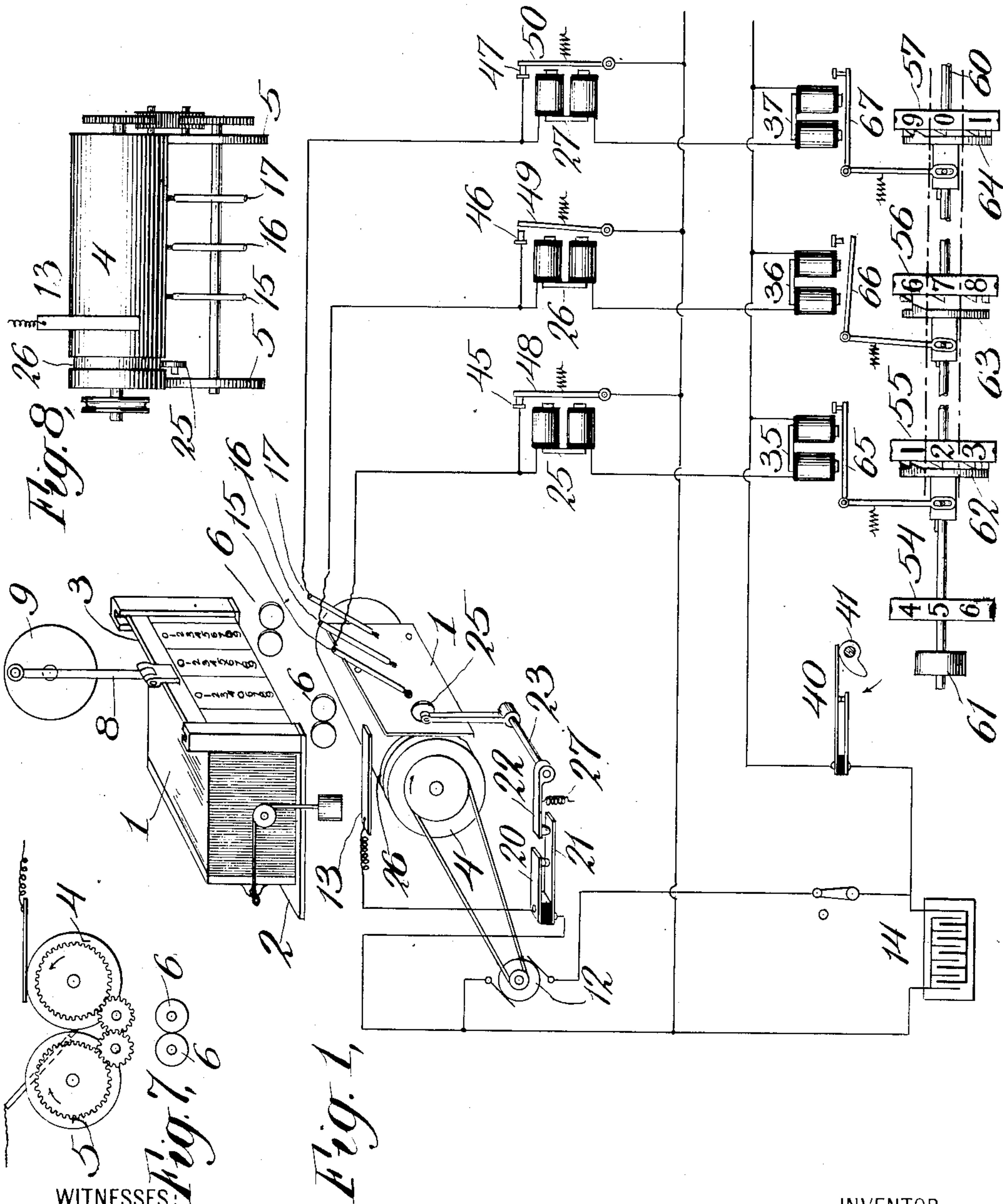


H. HOLLERITH.
 REGISTERING APPARATUS FOR TABULATING SYSTEMS.
 APPLICATION FILED AUG. 17, 1905.

945,236.

Patented Jan. 4, 1910.

3 SHEETS—SHEET 1.



WITNESSES:

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Robt. B. Killgore

INVENTOR

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3 SHEETS—SHEET 2.

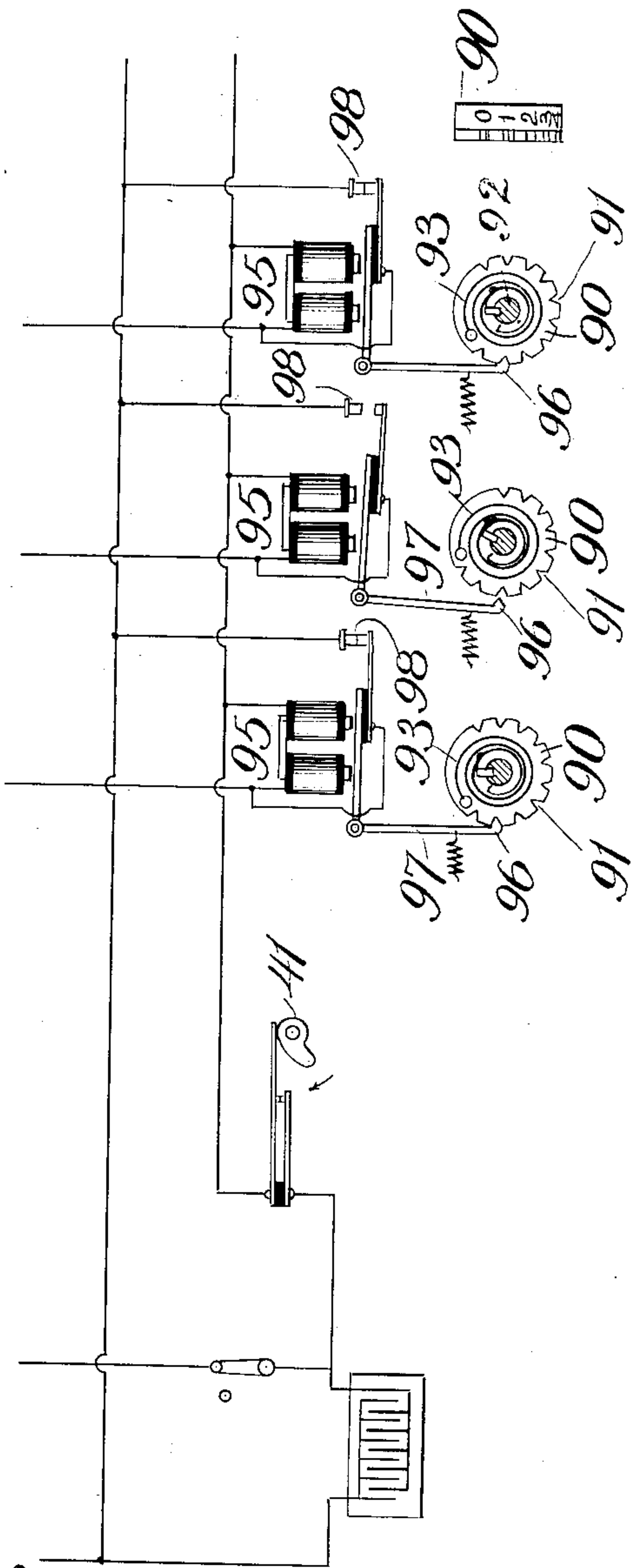


Fig. 3.

WITNESSES:

O. H. Hopwood.

Robert B. Killgore

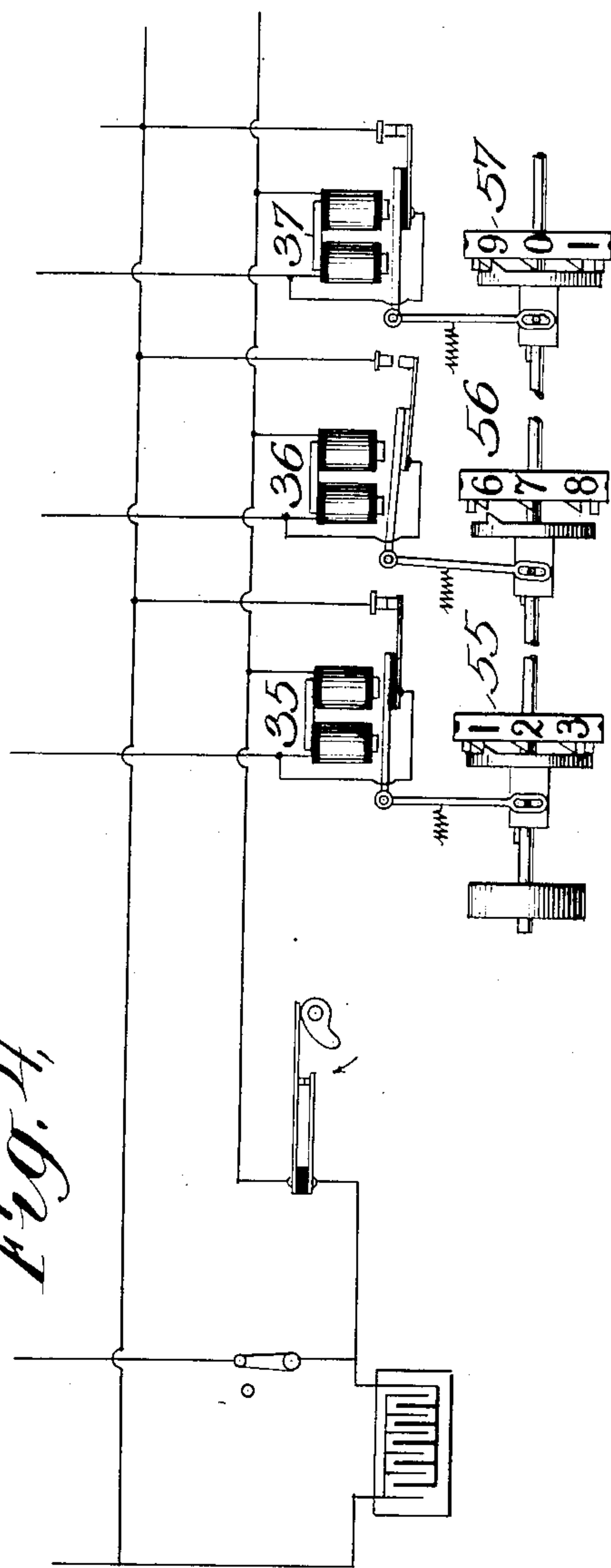


Fig. 4.

INVENTOR

Herman Hollerith

BY

J. M. [Signature]

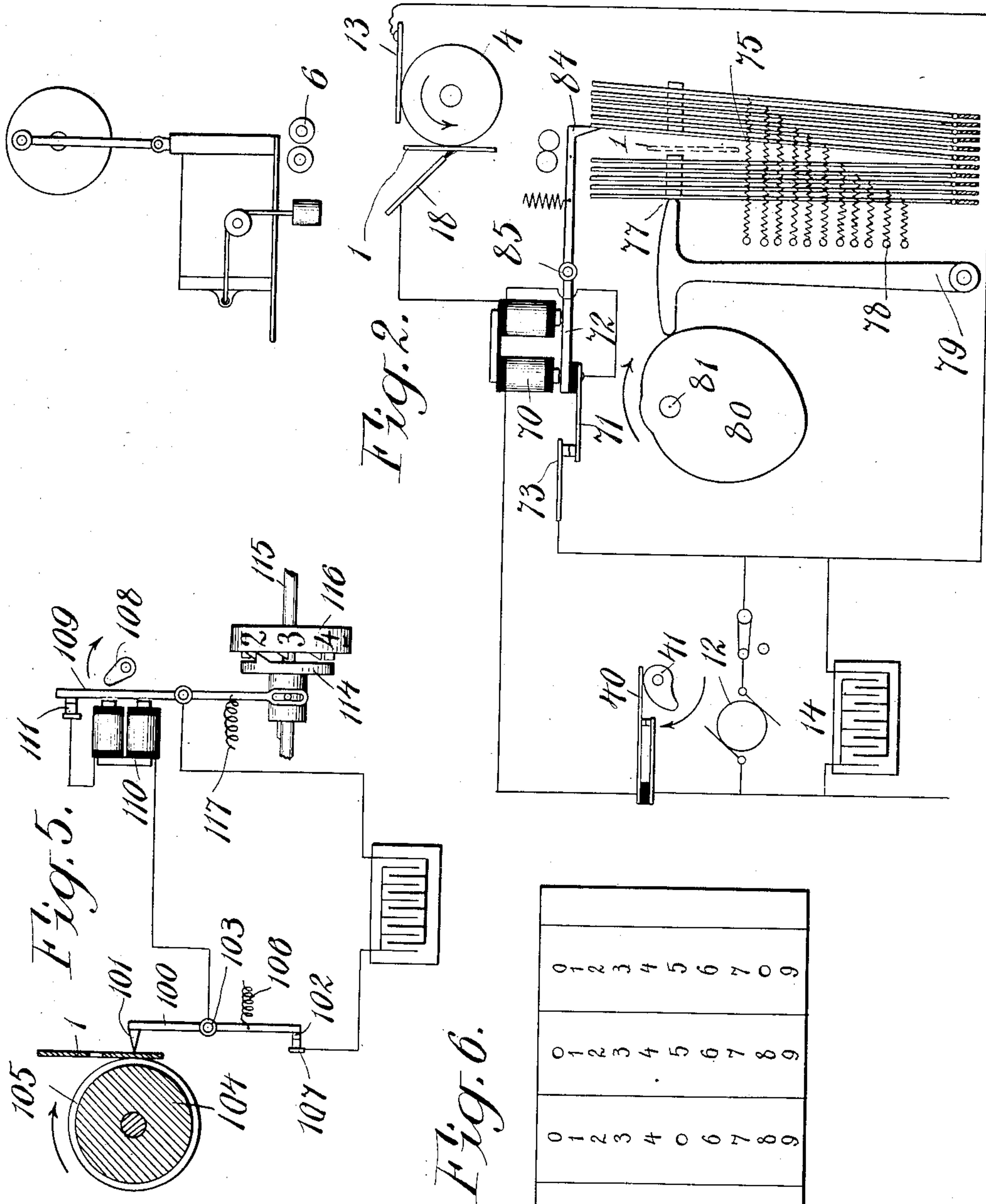
ATTORNEY

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3 SHEETS—SHEET 3.



WITNESSES:
B. Feinlicht
Leonard Hiehl

0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9

INVENTOR
Herman Hollerith
BY *J. M. Metcalf*
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UNITED STATES PATENT OFFICE.

HERMAN HOLLERITH, OF GARRETT PARK, MARYLAND, ASSIGNOR TO THE TABULATING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

REGISTERING APPARATUS FOR TABULATING SYSTEMS.

945,236.

Specification of Letters Patent.

Patented Jan. 4, 1910.

Application filed August 17, 1905. Serial No. 274,641.

To all whom it may concern:

Be it known that I, HERMAN HOLLERITH, a citizen of the United States, and a resident of Garrett Park, Montgomery county, Maryland, have invented certain new and useful Improvements in Apparatus for Use in Tabulating Systems, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

The object of this invention is to provide means for operating registering and other apparatus used in the Hollerith tabulating system in which is employed a record card having index-points, preferably punched holes, which are located on each particular record card in accordance with the data which that card represents. The system, of which these record cards form a distinguishing characteristic, comprises apparatus for registering the items constituting the record formed on each record card and totalizing or integrating the items of any desired number of the record; apparatus for indicating, without totalizing, the record on each card; apparatus for sorting or classifying the record cards into groups; apparatus for verifying the accuracy of the record on each card by rejecting or separately grouping such records as may contain inconsistent or incongruous items and other apparatus for performing analogous or incidental operations in the complete tabulation of the records.

The operation of the apparatus above referred to is all variably controlled by the record cards and the result of each operation thereof depends on the particular record on the card, which is then in control of the apparatus, and I have therefore hereinafter in referring to such apparatus, whether employed for integrating, sorting or verifying the records, for indicating the items of a record or for the other purposes referred to, described it generically as apparatus adapted to be operated according to the location of the index points on the record card.

My invention comprises the use of a record such as described, and in which the index-point positions are arranged in column, a record-actuated device, such, for example,

as a pair of electrical contacts, common to all the index-point positions of a column, which are put in action by the index-point, an operating circuit initially controlled by the record-actuated device or contacts, and means for holding such circuit under control for a variable period during each cycle of the machine, the duration of which is determined by the location of the index-point in its column. Electricity is the agent preferably employed for effecting the control or operation of the apparatus but it is not my intention to restrict my invention to the employment of that particular operating or controlling agent since other equivalent means may be employed instead of an electric circuit or circuits and electrically operated devices hereinafter described; but I consider electricity to be the most advantageous agent and have therefore selected, for the purpose of description, an electrically operated apparatus, and in this connection it is to be understood that where electricity is employed as an actuating or controlling agent the apparatus may be arranged for operation either on open or closed circuits.

My invention also comprises an apparatus of the character referred to, actuated by means of a record-card with index-point positions arranged in column, having a record-actuated device common to the index-point positions of a column, registering, indicating or sorting devices and an electro-magnet for controlling their operation which is held under control for a variable period during each cycle of operation of the apparatus.

My invention, in its specific relation to the registering and indicating apparatus referred to, also comprises means for starting the movement of the registering or indicating members and means for stopping such movement, one of said means being actuated when the record-actuated device is actuated by its index-point and the other of said means being actuated at a fixed point in the movement of the record, whereby a variable movement is imparted to the registering or indicating member, the extent or duration of which is determined by the location of the index-point on the record, which is moved relatively to the record-actuated device.

In the accompanying drawings, Figure 1 is a diagrammatic view, (shown partially in perspective), of my invention arranged to operate registering devices; Fig. 2 is a similar view showing my invention arranged for sorting or grouping the records; Fig. 3 is a partial diagram showing indicating devices; Fig. 4 is a similar diagram showing a modification of the arrangement illustrated in Fig. 1; Fig. 5 is a diagrammatic view showing a modification of the record-actuated contacts and circuit; Fig. 6 is a view of a record card on a larger scale; Fig. 7 is a detail end view of the card feeding and contact mechanism and Fig. 8 is a plan view thereof.

Similar reference characters are employed to designate like parts in all the views.

In the form of record-card which I have selected for the purpose of illustrating and describing my invention, but without intending to limit my invention thereto, the index-point positions, as shown in Fig. 6 are denoted by printed figures arranged in groups, each group consisting of one or more columns of figures comprising the nine digits and a cipher substantially as shown in my U. S. Letters Patent No. 777,209, with the cipher, (except in Fig. 5), at the top of each column in horizontal alinement and the digits following in order down each column to the figure 9. To secure brevity in this description I have shown only three columns of index-point positions, it being assumed that each card contains a record of value or of amount which does not exceed one thousand, but this theoretical form of record will enable the principle of operation of my present invention to be readily understood. In Fig. 1 I have illustrated my invention in a simple form adapted to integrate these records and to operate electrically.

Referring for the present to Fig. 1, a sufficient number of the records 1 are placed on edge, with the cipher at the top, upon a suitable platform 2 and are fed one by one to the action of the record-actuated contacts, to be presently described, by a reciprocating cross head 3, rotating drum 4, feed rollers 5 and, if desired, supplemental feed rollers 6. As this feeding mechanism may be substantially similar to that shown and described in my U. S. Letters Patent No. 685,608, dated October 29th, 1891, further description thereof in this specification is unnecessary except to state that the cross head 3 is reciprocated by a connecting rod 8 actuated by the crank disk 9 which is constantly driven in synchronism with the feed rollers, rotating drum 4 and other parts of the apparatus hereinafter referred to, by a suitable motor 12. The drum 4, as shown in Fig. 1, is made of conducting material and forms one terminal of an electric circuit, current being con-

veyed thereto by the conducting brush 13, which is connected with a suitable source of energy such as the battery 14. Conducting brushes 15, 16 and 17, insulated from each other are supported adjacent to the drum 4 so that their flexible ends, which are normally in contact therewith, are separated therefrom when a card is fed down between them and the drum. Each of the conducting brushes, (15, 16, 17), forms, with the conducting drum 4, a pair of electrical contacts which are actuated, or permitted to come together and move apart, by the record, and I therefore, for the sake of brevity, refer to each pair of these contacts as record-actuated contacts. The right hand column of index-point positions on the cards represents units, the middle column tens and the left hand column hundreds and to transfer an item, say the number 508 to the card, a hole is punched in the left hand column at the position denoted by the figure 5; in the middle column at the position denoted by the cipher and in the right hand column at the position denoted by the figure 8. When the card is fed down between the brushes and drum the index-point positions of each column, each of which represents a different characteristic or amount, are presented successively to the brushes or record-actuated devices, and when the punched hole in a column registers with the brush for that column, the brush will contact with the drum and an electrical contact will be established momentarily. The time at which the record-actuated devices are thus actuated to establish such contact, depends upon the location of the punched hole constituting the index-point, and in order that the circuit shall be established initially only through these contacts I provide a contact which will hold the circuit open at another point at all times when no card is between the drum and the brushes, as for instance during the period that elapses between the passage of successive cards. This contact is preferably, but not necessarily, actuated by the card itself and as shown it consists of the opposed spring-contact-arms 20 and 21 tending to close the circuit. A spring-depressed rock arm 22 engages the contact arm 21 and is secured to the rock shaft 23, to which is also secured an arm 24, carrying the roller 25. The roller 25, when no card is in position between the brushes 15, 16 and 17 and the drum 4, is held lightly in the groove 26 on the drum by the spring 27, and the arm 22 will hold the contacts 20 and 21 separated, but when a card is fed down it will pass between the drum 4 and the roller 25 forcing the latter out of the groove 26, raising the arm 22 and permitting the contacts 20 and 21 to come together to close the circuit.

Still referring to the particular form of apparatus illustrated in Fig. 1, each of the

brushes 15, 16 and 17 is separately connected in circuit with one of the relay magnets 25, 26 and 27. The magnet 25 is connected with a magnet 35, the magnet 26 with the magnet 36 and the magnet 27 with the magnet 37. The magnets 35, 36 and 37, which I may designate as control magnets to distinguish them from the relay magnets, are connected to the return wire through the contacts 40. The contacts 40 are arranged to be separated to break the circuit simultaneously through all the magnets, by a constantly revolving cam 41, at the instant the advancing movement of the card brings the index-point positions, denoted by the ciphers, under the brushes 15, 16 and 17. Each of the contacts 45, 46 and 47 is connected in series with one of the relay magnets and with its connected control magnet and each of the armatures 48, 49 and 50 of the relay magnets is separately connected to the opposite side of the line, so that when a circuit is established through any of the relay and control magnets by the card-actuated contacts, which are closed only momentarily, the armature of the relay magnet will be attracted to its contact, closing a circuit at that point which will include the coils of the relay and control magnets and such circuit will be held closed, after the record-actuated contacts are separated, until it is broken by the cam 40 at the instant the zero index-point positions on the advancing record are under the brushes.

The specific devices adapted to be operated according to the location of the index-points on the record card which I have illustrated in Fig. 1 comprise a register wheel or member and suitable driving means therefor, such as a clutch disk. Three such register wheels, 55, 56 and 57 are illustrated in Fig. 1 which is intended to illustrate a typical form of registering apparatus; but their number may of course, be varied, as desired. Any desired form of registering apparatus embodying directly actuated registering members with means for carrying or transferring from one member to that of the next higher order, accumulating members and zero resetting devices may be employed, and I have therefore not considered it necessary to illustrate or describe the same in detail since their construction and operation are well understood by those skilled in the art.

In the registering apparatus, 54 represents the thousands wheel which is an accumulating wheel actuated only by the transfer mechanism, 55 indicates the hundreds wheel, 56 the tens wheel, and 57 the units wheel, and the wheels are provided with a suitable sight opening, (indicated by dotted lines), through which only one number of each wheel is exhibited. Each wheel is mounted loosely on the shaft 60 which is constantly driven at a uniform speed by the pulley 61, suitably connected to the motor 12, in synchronism

with the moving card. The wheels are suitably supported so that the turning movement of the shaft 60 will not actuate the wheels until they are brought into positive connection therewith. Each of said wheels is provided with a series of peripheral numbers from 0 to 9, and in the form of apparatus illustrated this connection of the wheels with the shaft 60 is effected by means of a clutch, comprising a series of clutch teeth, one for each figure, on the wheels, and cooperating clutch members or disks 62, 63 and 64, splined on the shaft 60 so that they will slide on the shaft and turn therewith. These clutch members 62—64 rotate constantly in one direction during the operation of the machine, thus avoiding any reversal of movement and permitting the operation of the apparatus at high speeds and without objectionable vibration. Each clutch disk is provided with a clutch tooth which will engage a clutch tooth on its registering wheel when it is moved toward the wheel, locking the wheel and disk together so that the wheel will turn with the disk. The spring-retracted armatures 65, 66 and 67 of the control magnets are in the form of bell cranks and the depending arm of each bell crank is suitably connected to the hub of one of the clutch disks 62, 63 and 64. When any one of the control magnets is energized its armature will be attracted toward the magnet and the movement of the armature will carry the clutch disk connected therewith into locking engagement with its registering wheel. This engagement will be established by the closing of the circuit by the record-actuated contacts and will be maintained, after the record-actuated contacts are separated, by the circuit established through the relay contact until the circuit is broken at the contacts 40 by the cam 41. The shaft 60 is arranged to make one complete revolution while the index-point positions of a card pass under the brushes 15, 16 and 17. As will be understood the form and arrangement of the wheel-engaging devices or clutches are susceptible of modification, and I employ the term "clutches" in a broad sense as descriptive of any suitable connecting mechanism.

The operation of the apparatus illustrated in Fig. 1 is as follows: The punched cards being properly placed on the platform 2, the motor 12 is started and the cards are fed down so as to pass between the drum 4 and the brushes 15, 16 and 17. At the instant the lower edge of the card passes between the drum and the brushes the wheel 25 is, by the card, forced out of the groove 26 closing the contacts 20 and 21. Assuming that the record card denotes an item of 508 to be added to the total shown by the registering wheels, as the card advances the circuits between the drum and the brushes will all remain open until the index-

point 8 in the units column reaches the brush 17 when the latter will contact with the drum through the punched hole, closing the circuit through the magnets 27 and 37 and throwing the revolving clutch disk 64 into engagement with the register wheel 57. The control of the register wheel by the magnet 37 thus established through the card contacts is maintained, notwithstanding the momentary duration of the contact between the brush and the drum through the moving hole on the card, by the simultaneously established circuit, formed by the contacting of the relay armature 50 with the contact 47, through the coils of the magnets 27 and 37, the contacts 40 to the battery and back to the relay armature 50. When the 5 index-point in the hundreds column reaches its brush 15, the clutch disk 62 will be similarly actuated to impart the motion of the shaft 60 to the register wheel 55. The record under consideration will not close a circuit through the control magnet 36, because the cipher is punched in this column, and the circuit will be broken at the contacts 40, by the cam 41 when the cipher or zero index-point positions reach the brushes, and therefore the only movement imparted to the register wheel 56 will be that due to the transfer or carrying mechanism. When the circuit is broken at the contacts 40 the armatures 65 and 67 are released and the clutch disks 62 and 64 are drawn out of engagement with the registering wheels, which stop at this point in their movement. To each register wheel has been imparted a movement which corresponds with, and is determined by, the location of its index-point on the record card. Thus the wheel 57 will be rotated eight-tenths of one revolution or while 8 of the 10 index-point positions of the column pass under the brush, while the wheel 55 will be rotated five-tenths of one revolution or while five index-point positions are passing under the brush, so that 8 will be added to the units wheel, nothing to the tens wheel, except by the transfer mechanism, and 5 to the hundreds wheel. As the record passes from under the brushes it is deposited in a suitable receptacle, another record is presented and the action is repeated.

The form of apparatus embodying my invention which I have illustrated in Fig. 2 does not differ in its principle of operation from the apparatus hereinbefore described. The card feeding mechanism and card contacts are substantially alike in both forms of apparatus and require no further description. The devices adapted to be operated according to the location of the index-points comprise a plurality of movable guides for delivering or controlling the delivery of the record cards to different points so that the records are sorted or grouped ac-

ording to their index-points. Any scheme of sorting may be employed which is desirable in handling the records either before or after tabulation. The apparatus as shown is intended to sort the cards according to the location of the index-point in the hundreds column, the cards on which the item recorded is less than one hundred being delivered in one group, those on which the item between ninety-nine and two hundred being delivered in another group and so on. I have also illustrated in Fig. 2 a modification in the means for maintaining the control of said devices in which the relay magnet is dispensed with and the control of the control magnet 70 is maintained by means of a contact 71 actuated by the movement of the armature 72 to engage with a contact 73 to hold the circuit through the magnet closed after the separation of the card contacts. The sorting guides 75 are mounted directly below the card-actuated contacts and are so constructed that the ends of the guides, which are held apart by the separators 77, may be reciprocated across the path of the cards. The guides are movable separately with relation to each other but are yieldingly held to move in unison by springs 78 one of which is secured to each guide and which tend to move the guides to the left. The upper ends of the guides may be pivoted or they may be made of flexible material to permit the requisite reciprocating movement. The left hand guide of the series rests against a rock arm 79 which is engaged by a rotating cam 80 on the shaft 81 driven by the motor 12 and so arranged as to make one complete revolution for each card passing between the card contacts. As a card reaches the brush 18, (only one brush being employed in this modification), the cam 80 will be in the opposite position to that shown, with its longest radius to the right of the shaft and the guides will all be held to the right of the path of the descending cards and against the rock arm 79 by the springs 78. The rock arm 79 is pivoted to swing freely so as to follow the surface of the cam under the action of the springs. As the card descends the cam 80, which is arranged to revolve synchronously, permits the springs to draw the guides across the path of the card so that when the 9 index-point position of the card is under the brush the first guide, (from the left), will be just under the latch 84 which forms an extension of the armature 72 pivoted at 85, and when the zero index-point position of the card reaches the brush, (assuming that none of the intermediate points are punched), the tenth guide, (from the left), will be under the latch 84, the intermediate positions of the guides and card corresponding at all times. If a punched record card be fed between the card contacts, as for ex-

amplé the card heretofore described and punched as shown in Fig. 6. the brush 18 will traverse the index-point positions of the left hand column and when the 5 index-point position, (which has been punched), reaches the brush, the fifth guide, (from the left), will be approximately under the latch 84. At this instant the circuit will be closed by the brush 18 through the coils of the magnet 70 attracting the armature and carrying the latch 84 down into the space between the fifth and sixth guides, holding back or arresting the movement of all the guides on the right while the fifth guide and all on the left of it will continue their movement. This separates the fifth and sixth guides sufficiently to permit the card to enter the space freely and by the guides the card is conducted to a suitable receptacle in which all cards similarly punched in the hundreds column will be deposited. The cam 80 is of course, to be given the proper form to actuate the guides to receive the proper card, such form depending upon the distance between successive cards and the distance between the operative position of the cards and the tops of the guides. When the armature 72 is attracted toward the magnet 70 the contact 71 carried thereby will engage the contact 73 and close a circuit through the battery, contacts 40, magnet 70 and contact 71, thus holding the guides separated until after the zero point positions on the index cards pass the brush, when the cam 41 will break the circuit, releasing the armature and carrying the latch 84 out of engagement with the guides which will all be carried back to their initial position by the cam 80, ready for another operation. Any number of sorting guides up to the maximum number of controlling index-point positions on the cards may be employed; for instance if it be desired to separate the cards into two groups only two guides or a deflector for guiding the cards into either of two receptacles would be required.

In Fig. 3 I have illustrated a modification of my invention employing substantially the same means for maintaining the control of the control magnets as is shown in Fig. 2. In this modification each of the devices adapted to be operated according to the location of the index-point on the record cards comprises an indicating wheel and driving means therefor, by which the item or record on a card is simply indicated and which is then automatically reset at zero. The indicating wheels 90, of which three are shown, bear peripheral figures or other characters corresponding to the index-point positions on the card. As shown these characters may consist of the figures from 0 to 9. A notch 91 is formed on each wheel for each character and the wheels are loosely mounted on

a shaft which is given one complete revolution for each card. The wheels are secured to the shaft 92 by a spring 93 which is secured at one end to the shaft and at the other end to the wheel so that, unless restrained, each wheel turns with the shaft, while if the wheel be held against movement the shaft will turn independently of the wheel and when the wheel is released it will return to its initial or zero position. When the circuit through any of the magnets 95 is closed by the card contact, its armature will be attracted to the magnet, carrying the detent 96 on the arm 97 secured to the armature, into one of the notches on the wheel and hold the wheel in position to show through the sight opening that character on the wheel which corresponds to the index-point by which the circuit was closed. The magnet is maintained under control, with the wheel in its arrested position, by a circuit established by the contacts 98 until the zero index-point positions of the record have passed the contact brushes, of which three are employed as shown in Fig. 1. The circuit is then broken by the cam 41 and the wheels are set to zero position by the spring 93, which has been placed under tension by the movement of the shaft 92 after the locking of the wheel by the detent.

In Fig. 4 is illustrated a modification of Fig. 1 in which the relay magnets 25, 26 and 27 are dispensed with and the contact for closing the circuit, to maintain the control of the control magnet, is carried by the armature of the latter.

Although I prefer to employ electric circuits for the purpose of operating and controlling the devices adapted to be actuated according to the location of the index-points on the record card because many obvious advantages are secured thereby, I do not intend to exclude the use of equivalent operating or controlling means or circuits, nor to restrict the circuit or circuits to circuits which are closed to effect the operation of the devices, since it is obvious that the operating circuit or circuits may be held under control while open or closed; nor is it essential, although I deem it desirable, that where a circuit is controlled by the record card, it should be actually closed through the card even where the operating or controlling circuit are electric circuits, and as indicating how widely the details of the circuits, connections and operating means may be modified without departing from the spirit of my invention I have illustrated in Fig. 5 a possible modification of the apparatus illustrated in Fig. 4, in which the contact for establishing a circuit to maintain the control of the devices to be operated is actuated directly by the armature of the control magnet. In this modification a lever 100, having on one end a tapering point 101 and carrying at its oppo-

site end a contact 102, is mounted on the pivot 103, adjacent to the rotating drum 104. I have shown only one lever but it will be understood that, with the arrangement indicated, there would be one lever for each column of index-point positions. The drum 104 which is not in circuit is provided with circumferential grooves 105, one for each column of index-point positions, and the spring 106 tends to hold the point 101 in the corresponding groove on the drum with the contacts 102 and 107 separated. When a punched card is fed between the point 101 and the drum 104 it will swing the lever 100 to close the contacts 102 and 107, as shown, until the hole in the card reaches the point 101 when the latter will enter the groove 105 through the hole, swinging the lever 100 sufficiently to open the contacts 102 and 107 momentarily until the advancing card forces the point out of the groove and closes the contacts. In this modification the cards are fed so that the index-points will pass under the point 101 in the opposite order from that heretofore described, that is to say, the position of the cards or their feeding movement is reversed so that the zero position will pass under the point 101 first and the 9 position last. A revolving cam 108 which operates in synchronism with the card feeding means is arranged to move the armature 109 of the magnet 110 into engagement with the contact 111 at the instant the zero position of such card reaches the position 101. This movement of the armature causes the clutch disk 114 on the constantly rotating shaft 115 to engage the register wheel 116 and rotate the latter. The contacts 102 and 107 having been closed by the advancing card just before the cam 108 moves the armature 109, this movement of the armature completes the circuit through the magnet and the circuit is maintained by the magnet after the cam moves out of engagement with the armature until the magnet circuit is broken at the contacts 102 and 107 and the armature released by the movement of the lever 100 when the point 101 enters the hole in the card. When the circuit is thus broken the spring 117 draws the clutch disk out of engagement with the latter and the movement of the latter is arrested. As the shaft 115 makes one complete revolution while the index-point positions on the card are passing under the point 101, as heretofore explained, the register wheel will be turned one number for each index-point position passing under the point from zero when the wheel commences to turn, until the punched hole reaches the point when its movement ceases.

While for the purpose of illustrating and clearly describing my invention, I have selected certain specific means and forms of apparatus in which it is embodied, it is to be understood that the same may be modi-

fied in many respects without departing from the principle or spirit of the invention as set forth in the claims.

I claim:

1. In apparatus of the character described, the combination with a record card having index-point positions in column, of a record-actuated device common to the index-point positions of a column, an operating circuit and means for holding said circuit under control for a variable period during each cycle of operation, the duration of which is determined by the location of the index-point on the controlling record.
2. In apparatus of the character described, the combination with a record card having index-point positions in column, of a record-actuated device common to the index-point positions of a column, an electric circuit and means for holding said circuit under control for a variable period during each cycle of operation, the duration of which is determined by the location of the index-point on the controlling record.
3. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, means actuated by the index-point for establishing the control of said circuit and means for maintaining such control independently of the means for establishing the same.
4. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, record-actuated contacts for closing said circuit by means of an index-point, and means for maintaining a circuit around the record-actuated contacts when the latter are open.
5. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, record-actuated contacts for controlling said circuit by means of an index-point and means for controlling a circuit around the record-actuated contacts after the latter have been actuated by an index-point.
6. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, record-actuated contacts for controlling said circuit by means of an index-point, means for establishing the control of a circuit around the record-actuated contacts, means for maintaining such control after the record-actuated contacts are operated, during a variable period which is determined by the location of the index-point on the record card.
7. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, record-actuated contacts for controlling said circuit by means of an index-point, means actuated at a time determined by the

location of the index-point for establishing the control of a circuit around the record-actuated contacts and means actuated independently of the index-point for terminating such control, whereby the location of the index-point determines the period of such control.

8. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, record-actuated contacts for closing said circuit by means of an index-point, means for maintaining a circuit around the record-actuated contacts when the latter are open and means actuated independently of the record for opening the circuit.

9. In apparatus of the character described, the combination with a record card, having an index-point, an electric circuit, devices adapted to be operated according to the location of the index-point on the record card, an electromagnet in said circuit, means actuated by the index-point for controlling said magnet to actuate said devices and means for maintaining the control of said magnet independently of its index-point control.

10. In apparatus of the character described, the combination with a record card having an index-point, devices adapted to be operated according to the location of the index-point, an electromagnet for controlling the operation of said devices, means actuated by the index-point for establishing the magnet-control of said devices and means for continuing such control independently of the means for establishing the same.

11. In apparatus of the character described, the combination of a record card having an index-point, an electric circuit, devices adapted to be operated according to the location of said index-point, an electromagnet in said circuit for controlling the operation of said devices, means for establishing the magnet-control of said devices initially by means of an index-point on the record card and means for maintaining such magnet-control independently of the record card after it has been established by the index-point.

12. In apparatus of the character described, the combination of a record card having an index-point, an electric circuit, an electromagnet in said circuit, devices controlled by said magnet and adapted to be operated according to the location of the index-point, means for opening and closing said circuit by means of an index-point to establish the magnet control of said device, a branch circuit, and means for controlling the branch circuit to maintain the magnet-control of said devices.

13. In apparatus of the character described, the combination of a record card

having an index-point, an electric circuit controlled by means of the index-point, an electro-magnet in said circuit, devices adapted to be actuated according to the location of said index-point, contacts in said circuit actuated by means of the index-point for bringing said devices under the control of said magnet and a magnet-operated contact for maintaining the magnet-control of said devices.

14. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, devices adapted to be operated according to the location of the index-point, a magnet in said circuit for controlling the operation of said devices, record-controlled contacts in circuit with the magnet which are closed by the index-point for establishing the magnet-control of said devices and a magnet-operated contact for maintaining the control established by the index-point.

15. In apparatus of the character described, the combination with a record card having an index-point, devices adapted to be operated according to the location of the index-point, an electric circuit, an electromagnet in said circuit for controlling the operation of said devices, record-actuated contacts for closing said circuit to establish the magnet-control of said devices and means for continuing such control after the record-actuated contacts are opened.

16. In apparatus of the character described, the combination of a record card having an index-point, devices adapted to be operated according to the location of said index-point, an electric circuit, an electromagnet in said circuit for controlling the operation of said devices, record-actuated contacts for closing the circuit through the magnet to establish the magnet-control of said devices, and means for maintaining the circuit through the magnet independently of the record-actuated contacts.

17. In apparatus of the character described, the combination of a record card, having an index-point, devices adapted to be operated according to the location of said index-point, an electric circuit, an electromagnet in said circuit for controlling the operation of said devices, record-actuated contacts for closing the circuit through the magnet to establish the magnet-control of said devices, a branch circuit around the record-actuated contacts, means for closing said branch circuit when the circuit is closed through the magnet to maintain the magnet circuit after the record-actuated contacts are opened, and means for opening the branch circuit independently of the record-actuated contacts.

18. In apparatus of the character described, the combination with a record card having an index-point, devices adapted to

be operated according to the position of said index-point, an electric circuit, means therein for controlling the operation of said devices, record-actuated contacts for controlling said circuit, means actuated by said contacts for establishing the control of said devices, and short-circuiting the record-actuated contacts to maintain such control and means for breaking the short-circuit to release such control.

19. In apparatus of the character described, the combination with a record card having an index-point, an electric circuit, record-actuated contacts therefor, means for imparting a relative movement to the record card and contacts, devices adapted to be operated according to the location of the index-point, on the record card, means for controlling the operation of said devices, means for establishing such control at a variable point in the relative movement of the record and the record-actuated contacts, means for short-circuiting the record-actuated contacts to maintain such control, and means for releasing such control at a predetermined point in said movement.

20. In apparatus of the character described, the combination with a record card having an index-point, or record-actuated contacts, means for imparting a relative movement to the record card and contacts to actuate the latter during such movement, an electro-magnet in circuit with said contacts, devices adapted to be actuated according to the location of said index-point, means controlled by said magnet for actuating said devices, contacts actuated by the record-actuated contacts to short-circuit the latter and means for breaking said short-circuit at a predetermined point in the relative movement of the record and record-actuated contacts.

21. In apparatus of the character described, the combination with a record card having an index-point, or record-actuated contacts controlled by said index-point, an electro-magnet in circuit with the record-actuated contacts, magnet operated contacts in circuit with said magnet for controlling a circuit around the record-actuated contacts, devices adapted to be operated according to the location of said index-point, means actuated by said magnet for controlling the operation of said devices and means operating independently of the record-actuated contacts for maintaining the control of the circuit through the magnet.

22. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, record-actuated contacts for establishing the control of said circuit, and means controlled by the electric circuit for maintaining such control.

23. In apparatus of the character de-

scribed, the combination with a record card having an index-point, of an electric circuit, contacts for controlling said circuit, means for actuating said contacts in accordance with the location of the index-point to establish the control of said circuit and means under the control of said circuit for maintaining the control of the same.

24. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, record-actuated contacts for establishing the control of said circuit and means controlled by the electric circuit independently of the record for maintaining such control.

25. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, record-actuated contacts for closing said circuit and means controlled by the electric circuit for holding said circuit closed.

26. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, record-actuated contacts for closing said circuit, and means controlled by the electric circuit for holding the same closed independently of the record card.

27. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, contacts for controlling said circuit, means for actuating said contacts in accordance with the location of the index-point to establish the control of said circuit and means under the control of said circuit for maintaining the control of same.

28. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, contacts for controlling said circuit, means for actuating said contacts in accordance with the location of the index-point, to establish the control of said circuit and means under the control of said circuit for maintaining the control of the same independently of the record card.

29. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, contacts for said circuit, means for actuating said contacts to close the circuit in accordance with the location of the index-point, and means under the control of said circuit for holding the same closed.

30. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, contacts for said circuit, means for actuating said contacts to close the circuit in accordance with the location of the index-point and means under the control of said circuit for holding the same closed independently of the record card.

31. In apparatus of the character de-

scribed, the combination with a record card having an index-point, an electric circuit, circuit-controlling means actuated by the index-point, means for imparting a relative movement to the record card and said circuit-controlling means whereby the latter are actuated to control the circuit at a variable point in such movement, means under the control of the circuit for maintaining its control and means for releasing such control at a predetermined point in such movement.

32. In apparatus of the character described, the combination with a record card having an index-point, an electric circuit, an electro-magnet, devices controlled by said magnet, circuit-controlling means actuated by the index-point, means for imparting a relative movement to the record card and said circuit-controlling means, whereby the latter are actuated to establish the control of said magnet at a variable point in said movement, means actuated by the circuit for maintaining such control and means for releasing such control at a predetermined point in said movement.

33. In apparatus of the character described, the combination with a record card having an index-point, an electric circuit, devices adapted to be operated according to the location of the index-point on the record card, an electro-magnet in said circuit, means actuated by the index-point for controlling said magnet to actuate said devices, means for maintaining the control of said magnet independently of its index-point control, and means for releasing such control.

34. In apparatus of the character described, the combination with a record card having an index-point, devices adapted to be operated according to the location of the index-point, an electro-magnet for controlling the operation of said devices, means actuated by the index-point for establishing the magnet-control of said devices, means for continuing such control independently of the means for establishing the same, and means for releasing such control.

35. In apparatus of the character described, the combination with a record card having an index-point, an electric circuit, devices adapted to be operated according to the location of the index-point, an electro-magnet in said circuit for controlling the operation of said devices, means for establishing the magnet-control of said devices initially by means of an index-point on the record card, means for maintaining such magnet-control independently of the record card after it has been established by the index-point, and means for releasing such control.

36. In apparatus of the character described, the combination with a record card having an index-point, devices adapted to be operated according to the location of said

index-point, an electric circuit, means controlled by said circuit for controlling the operation of said devices, means actuated by an index-point and means cooperating therewith, but actuated independently of the index-point, for maintaining the control of said circuit for a variable period, the duration of which is determined by the location of the index-point on the record card.

37. In apparatus of the character described, the combination with a record card having an index-point, devices adapted to be operated according to the location of said index-point, an electric circuit, an electro-magnet therein for controlling the operation of said devices, means actuated by an index-point and means cooperating therewith but actuated independently of the index-point for maintaining the magnet-control of said devices for a variable period, the duration of which is determined by the location of the index-point on the record card.

38. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, record-actuated contacts for establishing the control of said circuit, means controlled by the electric circuit for maintaining such control, and means for releasing such control.

39. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, contacts for controlling said circuit, means for actuating said contacts in accordance with the location of the index-point to establish the control of said circuit, means under the control of said circuit for maintaining the control of the same, and means for releasing such control.

40. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, record-actuated contacts for establishing the control of said circuit, means controlled by the electric circuit independently of the record for maintaining such control, and means for releasing such control.

41. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, record-actuated contacts for closing said circuit, means controlled by the electric circuit for holding said circuit closed, and means for opening said circuit.

42. In apparatus of the character described, the combination with a record card having an index-point, of an electric circuit, record-actuated contacts for closing said circuit, means controlled by the electric circuit for holding the same closed independently of the record card, and means for opening said circuit.

43. In apparatus of the character described, the combination with a record card having index-points, registering devices

adapted to be operated according to the location of the index-points, an operating circuit for controlling the operation of said devices and means for holding said circuit under control for a variable period during each cycle of operation of the apparatus which is determined by the location of an index-point on the record.

44. In apparatus of the character described, the combination with a record card having index-points, indicating devices adapted to be operated according to the location of the index-points, an operating circuit for controlling the operation of said devices, and means for holding said circuit under control for a variable period during each cycle of operation of the apparatus which is determined by the location of the index-point on the record.

45. In apparatus of the character described, the combination with a record card, having index-points, a constantly rotating shaft, register wheels, rotating devices for engaging the wheels to rotate with the shaft and means for maintaining such engagements for a variable period at each operation, the duration of which is determined by the location of the index-point.

46. In apparatus of the character described, the combination with a record card having index-points, register wheels, continuously rotating, wheel-engaging devices, means for effecting the engagement of said devices with the wheel, means for maintaining said engagement for a variable period and means for releasing said engagement.

47. In apparatus of the character described, the combination with a record card having index-points, register wheels, continuously rotating, wheel-engaging devices, means controlled by the record for effecting the engagement of said devices with the wheels according to the location of the index-points, means for maintaining said engagement and means for simultaneously releasing said engagement.

48. In apparatus of the character described, the combination with a record card having index-points, record-actuated devices, means for imparting a relative movement to the record card and the record-actuated devices, rotatable register wheels corresponding to the record-actuated devices, means for starting the rotation of each wheel and means for stopping the rotation of each wheel, one of said means operating on the wheel when the record-actuated device for the wheel is actuated by an index-point, and the other of said means being operated at a fixed point in the relative movement of the record.

49. In apparatus of the character described, the combination with a record having index-point positions and index-points, record-actuated devices, means for moving the record to present the index-point posi-

tions successively to the record-actuated devices, rotatable register wheels, corresponding to the record-actuated devices, means for starting the rotation of each wheel and means for stopping the rotation of each wheel, one of said means operating on the wheel when the record-actuated device for the wheel is actuated by an index-point, and the other of said means being operated independently of the record-actuated devices.

50. In apparatus of the character described, the combination with a record having index-point positions and index-points, record-actuated devices, means for moving the record to present the index-point positions successively to the record-actuated devices, rotatable register wheels corresponding to the record-actuated devices, means for starting the rotation of each wheel when its record-actuated device is actuated by an index-point, and means, operated at a fixed point in the movement of the record, for stopping the rotation of each wheel.

51. In apparatus of the character described, the combination with a record having index-points, record-actuated devices, a motor, mechanism actuated thereby to move the records relatively to the record-actuated devices, rotatable register wheels corresponding to the record-actuated devices, means for starting the rotation of each wheel and means for stopping the same, one of said means being operated when the record-actuated device for the wheel is actuated by an index-point and the other of said means being operated by the motor at a fixed point in the movement of the record.

52. In apparatus of the character described, the combination with a record having index-point positions and index-points, record-actuated devices, a motor, mechanism actuated thereby to move the record to present the index-point positions successively to the record-actuated devices, rotatable register wheels, corresponding to the record-actuated devices, means for starting the rotation of each wheel when its record-actuated device is actuated by an index-point and means operated by the motor for stopping the rotation of each wheel at a fixed point in the movement of the record.

53. In apparatus of the character described, the combination with a record card, having index-point positions and index-points, record-actuated devices, means for imparting a relative movement to the record and said devices, a rotating shaft, register wheels, clutches for connecting said wheels with said shaft, means for engaging each clutch, and means for disengaging the same, one of said means being operated at a fixed point in the relative movement of the record and the record-actuated devices and the other of said means being operated at a variable point in said movement, which

point is determined by the location of the index-point.

54. In apparatus of the character described, the combination with a record card, having index-point positions arranged in columns and index-points, record-actuated devices, means for moving the record to present the index-point positions of each column successively to its record-actuated device, a rotating shaft, register wheels, clutches for connecting said wheels with said shaft, means for engaging each clutch and means for disengaging the same, one of said means being operated at a variable point in the movement of the record, determined by the location of the index-point, and the other of said means being operated at a fixed point in the movement of the record.

55. In apparatus of the character described, the combination with a record card having index-point positions arranged in columns and index-points, record-actuated devices, means for moving the record to present the index-point positions of each column successively to its record-actuated device, a rotating shaft, register wheels, clutches for connecting said wheels with said shaft, means for engaging said clutch and means for disengaging the same, one of said means being operated when a record-actuated device is actuated by an index-point and the other of said means being operated at a fixed point in the movement of the record card.

56. In apparatus of the character described, the combination with a record card having index-point positions and index-points, record-actuated devices, means for moving the record to present the index-point positions successively to the record-actuated devices, a rotating shaft, register wheels, clutches for connecting said wheels with said shaft, means for engaging each clutch at a variable point in the movement of the record determined by the location of the index-point and means for disengaging each clutch at a fixed point in the movement of the record card.

57. In apparatus of the character described, the combination with a record card having index-point positions and index-points, record-actuated devices, means for moving the record to present the index-point positions successively to the record-

actuated devices, a rotating shaft, register wheels, clutches for connecting said wheels with said shaft, means for engaging each clutch when the record actuates its record-actuated device, and means actuated independently of the record for disengaging said clutch.

58. In apparatus of the character described, the combination with a record card having index-point positions and index-points, record-actuated devices, a motor, means actuated by the motor for moving the record to present the index-point positions successively to the record-actuated devices, a rotating shaft driven by the motor, a register wheel for each record-actuated device, a clutch for connecting each wheel with said shaft, means for engaging each clutch and means for disengaging each clutch, one of said means being operated by the motor and the other of said means being operated when the record-actuated device is actuated by the index-point.

59. In apparatus of the character described, the combination with a record card having index-point positions and index-points, record-actuated devices, a register wheel for each record-actuated device, a motor, means operated by the motor for moving the record to present the index-point positions successively to the record-actuated devices, a rotating shaft driven by the motor, a clutch for connecting each wheel with said shaft, means operated when its record-actuated device is actuated by an index-point for engaging said clutch, and means operated by the motor for disengaging said clutch when the card reaches a fixed point in its movement.

60. In apparatus of the character described, the combination with a record card having index-points, an electric circuit, contacts in said circuit adapted to be actuated by the index-points at a variable point in the movement of the record card according to the location of the index-points, means for moving the record card relatively to said contacts, and a contact in said circuit adapted to be closed and opened by the record card at fixed points in its movement.

HERMAN HOLLERITH.

Witnesses:

MAMIE S. JONES,
JOSEPHINE C. GRANEY.