

April 3, 1928.

J. W. BRYCE

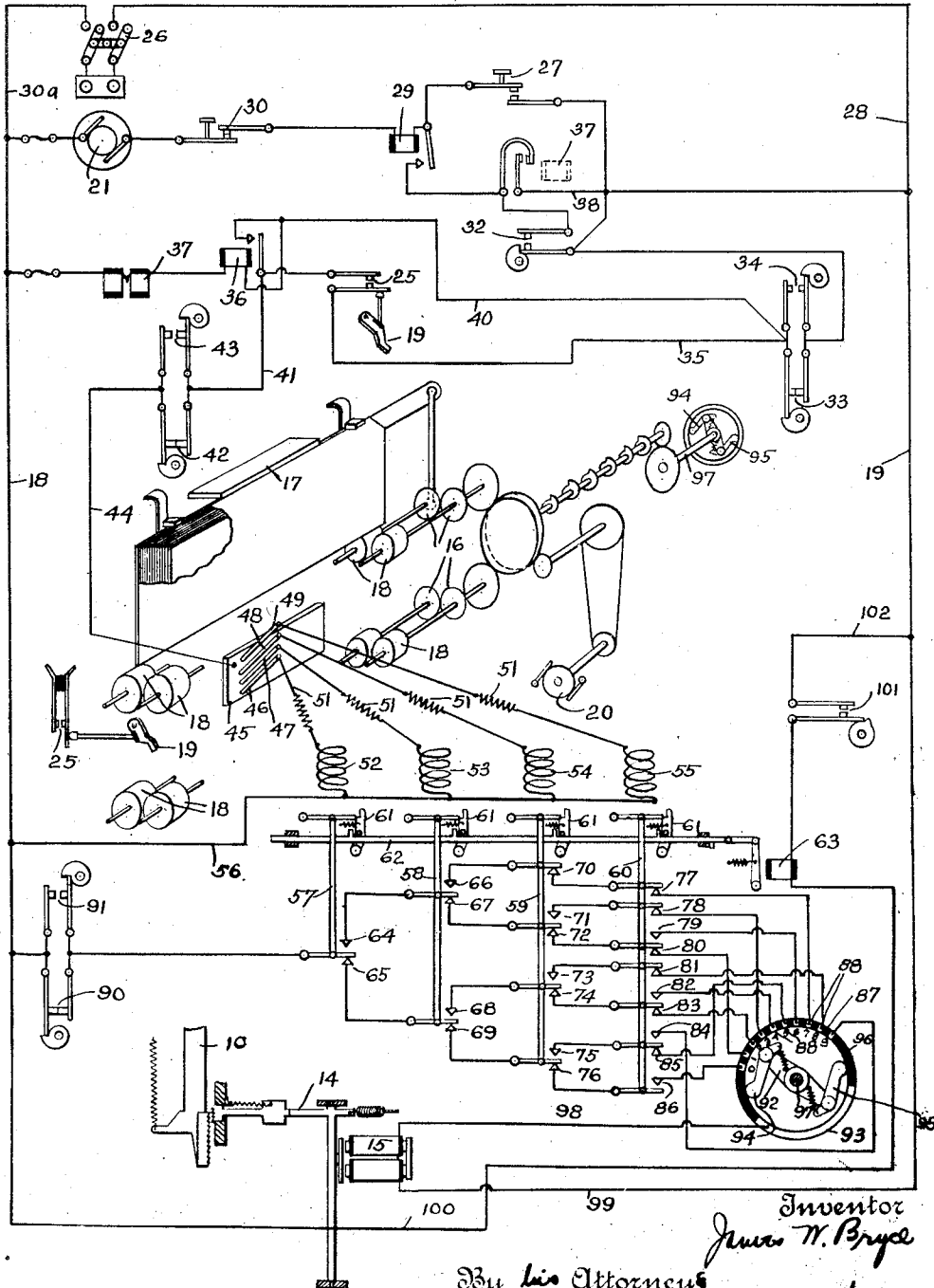
1,664,539

BRUSH READING DEVICE FOR COMBINATIONAL HOLE RECORDS

Filed June 11, 1924

2 Sheets-Sheet 1

Fig. 1.



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2 Sheets-Sheet 2

Fig. 3.

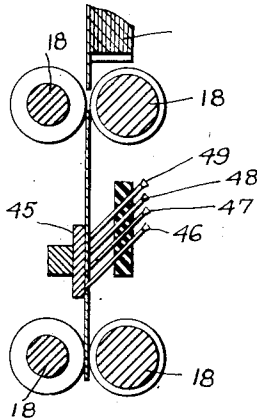


Fig. 4.

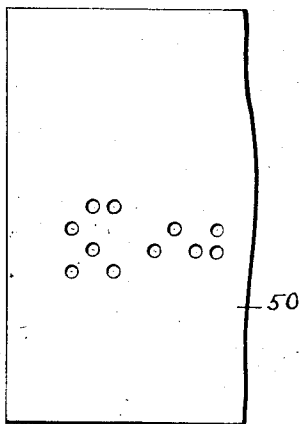


Fig. 5.

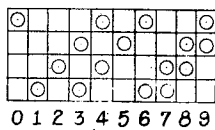
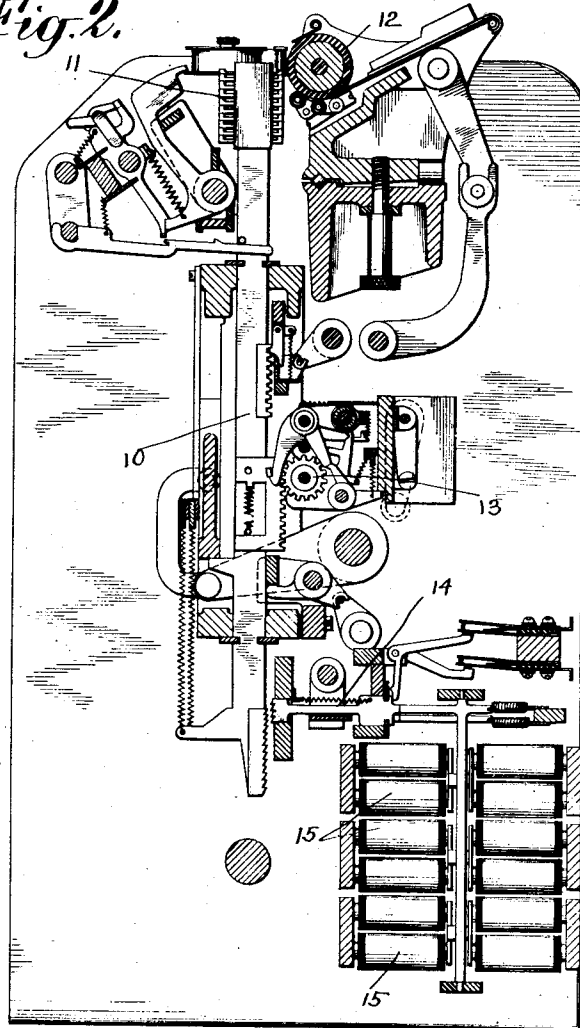


Fig. 2.



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UNITED STATES PATENT OFFICE.

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BRUSH READING DEVICE FOR COMBINATIONAL HOLE RECORDS.

Application filed June 11, 1924. Serial No. 719,453.

This invention relates to record-controlled machines and is more particularly directed to the provision of means for analyzing a combinational hole form of record without interrupting the feed of the records through the machine.

In tabulating machines and other record-controlled machines there are two general systems of perforated records. One is the Hollerith digit system in which a single hole is placed in a column, which hole or index point perforation by its location in that column designated the value of the perforation. The other form of machines utilizes so-called combinational hole records in which combinations of several holes are variously disposed in certain hole spaces to determine both by their location and number the value of the character which is to be expressed or designated thereby.

Heretofore with machines of the Hollerith type it has been the practice to utilize brush reading devices for reading the perforated records. The records are kept in continuous movement through the machine and readings are taken by the brushes while the records are in motion. In other forms of machines known as the Peirce type of machine in which combinational hole readings are taken it has been the general practice to utilize pins for reading the combinational hole records. In order to read records with pins it is necessary that each record be brought to a stop while the reading is taken therefrom.

The present application is directed to an improved means for reading combinational hole records preferably by means such as brush reading devices which are adapted to derive the reading from the records while the latter are in motion.

A further object of the present invention resides in the provision of suitable means for converting the combinational brush reading in a single reading which is adaptable to control any desired parts or devices such as the adding or printing section of a tabulating machine.

A further object of the present invention resides in the provision of suitable means for converting the combinational brush reading into a single reading which is adapt-

able to control any desired parts or devices such as the adding or printing section of a tabulating machine.

A further object of the present invention resides in the provision of means for controlling a tabulating machine or the like by record cards in which the record is in combinational hole form and in which the reading or sensing of the records is effected while the records are in continuous motion through the machine.

A further object of the present invention resides in the provision of means for electrically converting the combination hole reading into a single reading which will be adapted to control the operation of the devices in the machine.

Further objects and advantages of the present invention will be hereinafter pointed out in connection with the accompanying specification and shown in the drawings which, by way of exemplification, show one embodiment of the invention.

In the drawings:

Fig. 1 is a circuit diagram of the machine.

Fig. 2 is a sectional view of the tabulating machine counter which may be used in connection with the reading devices herein described.

Fig. 3 is a detail sectional view of the brush reading devices.

Fig. 4 is a fragmentary view of a record card perforated with combinational hole records.

Fig. 5 is a diagrammatic view showing the code combinations of the perforated records.

The tabulating action to which the present invention as shown is applied as illustrated in Fig. 2 and comprises rack bars 10, which rack bars at their upper ends carry type 11 cooperating with a record carried by the platen 12. 13 designates an accumulating mechanism. In the operation of the machine the rack bars are raised in synchronism and are arrested at differential positions by means of latch devices 14. These latch devices are controlled by magnets 15, there being an individual pair of magnets 15 for each column and for each rack. Tabulating machines of this class are more fully shown and described in the co-pending application of John Royden Peirce,

Serial No. 693,572, filed February 18, 1924. In order for such machines to tabulate it is necessary that the controlling magnets 15 be selectively energized at different times in the raising cycle of racks 10. The means for effecting such energization of magnets 15 will subsequently be described.

While I have herein shown tabulating printing devices which are to be controlled in accordance with the designation value of the combinational hole records, it will be understood that the brush reading and controlling devices may be utilized in connection with any devices which are to be controlled by combinational hole records.

To start the tabulator in operation the operator first closes main line switch 26 to the source of supply. Thereafter start key 27 is depressed which, upon the closure of its contacts, establishes a circuit from line 28 through start key 27, lower relay magnet 29, stop key 30. Tabulating motor 21 and back through wire 30^a to source. The energization of the motor relay magnet 29 establishes a holding circuit for the tabulating motor 21 through the armature of motor relay magnet 29, through cam contacts 32 which are closed after the motor has rotated the parts and thence back through wire 28 to source. Cards now pass downwardly through the feed rolls and close the card contacts 25. The movement of the cards is effected in the usual manner from motor 20 through belt and pulley driving connections and a suitable magnetically operated clutch not shown which in turn drives gearing 16 which actuates picker 17 and feed rolls 18. The contacts 25 are actuated by card lever 19 which is of the usual and conventional form and adapted to be displaced upon the passage of a card. These parts are shown duplicated in the diagram in order to simplify the wiring diagram. Cam contacts 33 and 34 are make and break cam contacts usually used in tabulating apparatus and serve to establish a circuit 35 to the card lever contacts 25 and to interrupt this circuit once per card cycle. The closure of the card lever contacts 25 when circuit 35 is established, energizes counter control relay magnet 36 and motor control relay magnet 37, current flowing from these magnets back to source. The attraction of the armature of the motor control relay 37 establishes another holding circuit for the tabulating motor through a line 38 and thence through the rest of the circuit, as previously traced. This holding circuit maintains the machine in operation when cam contacts 32 break once per card cycle. The purpose of contacts 32 is to interrupt the tabulating operation upon the de-energization of motor control relay 37 after the last card has passed through the machine and permit contacts 25 to open.

The foregoing description refers to those

circuits and operations of the machine which are customary and usual in all devices of this class.

In taking combinational hole readings by means of brushes and with the records in motion, it will be appreciated that any given designating value or combination of perforations is only momentarily under the brushes and that in this instant the reading must be taken. Prior to this instant and subsequently thereto other brush readings must be suppressed, otherwise readings might be taken of combinations of perforations which do not in any way represent a value. This is inherent in the Peirce combinational hole system since the system is based not only upon the number of holes in the combination, but upon their relative location upon the record. If the location of the holes with respect to the fixed reading brushes changes, the derived reading will be different.

The energization of the counter control relay 36 attracts its armature and closes a circuit 40 supplied from make and break contacts 34, 33. From wire 40 current flows through the armature of relay 36, thence through a line 41 to cam contact devices 42, 43. These cam contact devices close once per card cycle and are supplemental to those previously utilized in tabulating machines. The purpose of these contacts is to establish the brush circuit just at the time the combinational group of holes pass under the multiple brushes and to immediately interrupt the circuit after energization of the magnet or magnets controlled thereby and before another combination of holes comes under the brushes. From cam contacts 42, 43, a wire 44 leads to a common contact bar 45. Cooperating with this bar are a plurality of brushes 46, 47, 48 and 49. These brushes are normally kept out of electrical contact with the common bar 45 by means of the card material and establish contact therethrough when index point perforations are under the brushes. The vertical spacing of each set of brushes is in accordance with the vertical spacing of the combinational holes on the card 50 as shown in Fig. 4. Inasmuch as the combinational hole system provides four hole spaces four brushes are provided which are vertically separated the distance of the vertical sectors of the hole spaces. These brushes will establish circuits in various combinations in accordance with the combinations disposed thereunder. Each brush is provided with a wire containing resistance 51 which connects to respective magnets 52, 53, 54 and 55. A common line 56 connects with all of the magnets and extends back to the main supply lead 18. It follows therefore that if there is only a lower hole perforated in the card, magnet 52 will be energized. If a hole is present in the second hole space from the bottom, 53 will be energized, in the

third hole space, 54 will be energized, and in the upper hole space, 55 will be energized. Also if two or more holes are present in the combination two or more of the magnets 52, 53, 54 and 55 will be energized. For clearness the circuit through magnets 52 to 55 inclusive will be again traced: From line 28 through cam contacts 34, 33 wire 40, armature of relay 36, cam contacts 43, 42, wire 44, common brush bar 45 to one or more of brushes 46, 47, 48, 49, to one or more of magnets 52, 53, 54, 55 and back through wire 56 to source.

It will be understood that there is one row of brushes for each record card column and that in the present diagrammatic showing there is only one row of these brushes illustrated.

Magnets 52 to 55 for each record card column are selectively energized in accordance with the instant combinational value reading under the brushes at the time the brush circuit is made. Inasmuch as this brush circuit is immediately interrupted to prevent an improper subsequent re-selection and re-energization of the magnets. It is necessary that the instantaneous reading be held for such time as is necessary for the other parts to function and convert the combinational selective energization reading into a single reading corresponding to the designating value of the combination. The means for accomplishing these results will now be described.

Magnets 52 to 55 inclusive, when energized, are each adapted to draw upwardly through respective armature structures 57, 58, 59 or 60. After these armatures are drawn up by the energization of the magnets they are latched by individual latches 61. These latches are spring-operated in one direction and are adapted to be restored at the proper time in the cycle by means of a suitable restoring bar 62 which is magnetically actuated by magnet 63. Associated with armature 57 are upper and lower contacts 64, 65. Associated with armature 58 are two pairs of contacts 66, 67 and 68, 69. Associated with armature 59 are contacts 70, 71, 72, 73, 74, 75 and 76. Associated with armature 60 are contacts 77, 78, 79, 80, 81, 82, 83, 84, 85 and 86. These last contact points are wired to conducting segment plates on an insulated segment 87. These segment plates 88 are respectively valued at from 1 to 9 as shown in the diagram and, in addition, there is an additional conducting segment marked zero. The purpose of contacts 64 to 86 inclusive, is to factor out a combinational hole reading and convert the same into a reading which will selectively energize one or more of the segment plates 88 in accordance with the value of the combinational reading. The operation will be best understood by taking a particular com-

binational hole reading and tracing the resulting circuits secured thereby. From the left side of line current flows through cam contact devices 90 and 91 to the armature structure 57. It will be assumed for explanation that the numeral 6 be perforated on the card which, by referring to Fig. 5, is seen to comprise a hole space perforated in the first or bottom position and in the fourth or top position. Consequently, armatures 57 and 60 will be drawn up and latched whereas 58 and 59 will be left down. Now tracing the circuit current will flow from left side of line through 90, 91, through upper contact 64, through lower contact 67, through lower contact 72, through upper contact 79 to the No. 6 conducting segment 88. In this way the No. 6 segment will be rendered live.

It will be understood that cam contacts 90 and 91 make at the beginning point of a card cycle. The time of making of these contacts is identical with the time that a circuit making device, generally designated 92, establishes contact between zero segment 88 and common conducting segment 93. This device 92 comprises two arms 94, 95, spring connected to a cross arm which in turn is fixed to a shaft 97 driven in unison with the cams as shown in the upper part of the diagram. The timing of the operation of the switch device 92 is such that one of the arms 94 or 95 passes from the zero to 6 segment point in synchronism with the upward movement of the racks 10 in Fig. 2. Consequently at the time when the arm 94 contacts with live segment 6 a circuit will be established through cam contacts 90, 91, through the combinational contacts previously described, through live segment 6, through switch device 92, common segment 93, wire 98 to magnet 15 and thence back through wire 99 to the other side of line 19. The energization of magnet 15 releases the pawl device 14 and differentially arrests the rack or other device 10 in the usual manner. At the end of the card cycle it is necessary that the latches 61 be released to permit the various armature assemblies to drop preparatory to setting up a new combination. For this purpose magnet 63 is provided which, as previously explained, acts upon restoring rod 62 to trip the latches 61. Magnet 63 is in a circuit connected to the left side of the line 18 and also including a pair of cam contact devices 101 from which wire 102 extends to the right side of the line. At the proper time in the cycle cam contact devices 101 make momentarily thus permitting the momentary energization of the magnet 63 and the releasing of the latches 61.

In the description the operation has been described for one group combination and for one group column. The operation of other groups may be traced by considering the

armatures in the various other relative positions which they occupy. It will be understood also that the description has only set forth one column of mechanism and that in 5 complete machines as many columns of mechanism may be used as desired. These additional columns will be identical to the one herein described. The restoring magnet 63 and the restoring latch device 62 need 10 not be duplicated but a single restoring mechanism may be provided cooperating with the latches 61 on different card columns.

In the present description no reference is 15 made to the total-taking mechanism as this may be of the usual sort.

What I claim is:

1. In a combinational hole record controlled machine, in combination with devices 20 which are to be controlled in accordance with the designating values of the combinational hole records, reading means including brushes and circuits controlled thereby for reading said combinational holes in the said 25 records while the latter are in motion, means for controlling said circuits so that a single combinational reading only may be taken by said brushes from each controlling record, means for holding said combination reading, 30 means for converting said combination reading into a single reading which represents the designating value of the combination, and means controlled by said last named means for controlling the first mentioned 35 devices.

2. A tabulating apparatus or the like, comprising in combination with means for feeding combinational hole records through the machine, printing devices and adding devices, means for controlling the operation of 40 said devices to set up the designating value of the combinational hole readings thereon, said means including means for sensing the combinational holes for a plurality of designations concurrently while the records 45 which contain said holes are in continuous motion through the machine.

3. In a combinational hole record controlled machine, in combination, means for 50 feeding records through the machine, means for sensing the combinational holes by an instantaneous reading means while the records are in motion, means controlled by said sensing means for establishing combinational 55 circuits in accordance with the derived reading, magnets in said circuits said magnets having armatures adapted to be attracted when the magnets are energized, means for latching said armatures, factoring contacts 60 controlled by said armatures, a commutator having its segments connected to said factoring contacts, a switch device adapted to sweep over said segments and a controlling magnet adapted to be energized when said

switch device reaches a live segment on said 65 commutator.

4. In a combinational hole record controlled machine, in combination means for feeding the combinational records there- 70 through, a plurality of brushes for sensing the perforations while the combination hole records are in motion, a plurality of factoring contacts adapted to control a single controlling circuit, and means for controlling 75 said factoring contacts in accordance with the brush reading of the combinational holes in the record.

5. In a combinational hole record controlled machine, in combination with combinational hole record feeding means, brush reading 80 devices for reading said combinational holes while the records are in motion, magnets controlled selectively by said brush reading devices, factoring contacts controlled by said magnets, means for controlling the brushes 85 whereby the same derive an instant single reading from the records, means for temporarily holding the setting of the factoring contacts and means for deriving a single reading in accordance with said maintained 90 contact setting.

6. A combinational index point record controlled machine comprising a single analyzing station including individual analyzing 95 means for completely analyzing each character designating field on a controlling record while the latter is in motion and means controlled by said analyzing means for converting the combinational index point character designations into time differential 100 equivalents.

7. A combinational index point record controlled machine comprising a single analyzing station including analyzing means for 105 completely analyzing the character designating fields of a moving record, means for feeding records through the analyzing station in the direction of spacing of the combinational index points of a record field and means controlled by said analyzing means 110 for manifesting represented characters.

8. In a combinational index point record controlled machine adapted to operate concurrently upon a plurality of character designating record fields, analyzing means for 115 simultaneously sensing a combinational index point designation while the records are in motion and means for converting said combinational reading into a time differential equivalent. 120

9. In a combinational index point record controlled machine, electrical analyzing means consisting of sensing brushes for 125 simultaneously analyzing a combinational index point designation while the records are in motion and electrical means comprising a circuit controlled by said brushes for controlling converting mechanism to trans-

form said combinational reading into a time differential equivalent.

10. In a cyclically operable index point record controlled machine, analyzing means individual to each character designating record field for simultaneously sensing the combinational index point designation for a single character during a cycle of machine operation while the record is in motion and means for converting said combinational reading into a linear differential equivalent.

11. In a combinational index point record controlled machine adapted to operate concurrently upon a plurality of character designating record fields, analyzing means for sensing a combinational index point designation while the record is in motion, means controlled by said analyzing means for effecting a set up corresponding to a complete character designation and means for converting said set up into a timed operation for manifesting said designation.

12. In a combinational index point record controlled machine adapted to operate concurrently upon a plurality of character designating record fields, analyzing means for simultaneously sensing a combinational index point designation while the record is in motion, means controlled by said analyzing means for effecting a set-up corresponding to said designation, means for converting said set up into a timed operation and means controlled by said timed operation for manifesting said designation.

13. In a cyclically operable machine of the class described adapted to operate upon a record in a plurality of different fields thereof while the record is in continuous motion through the machine, electrical analyzing means for sensing a combinational index point character designation during a cycle while the record bearing the designation is in motion, a plurality of spaced electrical contact points, one for each possible character designation of a record character field, means controlled by said analyzing means for selectively energizing the contact point corresponding to the record designation, a control circuit controlled by said contact points, means operable during the machine cycle for engaging each contact point in succession for energizing said control circuit at a time in the cycle corresponding to the position of the energized contact point and means selectively controlled by the time of energization of said control circuit for indicating the designated character.

14. In a machine of the class described, adapted to operate upon a record in a plurality of different fields thereof while the record is in continuous motion through the machine, analyzing means for sensing a combinational index point character designation during an operative machine cycle while the record bearing the designation is in motion,

a control circuit and a cyclically operable timing device for fixing the time of energization thereof in accordance with the sensed designation and means controlled by the time of energization of said circuit for selectively indicating the designated character.

15. In a machine of the class described, adapted to operate upon a record in a plurality of different fields thereof while the record is in continuous motion through the machine, analyzing means for simultaneously sensing a combinational index point character designation during an operative machine cycle while the record bearing the designation is in motion, a control circuit and a cyclically operable timing device for controlling the time of energization thereof in accordance with the sensed designation and means controlled by the time of energization of said circuit for selectively indicating the designated character.

16. In a cyclically operated machine of the class described, analyzing means for sensing a combinational index point character designation on a controlling record while the record is in motion, cyclically operable indicating means manifesting in different positions different possible characters on a character designating record field, the operating cycle of said indicating means being non-synchronous with the machine cycle, electrical timing means controlled in its operation by a sensed combination on the controlling record and selective means controlled by said timing means for selecting a manifesting position of said indicating means corresponding to a sensed character designation.

17. In a cyclically operable machine of the class described, electrically analyzing means for sensing a combinational index point character designation on a controlling record while the record is in motion, cyclically operable indicating means manifesting in different positions different possible characters on a character designating record field, the operating cycle of said indicating means being non-synchronous with the machine cycle, electrical timing means controlled in its operation by a sensed combination on the controlling record and selective means controlled by said timing means for selecting a manifesting position of said indicating means corresponding to a sensed character designation.

18. In a cyclically operable machine of the class described adapted to operate concurrently upon a plurality of character designating record fields, analyzing means for sensing combinational index point designations while the record bearing them is in motion, a cyclically operable device manifesting in different positions different possible characters represented by combinational designations on said record, the oper-

ating cycle of said device being non-synchronous with the machine cycle and means controlled by said analyzing means for selecting a manifesting position of said device
5 corresponding to a sensed combination.

19. A combinational index point record controlled machine adapted to operate upon a record in a plurality of different fields thereof while the record is in continuous
10 motion through the machine comprising record feeding means, analyzing means for searching moving records on which characters may be represented by combinational index point designations in which each index point of a combination has reciprocal
15 character designating properties with every other index point of the combination and means controlled by the analyzing means for translating represented characters into time differential equivalents.
20

20. A combinational index point record controlled machine comprising analyzing means for searching moving records on which characters may be represented by combinational index point designations in which
25 each index point of a combination has reciprocal character designating properties with every other index point of the combination, means for feeding records to the analyzing means in the direction of spacing of index
30 points of a combination and means controlled by said analyzing means for manifesting represented characters.

21. A combinational index point record
35 controlled machine adapted to operate upon

a record in a plurality of different fields thereof while the record is in continuous motion through the machine comprising record feeding means, analyzing means for searching moving records on which characters may be represented according to a combinational index point system in which certain characters may be represented by single index points and others by a combination
40 of index points in which each index point has reciprocal character designating properties with every other index point of the combination and means controlled by the analyzing means for translating represented characters into time differential equivalents.
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22. A combinational index point record controlled machine comprising analyzing means for searching moving records on which characters may be represented according to a combinational index point system
55 in which certain characters may be represented by single index points and others by a combination of index points in which each index point has reciprocal character designating properties with every other index point of the combination, means for feeding
60 records to the analyzing means in the direction of spacing of index points of a combination and means controlled by said analyzing means for manifesting represented characters.
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In testimony whereof I hereto affix my signature.

JAMES W. BRYCE.