact with the card. After stop 22 is withdrawn, further rotation of disc 11 rocks bell crank 23 to its normal position and rolls 16ª are

again in position to cooperate with rolls 16 in feeding the card downward to the cutting rolls 26, which are provided with knives 27 which, if the operator so desires, may be placed to cut the card into two parts. From cutter rolls 26, if such are employed, the cards advance to a stacker 28 which is of conventional form. This stacker is driven from the shaft 10 by the train of gears shown in Fig. 4. The stacker discharges the cards into receiving magazine 29.

For effecting the printing on the cards as they successively pass through the machine a plurality of pivoted type sectors 30 are provided. These sectors are all loosely mounted on shaft 31. Also mounted on this shaft is a combined actuating and restoring bail structure 32. The individual sectors 30 are connected to this bail by tension springs 33. Thus upon clockwise rocking of the bail 32 the springs 33 will rock the sectors concurrently in the same direction. The sectors may be arrested at any point in their travel and subsequently the springs 33 will elongate and permit the further movement of bail 32. Upon the reverse rocking of bail 32 a suitable cross rod carried by the bail structure will contact with the sectors and positively rock them back to home position. For rocking the bail 32 the following mechanism is provided.

Referring to Fig. 4, gear 36 is fast on shaft 31 and meshes with a sector 37 pivoted at 37a. This sector at the proper time in the machine cycle is rotated by linkage 38 which is actuated by cams fast on shaft 10. The arrangement and timing of the parts is such that the type sectors 30 are rocked under the influence of the springs 33 synchronously with the movement of a card past the brushes 18. If the perforations under the brushes indicate that the figure 5 should be printed on the card the type 5 will be at the printing line.

There are a number of pairs of magnets 41, one pair for each column on the card, and each pair related to a type sector 30. The energization of any pair of magnets (hereafter called simply "magnet", for brevity) 41 will release a pawl 42 and allow it to engage one of the ratchet teeth 43, whereupon further movement of sector 30 in a clockwise direction is prevented. The type sectors are all positioned for printing while the card is passing the brushes and are held in that position while the card is passing from the analyzing to the printing position and during the printing operation. The means for determining which magnets 41 are to be energized will be later explained.

In Fig. 1, the printing platen is designated 44, and the usual inking ribbon 45.

For each type sector 30 there is a hammer 46 adapted to strike the printing type 47. The hammers are actuated by springs 48 after being released by bail 49 on shaft 50. Tripping of the hammers is effected by rocking shaft 50 by linkage 51 which is actuated through arm 52 by a cam on shaft 10. The hammers are restored by bail 54 fast on shaft 55 which is also rocked by a cam on shaft 10. Prior to the striking movement bail 54 is rocked clear of the hammers by a spring, not shown.

To suppress printing in any column, hammer locking devices 58 are provided, which, when manually lowered, engage arms 59 depending from the hammers, and prevent their operation.

Restoring bail 60, operated through linkage 61 and finger 62 by pin 63 on cam 23, serves to disengage pawls 42 from ratchets 43 after printing has been effected. The rocking of bail 60 during the restoring operation also, through springs 64, moves pivoted arms 65, thereby drawing armatures 66 away from magnets 41. In normal position arm 65 latches pawls 42 in position to be again tripped upon energization of its corresponding magnet 41.

To start my machine the operator first closes main line switch 76 to source of current supply. Then he presses start key 77, which establishes a circuit from the left side of the line 78, through stop key 80, start key 77, relay magnet 81, motor control relay magnet 82, through line 83 to right side of line 84. As soon as magnet 82 is energized a stick circuit is provided from line 78 through motor 86, line 87, armature of magnet 82, line 83 to line 84. At the same time, magnet 81 is energized and as soon as the card feeding device has advanced a card far enough to raise the card contact lever, shown conventionally at 88, thus closing contact 89, a holding circuit is set up around start key 77 by way of line 90, contact 89, and the armature of magnet 81. If stop key 80 be depressed its contact will be broken, magnets 81 and 82 will be deenergized, thus releasing their armatures and breaking circuits 87 and 90 and the machine will stop. If the supply of cards should fail, contact 89 will open and the result will be the same as if stop key 80 had been depressed.

For sensing the perforations in the cards I provide a set of four brushes for each vertical column of perforations on the card, the brushes being spaced vertically and horizontally so that when the perforated zone of the card is in position to be analyzed, a brush is resting on each index position.

For purposes of illustration I have shown in Fig. 5 only one vertical set of four brushes, and it will be understood that the operation of the other sets is similar in every way. There is one set of brushes, as shown, for each printing type sector 30. Brushes 18, in the absence of a card, are in contact with contact plate 19, which is con-

nected by wire 91 to make and break contacts represented conventionally at 92 and 93. The cams actuating these contacts are so timed that an impulse is sent through line 91 when, and only when, each card is in analyzing position under the brushes. This impulse comes from line 84, through line 94, contacts 92 and 93, and line 91, to plate 19. If no perforations are under the brushes no contact is made between plate 19 and brushes 18, but if either one or two brushes make contact through holes in the card, current flows through lines 95 to one or two of the magnets 96, 97, 98, or 99, through line 100 to line 78.

Magnets 96 to 99 for each card column are selectively energized in accordance with the combinational perforations under the brushes at the time the brush circuit is made. Inasmuch as this brush circuit is immediately interrupted to prevent arcing at the brushes and to prevent an improper subsequent reenergization of the magnets, it is necessary that the instantaneous reading be held for such length of time as is necessary for the other parts to function and convert the reading into a single reading corresponding to the value of the combinational hole reading. The means for accomplishing this result will now be described.

Magnets 96 to 99, when energized, are each adapted to draw upwardly their respective armature structures 101, 102, 103, and 104. After these armatures are drawn up by the energization of their magnets they are held in elevated position by individual latches 105. These latches are spring operated in one direction and are adapted to be restored at the proper time in the cycle by restoring bar 106 which is magnetically actuated by magnet 107. Associated with armature 101 are upper and lower contacts 108 and 109. Associated with armature 102 are two pairs of contacts 110, 111, and 112, 113. Associated with armature 103 are contacts 114, 115, 116, 117, 118, 119, and 120. Associated with armature 104 are contacts 121, 122, 123, 124, 125, 126, 127, 128, 129, and 130. These last contact points are wired to conducting blocks 131 in an insulated commutator segment 132. The contact blocks are respectively valued at 1 to 9, as shown in the diagram, and, in addition, there is an additional block marked 0. The purpose of contacts 108 to 130 is to factor out any combinational hole reading and convert it into a reading which will energize the proper commutator block 131 to insure the printing of the correct figure on the card.

The operation of this arrangement will best be understood by taking a particular combination hole reading and tracing the resulting circuits secured thereby. From the left side of line current flows through cam contact devices 133 and 134 to the armature structure 101. It will be assumed that the numeral 6 be perforated in the card. By referring to Fig. 3 it will be seen that the perforations meaning 6 comprise holes in the bottom and top positions of the reading zone. Consequently, magnets 96 and 99 will be energized and armatures 101 and 104 will be drawn up and latched whereas 102 and 103 will be left down. Tracing the resulting circuits while imagining armatures 101 and 104 to be in raised position, it will be seen that current flows from left side of line through 133, 134, through upper contact 108, through lower contact 111, through lower contact 116, through upper contact 123, to the No. 6 block 131. Thus the 6 block is rendered live. It will be found that any other combinational hole combination will set up proper factoring contacts to insure the proper block 131 being energized.

It will be understood that cam contacts 133 and 134 make at the beginning of a card cycle. The time of making these contacts is identical with the time that a circuit making device, generally designated 135, establishes contact between the contact block 131 that represents digit zero and common conducting segment 136. This device 135 comprises two arms 137, 138, spring connected to a cross arm 139 which in turn is fixed to shaft 140 driven in unison with the contact cams shown diagrammatically higher up in the diagram. The timing of the switch device 135 is such that one of the arms 137 or 138 passes from the zero to the 6 contact block in synchronism with the rotation of the type sectors 30 in Fig. 1. Consequently, at the time when the arm 137 contacts with live segment 6 a circuit will be established through cam contacts 133, 134, through the factoring contacts already traced, through live segment 6, commutator 135, common segment 136, wire 141, to magnet 41, and thence back through wire 142 to the other side of the line. The energization of magnet 41 releases the pawl 42, which engages the proper tooth 43 to stop sector 30 with the 6 type in printing position.

At the end of the card cycle it is necessary to release latches 105 to permit the various armature assemblies to drop preparatory to setting up a new combination. For this purpose magnet 107 is provided, which, as previously explained, acts on restoring rod 106 to trip latches 105. Magnet 107 is in a circuit 144 from left side of line and including the cam contact 145 from which wire 146 extends to the right side of the line. At the proper time in the cycle contact 145 is made thus permitting momentary energization of magnet 107 and the releasing of latches 105.

In the above description the operation has

been described for one group combination and for one card column. The restoring mechanism just described need not be duplicated for additional columns of brushes, but may be common to them all.

I claim:

1. An apparatus for printing record cards, comprising means for feeding cards through the machine, means for reading the combinational perforations in each card, means for translating the readings, and means for printing the translation on the card itself.

2. An apparatus comprising in combination, means for feeding record cards, means for reading combinational perforations in the cards, means for translating said readings, and means for printing on each card, the translation of the perforations on that card, said translating means including a plurality of factoring contacts.

3. A record controlled apparatus comprising in combination, means for feeding record cards, electric means for reading combinational perforations in the cards while they are in motion, means including a set of factoring contacts for translating said readings, and means controlled by a circuit through said factoring contacts for aligning type for printing said translations on said cards.

4. A record controlled apparatus comprising means for feeding record cards, means including a plurality of contact brushes for analyzing combinational hole perforations in the cards, said brushes being in circuits with magnets which actuate armatures controlling factoring contacts adapted to interpret the meanings of the combinational perforations, and means controlled by said circuits for causing the printing of said interpretations on the cards.

5. A card controlled apparatus comprising in combination, a device for feeding combinational hole record cards, means for taking an instantaneous reading of the perforations in the cards while they are in motion, magnetically actuated contacts controlled by said reading means for selectively establishing circuits in accordance with the readings, and magnetically controlled devices for imprinting each card in accordance with the reading of its perforations.

In testimony whereof I hereto affix my signature.

JAMES W. BRYCE.