

Dec. 23, 1930.

J. W. BRYCE

1,785,999

RECORD CONTROLLED PRINTING MECHANISM

Filed June 6, 1928

7 Sheets-Sheet 1

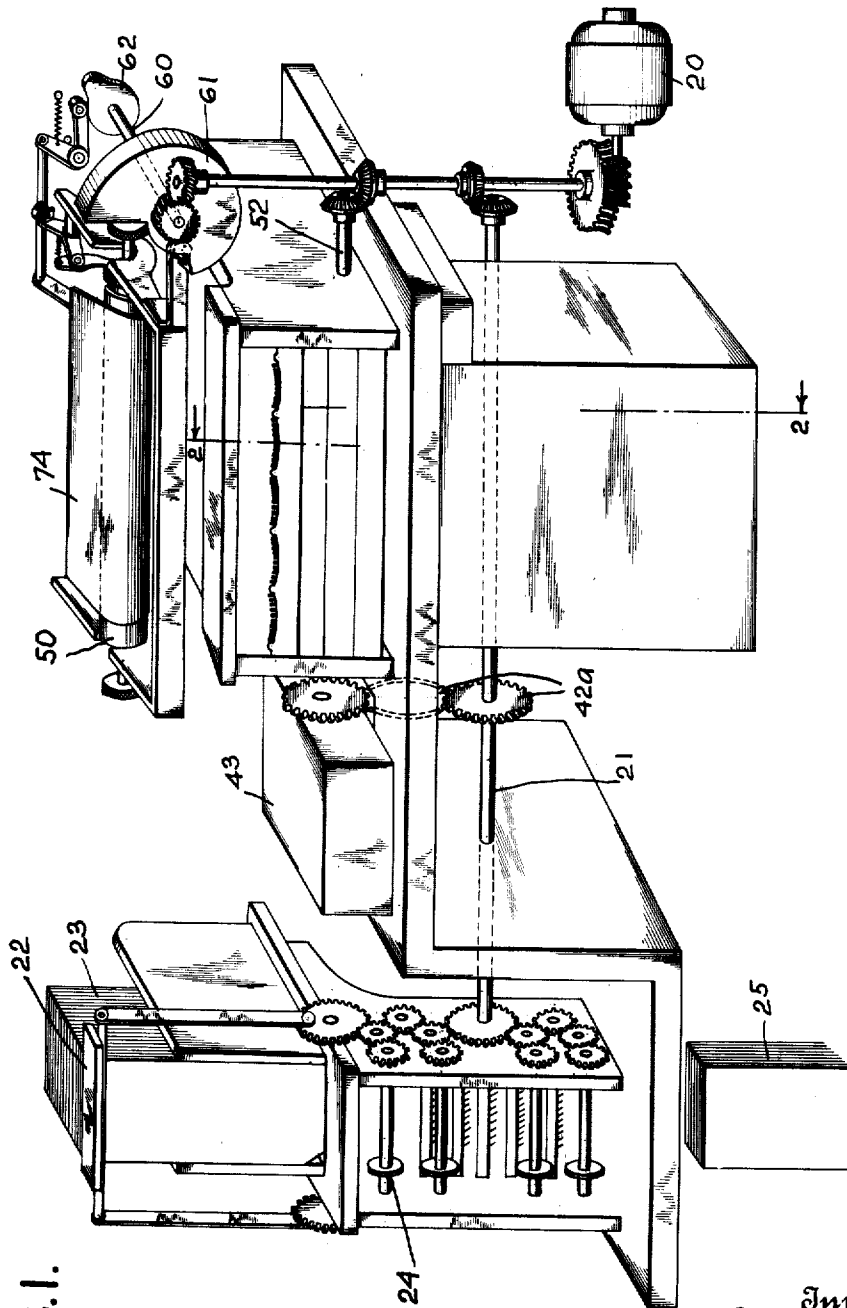


FIG. 1.

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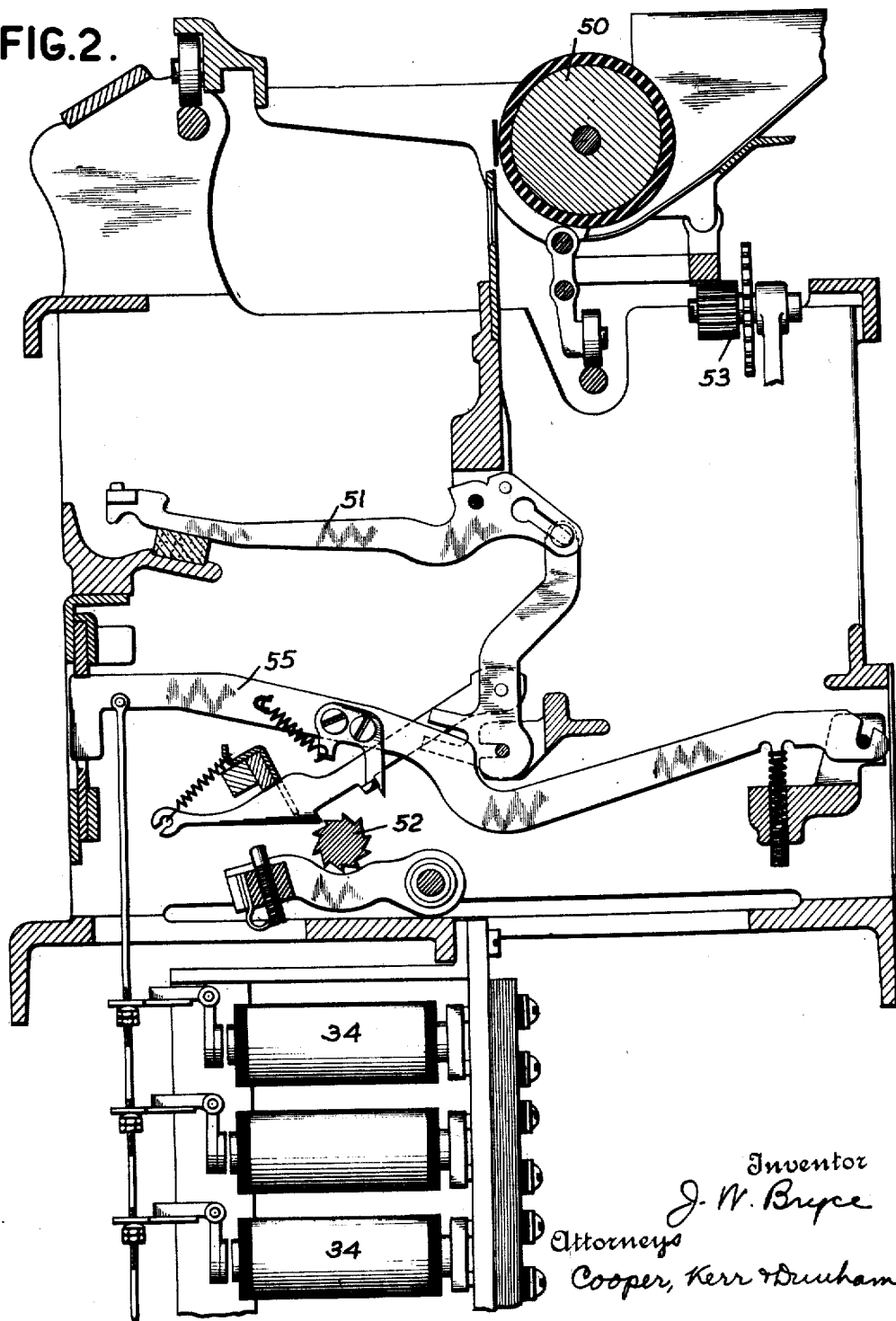
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RECORD CONTROLLED PRINTING MECHANISM

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7 Sheets-Sheet 2

FIG. 2.



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RECORD CONTROLLED PRINTING MECHANISM

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7 Sheets-Sheet 3

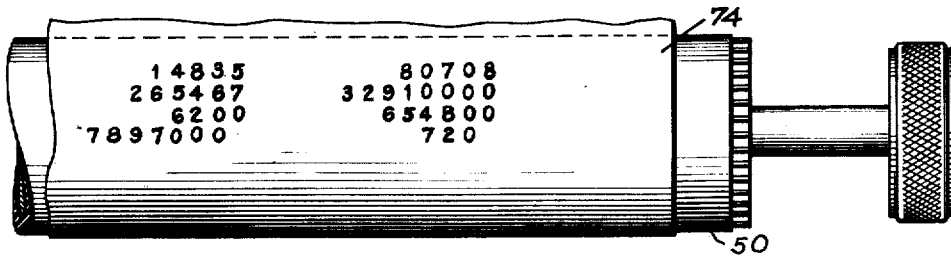
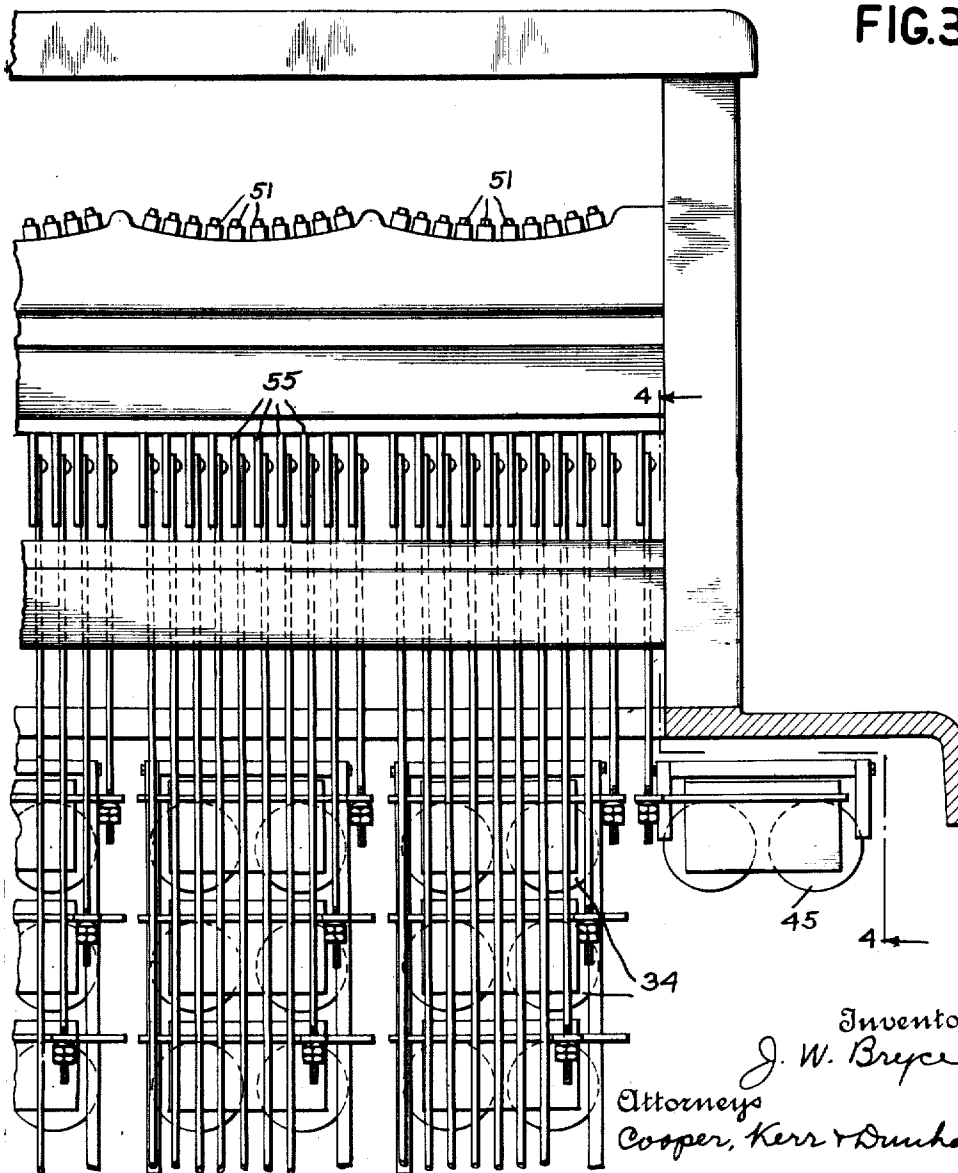


FIG. 3.



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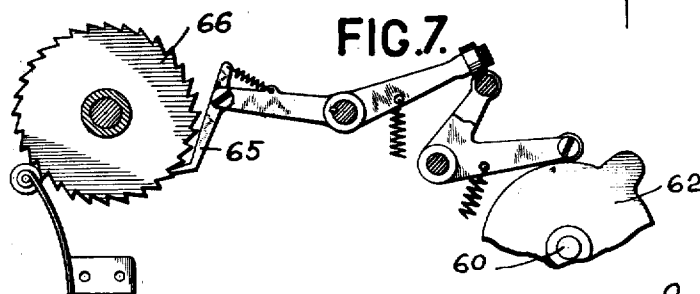
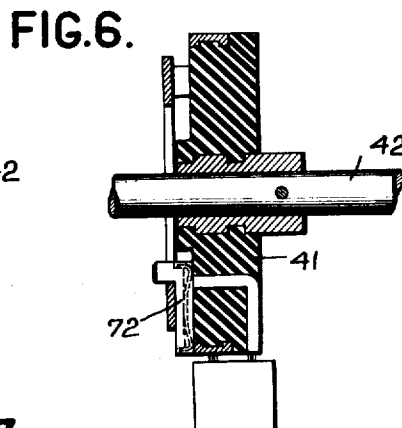
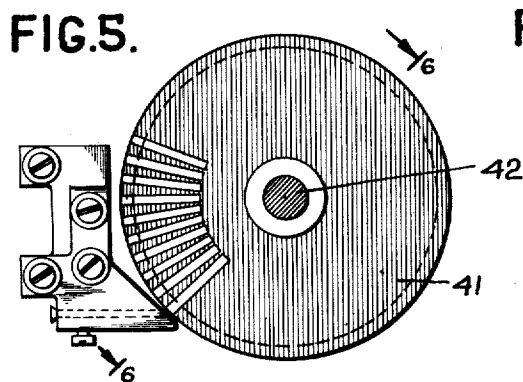
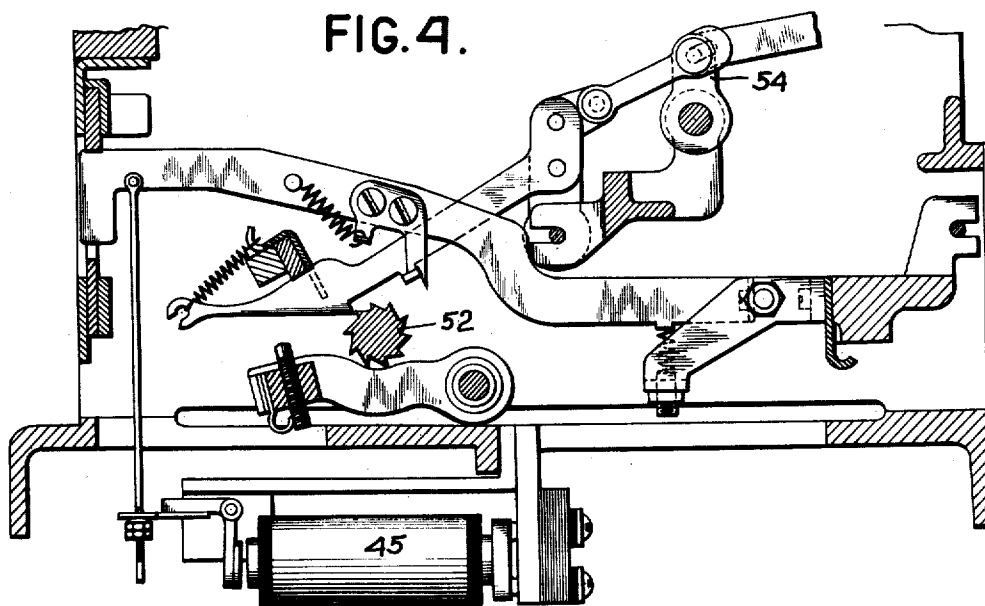
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RECORD CONTROLLED PRINTING MECHANISM

Filed June 6, 1928

7 Sheets-Sheet 4



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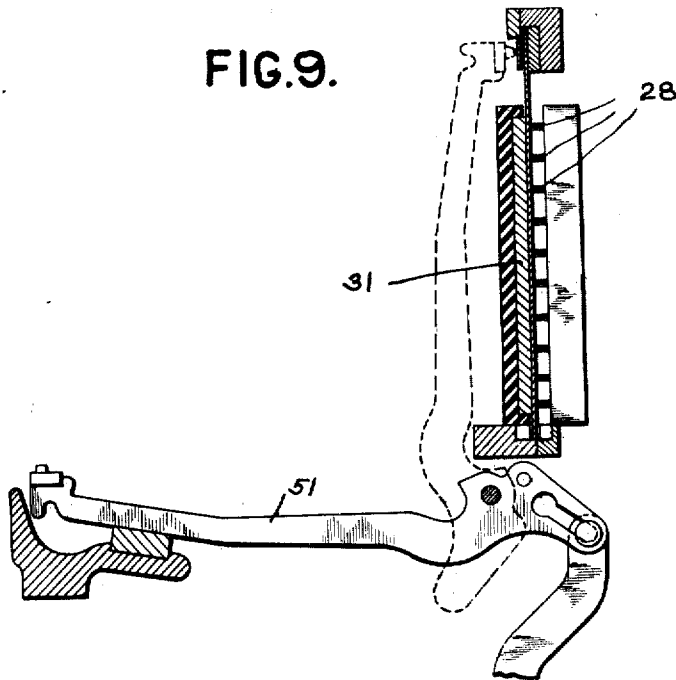
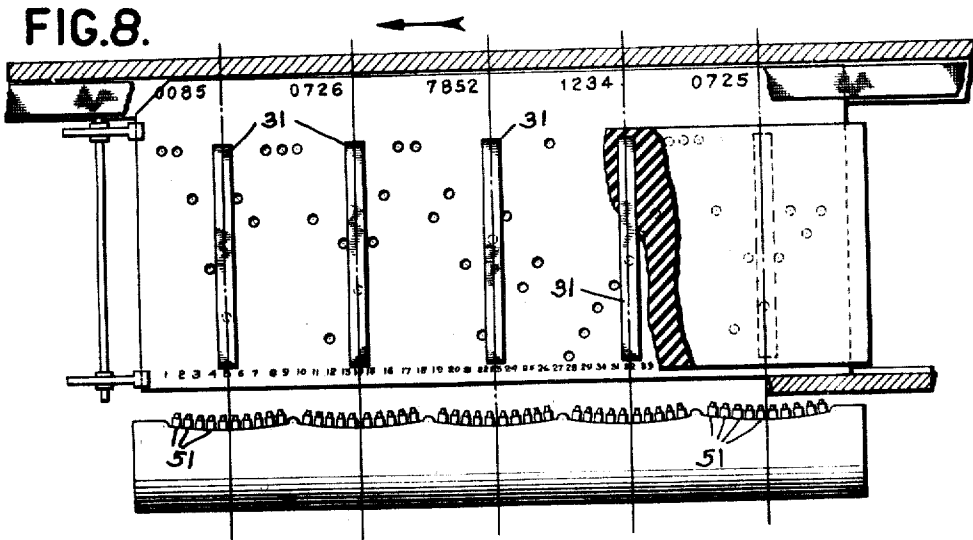
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RECORD CONTROLLED PRINTING MECHANISM

Filed June 6, 1928

7 Sheets-Sheet 5



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RECORD CONTROLLED PRINTING MECHANISM

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7 Sheets-Sheet 6

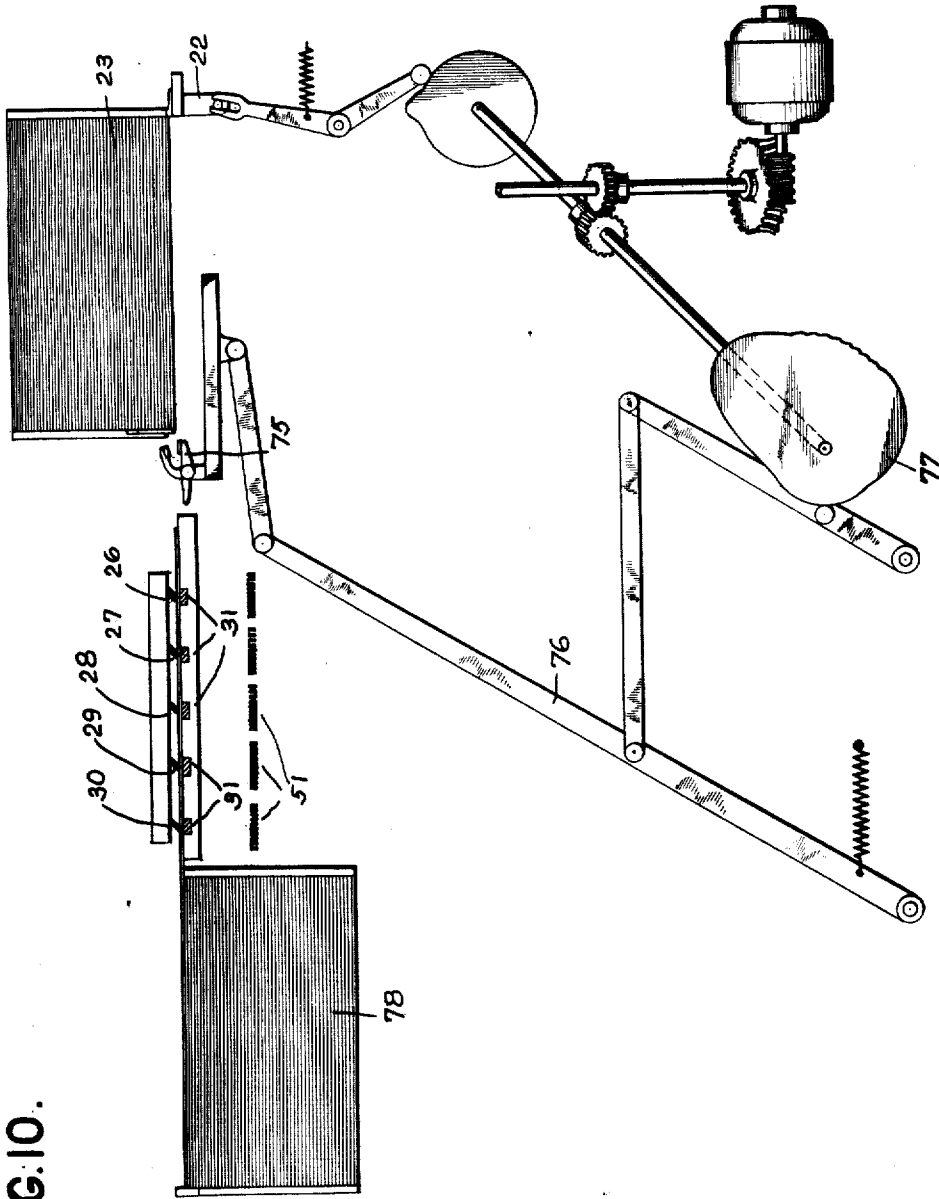


FIG. 10.

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RECORD CONTROLLED PRINTING MECHANISM

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7 Sheets-Sheet 7

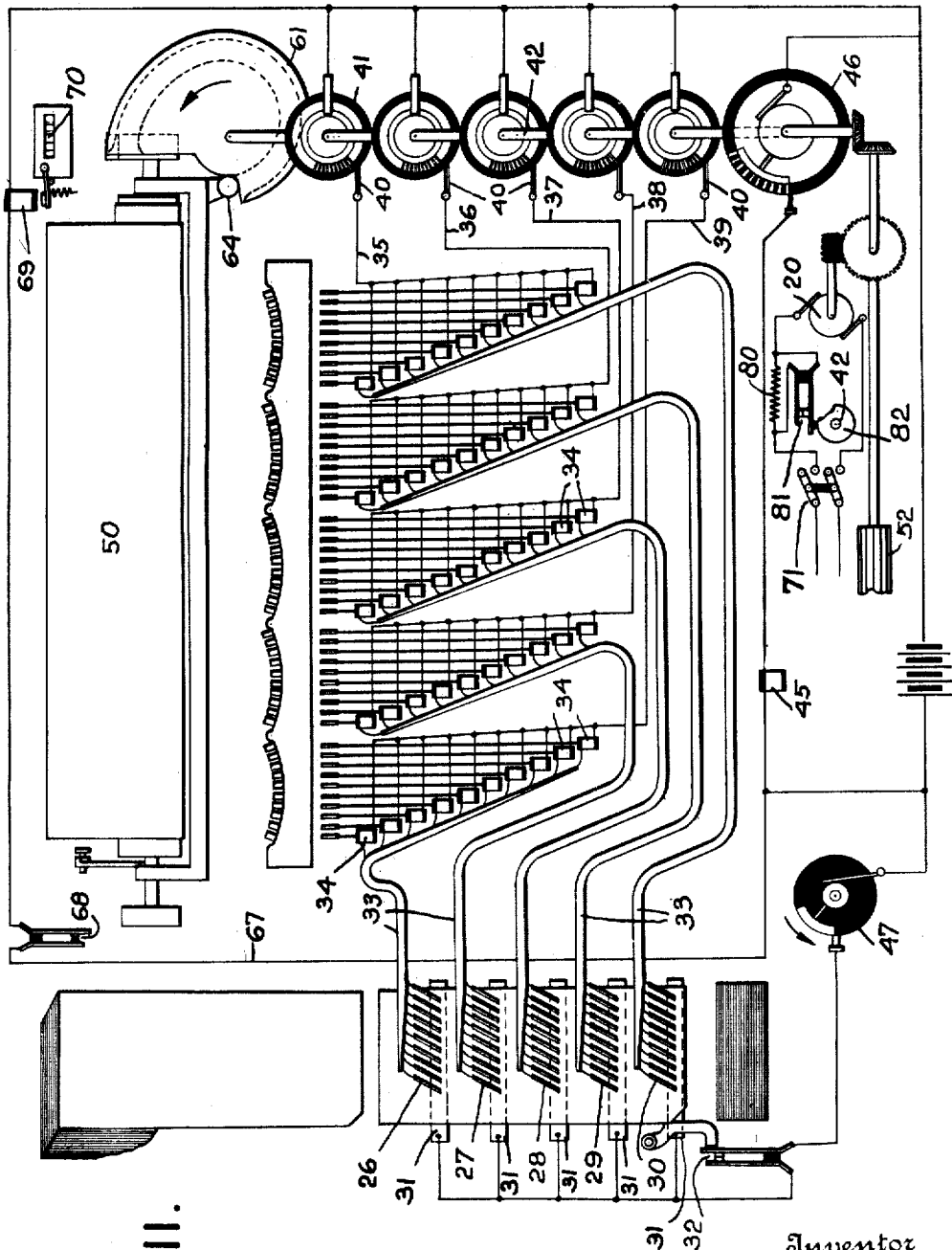


FIG. II.

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UNITED STATES PATENT OFFICE

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

RECORD-CONTROLLED PRINTING MECHANISM

Application filed June 6, 1928. Serial No. 283,149.

This invention relates to improvements in record controlled machines. In the use of such machines, printed records are frequently desired of perforated data. At the present
5 time it is the general practice to run the record cards through such machines in such a manner that the various data columns upon the cards are concurrently sensed or analyzed. With some machines, each data column on the card is traversed by a single
10 brush, which brush upon encountering a perforation in the column brings about the selection of a type carrier for the subsequent printing of a character representing the perforation in the column. With such forms of
15 machines it is the general practice to utilize one type carrier employing a plurality of type for each column and printing from the various type is effected simultaneously after they have been selectively stopped at the
20 printing position.

It has also been proposed to successively traverse the columns of a card under the single set of sensing means and to print from
25 each column successively and sequentially by a printing mechanism which is of the typewriter type. A device of this sort is shown in the Reynolds U. S. Patent No. 1,519,054. Such latter arrangement while affording
30 greater simplicity in the printing mechanism, secures such simplicity at the sacrifice of speed of operation. The loss of speed is due in part to the fact that there is a successive sensing of all of the individual columns
35 and a successive or sequential printing of the data pertaining to each column. With cards employing 45 or 80 columns of perforations, it will be obvious that the speed of printing will be materially reduced over that obtained
40 with machines of the more conventional type wherein only ten perforations have to be traversed and sensed successively in a particular column and wherein all columns of the record are sensed concurrently.

It is accordingly one of the objects of the present invention to provide an improved record controlled printing mechanism which is adapted to effect printing with greater
45 rapidity than is now obtainable with the successive reading type of printing machines and

with greater simplicity of mechanism than is now obtainable with the machines of the concurrent column reading type.

It is further an object of the present invention to provide for the speeding up of
55 printing data derived from records while maintaining comparative simplicity of the printing mechanism by providing, in a machine of the successive column sensing and
60 printing type, for multiple sensing and multiple printing. Thus with a 45 column record card traversed endwise or successively across the columns, a multiplicity, say five sensing mechanisms, may be provided and for each
65 set of sensing elements there can be a corresponding printing mechanism or set of printing elements. These printing elements are preferably of the typewriter type. With five of the analyzing or sensing mechanisms
70 and five sets of printing mechanisms, only nine columns need be traversed of a 45 column card to sense and print the record from the entire 45 columns. In this way greater
75 speed may be secured while the comparative simplicity of the typewriter type of printing mechanism can be retained. It will be apparent that 50 type bars would be required in the illustrative example of the simplified machine given above. Each type bar carries a single type and the gain in simplicity
80 will be apparent when it is considered that a conventional record controlled printing machine which concurrently reads and prints 45 columns would require 45 type carriers each with ten type or a total of 450 type.
85 Such conventional machines would also require the necessary hammer mechanism and like parts which would increase the number of parts to a further extent.

A further object of the present invention
90 resides in the provision of a record controlled printing machine which is adapted to control a power actuated typewriter of the type which employs a constantly rotating driving shaft for impelling the type
95 bars towards the platen for making printing strike impressions.

A further object of the present invention resides in the provision of a novel means for
100 interpreting card records at a greater speed

and with a simpler mechanism than heretofore. According to one embodiment of the invention the interpretation of the perforated data from the records is made upon a separate record sheet and in accordance with another embodiment of the invention the interpretations are made upon the record card itself which contains the perforated data.

Further and other objects of the present invention reside in the provision of an extremely simple record controlled printing machine, which machine contains less number of parts than machines heretofore in use, taking into account the speed of operation of the machine, and which machine is cheaper, easier to manufacture and assemble than previous machines of equivalent performance.

A further object of the present invention resides in the provision of a simple machine which is better adapted for making manifold copies of the original data from the perforated records.

Further objects of the present invention will be hereinafter set forth in the accompanying specification and claims and shown in the drawings, which by way of illustration show what I now consider to be preferred embodiments of the invention.

In the drawings,

Fig. 1 is a diagrammatic perspective view of the complete machine.

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

Fig. 3 is a front view of Fig. 2 with certain of the supporting frame parts removed.

Fig. 4 is a detail view showing the escapement mechanism taken substantially on line 4—4 of Fig. 3 looking in the direction of the arrow.

Fig. 5 is a detail view of one of the commutators which is used in the machine.

Fig. 6 is a detail sectional view of this commutator taken on line 6—6 of Fig. 5.

Fig. 7 is a detail view showing the paper feed mechanism.

Fig. 8 is a partial front view of a modification in which the printing is effected directly upon the records containing the perforations.

Fig. 9 is a detail transverse sectional view of the parts shown in Fig. 8.

Fig. 10 is a diagrammatic view showing the card feed for the mechanism of Figs. 8 and 9, and

Fig. 11 is a circuit diagram of the embodiment shown in Figs. 1 to 7 inclusive.

In more detail, referring to Fig. 1, 20 represents a continuously driven motor also shown in Fig. 11. This motor through suitable gearing drives a card feed shaft 21 which in turn actuates a card picker 22 to pick cards from supply magazine 23 and deliver them endwise to feed rolls 24. The

feed rolls ultimately deliver the cards to a discharge stack 25, and a suitable stacker could be provided if desired.

Referring to Fig. 11, it will be noted that a plurality of sets of sensing devices 26, 27, 28, 29, and 30 are provided. These sensing devices are disposed to cooperate with non-adjacent columns upon the record cards and to sense the perforations therein. Each sensing device comprises sets of brushes which individually are adapted to pass through a perforation in the card and establish contact with the common bars 31 which are disposed upon the opposite side of the card. Current supplied to the common bars 31 is provided by a conventional card lever contact generally designated 32 in Fig. 11. From the individual brushes and the sets of sensing devices 26 to 30 inclusive, cabled conductors 33 lead to and connect the brushes individually to selector magnets 34. It will be understood that there is an individual selector magnet 34 for each of the brushes 26 to 30 inclusive. Passing through the selector magnets 34 current flows to common return wires 35, 36, 37, 38 and 39. One common return wire is provided for each set of selector magnets as shown and each return wire terminates in a brush 40 which cooperates with a selecting commutator generally designated 41. The purpose of these commutators will be hereinafter described. In the circuit diagram, the commutators 41 are shown mounted on a vertical shaft 42 which is driven from the motor 20 as shown. The operation of the commutators is accordingly in synchronism with the card feed. In Fig. 1, the commutators 41 are disposed within the box 43 and are driven in synchronism with the card feed by the gearing 42a. The arrangement and timing of the commutators is such that when the various sets of sensing elements 26 to 30 are on the first presented column of a record card, the commutator brushes are on the first bar of their respective commutators. When the card feed has advanced the cards relatively to the brushes so that the brushes are in cooperation with the second or next adjacent sets of columns, the commutator brushes are in cooperation with the second commutator bars and so on.

The typewriter printing unit which will hereinafter be later described, is provided with an electrically controlled escapement. The escapement controlling magnet is shown in the diagram at 45 and this magnet is likewise in a commutator circuit extending to a commutator 46. The brush of this commutator establishes contact with its segment when the sensing brushes are in contact with the respective columns on the card. The relative timing of the commutators 41 and 46 is such that the commutators 41 make their contact slightly in advance of the contact established by the escapement circuit.

It will be appreciated that if the record card has 45 transverse columns, and 5 sets of sensing elements be used, as shown, the complete data from the card will be derived therefrom in 9 columnar readings. To shut off the current to the brushes after the card has passed these 9 columnar positions in an endwise direction a commutator 47 is provided likewise timed with the card feed and arranged to break the circuit after such nine columns have been traversed by the sensing brushes. The commutator 47 is in the nature of a safety device because it is obvious that the commutators 41 break the circuits at the same point.

Referring now to Figs. 2, 3 and 4, power driven typewriters are well known wherein the actual printing strike movement of the type bars is effected by power. One of the common forms of such typewriters comprises a constantly rotating fluted shaft with provisions for selectively coupling the type bars thereto when it is desired to swing the type bar for printing. Such coupling has heretofore been effected by the usual typewriter keys. Use is made of such a construction in the present machine.

Referring to Fig. 2, 50 is the usual platen. 51 is one of the type bars and 52 is the constantly rotating fluted shaft. The typewriter platen is mounted in the conventional manner for step by step lateral movement. 53 is the conventional escapement which is used for the platen. This escapement is actuated through the linkage generally designated 54 in Fig. 4, from the fluted shaft 52 in the conventional manner in which the escapement is operated in such power driven typewriters. The escapement is called into action by the escapement magnet 45 (Fig. 4) which has previously been described in connection with the circuit diagram of Fig. 11.

Referring again to Fig. 2, the type bars 51 are coupled with the fluted shaft by the energization of the selector magnets 34. The armatures of these selector magnets respectively connect to the bars 55 which take the place of the usual key bars of the ordinary typewriter. Referring now to Fig. 1, it will be noted that the type bars 51 are arranged in sets. As shown in this figure there are five sets of these type bars. The individual type bars are all operated by the common fluted shaft 52, the end of which shaft is shown in Figs. 1 and 11, properly geared to the motor drive shaft.

With the above described construction it will be understood that there will be simultaneous printing from one bar of each of the five sets if required. Each set of bars will be under the control of its respective set of selector magnets 34 and each set of selector magnets in turn is under control of its respective set of sensing devices and of the associated commutators 41.

Accordingly in the operation of the machine there will be a concurrent reading of five non-adjacent record card columns by the sensing device, there will be a concurrent printing of five non-adjacent columns upon the record sheets, thereafter the record card will move one column and the operation will be repeated until the record is completely read and printed.

In the embodiment illustrated, there will be nine such readings and actuations, during which nine actuations a total of 45 columns will be read from the card and the data printed. After one complete card record has been thus printed, a new card feeds into the sensing section of the machine and provision is made for restoring the platen to its initial position and for feeding the platen forward one step so as to present a new line in position to receive the data from the next card.

Referring to Figs. 1, 7 and 11, disposed adjacent the end of the platen is a transverse shaft 60 provided with a box cam 61 and a paper feed cam 62. Shaft 60 is suitably geared to the motor and the timing of shaft 60 is such that it makes one revolution per card cycle. Fig. 11 shows the box cam 61 at the beginning of the card reading and printing cycle. As the printing proceeds, the platen 50 moves step by step to the left as viewed in Fig. 11. In the present embodiment it would have nine such steps of escapement movement. After such nine steps of escapement movement have occurred the box cam 61 would engage the follower roller 64 and continued rotation of the box cam would draw the platen 50 back to the right to the initial or starting position shown. During the same time a new card is being advanced from the stack 23 to the reading position and the previously read card is being ejected. During the proper time in the cycle cam 62, Fig. 7, operates to advance the platen feed pawl 65 and through the ratchet 66 spaces the paper one line.

As shown in the diagram, Fig. 11, there is a supplementary circuit 67 including contact 68 adapted to be closed by the platen 50 when it is in extreme left position. This circuit is adapted to energize a magnet 69 which may actuate a card counter generally designated 70. In the diagram there is also shown a main motor switch 71 which is closed when it is desired to start the operation of the machine.

In the use of machines of this sort, it is sometimes desirable to suppress printing from selected card column positions. Use is made of the commutators 41 for this purpose. Each commutator is provided with a number of sliding switches 72, one sliding switch being provided for each column. By displacing these switches toward the center the contact may be broken for any particular column. With such switch pertaining to a given col-

umn or columns in such inward position no circuit will be established through any selector magnet 34, notwithstanding the presence of a perforation in the card.

5 The previous description has referred to the printing of a record upon a separate record strip or sheet 74 carried by the platen 50. The same type of printing and controlling mechanism can also be employed in other em-
10 bodiments of the invention for example, in a machine wherein it is desired to print on the record cards themselves a character or series of characters which are representative of the perforations in the card. Sets of type bars
15 51 are utilized as before.

Referring to Fig. 10, the record cards are individually fed from a stack 23 by a picker 22, which picker is operated in any suitable manner from a motor driven shaft. As the
20 cards are individually advanced from the magazine 23 by the picker, they are gripped by a suitable gripper 75. They are fed forward first with a rapid movement to bring them into sensing and print receiving position. This is effected by a cam and link
25 motion generally designated 76, 77. Suitable brushes or sets of sensing devices 26, 27, 28, 29 and 30 are provided as before and also common bars 31. The disposition of the sets
30 of type bars 51 with respect to the card under the sensing brushes is such that the various type bars can print directly upon the card. As each set of printing impressions are taken the advance of cam 77 permits the card to
35 make one increment of advance to the next column. After the card has received a printed interpretation of all the data perforated thereon the cam 77 through the linkage draws the card over and deposits it into a discharge
40 stack 78. The gripper operating mechanism is of conventional type and requires no detailed description. The circuits for controlling the various operations are the same as those given for the embodiment shown in
45 Figs. 1 and 11.

While it will be obvious that various supplementary controls and safety devices could be provided I have herein described the es-
50 sentials of the machine for simplicity and clarity of the description.

According to the present invention a power actuated card feeding device is provided which is adapted to successively feed card records endwise, that is to say, in suc-
55 cessive transverse columnar manner under a plurality of sets of sensing means which are relatively spaced apart. Coordinated with and controlled by the respective sets of sensing means are a plurality of sets of type-
60 writer type printing devices. Each set of these printing devices can be considered to be the ten numeral type bars of a power actuated typewriter. All of the various type
65 bars of all of the sets are preferably actuated from a common driving member such as a

fluted shaft and the selection of the type bars for actuation by the shaft is effected preferably electromagnetically under the control of the sensing means. Each set of sensing
70 means controls its corresponding set of printing type bars. The disposition of the parts is such that simultaneous printing can be effected of the data from a plurality of col-
75 umns after which a new columnar relation of the sensing device and record is effected. Thereafter there is another simultaneous printing action by the different set of printing
80 devices followed by a further column shifting action and so on until the record is completely printed. Means are also provided for feeding the record sheet one line space (in the
85 embodiment where a separate record sheet is used) and for restoring the platen to the initial position. The old and completely sensed record is automatically fed out from
90 the sensing means and the new record is introduced after which further recording is effected. According to another embodiment of the invention, printing is effected in a simi-
95 lar manner upon the record card itself and sensing is simultaneously effected by a plurality of sets of sensing elements. Provision is furthermore made for suppressing print-
ing in any desired column.

In the foregoing description no reference
95 has been made to the machine speed at different points of a single card cycle. It may be explained that the speed of operation during actual printing has a certain upper limit
100 which cannot be exceeded. The speed of operation at other parts of the cycle may be vastly greater. Such time in the cycle is merely taken up with the introducing of a
105 new card to initial sensing position, the removal of the old card, the feeding of the paper and the return of the carriage.

Various methods may be employed for obtaining such increased speed during this part of the cycle. One method is indicated in
110 the circuit diagram, Fig. 11, wherein the circuit to motor 20 includes a resistance 80 which is adapted to be thrown into the circuit by shunt contacts 81 which are actuated by
115 cam 82 timed with respect to the card cycle in any desired manner as by being mounted upon shaft 52 or any other cyclic shaft of the machine. It will be understood that when
120 the card is passing through the various analyzing positions in which printing is being effected the contact 81 will open, placing resistance 80 in the motor circuit (the motor
125 may be of series type). After printing is completed contacts 81 will close permitting the speeding up of the motor and the attendant speeding up of the operation during
the feeding and carriage return portion of the cycle.

It will be obvious that other methods of obtaining increased machine speed during
the parts of the cycle which are potentially

capable of being fast may be used, but the foregoing illustrates one manner of accomplishing this result.

What I claim is:

- 5 1. A record controlled apparatus including a plurality of sets of sensing means adapted for cooperation with perforated cards which are movable transversely of the columns thereof, a plurality of typewriter
10 type sets of printing devices each comprising a group of type bars and each coordinated with a set of sensing means and controlled thereby, means for feeding the cards column
15 by column to the multiple sets of sensing means, and means for effecting printing operations of the various type bars in the sets under the control of the said sensing means. 70
- 20 2. A record controlled machine including means for concurrently sensing a multiplicity of non-adjacent columns of a record card, means for concurrently printing in non-adjacent
25 columnar positions the record data sensed by the aforesaid sensing means, and means for thereafter establishing a new columnar relation of the record card and the multiple sensing means and a new columnar
30 relation of the record which receives the printing data with respect to the printing means. 75
- 35 3. The invention set forth in claim 2 in which the printing means comprises a plurality of sets of type bars, each type bar being of the striking type bar type, and in
40 which a common rotary actuator is provided for actuating the aforesaid type bars for striking movement. 80
- 45 4. The invention set forth in claim 2 in which the printing means comprises a plurality of printing devices, each device including a set of striking type bars of the typewriter
50 type with a common fluted actuator for operating all of the type bars of the various devices, and with selecting mechanism controlled by the sensing means for selectively
55 coupling various type bars to the said actuator and for simultaneously coupling bars in various devices to the actuator when required. 85
- 60 5. A record controlled machine with record feeding means, a typewriter formed of printing mechanism comprising a plurality of type bar sets with a common fluted actuator for operating all of the bars in said various
65 sets, and operating means for operating the record feeding means and said fluted actuator, multiple column record sensing means comprising sets of sensing means for various
70 record card columns, and selecting means controlled thereby for coupling the type bars with the actuator. 90
- 75 6. A record controlled printing machine with means for concurrently sensing a plurality of non-adjacent columns of a perforated record, means under the control of the
80 aforesaid means for concurrently effecting printing of records corresponding to the sensed data in said non-adjacent columns, said printing being correspondingly effected in
85 non-adjacent columns, means for establishing new sensing relations between the sensing means and the record to cause the former to sense a further plurality of non-adjacent
90 columns which are relatively adjacent to the previously sensed columns, and means for correspondingly reestablishing the same kind of columnar relations between the printing
95 means and the record which is being printed upon whereby printing of the complete record may be effected by a series of printing impressions which are simultaneous followed successively by another series of simultaneous printing impressions. 100
- 100 7. A record controlled interpreting machine comprising in combination with multiple sets of sensing instrumentalities, for
105 concurrently sensing non-adjacent columns upon a record, and multiple sets of printing devices for simultaneously printing upon the perforated record the representations of the readings taken from that record by the sensing
110 devices. 100
- 110 8. A record card interpreting machine comprising printing mechanism of the typewriter bar type with individual printing type upon individual type bars, a record sensing means
115 for sensing the perforations of a record, means controlled by the sensing means for selectively controlling the printing strike action of the typewriter printing mechanism to cause the
120 printing mechanism to print upon the record containing the data a representation of such perforated data. 100
- 120 9. The invention set forth in claim 8 in which power driven card feeding devices are provided for successively advancing the card to present a new column to the sensing mechanism
125 and a new zone of the card to receive the printed impression from the striking type bars of the printing mechanism. 105
- 130 10. A record controlled printing machine including a series of printing devices each of the typewriter type and with the individual numeral type bars, said various printing
135 devices being adapted to print in a single line upon a record the various non-adjacent columns simultaneously, a series of sets of sensing devices for controlling the selection of the type bars for printing strike operations, and
140 means associated with the sets of printing mechanisms for selectively suppressing printing action in any desired columns. 115
- 145 11. A record controlled machine having a plurality of sets of sensing devices for concurrently sensing various sets of perforations of a record which are disposed in different zones,
150 card feeding devices for feeding record cards successively to said sensing means, and means for providing a variable card speed to traverse the card under the plurality of sensing
155 devices at one speed to cause the concurrent 125

sensing of various sets of perforations by the sensing means and to traverse the card in other positions in its cycle when sensing is not being effected by the sensing devices at another speed so that the card may be rapidly
5 brought to the sets of sensing devices and thereafter sensed by the motion of the card past the sensing devices.

In testimony whereof I hereto affix my signature.
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CERTIFICATE OF CORRECTION.

Patent No. 1,785,999.

Granted December 23, 1930, to

JAMES W. BRYCE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, line 50, before the word "reading" insert the word column; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of January, A. D. 1931.

M. J. Moore,
Acting Commissioner of Patents.

(Seal)

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