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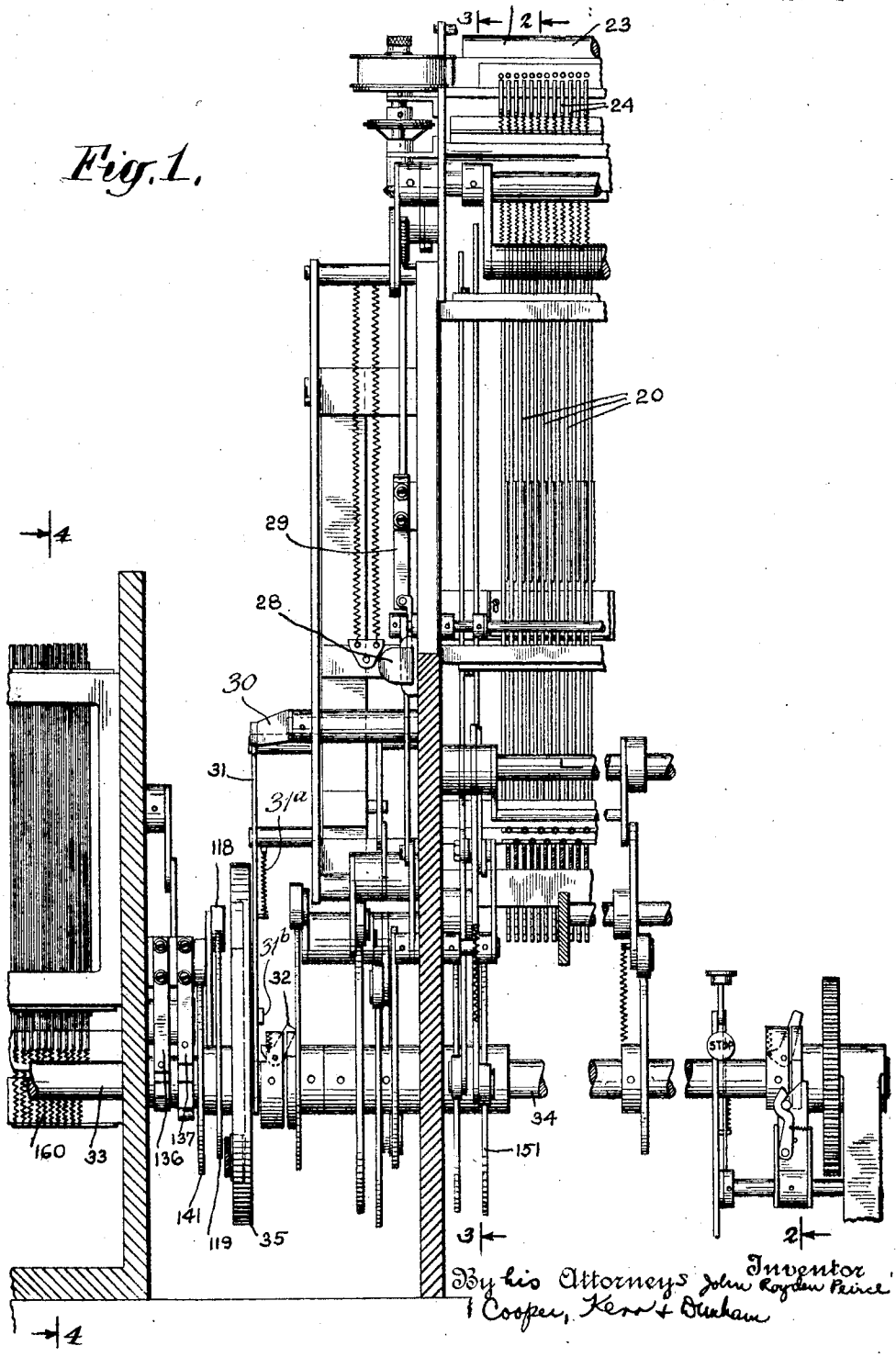
April 5, 1927. 1,623,204

J. R. PEIRCE

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Filed June 3, 1924 7 Sheets-Sheet 1

Fig. 1.



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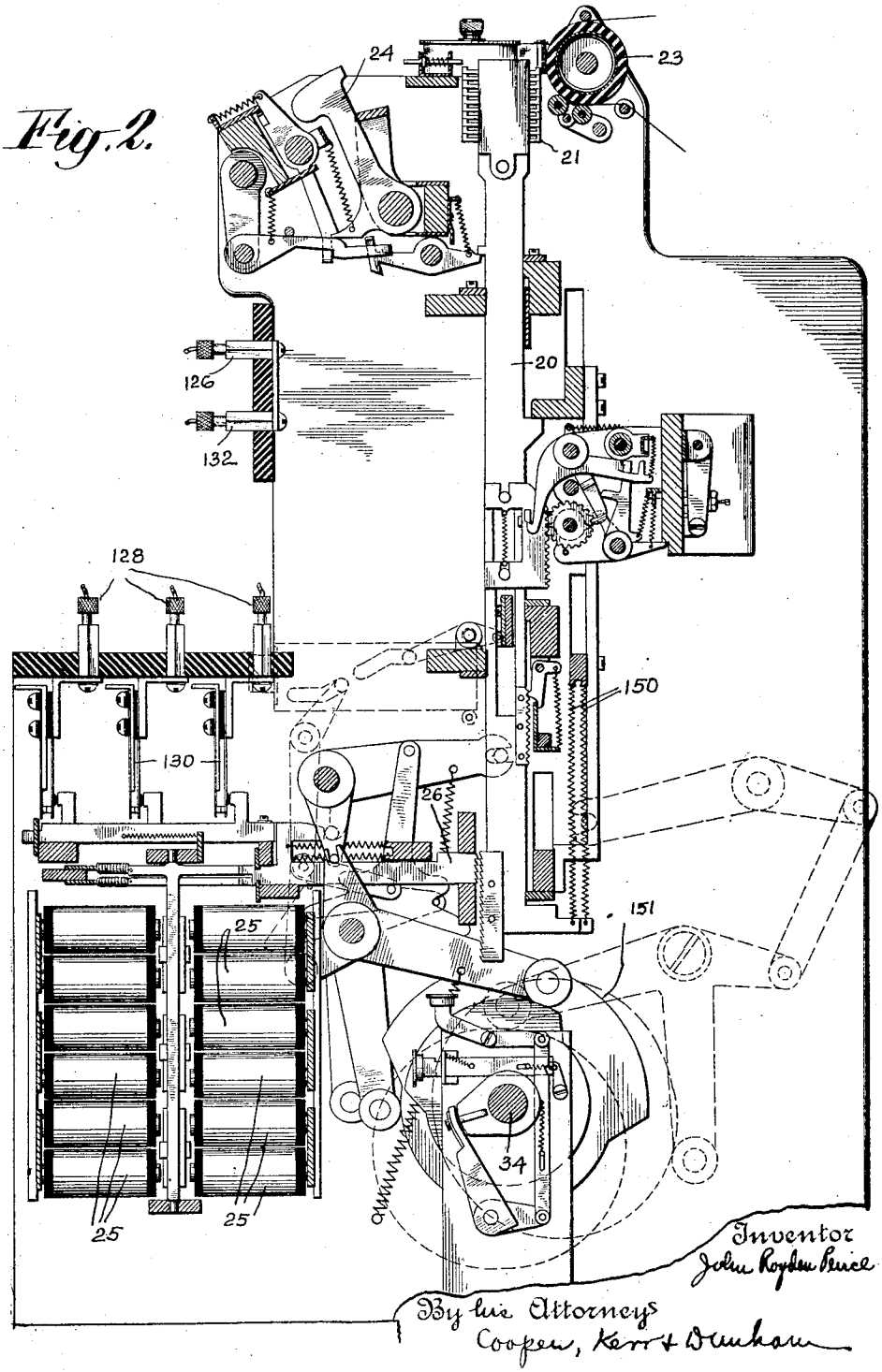
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Fig. 2.



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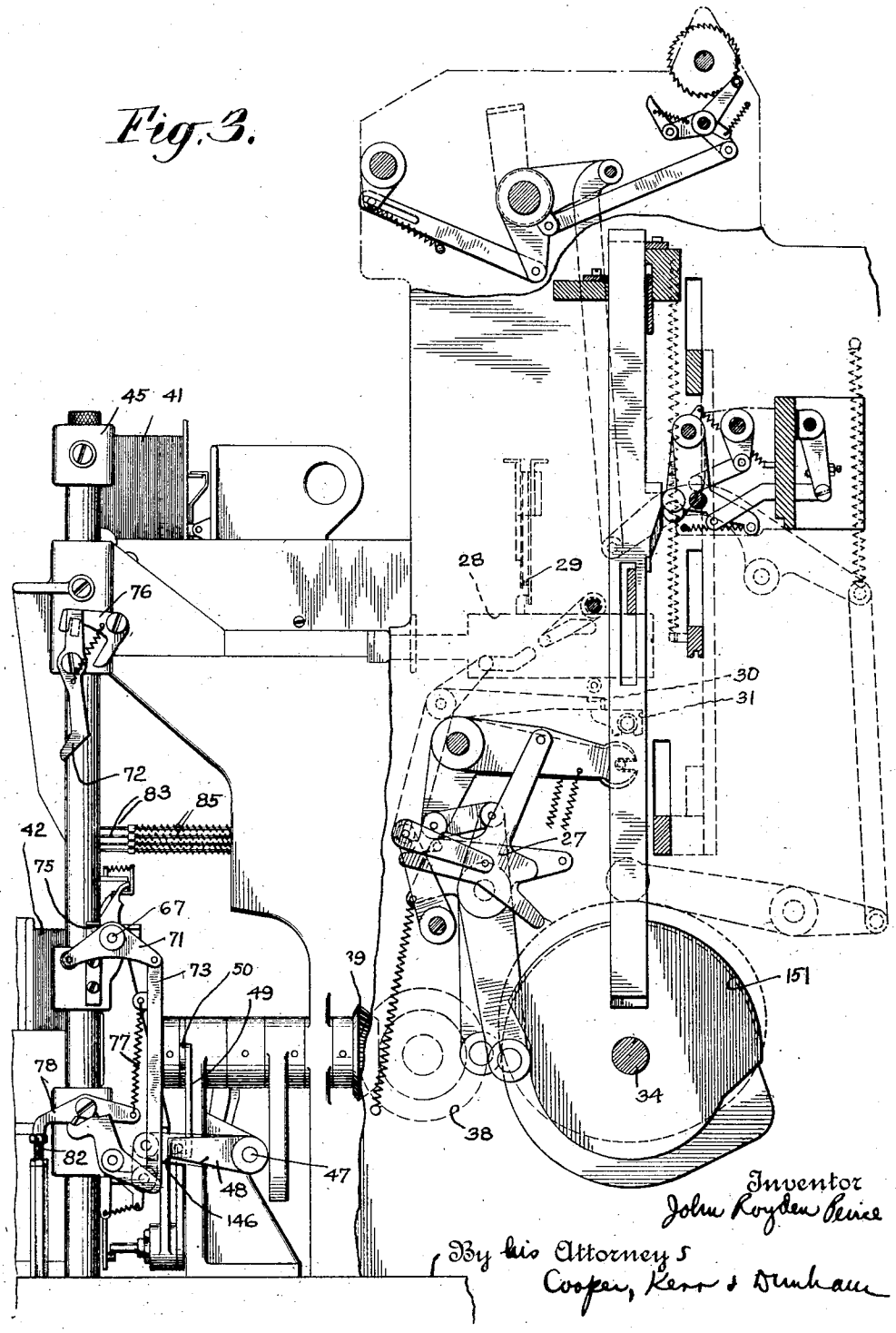
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Fig. 3.



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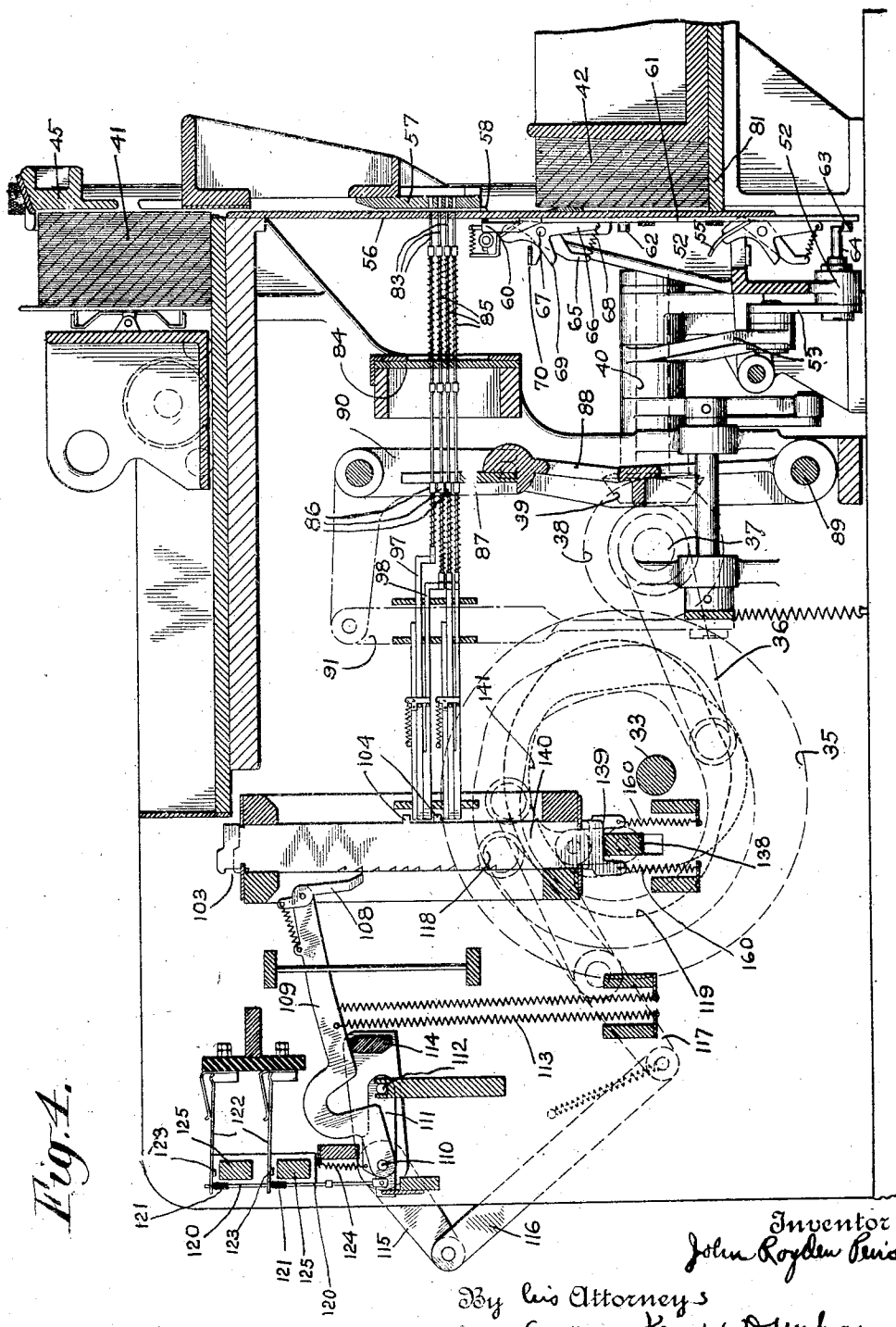


Fig. 4.

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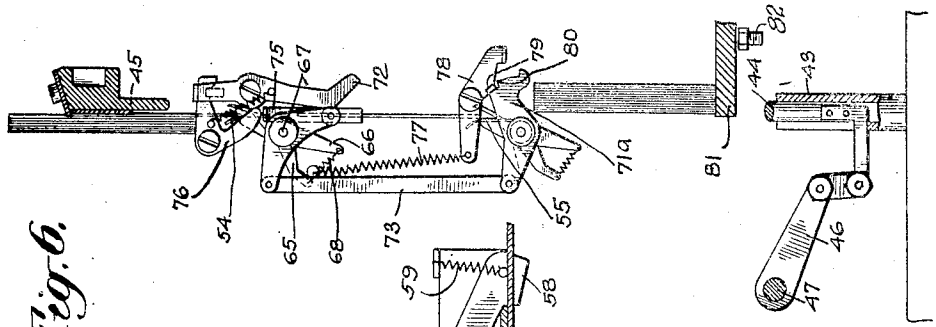


Fig. 6.

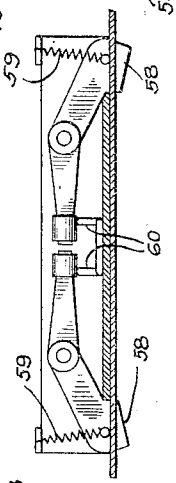


Fig. 7.

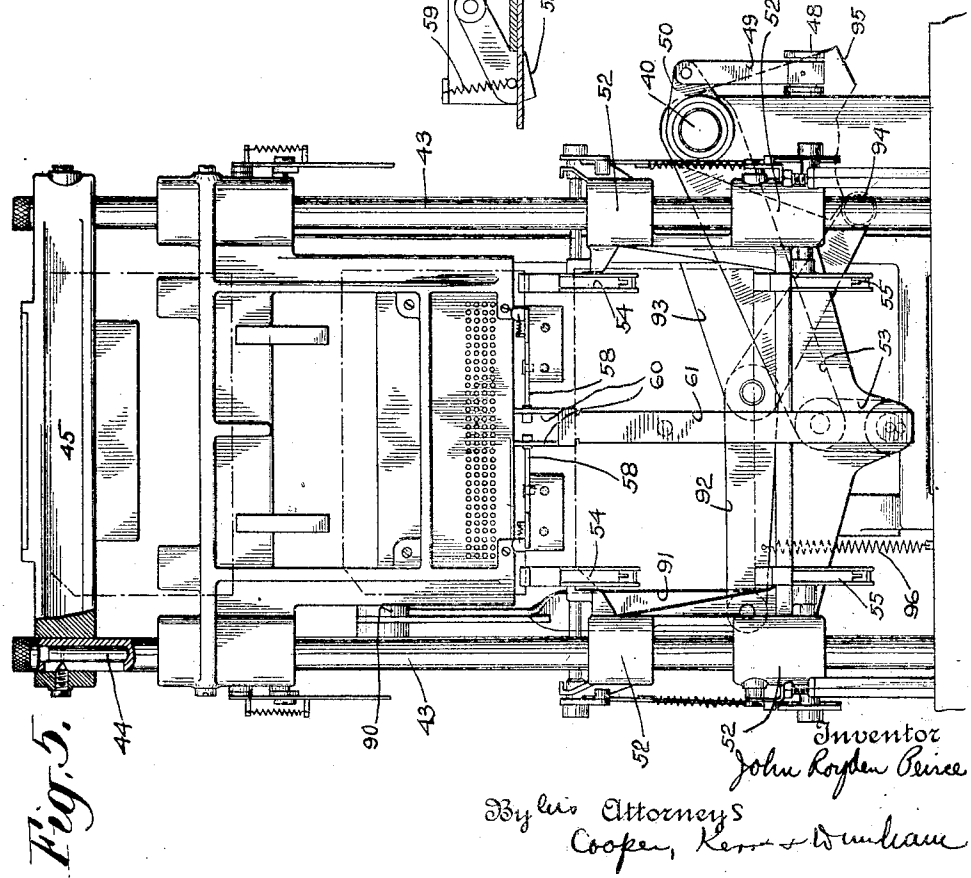


Fig. 5.

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Fig. 8a

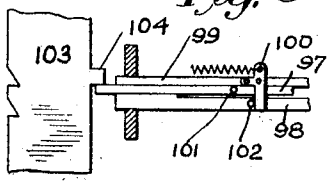


Fig. 8b

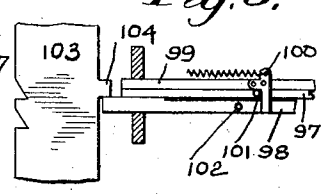


Fig. 8c

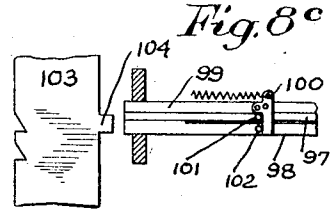


Fig. 9.

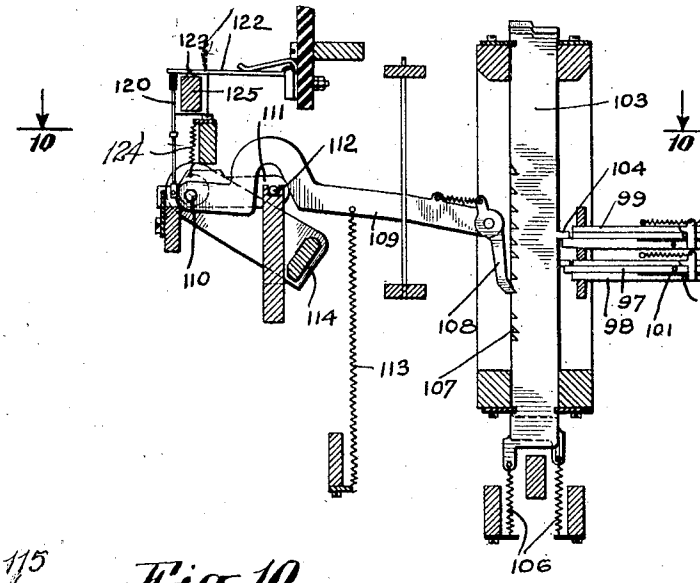


Fig. 11.

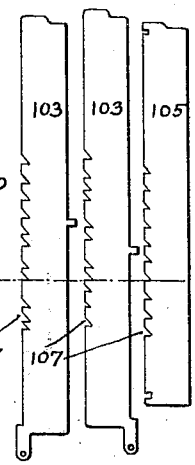


Fig. 10.

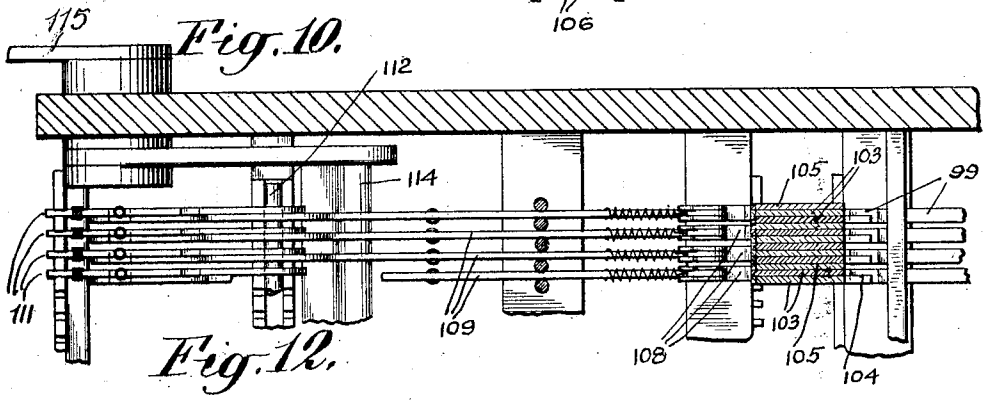
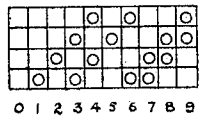


Fig. 12.



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J. R. PEIRCE

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Filed June 3, 1924 7 Sheets-Sheet 7

Fig. 13.

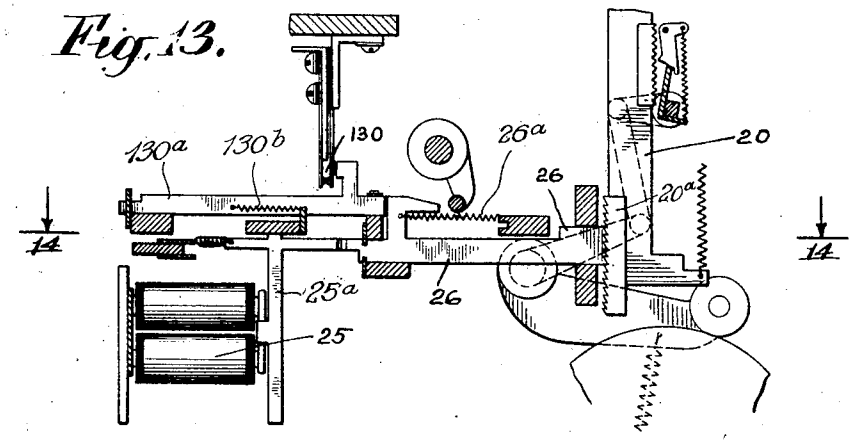


Fig. 14

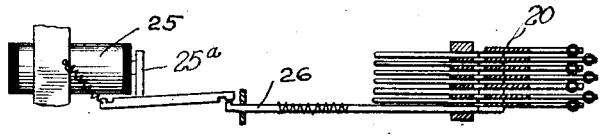
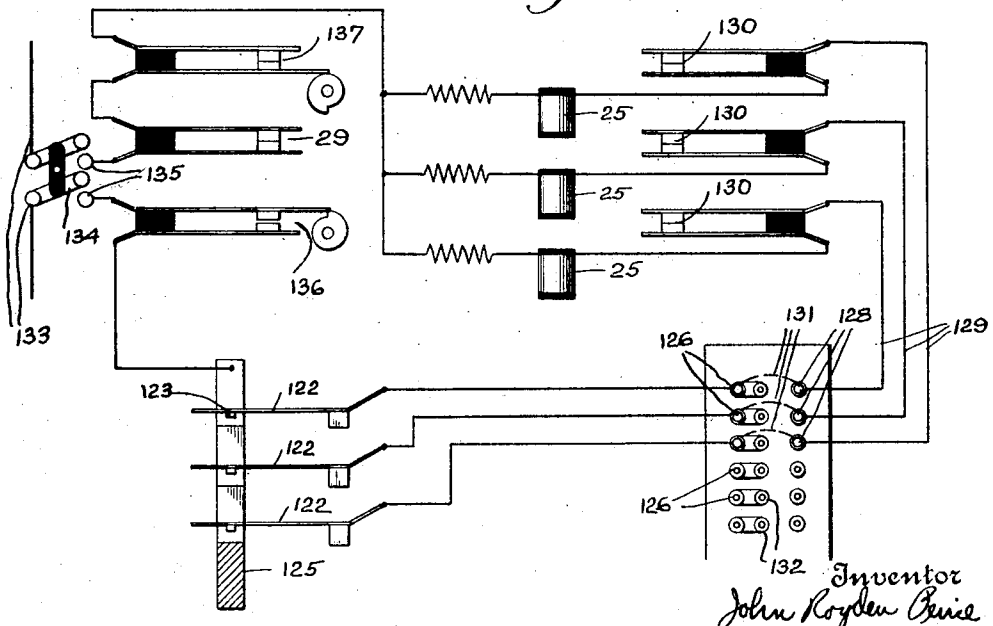


Fig. 15.



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Patented Apr. 5, 1927.

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1,623,204

UNITED STATES PATENT OFFICE.

JOHN ROYDEN PEIRCE, OF NEW YORK, N. Y., ASSIGNOR TO INTERNATIONAL BUSINESS MACHINES CORPORATION. OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

TABULATING APPARATUS.

Application filed June 3, 1924. Serial No. 717,498.

This invention has for its object the provision of novel means for transposing a reading from combinational holes of a perforated record to the controlled elements of a perforated record machine.

Heretofore machines controlled by perforated records have comprised so-called Hollerith type machines and Peirce type machines. The former use the digit form of perforation and the latter utilized multiple or combination hole systems in their controlling records. Both systems have advantages, and in general it may be stated that the Peirce form of record permits a greater amount of data to be placed upon a record of given size than with the Hollerith system.

Heretofore in utilizing Peirce records in controlled machines, it has been the general practice to allocate fixed fields or zones upon the card to predetermined and controlled machine elements such as accumulator type carriers and the like. Accordingly it has not heretofore been possible with Peirce machines to obtain the flexibility which has generally been secured with Hollerith type machines which employ electrical circuits controlled by the index point perforations in the cards.

The present invention has for one of its objects the provision of a construction which will permit so-called Peirce type of machines utilizing combinational hole systems of perforated records to operate with the flexibility heretofore only obtained in Hollerith machines using digital perforated records.

A further object of the present invention resides in the provision of a novel combination of devices for reading combinational hole records, transposing such readings into differential linear readings which last readings are thereafter adapted to control certain electric circuits which extend to magnet devices.

A further object of the present invention resides in the provision of novel combinations of devices for first reading combinational hole records, secondly converting such multiple readings into single linear readings, thirdly utilizing said single linear readings to control circuits at differential times in the machine cycle and finally in controlling the operation of parts of the machine by the said circuits. Provision is made for adjusting the circuit connections from certain positions to other positions whereby the desired flexibility of connection between the record card and the machine parts may be secured.

Further objects and advantages will be pointed out hereafter in detail in the accompanying specifications shown in the drawings and pointed out in the appended claims.

In the drawings—

Fig. 1 is a front elevational view of the machine with certain parts broken away and others shown sectionally.

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is a similar sectional view taken on line 3—3 of Fig. 1, and in addition showing a part of the card feeding attachment.

Fig. 4 is a sectional view taken on line 4—4 of Fig. 1 and shows the card reading section of the machine and the converting devices for converting combinational hole readings into linear readings.

Fig. 5 is a rear elevational view of the card feeding section of the machine. This view may be considered as taken from the left of Fig. 3 looking to the right.

Fig. 6 is a detail view of the card clip devices.

Fig. 7 is a detail view of the card stop devices.

Figs. 8^a, 8^b, and 8^c represent different positions of the pin controlled elements and the corresponding positions of the selecting comb controlled thereby.

Fig. 9 is an enlarged detail view of certain of the parts shown in Fig. 4 in a moved position and shows the operation of the transposing device.

Fig. 10 is a top plan and part sectional view of the devices shown in Fig. 9. The section is taken on line 10—10.

Fig. 11 shows detail view of the three selecting or translating combs used with the pin groups which sense each record card column.

Fig. 12 is a detail view showing the combinational hole arrangement used in the cards which are handled by the machine.

Figs. 13 and 14 are detail views of the

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magnet devices and associated latch mechanism, Fig. 14 being taken on line 14—14 of Fig. 13.

Fig. 15 is a circuit diagram of the machine.

The tabulator printing and adding action shown in the present application is of the type heretofore devised by me and more specifically described in my copending application Serial No. 693,572, filed February 18, 1924.

Broadly it includes a plurality of racks 20 which differentially position type 21 and also add in the amount to an accumulator. The racks are raised synchronously by means of suitable springs 150, this operation being permitted at the proper time in the cycle by means of the cam devices 151 or main machine drive shaft 34. The racks are subsequently restored by this cam mechanism to normal or lower position. All of the parts are more fully described in my copending application and are of the usual form in tabulating machines of the Peirce type. Printing is secured upon the record carried on the platen roll 23 by operation of the hammer devices 24. The differential movements of the racks are controlled by magnets 25, there being an individual magnet for each record card column and for each rack. The magnets individually control latch devices 26 which arrest the racks at differential elevated positions.

Totals are taken by reversing the accumulator shifting mechanism (see the parts designated 27, Fig. 3). To set the parts for taking totals a button or slide 28 (Figs. 1 and 3) is provided. To set the parts for total taking this slide is pressed in to the position shown in Fig. 3. A suitable shoulder on the slide opens contacts 29 and in addition an arm 30 shown in dotted lines is rocked clockwise, thus depressing a link 31 (Figs. 1 and 3) against the action of the restoring spring 31^a. The link carries a block or projection 31^b which is adapted to depress and disengage a pivoted spring returned clutch dog 32 (Fig. 1) and thus disengage the drive shaft 33 for the card feed from the main drive shaft 34 of the tabulating section of the machine. During regular printing and tabulating operations this clutch is engaged.

Drive for card feed and transposing section of the machine.

Fixed to the shaft 33 is a box cam 35. A follower 36 (Fig. 4) co-operates with the cam and rocks a rock shaft 37 to which is fixed a bevel gear 38. Meshing with this gear is a second gear 39 which is fast to the end of a rock shaft 40. The movement of this rock shaft is utilized for feeding the cards and for advancing the pins into contact therewith.

Referring to Fig. 4, the card feed section of the machine includes the usual card supply and discharge pockets 41 and 42. Intermediate the card supply and discharge pockets is a reading station.

Like previous machines utilizing combinational hole cards the cards are advanced from the card supply pocket to a reading station. Here they remain for a period of time while the pins are advanced into contact with the cards and take a reading of the perforations. Subsequently the pins are withdrawn and the cards are again advanced to the discharge pocket 42. For advancing the cards from the supply to the discharge stack a suitable picker and card clip carriage mechanism is provided.

Referring to Fig. 5, at each side of the card path there are provided two slide or guiding posts 43. The interior of these posts is hollow to permit passage therethrough of the picker actuating rods 44 (see Figs. 5 and 6). The picker bar 45 is attached to these rods 44 in the manner shown in Fig. 5. Reciprocation of the picker bar is effected by means of the linkage 46 shown in Fig. 6. This linkage is actuated by rocking shaft 47 (Figs. 6 and 3) to which shaft is attached a crank arm 48 (Fig. 3) which in turn through link 49 is attached to a crank 50 which is fast to rock shaft 40 (see Fig. 5).

The clip carriage comprises a frame 52 slidably mounted upon the guide rods 43. Reciprocation of this frame is effected by means of a linkage 53 which extends to and is fixedly connected to the rock shaft 40 (see Figs. 5 and 4). The clip mechanism is of the form usually used in machines of this class and comprises upper pairs of clips 54 and lower pairs of clips 55 (see Fig. 6). The picker advances the card into the jaws of the upper clips whereupon these clips close and subsequently upon the lowering of the frame 52 the upper clips draw a card between guide plates 56 and 57 (Fig. 4). To arrest the card at the proper reading position and strip it from the clips card stops or abutment pieces 58 are provided. These abutment pieces are of pivotal construction being suitably mounted in a fixed frame portion of the machine and are normally retracted from the card path by means of springs 59. At the proper time in the cycle of the machine camming elements 60 are raised upwardly thus forcing the stop pieces 58 outwardly and into the path of the lower edge of the card (see Fig. 7). The cam pieces 60 are preferably carried on a link 61. Link 61 is slidably mounted for vertical movement as adjacent back plate 56, as shown in Fig. 4. This link 61 is provided with two pins 62 and 63. The frame 52 of the card carriage carries a pin 64 which is vertically aligned with the pins 62, 63. Upon the frame 52 being elevated

and approaching its upward extent of movement pin 64 will strike pin 62 and elevate the link 61 thus permitting the card stop-pieces 58 to be retracted. On the lowering of the card clip carriage the pins 64 will contact against pins 63, thus shifting link 61 in a reverse direction and forcing the stop pieces outwardly into the position shown at Fig. 7.

The mechanism for operating the clips is of the form usually used in machines of this class. The clips are substantially identical in construction and one will be described.

Referring to Figs. 6 and 3, the clip mechanism comprises a pair of clip members 65 and 66. Clip member 65 is fixed to the clip shaft 67, which shaft is suitably journaled in the frame of the clip carriage 52. Clip member 66 is connected to the clip member 65 by a tension spring 68. Member 66 has a tail portion 69 (Fig. 4) which projects under a shoulder portion 70 fixed to the clip carriage frame 52.

Referring now to Fig. 3, fixed to the clip shaft 67 is a bell crank member 71 which, upon the upward movement of the clip carriage, is adapted to strike a camming member 72 thereby rocking bell crank 71 in a counterclockwise direction as viewed in Fig. 3 and in a clockwise direction in Fig. 6. Fixed to the bell cranks 71 are links 73 which rock the lower clip shafts and cause a concurrent operation of the lower pairs of clips. The effect of rocking clip shafts 67 is to rock clip member 65 in a clockwise direction in Fig. 6. Through the tension of spring 68 clip member 66 is rocked in a similar direction until further rocking movement of this clip is prevented by its tail 69 contacting against fixed stop 70 (Fig. 4). Subsequent rocking movement opens the clip jaws to the position shown in Fig. 6. In Fig. 6 the clips 54 and 55 are not shown in their extreme uppermost position. In this figure the jaws are both shown open. The subsequent further upward movement causes a member 75 which is fixed to the frame 52 to engage a pivot dog 76 and rock the latter so as to release it from the locking engagement with cam member 72.

Referring to Figs. 6 and 3, a spring 77 at its upper end is connected to the link 73 and this spring normally tends to rock the clip shaft in a clockwise direction (Fig. 6). The lower end of this spring is fixed to a dog 78 which will hereafter be described.

The action of spring 77 together with the clip action previously described causes the upper clips 54 to grip the card which has been advanced by the picker. Concurrently the lower clips 55 will grip the card which has previously been at the reading station. Means must be provided for preventing excessive rocking of the clip assembly in a counterclockwise direction about its pivots after it has gripped the card.

Referring to Fig. 6, the member 78 which is pivoted on the clip carriage is provided with a locking projection or shoulder 79 which engages a notch 80 in a bell crank 71a. As shown in Fig. 6, there is a slight clearance between projection 79 and the end of notch 80. Consequently members 71a can only rock to a limited extent after the cam 72 has been released from its locked condition. Thus the slot 80 prevents excessive rocking of the clip assemblies.

The description heretofore given has described one clip operation but it will be understood that there are similar parts at the other side of the card, and as to these a similar mode of operation applies. The clip carriage is now lowered drawing the card which was previously at the reading station down to its storage stack where it is stripped from the clips by means of the base plate 81. Concurrently therewith a new card is drawn from the supply pocket 41 and advanced to the reading station where it is stripped by the displaceable stops 58. When the clips again move in an upward direction it is necessary that they be displaced out of the card path to prevent pushing the card which is at the reading station in an upward direction. To thus displace the clips out of the path the following mechanism is provided:

Referring to Fig. 3, these members 78 when the clip carriage makes its extreme downward movement contact with stop members 82 (Fig. 3) thereby rocking member 78 sufficiently in a counterclockwise direction (Fig. 6) to release shoulder 79 from the notch 80, springs 77 being now under tension then act to turn the clip assemblies as a unit out of the card path. The clips are then moved upwardly and the action is repeated for the next card and so on.

Pin reading devices for reading the perforations in the cards.

For each card column four pins 83 are provided. These pins are guided at one end in frame 56 and are adapted to be projected from aligned openings in frame or plate 57. The pins 83 are guided at their rear ends in a fixed frame 84 and are normally pressed to the right in Fig. 6 by means of individual springs 85. The pins extend beyond frame 84 and are provided with collars 86 which abut against a slotted frame or comb member 87. The purpose of this comb 87 is to restore the pins 83 after a reading is taken and reapply the tension to springs 85. In addition it may be stated that by advancing comb 87 to the right the pins are permitted to advance in a similar direction. As usual in machines of this type only such pins will advance as encounter

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holes in the card. To actuate the comb plate 87 the following mechanism is provided. Comb plate 87 is fixed to a rock frame 88, which frame is suitably pivoted upon a rock shaft 89 in the frame of the machine. The rock frame 88 is actuated by means of a bell crank 90 which has a pin and slot connection with the frame 88. Bell crank 90 is suitably pivoted and has connected to it a link 91, which link at its lower end connects to a lever 92 which is pivoted at its center to a fixed frame member 93 (Fig. 5). Lever 92 is provided with a follower roller 94 cooperating with a cam 95 which is fixed to rock shaft 40. The lever 92 is kept in contact with the follower by a suitable operating spring 96 (Fig. 5). Upon the rocking of rock shaft 40 at the proper time in the cycle the pin comb 87 will be actuated to permit the advance of the pins or restore them as the case may be.

The pins 83 when displaced to the right are adapted to displace stop pieces and, as usual, in machines of this character there is a flexible connection provided between the pins and stop pieces to permit the pins to be restored without restoring the stop pieces. Referring to Figs. 4 and 8, the stop pieces which are directly acted upon by the pins comprise stop members 97 and 98. Similar stop pieces are provided for the lower pairs of pins and the action of these stop pieces being identical the action of only one pair of stop pieces will be described.

Referring to Fig. 8, it will be noted that stop pieces 97 and 98 are shown together with a supplemental stop piece 99. Fixed to supplemental stop piece 99 is a lug or block 100. Stop pieces 97 and 98 respectively carry pins 101, 102. The arrangement of the parts is such that if stop piece 98 is moved to the right pin 102 will cooperate with block 100 and displace the supplementary stop 99 to the right as shown in Figure 8ª. On the other hand, if the stop member 97 is actuated pin 101 will abut block 100 moving stop piece 99 to the right and leaving stop 98 in extreme left position (Fig. 8ᵇ.) Similarly, if both stops 97 and 98 are moved all of these stops will be displaced as shown in Fig. 8ᶜ. Cooperating with the stop pieces 99, 97 and 98 is a comb member 103. For each record card column two movable combs 103 are provided. One of these combs cooperates with the upper group of stop pieces and the other cooperates with the lower group as shown in Fig. 4. Each comb 103 is provided with a lug 104 and this lug is arranged to extend over the end of the stop pieces and be positioned according to the relative position of the stops (see Fig. 8). In Figs. 4 and 8 it will be clear that each comb 103 has four possible positions, i. e., extreme upper position with no stops withdrawn as shown in Fig. 4; the comb may be dropped one step, two steps or three steps as shown in Figs. 8ª, 8ᵇ, and 8ᶜ, respectively. In addition to the movable combs 103 a fixed or dummy comb 105 (Fig. 11) is provided with each group of two movable combs 103. This comb is fixed in a suitable manner in the frame parts of the machine and the movable combs 103 are suitably guided for vertical movement and are normally drawn downward to their stop positions by means of springs 106 (Fig. 9).

In order to convert the combinational hole readings into a linear reading peculiarly positioned notches 107 are provided on the fixed and movable combs 105 and 103. The arrangement of these notches is such that a notch in each comb will align with a fixed line and corresponding notches in other combs will also align with this line for each differential displacement of the combs. Thus in Fig. 11 the fourth notch from the bottom of one comb is in alignment with the fourth notch from the bottom of the next comb and the corresponding notch from the bottom of the fixed comb. The arrangement of the notches is such that for each card reading there is a different open alignment of notches. In addition to providing individual alignments for the different numerals from zero to nine, I also provide an alignment of notches which is effective when all of the pins advance, which condition takes place when there is no card present at the reading station. In the construction described the movable combs are provided with eleven notches and the fixed combs with ten notches. Thus there are ten different lineal alignment positions of these notches. These aligning positions are equally differentially spaced from each other so that if a member is passed over the face of the combs and allowed to drop into the notches it will drop in after travelling differential distances.

It will be understood that for each card column there are two movable combs and one fixed comb constituting a group. By varying combinational movements of the movable combs with respect to the fixed comb it is possible to get ten different alignment positions corresponding to the digits and zero. If no card is present both movable combs will drop down and there will be an additional alignment position secured which is secured by different notches but which in point of location is the same as the alignment position which would be secured for zero, i. e., when no holes were perforated in the card.

The mechanism for reading the alignment positions of the combs will now be described.

Referring to Fig. 10, it will be seen that

there are several groups of movable and fixed combs 103 and 105. Cooperating with each group of these combs is a spring-pressed pawl 108, which pawl is carried upon an arm 109 (Fig. 9). One arm 109 is provided for each pawl 108 and for each group of movable and fixed combs. Thus there is one arm 109 for each record card column. Each arm 109 is pivoted at 110 to a supplementary arm 111, one of which is provided for each arm 109. Arms 111 are pivoted upon a common pivot 112 which is suitably fixed in the frame of the machine. Arms 109 are drawn downwardly by individual springs 113. Normally these arms 109 are all held in upper position by means of a bail 114, which bail is suitably journalled in the frame of the machine as shown in Fig. 10. To actuate the bail and rock it clockwise from the position shown in Fig. 4 a linkage 115, 116, 117, is provided having a follower 118 cooperating with a cam 119 fast to shaft 33. In the operation of the machine once per card cycle bail 114 will be lowered and this motion will be in synchronism with the elevation of rack bars 20 previously referred to. At the time the pawl 108 finds a commonly aligned set of notches the pawl will drop into an aligned notch opening and thus arrest further descent of the right hand end of the arm 109. Subsequently the arm 109 will rock about the top of the pawl at its pivot carrying down the left hand end of the arm 109, lowering the pivoted pin 110 and causing the corresponding supplementary arm 111 to rock in a counterclockwise direction about its pivot 112. Fast to each individual supplementary arm 111 is a contact actuating wire or rod 120. Each element 120 carries at its upper end a piece of insulation 121 cooperating normally with a contact blade 122. Thus upon the moving downward of the element 120 the contact blade 122 will operate under spring action and close contact points 123. These contact points 123 just closed establish a circuit to the controlling magnet 25 (Figs. 2 and 13) and arrest further outward movement of the rack bar. Thus the closure of the contacts is affected at different times depending upon the alignment position of notches for pawls 108.

It will be understood that until the arm 109 starts to rock in a reverse direction about the pawl 108 as a fulcrum that the wires 120 and the supplementary arms 111 to which they are attached will all be held in elevated position by individual springs 124 and this action will be assisted by the tension of the springs 113 since the bail 114 will serve as a fulcrum for the arms 109 and these arms will tend to rock the supplementary arms 111 in a clockwise direction about its pivots. After bail 114 has moved clear of the arms 109 the springs 113 will have sufficient tension to overcome springs 124 and permit contacts 123 to close. It will be understood that there is one contact blade 122 for each card column and the contact point 123 carried by each of these contact blades is adapted to establish contact with common bars 125.

It will be understood that for each numeral in a particular column there are four possible hole spaces and four analyzing pins 83 (see Figs. 4 and 12). Each group of four pins variously controls stop pieces 99, 97 and 98 (Fig. 8). There are two groups of these stop pieces (see Fig. 4) which cooperate respectively with the two movable combs 103. For each pair of movable combs there is a corresponding fixed comb 105 (Figs. 11 and 10). Each group of two movable combs has cooperating with it an individual pawl 108 which through the instrumentalities previously described assumes differential alignment stopping positions and thus controls the establishment of the circuit to the magnet 25 which controls the differential position of the rack bars 20 for the corresponding card column. It will be further understood that pawls 108 for different card columns may reach their so-called alignment positions at different times and thus establish the controlling circuits to magnets 25 at different times relatively to the timing of the raising cycle of rack bars 20.

The mechanism just described constitutes a transposing mechanism adapted to derive combination hole readings from perforated records and to convert each combinational reading into a timed reading which may impart a timed flow of current through a circuit to a controlling magnet. Provision is made for reading all the combinational hole readings simultaneously and for delivering the controlling current impulses at the same or different times to the controlling magnets depending upon the value of the combinational hole readings which are made by the analyzing devices. Preferably the readings or analyzation of the card readings is made mechanically and the transposition of the readings to a timed differential control of the contact devices is also effected mechanically.

Referring now to the circuit diagram the individual contact blades 122 are wired to plug sockets 126. On this plugboard sockets 128 are provided which, through wires 129, lead to the contacts 130 and thence to the magnets 25. Suitable plug connections 131 can be used intermediate sockets 126 and 128 and it will be understood that these plug connections may be transposed at will thereby providing for flexibility of connection intermediate blades 122 and magnets 25 which are to be controlled thereby. Supplemental sockets 132 are also provided en-

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abling certain contact blades or record card columns to be plugged up with multiple connections.

The type carrier 20, (Figs. 2, 13 and 14) is adapted to rise synchronously with the rocking movement of the arm 109, (shown in Fig. 9) so that when the said arm 109 is stopped by the notches 107 causing closure of contacts 123, the resultant energization of magnet 25 will rock its armature 25^a thus releasing the latch 26, permitting the latter to be actuated by its spring 26^a into cooperation with a notched member 20^a fixed on the type carrier 20. The type carrier will thus be stopped in a position which will present at the printing line the type corresponding to the value of the combination of notches 107 which caused stoppage of the rocking arm 109. The movement of the latch 26 to the right as viewed in Figs. 13 and 14 also releases the slide 130^a permitting the latter to be moved to the right by its spring 130^b thus permitting contacts 130 to open. This breaks the circuit through magnet 25 as will be observed in connection with Fig. 15. Contacts 130 are adapted in this way to open before the arm 109 is returned to its normal position and contacts 123 are again opened. The object of contacts 130 is to break the circuit as soon as magnets have performed their function.

The tabulator circuit is of the usual form and it may be stated that current is derived from a supply source 133. A double pole switch 134 when closed establishes a circuit to points 135. Connected in circuit to the points 135 are two contacts 136 and 137 and in addition there is a pair of contacts marked 29. Contacts 137, 136, are the usual cam contacts used in tabulating machines and serve to supply the current only at the proper time in the card cycle and interrupt at other times. Contacts 29 are the so-called total contacts previously referred to and these contacts open up during a totaling operation and prevent any control of the raising of the racks by the magnets 25 during this time in the cycle.

After the reading has been taken from the displaceable and fixed combs and after the contact controlling arms 109 have been restored to their normal position shown in Fig. 4, means is provided for restoring the displaced combs to normal elevated position. Such restoration is effected by means of a bar 138 which extends under the lower ends of the comb, which bar is elevated by means of a link 139 connected to a pivoted follower 140 cooperating with cam 141 fast on shaft 33.

What I claim is:—

1. A record controlled machine comprising means for analyzing combinational hole readings, means for mechanically transposing said combinational readings to single differentially timed readings, and means controlled by the aforesaid differentially timed readings for establishing electrical controlling circuits at corresponding differential times.

2. A record controlled machine comprising analyzing devices for combinational hole readings, comb devices controlled thereby, means for deriving linear readings from said combs and means controlled by the aforesaid means for controlling the circuit of the machine for the purpose described.

3. A record controlled machine comprising analyzing devices for combinational hole readings, relatively movable combs controlled thereby, a fixed comb cooperatively disposed with respect to the relatively movable combs, all of said combs having notches thereon, means adapted to slidably sweep over the movable and fixed combs and to be arrested upon reaching an open alignment position of the notches of all said combs, contact devices adapted to be operated by said last mentioned means when arrested, circuits controlled by said contact devices, magnets in said circuits, and parts controlled by said magnets for the purpose described.

4. A tabulating apparatus comprising combined type carrying and register actuating elements, magnets for controlling the differential setting of the same, timed circuit controlling devices, means for mechanically reading the perforations of combinational hole record cards and controlling the times of operation of the circuit controlling devices thereby and circuits connecting said circuit controlling devices and said magnets for the purpose described.

5. A tabulating apparatus comprising printing and adding devices, means for controlling the operation thereof in accordance with the values of combinational hole readings in record cards comprising magnet devices, circuits therefor, means for mechanically reading the cards, and means controlled by said last mentioned means controlling the said circuits in timed relation corresponding to the values which have been read.

6. A record controlled machine comprising means for reading the perforations of the cards, comb devices controlled thereby, differentially movable devices controlled by said combs, electrical circuits, contact devices in said circuits controlled by the differentially movable devices and record producing and register actuating devices controlled by said circuits.

7. A record controlled machine in combination with recording and register actuating devices, and means for controlling the differential setting of the same comprising combinational hole reading devices, transposing devices controlled thereby adapted to

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convert the combinational hole reading into linear readings, said transposing devices including differentially movable devices, and means including adjustable circuit connections controlled by said last mentioned differentially movable devices for controlling the setting of the recording and register actuating devices.

8. In a record controlled machine in combination with reading devices for reading the cards and the perforations therein, a plurality of combs controlled in one way by said reading devices upon the latter obtaining a zero reading from a card, said combs being controlled in a different way by the reading devices when the latter detect the absence of a card and means operative with said combs controlled in either way for effecting a like control of other parts of the machine.

9. In a record controlled machine, in combination with perforation reading devices for reading a card at a reading position, movable combs controlled thereby for controlling certain operations of the machine, the reading devices being adapted to effect a predetermined control upon the combs when the reading means detect the absence of a card at the reading position, said reading means being adapted to effect a different control upon the combs when a card is present at the reading position with no perforations in the card, and means for deriving an identical reading from said combs when the latter are in either of the before mentioned positions.

10. A record controlled machine including in combination, a plurality of movable combs adapted to be variously relatively displaced in accordance with different combinational hole readings in the record cards, means having sliding engagement with said combs and adapted to be controlled thereby in accordance with positions of the combs for controlling the operation of parts of the machine.

11. A record controlled machine including in combination, a plurality of movable combs adapted to be variously relatively displaced in accordance with different combinational hole readings in the record cards, a fixed comb, means having sliding engagement with said movable and fixed combs and adapted to be controlled thereby in accordance with the positions of the movable comb with respect to the fixed comb for controlling the operation of parts of the machine.

12. A record controlled machine comprising means for reading combinational holes in a record, means for transposing the combinational reading into a definite value, a plurality of elements upon which said value may be set up, and means for selectively coupling said transposing means to any of said elements for controlling the latter.

13. A record controlled machine comprising means for reading a plurality of groups of combinational holes in a controlling record, a plurality of transposing devices for converting each combinational reading into a definite value, a plurality of elements upon which the values may be set up and means for selectively coupling any one of the transposing means to any one of said elements for controlling the latter.

14. A record controlled machine comprising means for reading a plurality of groups of combinational holes in a controlling record, a plurality of transposing devices for converting each combinational reading into a definite value, a plurality of elements upon which the values may be set up and means for selectively coupling selected transposing means to selected elements for controlling the latter.

15. A record controlled machine comprising means for reading combinational hole records, means for converting said combinational hole readings into single linear readings, circuit controlling contact devices controlled by said converting means, a plurality of registering elements, and means for selectively plugging the circuits thus controlled variously to said elements to control the latter as desired.

16. A record controlled machine comprising means for reading combinational hole records, means for converting said combinational hole readings into single linear readings, circuit controlling contact devices controlled by said converting means, a counter comprising a plurality of recording elements, and means for selectively associating the circuits thus controlled variously with said elements to control the latter as desired.

17. The invention set forth in claim 15 in which a selectable plugboard is provided for selectively associating the elements and circuits.

18. The invention set forth in claim 15 in which a selectable plugboard is provided for selectively associating the recording elements and circuits.

19. In a record controlled machine, means for analyzing combination index point records, means controlled by said analyzing means and responsive to an instantaneous sensing operation thereof for effecting a set-up corresponding to a sensed combination and electrical timing means for converting said set-up into a differential time equivalent.

20. In a record controlled machine, means for analyzing combinational index point records, means controlled by said analyzing means for effecting a set-up corresponding to a sensed combination, said last named means comprising means for retaining the set-up independently of the period of duration of the sensing operation and electrical

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timing means for converting said set-up to a differential time equivalent.

21. In a record controlled machine, means for analyzing combinational index point records, electrical time controlled means for manifesting characters designated by index point combinations, a control circuit therefor comprising a time circuit maker and breaker and means controlled by said analyzing means and responsive to an instantaneous sensing operation thereof for determining the time of operation of said circuit maker and breaker.

22. In a record controlled machine, means for analyzing combinational index point records, electrical time controlled means for manifesting characters designated by index point combinations, a control circuit therefor including a timed circuit maker and breaker, means independent of said analyzing means for operating said circuit maker and breaker and means controlled by said analyzing means for determining the time of operation thereof.

23. In a record controlled machine, means for analyzing combinational index point records, electrical time controlled means for manifesting characters designated by index point combinations, a single control circuit therefor for all character manifestations, said circuit including a timed circuit maker and breaker and means controlled by said analyzing means for determining the time of operation of said circuit maker and breaker.

In testimony whereof I hereunto affix my signature.

JOHN ROYDEN PEIRCE.