June 30, 1931. J. W. BRYCE 1,812,838

PRINTING MECHANISM FOR ACCOUNTING MACHINES

Filed March 27, 1929 4 Sheets-Sheet 1

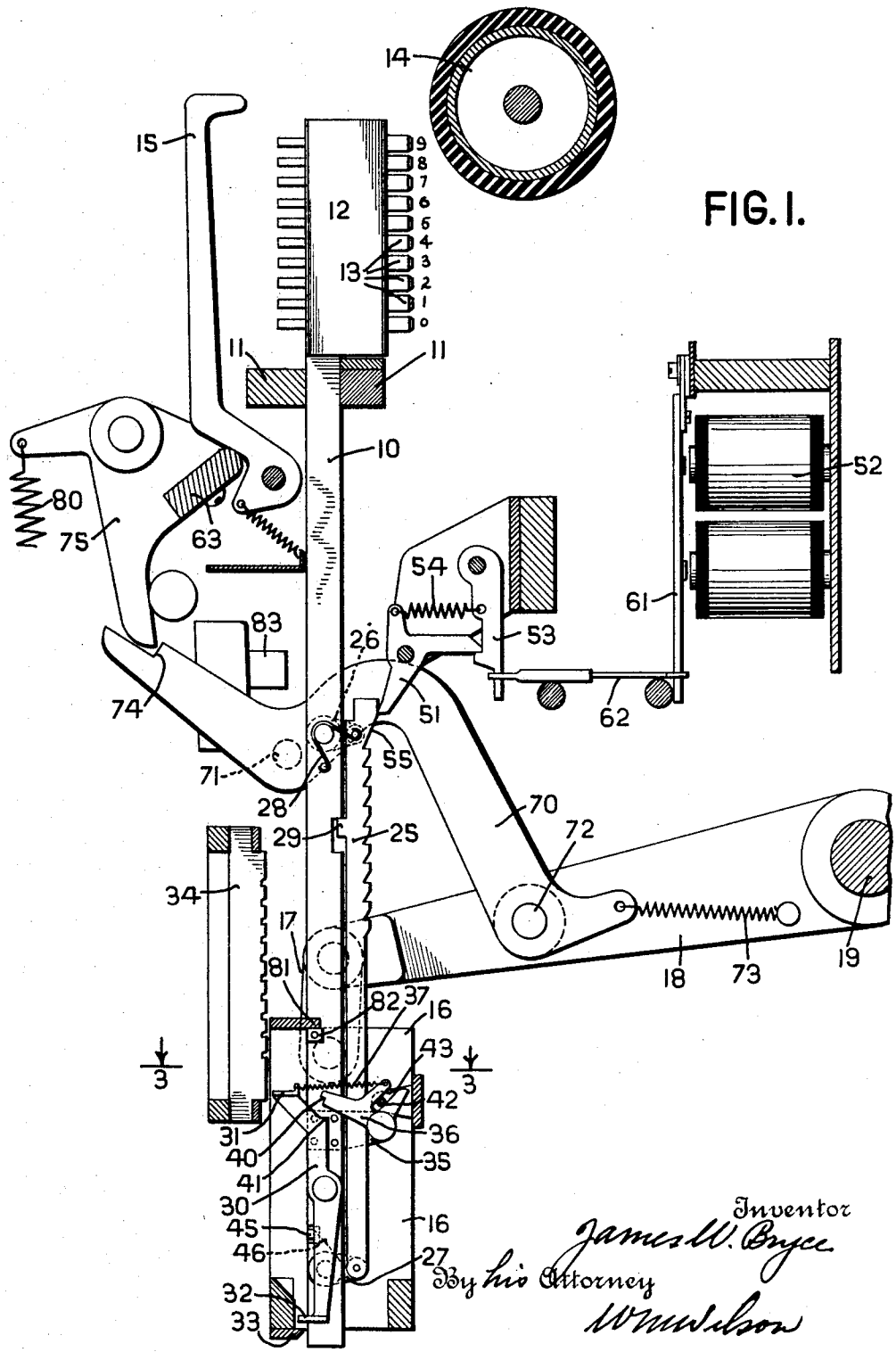


FIG. 1.

Inventor
James W. Bryce
By his Attorney
W. W. Wilson

June 30, 1931. J. W. BRYCE 1,812,838

PRINTING MECHANISM FOR ACCOUNTING MACHINES

Filed March 27, 1929 4 Sheets-Sheet 2

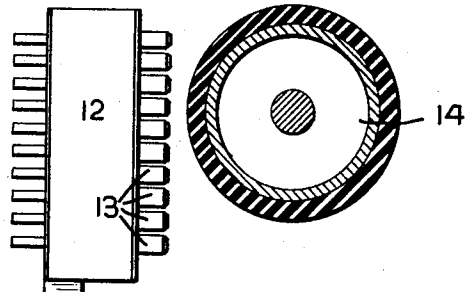


FIG. 2.

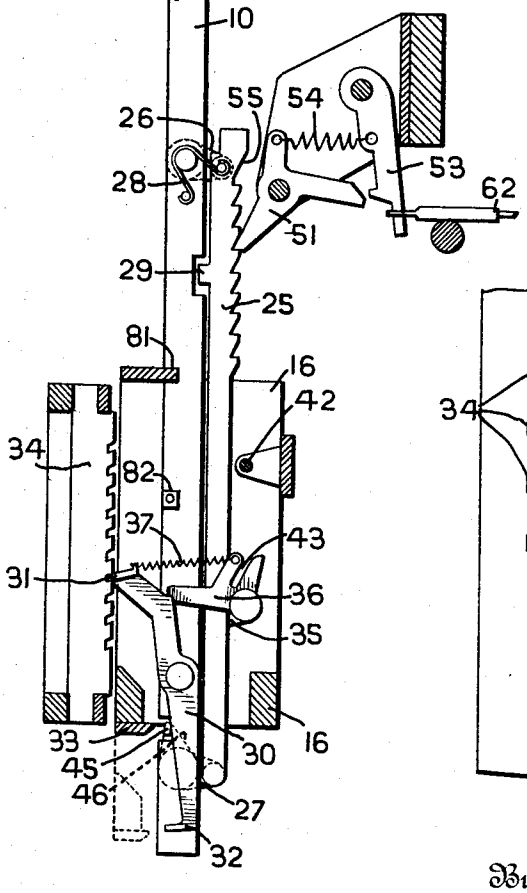
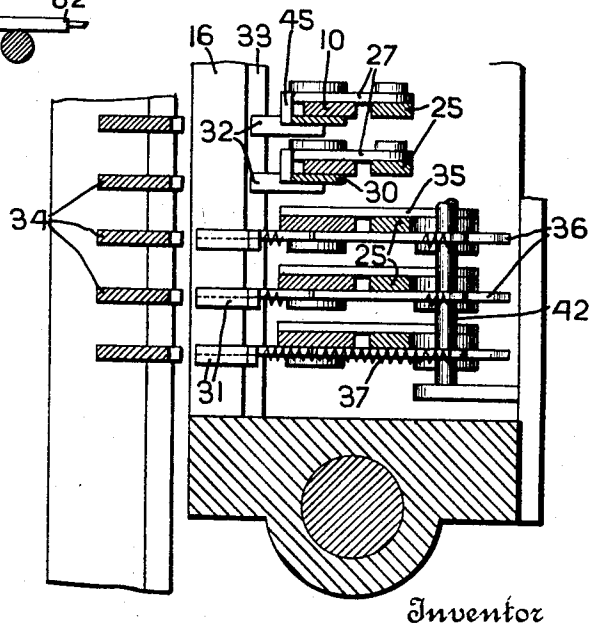


FIG. 3.



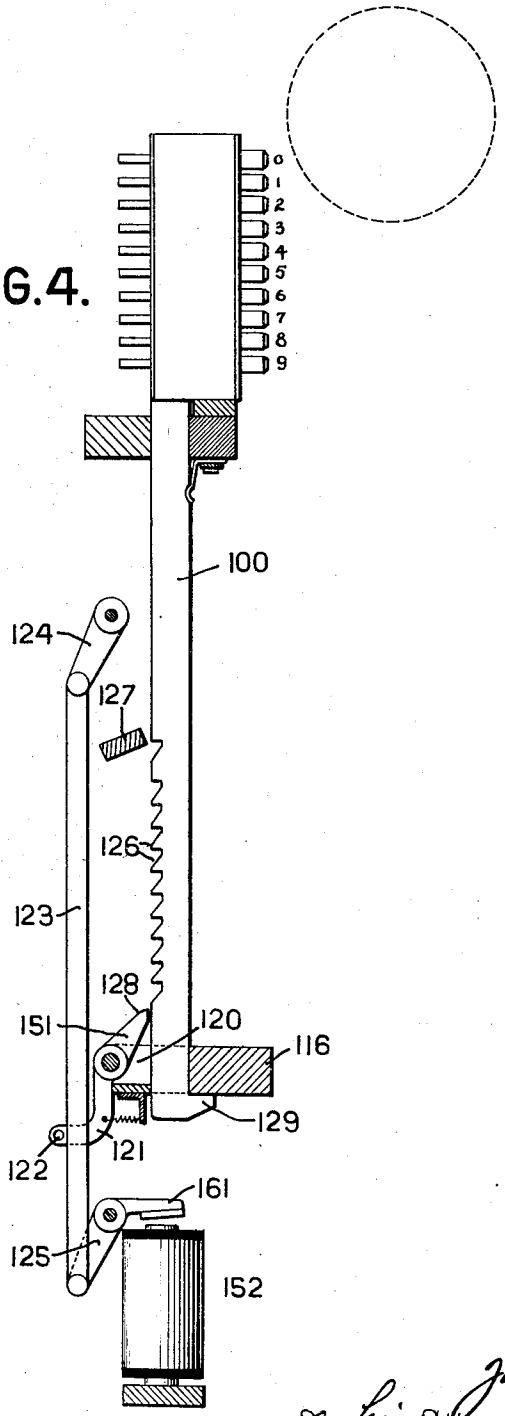
Inventor
James W. Bryce
By his Attorney
W. Madison

June 30, 1931. J. W. BRYCE 1,812,838

PRINTING MECHANISM FOR ACCOUNTING MACHINES

Filed March 27, 1929 4 Sheets-Sheet 3

FIG. 4.



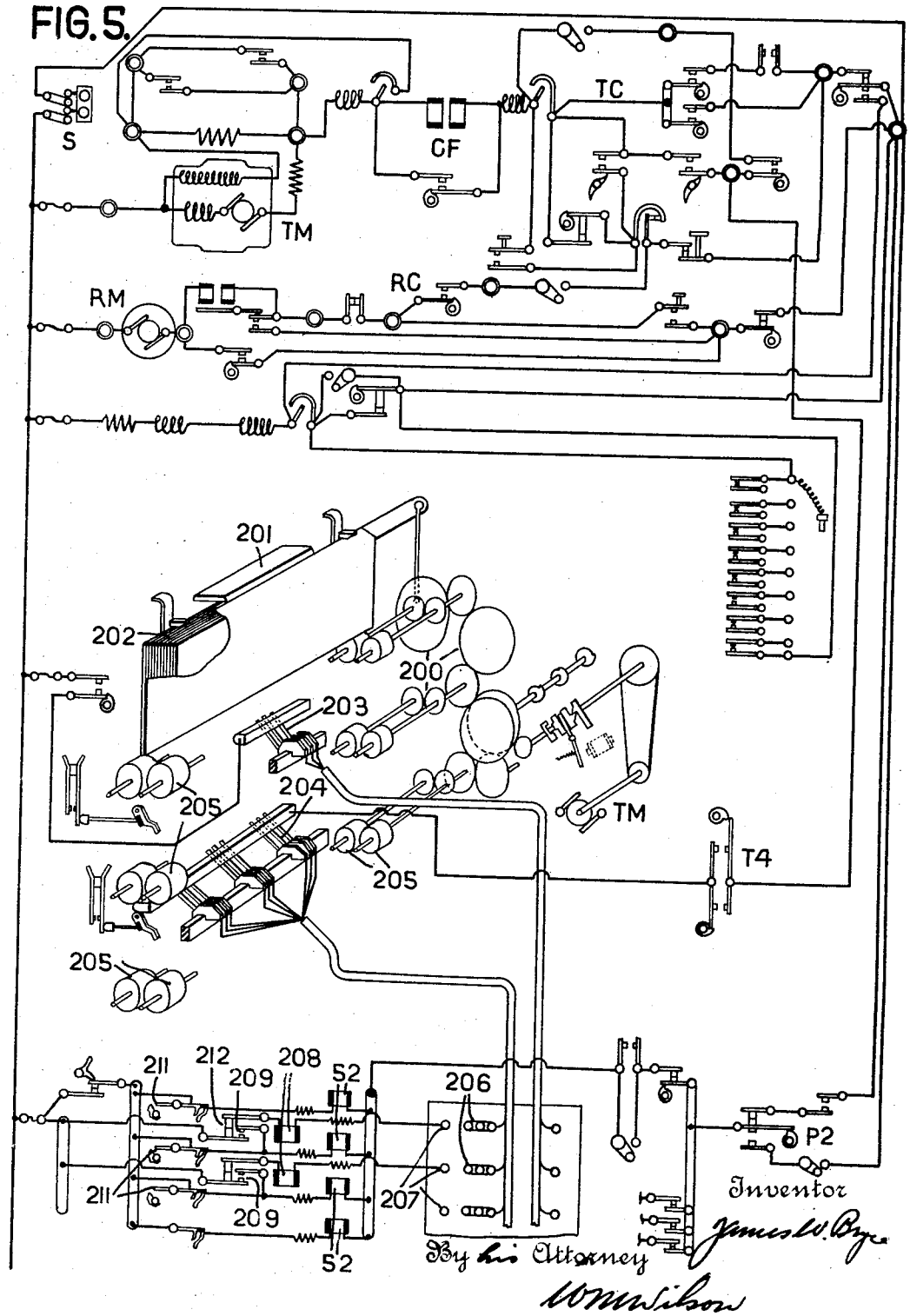
Inventor
James W. Bryce
By his Attorney
W. W. Wilson

June 30, 1931. J. W. BRYCE 1,812,838

PRINTING MECHANISM FOR ACCOUNTING MACHINES

Filed March 27, 1929 4 Sheets-Sheet 4

FIG. 5.



Inventor
James W. Bryce
By his Attorney
W. M. Wilson

Patented June 30, 1931 1,812,838

UNITED STATES PATENT OFFICE

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

PRINTING MECHANISM FOR ACCOUNTING MACHINES

Application filed March 27, 1929. Serial No. 350,379.

The present invention concerns printing mechanism for accounting machines and has for its principal object the provision of improved mechanism with positively driven type bars.

Another object of the invention is the provision of improved printing mechanisms for accounting machines with devices for positively locking the type bars in printing position.

Another object is to provide such printing mechanism having one or both of the above improvements for use in connection with a record controlled accounting machine.

Still another object of the invention is to provide such a printing mechanism having one or both of the above improvements and which may be electromagnetically controlled.

These and other objects of the invention will be hereinafter pointed out in the following description which should be read in connection with the accompanying drawings which illustrate several modifications of the invention and in which:

Fig. 1 is a sectional view showing printing mechanism for a tabulator according to a preferred form of the invention,

Fig. 2 is a view similar to Fig. 1 but showing the operating parts in different positions,

Fig. 3 is a section on line 3—3 of Fig. 1,

Fig. 4 is a diagrammatic showing of a modification of the invention, and

Fig. 5 is a circuit diagram for a well known type of tabulator.

The circuit diagram in Fig. 5 is well known and will be recognized as belonging to a well known type of electric tabulator. The circuit diagram is explained in detail in the copending application of C. D. Lake, Serial No. 639,153, filed May 15, 1923. In the present case, it will be described sufficiently to explain the cooperation between the operating impulses governed by the perforated tabulating cards and the improved printing mechanism forming the subject matter of the present invention. The operating circuits of the machine are supplied from a source of power S. During adding and listing operations the machine is driven by a tabulating motor TM controlled by a network of circuits and contacts designated generally at TC. Generally the tabulating motor when in operation always operates for complete cycles while the several differential mechanisms and printer operators are driven in synchronism with the passage of tabulating cards through the machine. The tabulating cards as usual are provided with differentially located index point positions in each column and the differential locations of the perforated index points may represent the numerals from 0 to 9. When the tabulating motor TM is in operation a card feed clutch magnet CF is energized to throw in a clutch establishing driving relationship of the card feed mechanism designated generally at 200 which through a picker mechanism 201 feeds the perforated record cards shown at 202 past upper analyzing brushes 203 and lower analyzing brushes 204. The feeding of the cards is continuous after they are once started, the feed rolls 205 carrying them with uninterrupted motion past the upper brushes 203 and the lower brushes 204.

Whenever the lower brushes encounter a perforation in the card, an electric impulse is established which is available at sockets 206 connected to contacts cooperating with the lower brushes. These contacts are on a switch board and may be plugged to sockets 207 connected to countermagnets 208. When so connected, each differentially timed impulse from the particular card column selected energizes the countermagnet 208 at differential times to throw in the differential mechanism and drive it for a portion of a cycle fixed by the time of occurrence of the impulse thereby entering the number represented by the index point perforation. The magnet 208 on being energized closes contacts 209 thereby substantially simultaneously closing the circuit of the printing magnet 52. The printing magnet 52, of course, is likewise energized at different times to control the printing mechanism to effect printing of the number entered into the counter. This listing circuit extends through contacts 209, printer magnet 52 and cam contacts T—4 which are closed only during listing operations.

After a plurality of items have been accumulated a total may be printed with incidental reset of the counters by starting the reset motor RM which is controlled by a group of circuits and contacts designated generally RC. In this case the printing magnets 52 are controlled from contacts 211 which are arranged to feel out the accumulators and initiate an impulse differentially timed according to the number which is standing on the accumulator. In this case the printing circuit extends through the contacts 211, magnet 52 and contacts P—2 which are closed only during totaling.

These operations are all well understood and need not be further explained, but from this general explanation it will be understood the numbers are actually printed by differentially timed impulses which may result from moving cards passing analyzing brushes or from mechanically operated contacts which are closed by machine operations at different times representing the different numerals.

Referring to Fig. 1 a type bar 10 for the tabulating machine is guided between slotted bars 11. At its upper end the type bar carries a type head 12 in which are located ten type 13 for the numerals 0 to 9, the nine type being uppermost. A platen 14 is supported in proximity to the type bar so that as the bar rises to select different type for printing, the selected type may be forced against the platen by the hammer 15, the type being slidably supported in the head 12 for this purpose.

The type bar is raised once each machine cycle by means of a crosshead 16 which is connected by a link 17 to an arm 18 fixed to a rock shaft 19. Once each cycle the shaft 19 rocks first clockwise to raise the crosshead 16 and then counterclockwise to lower it. This mechanism is well known and fully explained in U. S. patent to Lake No. 1,379,268, dated May 24, 1921 and the copending application Serial No. 639,153, filed May 15, 1923 and as its details per se do not enter into the present invention it will not be described further.

A rack bar 25 is pivoted on arms 26 and 27 which in turn are pivoted to the type bar 10. A spring 28 normally raises the rack bar to a position limited by a lug 29 thereon engaging in a notch in the type bar. At its lower end the type bar carries a pivoted lever 30 having an extension 31 on one arm adapted to cooperate with a stationary notched locking plate 34. The lever 30 is yieldingly held with extension 31 free of the locking plate by a spring 37 whose free end is attached to a latch 36 to be described later. The other arm of lever 30 has an extension 32 which normally lies in the path of a ridge or extending plate 33 on the lower part of crosshead 16 so that as the latter rises the type bar will be carried up with it. The position of the lever 30 under action of spring 37 is limited by a sidewise extension 45 on an arm 46 fixed to the pivot of arm 27 which supports the lower end of rack bar 25.

The latch 36 pivoted to extension 35 fixed to type bar 10, and to which one end of spring 37 is attached has a notch 40 in its end adapted to cooperate with a shoulder 41 on lever 30. This latch is normally held inoperative by a rod 42 fixed to the crosshead 16 and engaging a notch 43 in the latch. As the shaft 19 rocks clockwise the crosshead 16 rises and ridge 33 thereon engages extension 32 on lever 30 and also raises the type bar 10. The type bar is arrested in its several printing positions by a pawl 51 controlled by the magnet 52. The pawl 51 is normally latched by a latch 53, the latch being urged to latching position and the pawl 51 into the path of the teeth on rack bar 25 by a common spring 54. When the type bar 10 is in or reaches lowermost position a cam surface 55 on rack bar 25 forces pawl 51 into latching position and the latch 53 holds it until released by the magnet 52. This magnet as previously explained is energized at different times during the machine cycle to select the different type.

On energization of magnet 52 to attract its armature 61 a call wire 62 is moved to the right and thereby releases latch 53 whereupon pawl 51 engages the next tooth in rack bar 25. As the type bar is rising with crosshead 16 at this time the arresting of the rack bar causes rocking of its supporting pivoted arms 26 and 27 and extension 45 on arm 46 attached to the latter rocks lever 30 counterclockwise removing extension 32 from ridge 33 to permit the crosshead to continue its movement without the type bar. The rocking of lever 30 incidentally forces extension 31 into the appropriate notch in locking plate 34 and the relative movement of the crosshead and type bar causes rod 42 to cam latch 36 into position with its notch 40 engaging shoulder 41 on lever 30 thus firmly locking the type bar in position to print from the proper type.

After the arm 18 has moved to the limit of its upward movement a bail 63 is tripped to operate the printing hammers 15 and effect printing from the type which are opposite the platen. A lever 70 is pivoted on arm 18 at 72 and held by a spring 73. The other arm of lever 70 is notched at 74 to cooperate with a lever 75 bearing bail 63. As the arm 18 rises lever 70 rocks about pivot 72 and rocks lever 75 clockwise, retracting bail 63 and tensioning spring 80. As the crosshead 16 approaches the upper limit of its movement a pin 71 on lever 70 encounters a stop 83 and notch 74 slides off levers 75 and spring 80 forces bail 63 smartly against hammers 15 to accomplish the printing stroke.

On the downward movement of crosshead 16, rod 42 first enters groove 43 in latch 36 and rocks the latter out of latching position

whereupon spring 37 rocks lever 30 and withdraws extension 31 from locking plate 34. thereafter an overhanging plate 81 on crosshead 16 encounters a lug 82 on type bar 10 and restores it with the crosshead. On reaching normal home position the pawl is restored by cam surface 55 and relatched by latch 53.

It is customary in machines of this nature to print the figures from 1 to 9, inclusive, either from perforations in record cards or from the accumulators but the printing of zeros is effected by the position of type bars to the left. That is if any type bar has its type from 1 to 9 selected and the type bar to the right of it has not been selected for one of these figures the latter will automatically be selected for zero. This zero printing control may be either electrical or mechanical and in the present case it has been assumed that it will be done electrically. In this case a tooth for zero type position is provided on the rack 25 and the magnet 52 is energized for zero type selection under control of the type bars to the left. The method of this zero printing is well known and fully described in U. S. Patent No. 1,702,628, dated February 19, 1929.

A modification of the invention is shown in Fig. 4. In this case the type bars 100 move only when called. The crosshead 116 moves upward in the manner previously described but the type bar 100 does not always move with it. The pawl 151 in this case is mounted on a bracket 120 on the crosshead and a tail piece 121 on the pawl carries a pin 122 in proximity to a bar 123 mounted on pivoted arms 124 and 125.

The armature 161 of the printing call magnet 152 is fixed to the pivot of arm 125 so that when the magnet is energized bar 123 moves to the left and encounters a pin 122 to rock pawl 151 into engagement with one of the teeth of rack 126 fixed to type bar 100. Until the pawl 151 is operated in this case the type bar remains stationary but after it is engaged the type bar moves with the crosshead to bring the proper type opposite the platen. Owing to the different mode of operation it will be obvious that the arrangement of the type in the head must be just the reverse of that shown in the other modification. When the crosshead reaches its uppermost position a stop bar 127 encounters a cam surface 128 on the pawl 151 and locks the type bar positively in printing position. On the return movement of the crosshead 116 a part of the latter encounters a shoulder 129 on the type bar and positively restores it.

The invention has now been explained in several forms but it is obvious that many changes in the arrangement and construction of parts will readily occur to those skilled in the art. The invention is to be limited only as indicated by the scope of the following claims:

1. In a machine of the class described, a printing element movable to a plurality of printing positions, a driving element for the same having an invariable movement, latching means for positively coupling the printing element to the driving element for varying times to position the printing element in its different printing positions and electromagnetic means controlled by differentially timed electrical impulses for controlling the latching means to effect different durations of coupling between the printing element and its driving element.

2. In a machine of the class described, a printing element movable to a plurality of printing positions, a driving element for the same having an invariable movement, latching means for positively coupling the printing element to the driving element for varying times to position the printing element in its different printing positions, electromagnetic means controlled by differentially timed electrical impulses for controlling the latching means to effect different durations of coupling between the printing element and its driving element and locking means for positively retaining the printing element in position on reaching the selected printing positions.

3. In a machine of the class described, a printing element movable to a plurality of printing positions, a driving element for the same having an invariable movement, latching means for positively coupling the printing element to the driving element for varying times to position the printing element in its different printing positions, electromagnetic means controlled by differentially timed electrical impulses for controlling the latching means to effect different durations of coupling between the printing element and its driving element and means cooperating with said latching means when the printing element reaches its selected printing position for positively locking the printing element against displacement.

4. In a machine of the class described record feeding means for automatically feeding records one by one, analyzing means for successively searching index point positions on records, a printing element movable to a plurality of printing positions, a driving element for the same having an invariable movement and latching means controlled by the analyzing means for positively coupling the printing element to the driving elements for varying duration to position the printing element according to index points on the records.

5. In a machine of the class described record feeding means for automatically feeding records one by one, analyzing means for successively searching index point positions

on records, a printing element movable to a plurality of printing positions, a driving element for the same having an invariable movement, latching means controlled by the analyzing means for positively coupling the printing element to the driving element for varying durations to position the printing element according to index points on the records and locking means for positively retaining the printing element in position on reaching the selected printing positions.

6. In a machine of the class described record feeding means for automatically feeding records one by one, analyzing means for successively searching index point positions on records, a printing element movable to a plurality of printing positions, a driving element for the same having an invariable movement, latching means controlled by the analyzing means for positively coupling the printing element to the driving element for varying durations to position the printing element according to index points on the records and means cooperating with the latching means when the printing element reaches selected position for positively locking it therein.

7. In a machine of the class described record feeding means for automatically feeding records one by one, analyzing means for searching index point positions on records while they are in motion, a printing element movable to a plurality of printing positions, a driving element for the same having an invariable movement and latching means controlled by the analyzing means for positively coupling the printing element to the driving elements for varying duration to position the printing element according to index points on the records.

8. In a machine of the class described record feeding means for automatically feeding records one by one, analyzing means for searching index point positions on records while they are in motion, a printing element movable to a plurality of printing positions, a driving element for the same having an invariable movement, latching means controlled by the analyzing means for positively coupling the printing element to the driving element for varying durations to position the printing element according to index points on the records and locking means for positively retaining the printing element in position on reaching the selected printing positions.

9. In a machine of the class described record feeding means for automatically feeding records one by one, analyzing means for searching index point positions on records while they are in motion, a printing element movable to a plurality of printing positions, a driving element for the same having an invariable movement, latching means controlled by the analyzing means for positively coupling the printing element to the driving element for varying durations to position the printing element according to index points on the records and means cooperating with the latching means when the printing element reaches selected position for positively locking it therein.

10. In a machine of the class described record feeding means for automatically feeding records one by one, analyzing means for searching index points on records while they are in motion, a printing element and driving mechanism for positively driving the same to any one of a plurality of printing positions and means controlled by said analyzing means according to index points on records for fixing the extent of movement of said printing element.

11. In a machine of the class described record feeding means for automatically feeding records one by one, analyzing means for searching index points on records while they are in motion, a printing element and driving mechanism for positively driving the same to any one of a plurality of printing positions, means controlled by the analyzing means according to index points on records for fixing the extent of movement of said printing element and means for positively locking the printing element against movement when it reaches its selected position.

12. In a machine of the class described, record feeding means for automatically feeding records one by one, analyzing means for searching index point positions on records, a printing element movable to a plurality of printing positions, a driving element for the same and means for positively coupling the printing element to the driving element for positive driving action thereby and means controlled by the analyzing means for limiting the extent of driving operation according to index points on records.

13. In a machine of the class described, record feeding means for automatically feeding records one by one, analyzing means for searching index point positions on records, a printing element movable to a plurality of printing positions, a driving element for the same having an invariable excursion at each operation, coupling means for positively coupling the printing element to the driving element at the beginning of the excursion of the latter to be positively driven thereby and means controlled by the analyzing means according to index points on records for releasing said coupling means.

14. In a machine of the class described, record feeding means for automatically feeding records one by one, analyzing means for searching index points on records, a printing element movable to a plurality of printing positions, a driving element for the same having an invariable excursion at each operation, coupling means for positively cou-

pling the printing element to the driving element at the beginning of the excursion of the latter to be positively driven thereby, means controlled by the analyzing means according to index points on the records for releasing said coupling means and means for positively latching the printing element immediately upon release of said coupling means.

In testimony whereof I hereto affix my signature.

JAMES W. BRYCE.