Nov. 25, 1924. 1,516,772

E. M. LA BOITEAUX

TABULATING MACHINE

Filed March 1, 1924 11 Sheets-Sheet 1

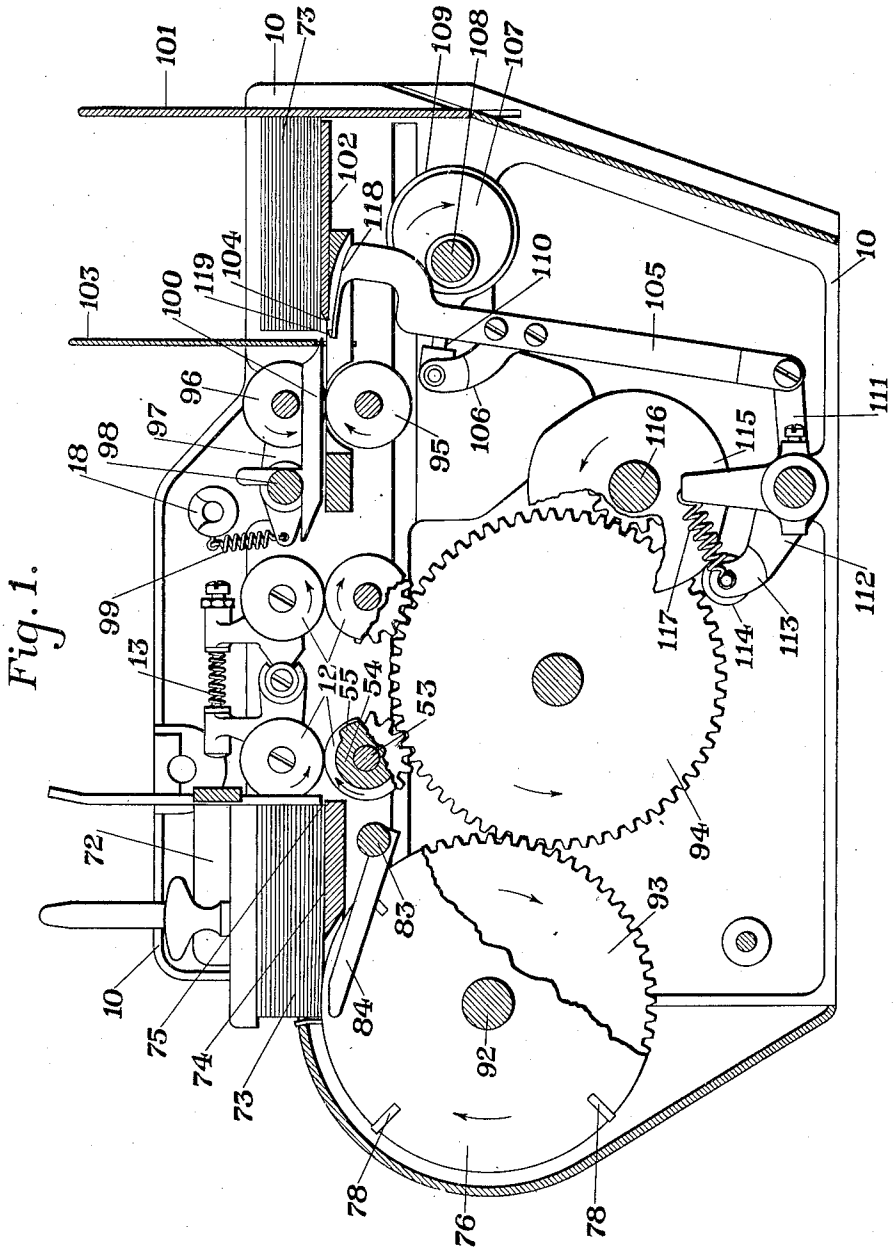


Fig. 1.

Witnesses:
M. R. Vollmer.
J. C. Noel

INVENTOR.
E. M. La Boiteaux

Nov. 25, 1924. 1,516,772

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TABULATING MACHINE

Filed March 1, 1924 11 Sheets-Sheet 2

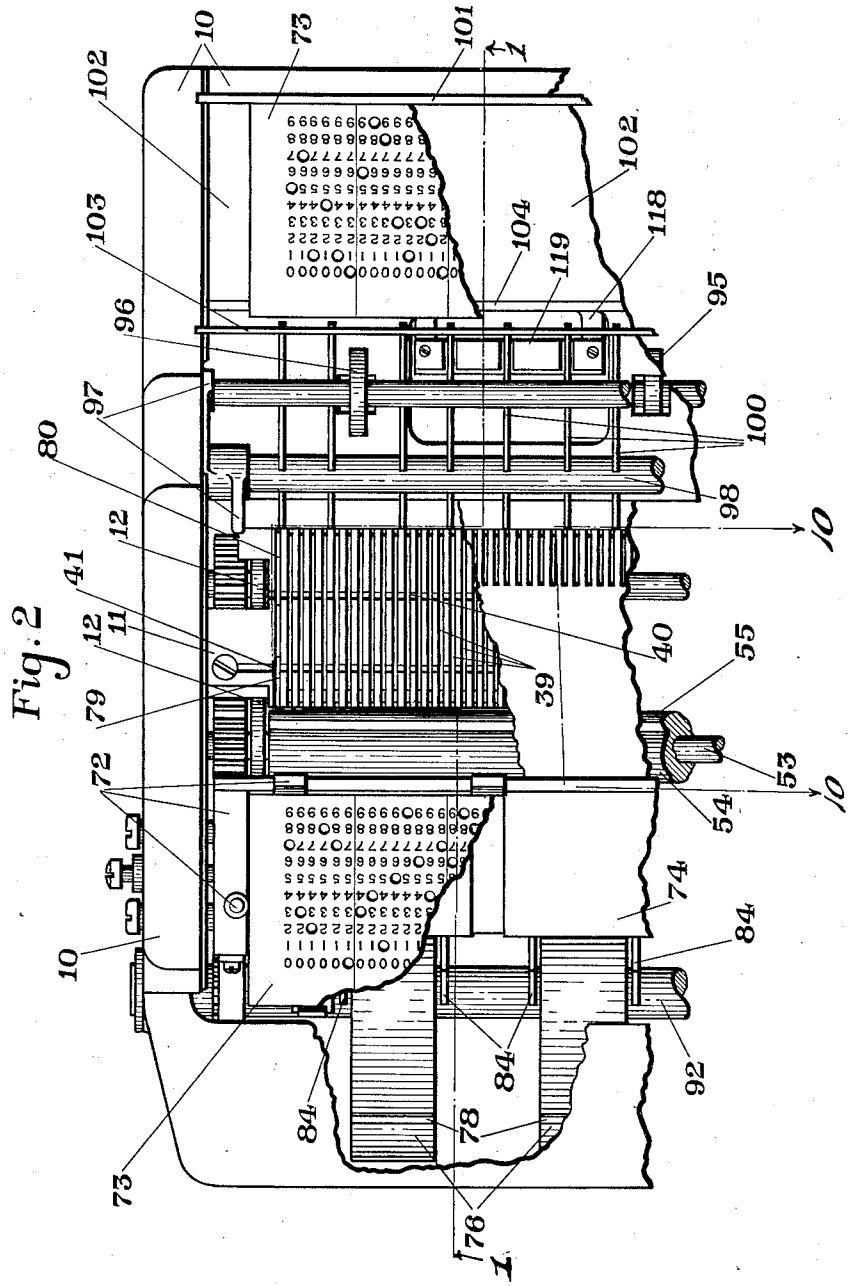


Fig. 2

Witnesses:
M. A. Vollmer
J. C. Noel

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Nov. 25, 1924. 1,516,772

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TABULATING MACHINE

Filed March 1, 1924 11 Sheets-Sheet 3

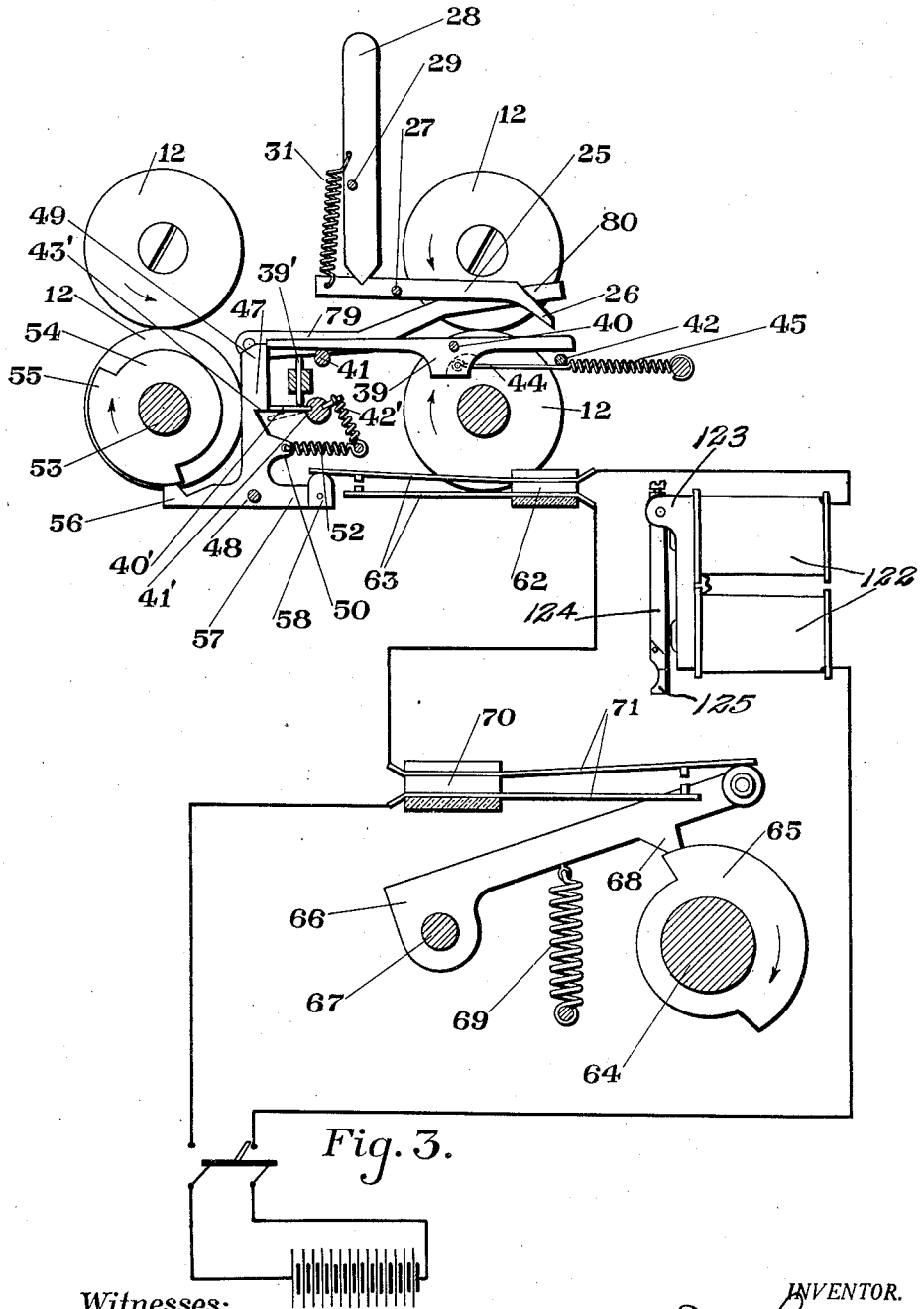


Fig. 3.

Witnesses:
M. R. Vollmer
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Nov. 25, 1924. 1,516,772

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TABULATING MACHINE

Filed March 1, 1924 11 Sheets-Sheet 4

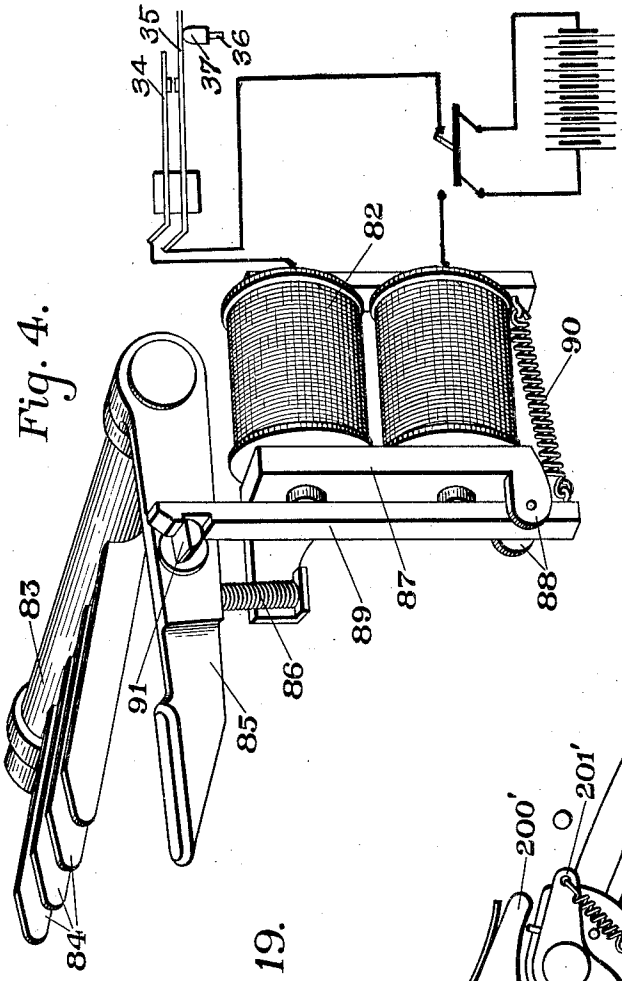


Fig. 4.

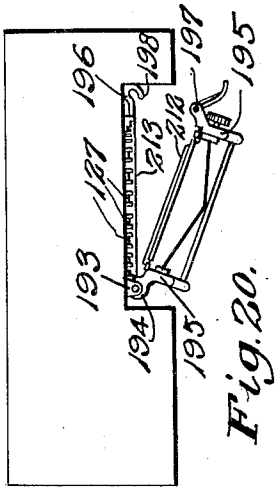


Fig. 20.

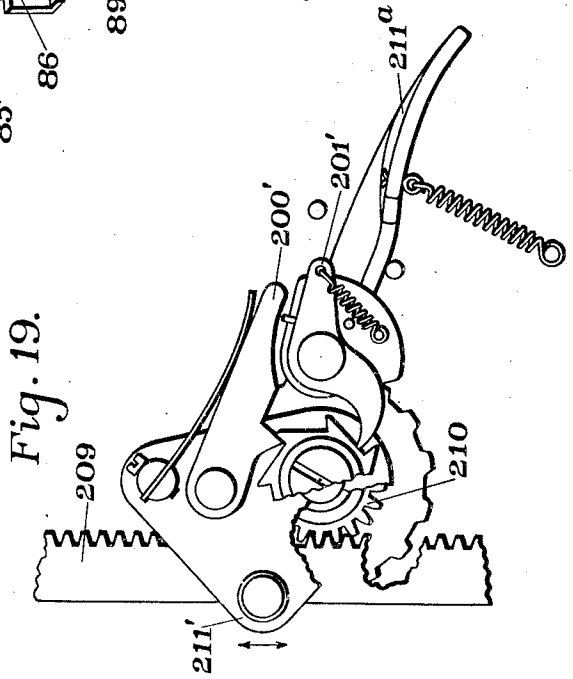


Fig. 19.

Witnesses:
M. R. Vollmer.
J. C. Noel

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Nov. 25, 1924. 1,516,772

E. M. LA BOITEAUX

TABULATING MACHINE

Filed March 1, 1924 11 Sheets-Sheet 5

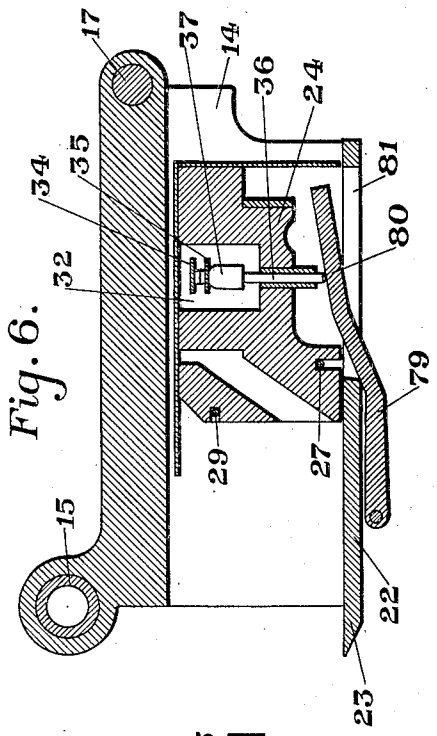


Fig. 6.

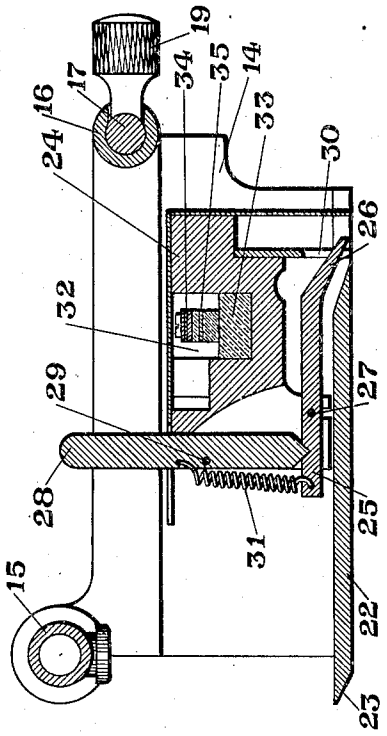


Fig. 7.

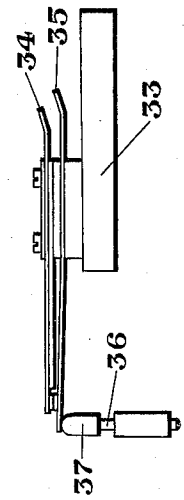


Fig. 5.

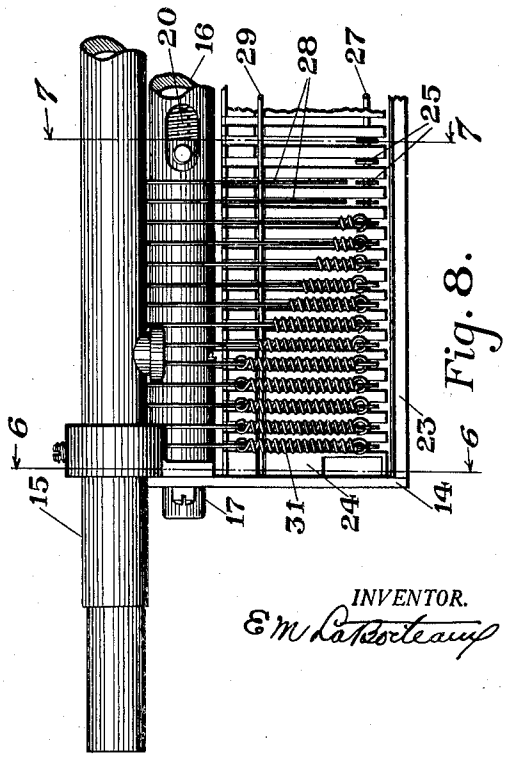


Fig. 8.

Witnesses:
M. R. Vollmer.
J. C. Noel.

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Nov. 25, 1924. 1,516,772

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TABULATING MACHINE

Filed March 1, 1924 11 Sheets-Sheet 6

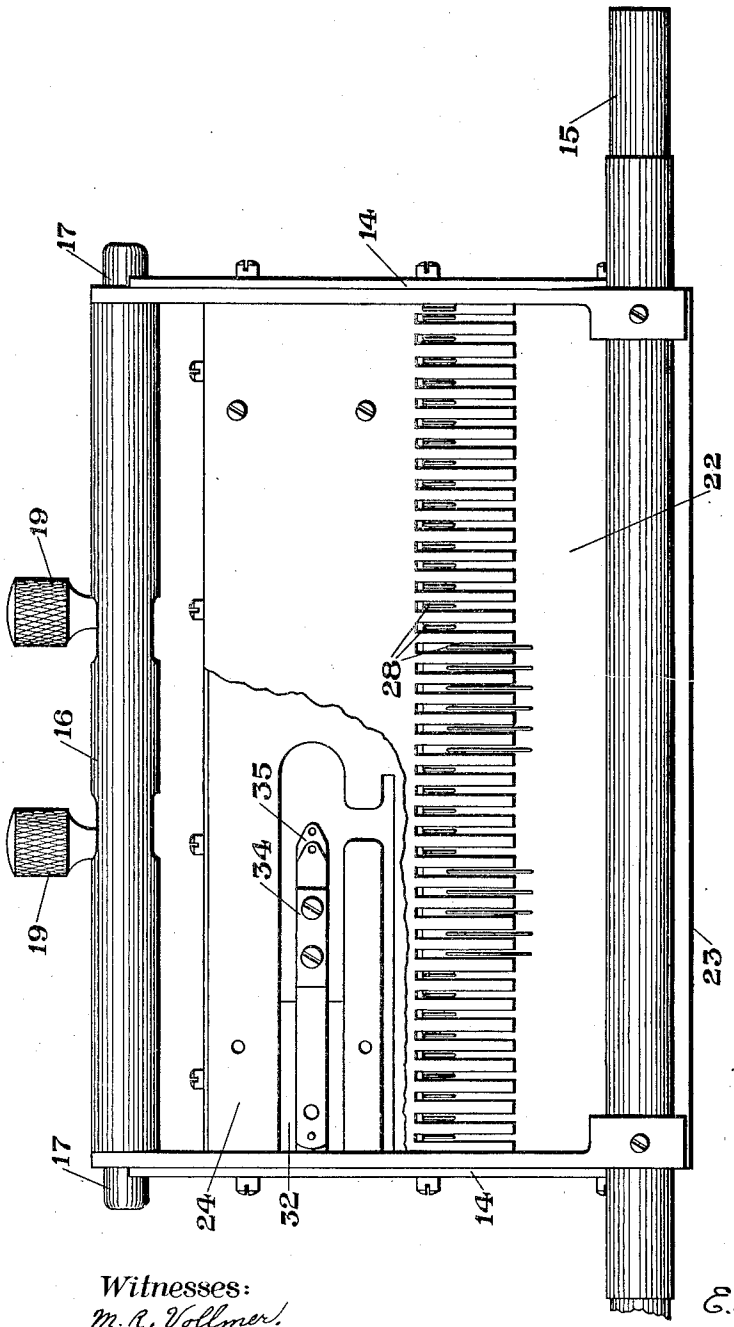


Fig. 9.

Witnesses:
M. R. Vollmer.
J. C. Noel

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TABULATING MACHINE

Filed March 1, 1924 11 Sheets-Sheet 7

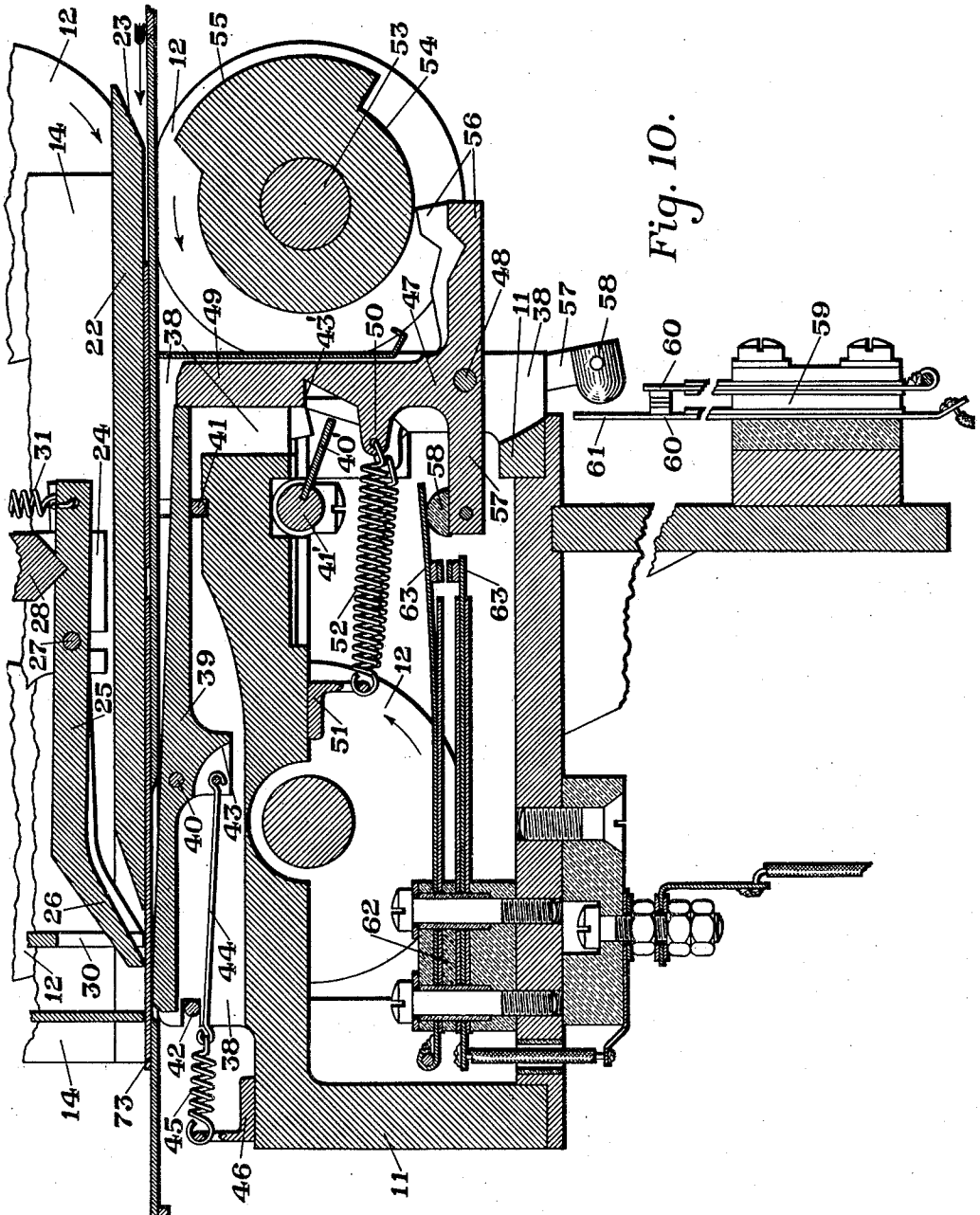


Fig. 10.

Witnesses:
M. R. Vollmer.
J. C. Noel.

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TABULATING MACHINE

Filed March 1, 1924 11 Sheets-Sheet 8

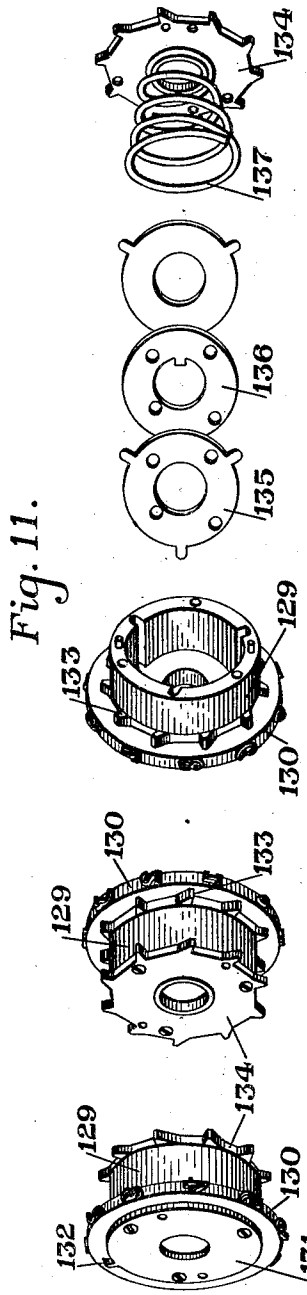


Fig. 11.

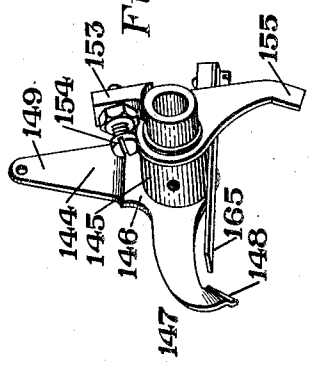


Fig. 13.

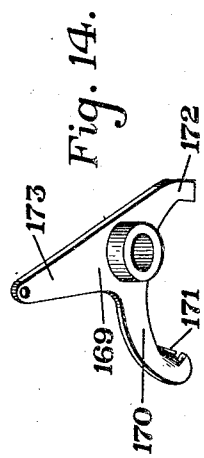


Fig. 14.

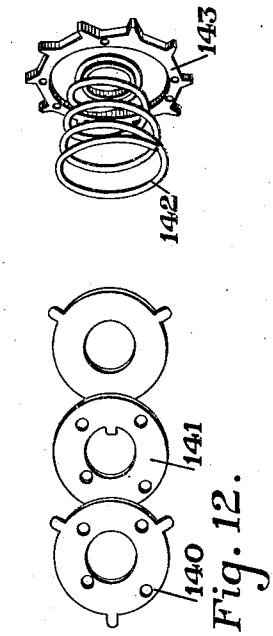
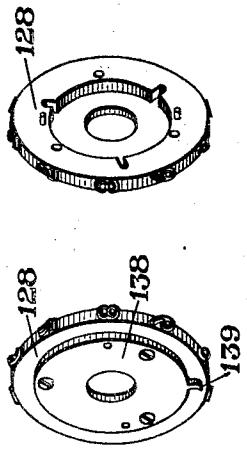


Fig. 12.



Witnesses:
M. R. Vollmer.
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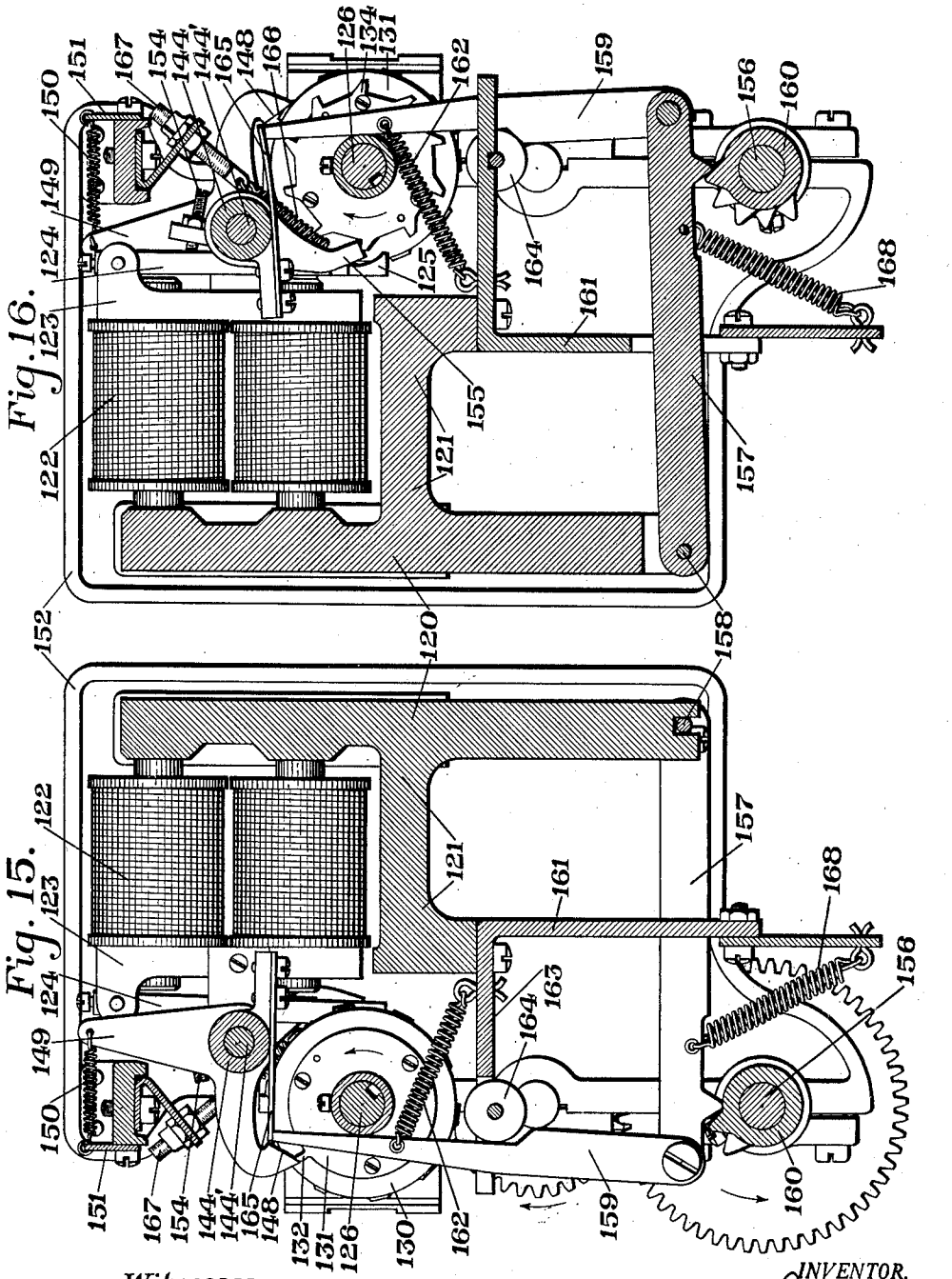
INVENTOR.
E. M. La Boiteaux

Nov. 25, 1924. 1,516,772

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TABULATING MACHINE

Filed March 1, 1924 11 Sheets-Sheet 9



Witnesses:
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J. C. Nost

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E. M. La Boiteaux

Nov. 25, 1924. 1,516,772

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TABULATING MACHINE

Filed March 1, 1924 11 Sheets-Sheet 10

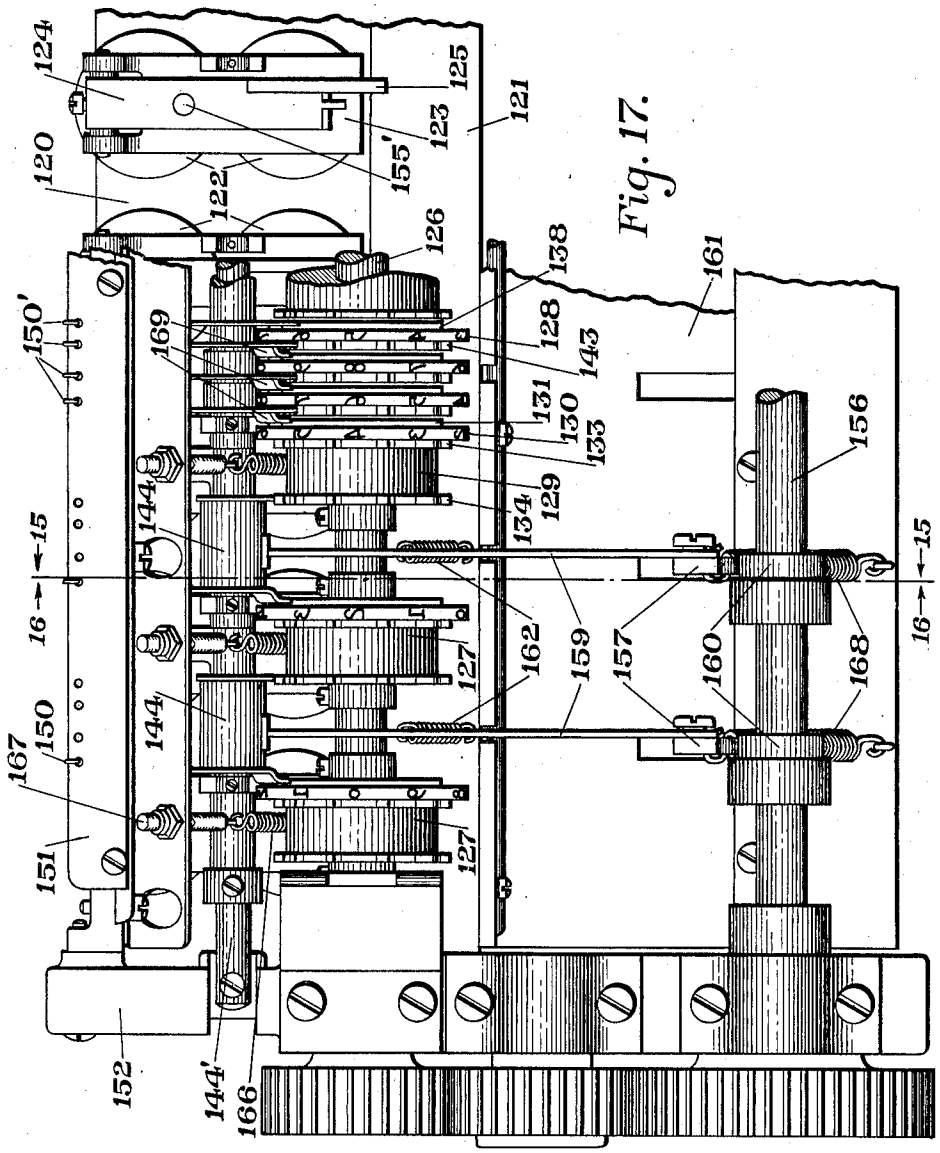


Fig. 17.

Witnesses:
M. R. Vollmer.
J. C. Noel

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E M La Boiteaux

Nov. 25, 1924. 1,516,772

E. M. LA BOITEAUX

TABULATING MACHINE

Filed March 1, 1924 11 Sheets-Sheet 11

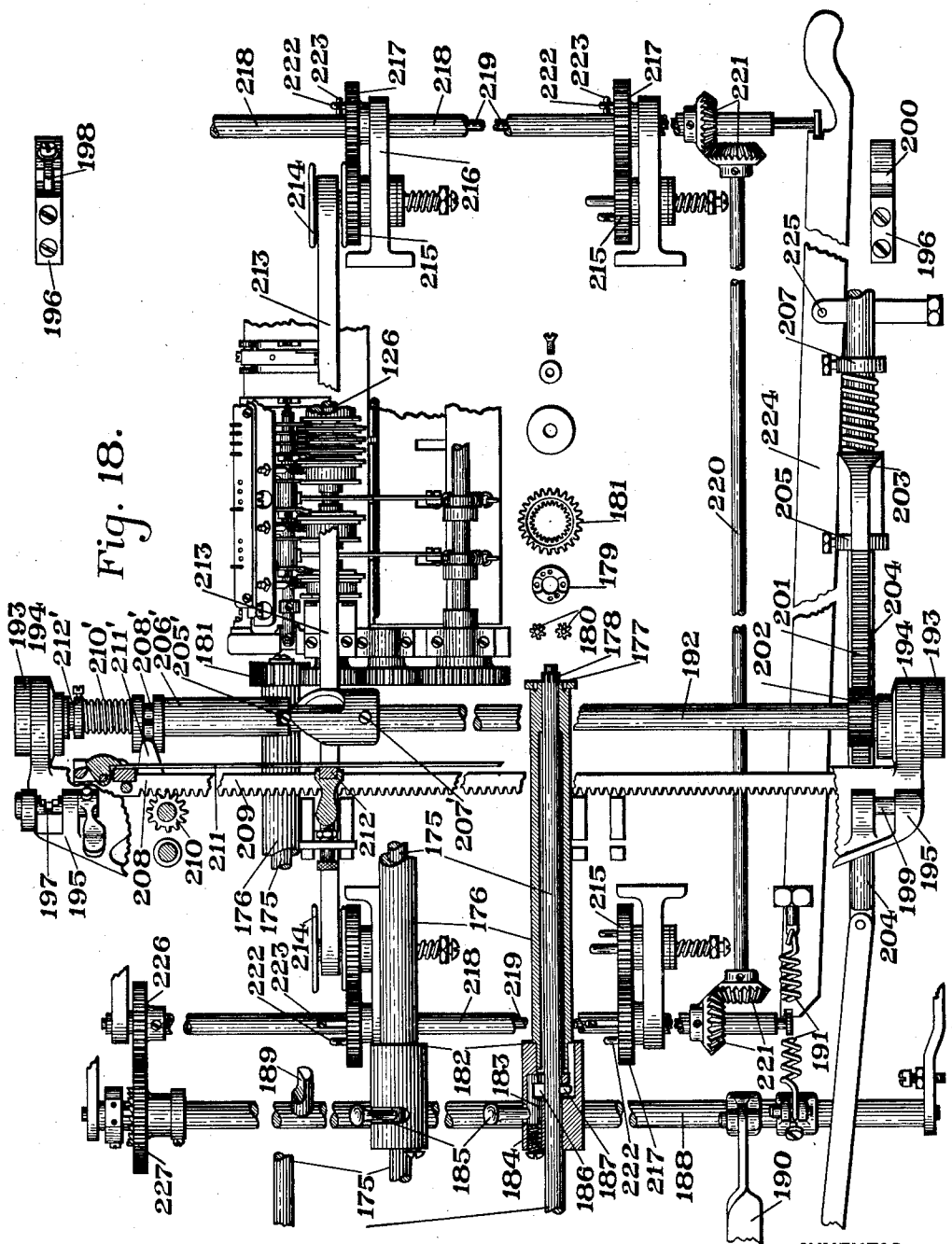


Fig. 18.

Witnesses:
M. R. Vollmer.
J. C. Noel.

INVENTOR.
E M La Boiteaux

Patented Nov. 25, 1924. 1,516,772

UNITED STATES PATENT OFFICE.

EUGENE M. LA BOITEAUX, OF WASHINGTON, DISTRICT OF COLUMBIA.

TABULATING MACHINE.

Application filed March 1, 1924. Serial No. 696,235.

To all whom it may concern:

Be it known that I, EUGENE M. LA BOITEAUX, a citizen of the United States, residing at Washington, District of Columbia, have invented certain new and useful Improvements in Tabulating Machines, of which the following is a specification.

This invention relates to improvements in tabulating machines.

The invention more particularly relates to a machine or apparatus of the above character, adapted to be employed for recording or accumulating and recording the results of numbers represented by perforations in record cards of the type commonly used in connection with systems of mechanical tabulation.

The general object of the invention is to provide a machine or apparatus of the type referred to which will operate in an exceedingly efficient manner for accomplishing the purposes of the invention.

It is also an object of the invention that the different units comprising the machine or apparatus be arranged in an exceedingly compact manner.

A still further object of the invention is that the units employed in the machine or apparatus be interconnected to operate jointly in a positive manner.

It is a further and important object of the invention that the electrical circuits employed in connection with the apparatus for operating different units or devices be established positively and thereby to insure that the apparatus as a whole operates accurately.

It is a still further object of the invention that no burning of contacts can occur in establishing the different electrical circuits referred to.

Other objects, and objects relating to details of construction, combination and arrangement of parts will hereinafter appear in a detailed description to follow.

Like reference numerals refer to similar parts throughout the different views in the drawings.

The invention is illustrated by way of example in the accompanying drawings, in which:

Figure 1 is a vertical sectional view taken substantially on the line 1—1 of Figure 2, and having parts of the indexing mechanism removed to more clearly illustrate certain features of the invention;

Figure 2 is a fragmentary top plan view of the indexing mechanism and the associated card feeding and card receiving mechanisms;

Figure 3 is a schematic view showing the co-acting elements employed in connection with the card indexing mechanism;

Figure 4 is a detailed perspective view illustrating the electromagnetically controlled device employed for discontinuing the feeding of record cards to the indexing mechanism;

Figure 5 is a detailed view in side elevation illustrating the electrical circuit-breaker employed in connection with the card feeding mechanism;

Figures 6 and 7 are sectional views taken substantially on the lines 6—6 and 7—7 respectively of Figure 8;

Figure 8 is a fragmentary front elevation of the index finger unit and illustrating the manner in which the same is pivotally supported;

Figure 9 is a top plan view of the index finger unit;

Figure 10 is an enlarged sectional view taken substantially on the line 10—10 of Figure 2, and also illustrating a portion of the index finger unit operationally positioned with respect to the trip lever unit of the indexing mechanism;

Figure 11 is a group view illustrating different views of primary counter members used in connection with the counter mechanism, and also the elements for connecting these counter members with the counter shaft;

Figure 12 is a view similar to Figure 11 and illustrating the secondary or accumulative counter members, together with elements for connecting the same to the counter shaft;

Figure 13 is a detailed perspective view of a transfer member or unit employed in connection with each of the primary counter members;

Figure 14 is a view similar to Figure 13 and showing the transfer member or unit employed in connection with each secondary or accumulative counter member;

Figures 15 and 16 are sectional views taken substantially on the lines 15—15 and 16—16 respectively of Figure 17;

Figure 17 is a partial front elevation of the counter mechanism;

Figure 18 is a schematic representation of

a portion of the counter mechanism, the printing apparatus associated therewith, together with the immediate operating means employed therewith; and

Figure 19 is a detail view in side elevation showing the pawl and ratchet means for operating the printing frame.

Figure 20 is a top plane view of the counter and printing mechanism, the record carrying door being shown partly open.

In carrying out the present invention there is employed an indexing mechanism which will operate to establish an electrical circuit upon any card being operated upon presenting an index point to said mechanism. The indexing mechanism has connected therewith a counter-mechanism whereby the number represented by each index point is registered and this operation is followed by an operation for totalling and registering the index points brought into registration by the indexing mechanism. Also operating in conjunction with the counter mechanism is a printing apparatus whereby the resultant numbers registered upon the counter mechanism may be transferred to a record sheet. Means are further provided whereby the printing operation is followed by the return of the different counters employed to their non-registering or non-recording position. The index mechanism has immediately associated therewith a suitable card feeding mechanism or apparatus whereby record cards may be successively fed to the indexing mechanism, and also provided for the indexing mechanism is a suitable card receiving apparatus. The indexing mechanism, the card feeding mechanism, and the card receiving mechanism are closely associated and consequently are supported by the one housing 10 (Figs. 1 and 2).

First describing the indexing mechanism the same may constitute a table generally designated by the reference numeral 11, together with suitable rollers 12 for moving cards over the table. The rollers should be such a distance apart that they will only engage the edges of the cards and thereby permit space between the rollers for the indexing fingers. As shown in Figure 1, two pairs of rollers 12 are provided for engaging each edge of a card. The upper rollers 12 of each pair occurring upon one side of the indexing mechanism are interconnected as at 13, and said connection being adjustable whereby to permit the desired pressure of the top rollers upon the cards. Any suitable flexible and adjustable connection to accomplish this purpose may be provided similar to that shown in Figure 1.

Above the rollers there is positioned the finger index unit comprising a frame 14 which is rectangular in shape and which is supported for swinging movement by a shaft 15, said shaft being supported by the housing 10. The rear side of the frame may be provided with a sleeve 16 and in said sleeve there is slidable a pair of elongated pins 17, each pin having its one end projecting from the sleeve 16 and this projected end adapted to seat in a socket 18 carried by the housing 10. The inner end of each pin 17 carries a laterally extending knob 19, and between the inner ends of pins 17 there is positioned a suitable compression spring 20 and, as is obvious, the pins 17 may be manipulated to lock or release the frame 14.

Within the frame 14 there is secured the index finger housing, generally indicated by the reference numeral 24. The frame 14 carries a bottom plate member 22 (Fig. 10) which has its forward edge beveled as at 23. The housing 24 supports a plurality of index fingers 25. Each finger 25 is in the form of a bar having its one end formed with a downwardly extending and pointed portion 26. These bars are pivotally supported by a rod 27 carried by the housing 24. For each index finger 25 there is provided a release member 28 (Fig. 7), said release members being fulcrumed by a rod 29, and said rod being supported by housing 24. The one end of the frame 14 is open as shown to advantage in Figures 6 and 7. Between each release member 28 and its associated index finger 25, there is extended a coil spring 31, said coil spring being connected at its one end to its associated release member 28 at a point above the fulcrum of said release member and connected at its other end to the rear end of the associated index finger 25. With the release members 28 arranged as illustrated in Figure 7, the index fingers 25 may be held in inoperative position. Upon swinging the upper ends of the release members 28 outwardly, with respect to the housing 24 the index fingers 25 may be released. The releasing of the index fingers 25 may be done manually.

The housing 24 within the frame 14 is provided with a longitudinal groove 32, in which there is positioned a block of insulating material 33 carrying the contact fingers 34 and 35. These contact fingers are also shown in Figure 5. Beneath the contact finger 35 and adjacent its free end there is arranged a plunger 36, said plunger carrying at its upper end a head 37 which is of insulating material, and which is adapted to engage with the finger 35 when moved upwardly and lift said finger to bring the same into contact with the finger 34. The purpose of this electrical circuit establishing device will later be described.

Referring to Figure 10, the table 11 of the indexing mechanism is provided with a plurality of transverse grooves 38, one for each of the index fingers 25. Within each

of the grooves 38 there is disposed a trigger bar 39. The trigger bars 39 are fulcrumed by a rod 40, said rod being supported by the table 11. Stop rods 41 and 42 supported by the table 11 serve to limit the rocking movement of the trigger bars 39. Each trigger bar 39 is formed at a point intermediate its ends with a downwardly extending protrusion 43, to which there is connected the one end of a link 44, the other end of said link being connected to a coil spring 45 which is anchored to an angle bar 46 carried by the table 11. Forward to each of the trigger bars 39 there is positioned a bell crank lever 47, said bell crank levers being fulcrumed by a rod 48 which is supported by table 11. Each bell crank lever 47 has an upwardly extending arm 49, the upper end of which is adapted to be brought to engage the associated trigger bar 39, as illustrated to advantage in Figure 10. Also each bell crank lever 47 is provided with a suitable lug 50, and between this lug and an angle bar 51 carried by the table 11 there is connected a coil spring 52. Forward to the bell crank levers 47 occurs a shaft 53 which carries a pair of the rollers 12, and intermediate this pair of rollers there is mounted upon this shaft a cam 54, the raised portion 55 of which is adapted to engage with the free end of an arm 56 formed upon each of the bell crank levers 47. With the rotation of the shaft 53, in the direction of the arrow shown in Figure 10, the raised portion 55 of the cam 54 will bring the bell crank levers to the position illustrated; that is, to the position for engaging the trigger bars 39. Each bell crank lever 47 is provided with an arm 57, said arm 57 of alternate bell crank levers extending downwardly, while the others extend horizontally, as shown. Each arm 57 carries at its free end a block of insulating material 58. For each of the downwardly extending arms 57 of the bell crank levers 47 there is provided an electrical circuit contact maker 59 which comprises a pair of resilient fingers 60 normally adapted to establish an electrical circuit. One of said fingers is extended as at 61 and adapted to be engaged by the associated contact arm 57. The arm 57 of each of the remaining bell crank levers 47 is adapted to operate an electrical circuit contact maker 62, said contact maker comprising a pair of resilient fingers 63, likewise adapted to establish normally an electrical circuit, and one of said fingers being extended and adapted to be engaged by the arm 57 of the associated bell crank lever 47.

Referring to Figure 3, 64 indicates a shaft which carries a cam 65. At 66 there is shown a lever which is pivoted, as at 67, for swinging movement. The lever 66 is formed with a protrusion 68, which is adapted to ride upon the periphery of the cam 65. The lever 66 is normally held in engagement with the cam 65 by a spring 69. At 70 there is illustrated a contact making device comprising the two resilient fingers 71, which normally are adapted to close an electrical circuit, as shown, and when one finger is engaged by the free end of the lever 66, the same will be separated to break said electrical circuit. As further illustrated in this figure, the contact making devices or units are connected in series with the contact making device 62, and this is also true in connection with the contact makers 59. With this arrangement the main electrical circuit may be broken by the contact making device 70 previous to operating any of the contact making devices 59 or 62, and thereby to prevent sparking in the operation of the last named contact making devices.

The card feeding mechanism may comprise a suitable hopper 72 in which record cards 73 may be stacked, as shown in Figure 1. The hopper is provided with a bottom 74 upon which the cards normally rest, and at the forward end of the hopper there is formed a slot 75 through which cards may be singly projected to engage with the adjacent rollers 12 of the indexing mechanism previously described. The forward end of the hopper bottom 74 is recessed to receive drums 76, said drums each carrying protrusions 78 arranged in spaced relation around the peripheries thereof, and said protrusions being adapted to engage with the forward edges of the cards 73 and singly eject the cards from the hopper 72 through the slot 75.

At one end of the table 11 there is pivotally supported what may be termed a "no card" index finger or lever 79 best shown in Figure 6 of the drawings. The finger 79 is positioned so that the same will not interfere with the operation of any of the index fingers 25. The finger 79 is pivoted at its one end to permit free swinging movement thereof, and adjacent its free end terminates in a straight portion 80 which is greater in length than the space between any two successive cards being fed through the indexing mechanism. The cards being fed through the indexing mechanism pass over the finger 79 and beneath the bottom 22 of the frame 14. This bottom 22 is provided with a suitable slot 81 to permit upward movement of the free end of the finger 79 and thereby to allow this finger to engage with the plunger 36 and elevate the same for bringing together the contact fingers 34 and 35. The passage of the card through the indexing mechanism depresses the finger 79 and thus permits the plunger 36 to move downwardly and the contact finger 35 to move away from the contact finger 34.

The member 79 when depressed is adapted to engage a plunger 39' (Fig. 3) and de-

press said plunger, which, in turn, engages a plate 40′ extending radially from a rocker shaft 41′. The shaft 41′ is normally held by spring 42′ for bringing the plate 40 into engaging relation with the arm 49 of the bell crank levers 47 and to hold or maintain the same in position for engaging the trigger members 39, as illustrated in Figure 10. Each bell crank lever 47 has its arm 49 recessed, as at 43′, and said recesses being adapted to permit the plate 40′ to assume the position shown in Figure 10 when depressed by the plunger 39′, and thus permit tripping of the bell crank levers 47.

The contact fingers 34 and 35 are adapted to open and close an electrical circuit through the electromagnet 82 (Fig. 4). The electromagnet 82 is positioned at one side of the hopper 72. Immediately beneath the hopper 72 there is rockably supported a shaft 83 carrying a plurality of radially extending fingers 84 which are adapted with rocking movement of the shaft 83 in one direction to engage with the forward edges of the cards 73 and elevate the same out of contacting relation with the drums 76. The shaft 83 has secured to its one end a lever bar 85 which protrudes from the apparatus so that the same may be manually depressed. The bar 85 is urged upwardly by a spring 86. The electromagnet 82 carries a supporting member 87 of non-magnetic material, which is formed with a pair of ears 88 adjacent its lower end whereby to support pivotally a latch member 89. The lower end of the latch member 89 has connected thereto one end of a coil spring 90, the other end of said coil spring being anchored, as shown, and said spring being adapted to draw the latch away from the electromagnet 82. The bar 85 carries a lateral projection 91 which is adapted to be brought to engage with the latch member 89 and thereby to hold the bar 85 depressed. Upon energizing the electromagnet 82, as is obvious, the latch member 89 will be drawn inwardly and thereby to release the arm 85 and permit the fingers 84 to be swung upwardly for lifting the forward edges of the cards 73.

The drum 76 may be driven by a power shaft 92, and this power shaft may be utilized for driving the rollers 12 of the indexing mechanism through any suitable gearing arrangement. Preferably the lower rollers 12 of the indexing mechanism are driven through the gear wheel 93 carried by the shaft 92 and the gear wheel 94 meshing therewith, which in turn meshes with gears carried by shafts supporting the lower rollers, as illustrated in Figure 1. The upper rollers may be suitably connected by gears with the shafts driving the lower rollers.

The card receiving mechanism may comprise a pair of bottom rollers 95 and a pair of top rollers 96. These rollers may be driven in any desirable manner from the power shaft 92 and the top rollers are preferably carried by arms 97 which are fulcrumed, as at 98. The arms 97 may be urged by a spring 99 to swing the rollers 96 into contact with the rollers 95. Skids 100 are provided to guide the cards passing between the rollers 95 and 96.

A receiving hopper 101 is provided, said hopper having its bottom 102 terminating in spaced relation to the rear of wall 103 of said hopper, and said wall 103 being slightly cut away at its lower end to permit the entrance of cards into the hopper. The forward edge of the bottom 102 is beveled, as as 10, and this bottom is slightly less in width than a record card, as shown in Figure 1. The rollers 95 and 96 cooperate with the skids 100 to bring the cards partially into the hopper. The disposal of the skids 100 causes the forward edge of each card entering the hopper to engage the beveled edge 104 of bottom 102, and thus insure that such card must pass beneath the lowermost of the cards which may be in the hopper. In order to move each of the cards fuly into the hopper 101 there is provided a frame 105, which carries an arm 106 connected to an eccentric 107 on a shaft 108 by means of an eccentric strap 109 and connecting rod 110. The lower end of this frame 105 is pivotally connected to the free end of arm 111 of a bell crank lever 112, said bell crank lever having its remaining arm 113 provided with a roller 114 adapted to engage upon the peripheral surface of a cam 115 carried by a shaft 116. The shaft 116 may be driven from the power shaft 92 through the gear 94 in suitable timed relation, and the roller 114 may be held in engagement with the peripheral surface of the cam 115 by a suitable coil spring 117. The upper end of the frame 105 is provided with a shoe 118 which has an upper arcuate shaped surface, and adjacent one end of this surface there is provided a protrusion 119. Upon the frame 105 being oscillated by the mechanism described the protrusion 119 thereof will engage with the edge of the card partially within the hopper 101 and move the same entirely within said hopper. This operation insures an orderly arrangement of the record cards in the hopper.

Referring to Figures 11 to 17, inclusive, in which the counting mechanism of the present invention is disclosed, 120 indicates a supporting plate which may be carried by any suitable frame work, and which is formed centrally and longitudinally with a laterally extending flange 121. The plate 120 carries a plurality of electromagnets 122, one for each of the trip levers 39. Each electromagnet 122 is electrically connected so that a circuit may be established therethrough by a contact maker 59 or a contact

maker 62. As before described, these circuits may be all broken by the contact maker 70.

Each of the electromagnets 122 carries a supporting member 123 of non-magnetic material upon its forward face, and to the upper end of each member 123 there is pivotally connected an armature or latch member 124. Each latch member terminates at its lower end in a tooth projection 125. Forward to the member 120 there is rotatably supported a shaft 126 which may be termed the counter shaft. The shaft 126 carries a plurality of primary counter members 127 and a plurality of secondary counter members, or what might be termed accumulative counter members or discs 128. The construction of the primary and secondary counter members is specifically shown in Figures 11 and 12, respectively. Each primary counter member comprises a hub portion 129 which is in the form of a sleeve, and at one end of this sleeve there is secured a disc or type wheel 130 which carries type numbers upon the periphery thereof. These numbers read from 1 to 9, inclusive, in successive order, and between the numbers 1 and 9 occurs a cipher. The disc 130 in each instance has an opening adapted to accommodate the shaft 126 (Fig. 17), and upon the outer face of each disc there is secured a plate 131 which is formed with a tooth 132, preferably of the shape shown. Each sleeve 129 is also formed with a series of circumferentially arranged teeth 133, which occur adjacent the disc 130. Also each sleeve 129 carries a toothed disc 134 which is removable and provided with a suitable opening whereby to receive the counter shaft 126. Within each sleeve 129 there is positioned a plurality of friction discs 135 which are splined to the sleeve as shown. Between alternate discs 135 there is positioned friction discs 136, which are splined to the shaft 126. A compression spring 137 is held by toothed disc 134 to press against the discs 135 and 136 by the toothed disc 134. Preferably the friction discs 135 and 136 are made of different materials such as hard fibre and spring tempered steel. Also the friction discs should be provided with openings as shown, whereby to permit distribution of lubricant therebetween. Each of the secondary counter discs 128 has secured to one side thereof a plate 138 which is similar to the plate 131 secured to the primary counter members, and which is also formed with a curved tooth 139. Suitable friction discs 140 and 141, together with a spring 142, are employed in connection with each of the counter discs 128 for the same purpose as the friction discs 135 and 136 and spring 137 described for the primary counter members. Also each member 128 has secured thereto a tooth wheel or disc 143 which places the spring 142 under tension.

Above the shaft 126 there occurs a fixed shaft 144′ which carries a plurality of transfer members 144, one for each of the primary counter members 127. As shown to advantage in Figure 13, each transfer member comprises a sleeve 145 which is adapted to receive the shaft 144′. The sleeve carries at its one end a bell crank lever 146 which has its arm 147 provided with an offset terminal 148. The remaining arm 149 of each bell crank lever is connected through a spring 150 to the support 151 carried by one or more brackets 152. Each member 144 is also provided with a lug 153 which carries an adjustable set screw 154, which is in alignment with the hardened inset 155′ of the associated latch 124. Each member 144 also carries a pawl 155. Each pawl 155 is in alignment and adapted to engage the teeth of disc 134 of a primary counter unit, and the offset portion 148 of the bell crank lever arm 147 is adapted to be engaged by the tooth 132 carried by the same primary counter member. The offset portion 148 of each bell crank lever arm 147 is so shaped that the teeth 132 may lift these arms when the primary counter units are rotated in the proper direction.

A shaft 156 is rotatably supported by suitable bracket members and this shaft is geared to the counter shaft 126, as shown in Figure 17. A plurality of levers 157 are provided one for each of the transfer members 144. Each lever 157 has its one end pivotally supported by a rod 158. The other end of each lever has pivotally connected thereto the one end of a lifter 159. The shaft 156 carries a cam 160 for each of the levers 157 and these cams are arranged so that the lifting action thereof upon the levers 157 will occur successively. Each lifter 159 is connected to an angle iron 161 by a spring 162. The angle member 161 is provided with slots in its portion 163 which permit movement of the levers 159. Also in each slot there is supported a roller 164. The inner edge of each lifter member 159 is of such formation that upon a predetermined upward movement thereof the same will be urged outwardly by the associated roller 164. Each of the members 144 carries a spring finger 165, and normally the inner edge of each lifter 159 is adapted to engage with the free end of the associated spring finger 165.

As previously described there is provided an electromagnet 122 for each of the primary counter members 127 and the armature or latch 124 of each electromagnet is normally held in engaging relation with the toothed disc 134 of the associated primary

counter member by a spring 166, said springs being adjustably anchored by the screw bolts 167, as shown to advantage in Figures 15, 16 and 17. Also it should be here mentioned that each lever 157 is urged downwardly by a coil spring 168.

With respect to the secondary counter members or accumulative counter members, the same are positioned upon the counter shaft 126 in an obvious manner, and between each adjacent pair of the counter discs 128 there is movable a transfer member 169. Each transfer member 169 may be in the form of a bell crank lever having its one arm or prong 170 formed with an offset terminal 171 which is of such formation and shape that the same will be disposed in the path of tooth 139 of one adjacent disc and also engage the toothed disc 143 of the other adjacent disc 128. A second arm 172 of each transfer member 169 is in alignment with the toothed disc 143 engaged by the arm 170. Each transfer member is further provided with an arm 173 to which there is connected a suitable spring 169′ whereby to urge the arm 147 into its engaging position with the associated toothed disc 143.

Referring to Figure 18, it will be seen that the counter mechanism has its counter shaft 126 connected through suitable gears to a shaft 175. It should be here mentioned that any number of these counter shafts 126 may be provided in order to increase the capacity of the counting mechanism; that is to say, each counter shaft 126 would carry a required number of primary counter members and also a required number of secondary or accumulative counter members for registering or recording the index points upon a certain number of divisions of a card. The lowermost shaft 175 is shown specifically in order to illustrate the manner in which this shaft can be connected to the counter shaft 126 for driving the same in either direction. It is, of course, to be understood that the shafts 175 are connected in proper timed relation to the drive shaft 92 of the card feeding mechanism previously described. The shaft 175 has loosely mounted thereon a sleeve 176 which carries at its one end a plate member 177. The shaft 175 projects through this plate member and adjacent its end is formed with gear teeth 178. A pinion carrier 179 is provided and supports a pair of pinions 180. This pinion carrier is secured to the plate 177 and about the pinion carrier there is positioned a combination gear wheel 181. The combination gear wheel 181 is suitably held in position by the washers and screws shown to the right thereof in Figure 18. The combination gear 181 meshes with a suitable gear carried by the counter shaft 126. The other end of the sleeve 176 has secured thereto a collar extension 182, which turnably supports a pin 183, said pin being yieldably held against rotation by a torsional spring 184. The pin 183 carries a radially extending arm 185 and also this pin is formed with a recess 186, which will permit the passage of a detent 187 carried by the shaft 175 when the pin 183 is rotated to a certain position.

A spindle or shaft 188 is suitably mounted in the position shown and carries a plurality of interference arms 189, one for each of the shafts 175, and adapted to engage with the projections 185 of the pins 183 when rotated a certain degree. The shaft 188 may have connected thereto a suitable connecting link for rotating the same against the tension of a spring 191. The spring 191 will, of course, at all times return the shaft 188 to its non-interfering position when said shaft is released. The mechanism described permits rotation of the counter shaft 126 in either direction and the exact manner in which this operation takes place will be later explained.

A shaft or spindle 192 is suitably supported for rotative movement, and this shaft carries at each end an eccentric 193 about which there is positioned a collar or strap 194 carried by a door frame generally indicated by the reference character 195. This door frame is adapted to be swung upon the eccentrics 193 to a position so that its free end may be brought into engaging relation with the latch members 196. The door frame carries at its upper free end a rotatable stub shaft 197 whereby to permit an engaging relation with a hook 198 carried by the associated latch 196. The lower and free end of the door frame supports a fixed engaging member 199, which may be brought into position for engaging a hook 200 carried by the lower latch 196. The hooks 198 and 200 are of such construction that a biased movement of the door frame is permitted after the same has been brought into engaging relation therewith. This biased movement of the door frame occurs upon the spindle 192 being rotated in a predetermined direction after the door frame has been brought to its closed position. The spindle or shaft 192 may be rotated through a rack 201 and pinion 202. The rack terminates at its one end in head 203 which is loosely mounted upon a rod 204 and which is rigidly held against movement in one direction by a collar 205 and yieldably held against movement in the other direction by the spring 206 and collar 207. The spring 206 provides a yieldable connection between the rod 204 and the rack 201 in order to avoid any great strains when

rotating the spindle 192 to obtain the biased movement for locking the door frame 195. The rod 204, together with the bar 190, may be operated by any suitable means which can be utilized to reciprocate these members at the proper intervals and degree in order to carry out the complete operation of the apparatus hereinafter to be described.

The door frame 195 carries a record sheet supporting frame 208 which is vertically movable and which includes a pair of rack bars 209 adapted to be moved by pinions 210.

Upon the spindle 192 there is slidable a sleeve 206'. A double faced cam member 207' is rigidly secured to the spindle 192 and adapted to cooperate with pins 205' for elvating the sleeve 206' upon rotation of the shaft or spindle 192 in one direction. A collar 208' is splined to the shaft or spindle 192, and above this collar there is positioned a compression spring 210' which is adjustably held against upward movement by a collar 212'. The collar 208' has an annular groove, the bottom thereof corresponding in curvature to the eccentrics 193. In this groove there is positioned a roller which is turnably connected to a ratchet arm 211', said ratchet arm being connected for rotating the pinions 210 upon the collar 208' moving downwardly through the cooperating pawl and ratchets shown in Figure 19. The pawl 200' rotates the pinions 210 and pawl 201' retains the racks 209 in adjusted position. A hand lever 211ª is provided whereby to bring the pawls 200' and 201' into non-operative position and thus permit free movement of the rack bars 209, Figure 19.

The frame 208 may have any suitable means for supporting a record sheet 211 which is disposed forward to a platen 212. One or more of these platens may be arranged upon the frame 208, depending upon the number of counter sets or groups employed, and between each platen and the associated counter set there is interposed a ribbon 213. This ribbon is extended between the reels 214 and each reel is removably secured to a gear wheel 215 supported by a bracket arm 216. Each gear wheel 215 is in mesh with a gear wheel 217 carried upon a sleeve 218, said sleeve having turnably disposed therein a shaft 219. The sleeves 218 are connected to each other through the connecting rod 220 and pinions 221. Each gear 217 is loose upon the associated sleeve 218 and each gear carries an upstanding pin 222, which is adapted to be engaged by a radially extending pin 223 carried by the associated shaft 219 whereby to connect the sleeves 218 with the gears 217. As is obvious with this construction, upon either of the shafts 219 being elevated the gears 217 would be disconnected from the associated sleeve 218. Suitable slots in sleeves 218 permit the upward movement of pins 223. A control bar 224 is fulcrumed to a suitable support, as at 225, and this bar is disposed between the spindles or shafts 219 and adapted to engage the same in the manner illustrated in Figure 18. As is entirely apparent from this arrangement, the gears 217 carried by one of the sleeves 218 may be disconnected therefrom while the same gears of the other sleeve remain connected thereto. The purpose of this construction is to change or reverse the rotation of the reels 214 and thus to change the direction of feed of the ribbon carried by said reels.

One of the sleeves 218, as shown in Figure 18, is connected through gears 226 and 227 with the shaft or spindle 188. The gear 227 is loose upon the shaft 188 and through the pawl and ratchet means shown, will be rotated with said shaft when movement of the shaft occurs in one direction and thus to impart intermittent movement in one direction to the sleeve 218 carrying the gear 226.

Previous to the description of the general operation of the present apparatus it might be stated that the different mechanisms described are all interconnected and driven by the shaft 92. The shaft 108, as well as the rollers 96 and 95, shafts 64 and 175 are all connected through suitable gears for being rotated in the proper ratios and timed relation in order to carry out the different operations of the apparatus.

Let it be assumed that the apparatus is assembled and connected, as heretofore described, and record cards deposited in the hopper 72 in the manner shown in Figure 1. Each record card, as illustrated in Figure 2, has a plurality of division lines extending transversely thereof, and each space provided by the division lines is divided into a plurality of columns. The cards are fed transversely through the indexing apparatus. Upon starting rotation of the shaft 92 the drum 76 will feed cards 73 singly to the indexing mechanism. Cards are illustrated in Figures 10 and 2 when passing over the table 11 and beneath the index fingers 25. It is necessary before starting the machine in operation to set the number of index fingers 25 required; that is, an index finger 25 is required for each column of the different divisions of a card to be tabulated. These index fingers can be released by tripping the release members 28 in the manner heretofore described. The shaft 53 rotating will set the bell crank levers 47 for engaging the trigger bars 39. As the cards pass beneath the index fingers 25, upon a perforation occurring in a column and coming into register with an index finger, the index finger will promptly trip the associated trigger bar 39 and thus in turn trip a bell crank lever 47, which will establish an electric circuit

through one of the electromagnets 122. As a card passes beneath the index fingers 25 a number of these fingers may operate for tripping different trigger bars 39, depending upon the perforations in the different columns of the card. Each column of any division on a card contains the nine digits, and these digits occur in their successive order. The columns are arranged so that the aligned numbers longitudinally of the card may indicate the units, tenths, hundredths, thousandths, etc. Each card is advanced so that the number 9 in each column will first come beneath the index fingers 25. The moment that an index finger 25 enters a perforation the electric circuit heretofore described is established, and this circuit is maintained until the card passes its operative positions beneath said finger, at which moment the cam 65 operates to discontinue the current through the different contact makers 62 and 59, and also through the electromagnets 122, whose circuits are established by these contact makers.

The counter shaft 126 is continuously rotating and upon an electromagnet 122 being energized the same will draw its latch or armature 124 from engagement with the primary counter member 127 and permit the same to rotate. The registering position for any numeral carried by the counter members, either primary or secondary, occurs when such numeral is brought into alignment with the platen 212. When a latch 124 is operated to release a primary counter member the same is drawn against the tension of its associated spring 166. The counter member released will, of course, rotate with the counter shaft as long as the associated electromagnet 122 is energized. This time or interval as before stated, is controlled by the position of the punch in a column of a record card, and therefore this position of the punch will determine the amount of rotation of the counter member and thus enable the proper number, representing the punch, to be brought into registering position by the counter member. The operation described is the same for each of the perforations presented by a card to the index fingers 25.

It may be well here to state that the finger 79 is readily depressed when cards move thereover, whereby to permit the electric circuit through the electromagnet 82 to open and thereby, with the operator drawing down upon the hand lever 85 carried by the rocker shaft 83, the fingers 84 can be brought to their non-operative position. In starting the apparatus this lever 85 should be depressed by the operator and substantially at the same moment a card will depress the finger 79 and close the circuit through electromagnet 82 which avoids further holding down of the lever 85. Immediately upon an abnormal gap occurring between successively fed records, the circuit through the electromagnet 82 will be discontinued and the fingers 84 of rocker shaft 83 will lift the rear edges of the cards 73 and prevent further feeding thereof to the indexing mechanism.

The primary counter members 127 upon each counter shaft are arranged in the same order as the different columns in the different divisions of a record card; that is to say, starting at one end of the counter shaft, the first primary counter member represents units, while the next represents tens, etc. Upon any primary counter member 127 making a complete rotation, a transfer or carry of the increment one to the next higher primary index or type wheel is accomplished. With respect to the primary counter members 127 the transfer operation is accomplished by the bell crank levers 144. Upon one of these counter members completing a rotation its tooth 132 is brought to engage and lift the arm 147 of the associated bell crank lever 144, and thus to bring the spring finger 165 of said bell crank lever in the position shown in Figures 15 and 16. These preliminary movements might be termed "the set-up operation of the transfer elements." The shaft 156 is so timed that immediately after a record card has passed its operative position beneath the index fingers 25, the same will raise the lifters 159 and this action will further rotate the bell crank levers which are set in the position shown in Figures 15 and 16, and cause the set screw 154 to depress the latch 124 of the next successive counter member and thereby release the same to permit said counter member to rotate with the counter shaft. The amount of rotation is controlled by the finger 155 of the transfer unit operated; that is, this finger engages with the teeth 134 of the counter member being advanced, and permits of a slight movement thereof. Upon the shaft 156 rotating a sufficient degree, the spring fingers 165 engaged by the lifters 159 will be released and then the transfer members 144 can assume their original position. This operation is true with respect to each of the primary counter members.

In connection with the secondary or accumulative counter members the bell crank lever 169 disposed between each adjacent pair of counter members is first operated upon by the tooth 139 of one of said counter members and the offset portion 171 is lifted so that the toothed disc 143 of the adjacent disc is released and thus permitting the adjacent disc to rotate with the counter shaft, carrying or adding the increment one to the next higher index wheel. This rotation is sufficient to permit one of the teeth of the disc 143 to clear the offset portion 171 upon

the arm 170 and also clear the tooth 139 upon the actuating disc. The bell crank lever will now assume its initial position, and in so doing permit a slight additional rotation of the disc 128 carrying the next higher unit.

The apparatus will operate in the manner heretofore described to record numbers of substantially an infinite degree, and when it is desired to know the total recorded it is only necessary to reciprocate the rack bar 201 whereby to rotate the spindle 192 for moving the frame 195 inwardly and thereby to cause a printing of the type numbers in registering position upon the record sheet 211. Also immediately upon this printing operation taking place the downward movement of the sleeve 206′ carried by the spindle 192 causes a spacing of the record sheet 211 with respect to the different counter units. The means heretofore described for holding the different counter members against rotation with respect to the counter shaft would permit free rotation of said members in the opposite direction with said counter shaft; that is, each primary counter member could rotate reversely until its tooth 132 engaged the associated transfer lever 144, and the same is also true with relation to the counter discs 128. It will be noted that teeth 132 and 139 are so arranged that when brought into engagement with the transfer members 144 and 169 respectively that all the counter members will be in non-registering position—that is, the ciphers would be in alignment with the plate 212. In order to accomplish this operation (i. e., to bring the different counter members to their non-registering or non-recording position,) the shaft 188 is rocked to bring its interference arms 189 into engaging relation with the projections 185, and also to rotate the pins 183 whereby to permit the shaft 175 to turn freely within the sleeve 176.

During the preceding interval or while tabulation is progressing said drive shaft 175, together with sleeve 176 and its component parts as shown and described, rotate as an integral part of said shaft 175. The partial rotation of said pin 183, however, due to interference arm 189, permits aforesaid shaft 175 to turn freely within the collar 184, due to non-interference between the detent 187 and the pin 183, thereby permitting motion to be transmitted through said shaft 176 to said combination gear 181 and to driving gear on counter shaft 128. Pinions 180 in this manner function as intermediates in a train of gears and reverse the direction of rotation of the combination gear 181 and consequently the direction of rotation of said counter shaft 126. It will be understood, of course, that during the reversal interval just described, the collar 184 and sleeve 176 have remained stationary, due to the continued opposition of interference arm 189. Completion of the oscillation cycle of shaft 188 swings the interference arm 189 out of the path of arm 185, thus permitting pin 183 to return to its normal position, and pinions 180 to again function merely as driving pawls in the transmission of motion from said shaft 175 direct to aforesaid gear on said counter shaft 126, all of which will be readily apparent to one skilled in the art.

It should be here pointed out that with the type disc members or type wheels operated and controlled by electromagnets and latches heretofore described, is of considerable importance in obtaining speed and accuracy in operation of the machine.

While I have shown and described the preferred form of the combination and arrangement of the parts of my invention I wish it to be understood that I am aware of the fact that the same might be changed by those skilled in the art without departing from the spirit of my invention, as indicated by the appended claims.

What I claim is:

1. A tabulating machine for record cards, comprising an indexing mechanism adapted to operate successively upon record cards, means whereby mechanical elements will be actuated for establishing an electrical circuit remote from the indexing mechanism for each index point presented by a record card to said indexing mechanism, an individual counter-unit for each index column upon a card, means for interconnecting the individual counter-units whereby the results recorded by said units may be accumulative, and separate accumulative counter-units interconnected to the first-named counter-units whereby to enable any degree of recordation by said counter-units.

2. A tabulating machine for record cards, comprising an indexing mechanism adapted to operate successively upon record cards, means whereby mechanical elements will be actuated for establishing an electrical circuit remote from the indexing mechanism for each index point presented by a record card to said indexing mechanism, an individual counter-unit whereby each index point upon a card may be registered, means for interconnecting the counter-units whereby the results recorded by said units may be accumulative, separate accumulative counter-units interconnected to the first-named counter-units whereby to enable any degree of recordation by said counter-units to be registered, and means whereby the individual counter-units and also the accumulative counter-units may be simultaneously brought to a non-registering position.

3. A tabulating machine for record cards, comprising an indexing mechanism adapted to operate successively upon record cards, means whereby mechanical elements will be

actuated for establishing an electrical circuit remote from the indexing mechanism for each index point presented by a record card to said indexing mechanism, an individual counter-unit whereby each index point upon a card may be registered, means for interconnecting the counter-units whereby the results recorded by said units may be accumulative, separate accumulative counter-units interconnected to the first-named counter-units whereby to enable any degree of recordation by said counter-units to be registered, and means whereby the individual counter-units and the accumulative counter-units may be simultaneously returned to the non-registering positions during the moment the indexing mechanism is inoperative.

4. A tabulating machine for record cards comprising an indexing mechanism, means for moving record cards through the index mechanism successively and continuously, means whereby mechanical elements will be actuated for establishing an electrical circuit remote from the indexing mechanism for each indexing point presented by the cards, a rotary counter-unit for each column of a record card, and means whereby each counter-unit will be rotated upon the associated electric circuit therefor being established.

5. A tabulating machine for record cards comprising an indexing mechanism through which record cards may be fed, each card having a plurality of index columns and adapted to move through the indexing mechanism parallel with said columns, mechanical means in the indexing mechanism adapted to operate for establishing a separate electric circuit upon any index point being presented in either of the columns of a card, said means maintaining said electric circuit until the card passes from the indexing mechanism, and a rotary counter-unit for each electric circuit established and adapted to be released by the action of the current of said circuit for a period corresponding to the time said electric circuit is maintained.

6. In an apparatus of the character described a record card indexing mechanism comprising a table, means for causing cards to move successively and continuously over said table, and mechanical elements adapted to be actuated for establishing an electrical circuit remote from said indexing mechanism upon an indexing point of a card being presented.

7. In an apparatus of the character described a record card indexing mechanism comprising a table over which record cards may be successively moved, an index finger adapted to press upon a card moving over said table, said cards having openings or holes for index points, and an index trigger beneath said cards adapted to be engaged by the index finger when said finger extends through an index hole or opening in one of said cards whereby to trip said index finger.

8. In an apparatus of the character described a record card indexing mechanism comprising a table over which record cards may be successively moved, a pivoted index finger having its one end adapted to yieldably press upon the top surface of cards passing through said indexing mechanism, said cards having openings for index points, an index trigger carried by the table and adapted to be tripped upon said index finger coming into register with an index opening in one of said cards and engaging said trigger.

9. In an apparatus of the character described a record card indexing mechanism comprising a table over which record cards may be successively moved, a plurality of indexing fingers each of which has one end adapted to rest upon the top surface of the cards passing through said indexing mechanism, a plurality of indexing triggers, one for each of said indexing fingers and each trigger adapted to be tripped when its associated indexing finger engages therewith, and means whereby each index trigger may establish an electric circuit when tripped.

10. In an apparatus of the character described a record card indexing mechanism comprising a table over which record cards may be moved successively, a plurality of index fingers one end of each finger being adapted to press upon the top surface of the cards passing through said indexing mechanism, a plurality of index triggers pivotally supported by said table, one for each of said index fingers, said cards having openings or holes for index points adapted to permit an index finger to project therethrough when brought into registering relation therewith and trip the associated index trigger, an electrical contact-making member for each trigger finger and adapted to be maintained in its inoperative position during the set period of its associated trigger.

11. In an apparatus of the character described a record card indexing mechanism comprising a table over which record cards may be moved successively, a plurality of index fingers one end of each finger being adapted to press upon the top surface of the cards passing through said indexing mechanism, a plurality of index triggers pivotally supported by said table one for each of said index fingers, said cards having openings or holes for index points adapted to permit an index finger to project therethrough when brought into registering relation therewith and trip the associated index

trigger, a bell crank lever for each index trigger, spring means for urging each bell crank lever to swing in a predetermined direction, and contact means whereby upon a bell crank lever being released from its associated index finger an electrical circuit will be established.

12. In an apparatus of the character described a card indexing mechanism comprising a table over which record cards may be successively moved, said record cards having openings or holes for index points, a plurality of fingers arranged above the cards and adapted to press thereon, a plurality of indexing triggers arranged beneath the cards, said triggers being supported for pivotal movement and one end of each trigger being disposed in alignment with the contacting end of one of said indexing fingers whereby upon an indexing finger coming into registering relation with an opening in a record card the associated index trigger will be tripped.

13. In an apparatus of the character described a card indexing mechanism comprising a table over which record cards may be successively moved, said record cards having openings or holes for index points, a plurality of fingers arranged above the cards and adapted to press thereon, a plurality of indexing triggers arranged beneath the cards, said triggers being supported for pivotal movement and one end of each trigger being disposed in alignment with the contacting end of one of said indexing fingers whereby upon an indexing finger coming into registering relation with an opening in a record card the associated index trigger will be tripped, a bell crank lever for each of the index triggers, springs urging said bell crank levers to swing in one direction, said triggers engaging the bell crank levers to hold the same against rotation, and means whereby upon either of the bell crank levers being released an electrical circuit will be established.

14. In an apparatus of the character described a record card indexing mechanism comprising a table over which record cards may be successively moved, said cards having openings or holes for registering points, a plurality of index fingers each of which is adapted to have its one end engaged upon the top surface of the cards, a trigger bar for each of said index fingers and disposed in alignment therewith, said bars being adapted to be tripped upon the index fingers engaging therewith, a bell crank lever for each trigger bar having an arm adapted to be brought into engaging relation with one end of the associated trigger bar and thereby to hold said bell crank lever against swinging movement in one direction, a pair of resilient electrical contact-making members for each bell crank lever, means whereby said bell crank levers when in their last-named position will maintain the different contact-making members separated, and means whereby upon a bell crank lever being released from its associated trigger bar the same will be moved for permitting its associated contact-making members to engage each other.

15. In an apparatus of the character described a record card indexing mechanism comprising a table over which record cards may be successively moved, said cards having openings or holes for registering points, a plurality of index fingers each of which is adapted to have its one end engaged upon the top surface of the cards, a trigger bar for each of said index fingers and disposed in alignment therewith, said bars being adapted to be tripped upon the index fingers engaging therewith, a bell crank lever for each trigger bar having an arm adapted to be brought into engaging relation with one end of the associated trigger bar and thereby to hold the bell crank lever against swinging movement in one direction, a pair of resilient electrical contact-making members for each bell crank lever, means whereby said bell crank levers when in their last-named position will maintain said contact members separated, means whereby upon a bell crank lever being released from its associated trigger bar the same will be moved for connecting the pairs of contact-making members associated therewith, and means whereby said bell crank levers will be simultaneously moved to their positions for engagement with the trigger bars.

16. In an apparatus of the character described a record card indexing mechanism comprising a table over which record cards may be successively moved, said cards having openings or holes for registering points, a plurality of index fingers each of which is adapted to have its one end engaged upon the top surface of the cards, a trigger bar for each of said index fingers and disposed in alignment therewith, said bars being adapted to be tripped upon the index fingers engaging therewith, a bell crank lever for each trigger bar having an arm adapted to be brought into engaging relation with one end of the trigger bar and thereby to hold the bell crank lever against swinging movement in one direction, a pair of resilient electrical circuit contact-making members for each bell crank lever, means whereby said bell crank levers when in their last-named position will maintain said contact members separated, means whereby upon a bell crank lever being released from its associated trigger bar the same will be moved for establishing the electrical circuit controlled thereby, a continuous rotary shaft and means carried by said shaft adapted to return the bell crank levers to their engag-

ing positions with said trigger bars simultaneously and at predetermined intervals.

17. In an apparatus of the character described a record card indexing mechanism comprising a table over which record cards may be successively moved, said cards having openings or holes for registering points, a plurality of index fingers each of which is adapted to have its one end engaged upon the top surface of the cards, a trigger bar for each of said index fingers and disposed in alignment therewith, said bars being adapted to be tripped upon the index fingers engaging therewith, a bell crank lever for each trigger bar having an arm adapted to be brought into engaging relation with one end of the trigger bar and thereby to hold the bell crank lever against swinging movement in one direction, a pair of resilient electrical circuit contact-making members for each bell crank lever, means whereby said bell crank levers when in their last-named position will maintain said contact members separated, means whereby upon a bell crank lever being released from its associated trigger bar the same will be moved for establishing the electrical circuit controlled thereby, and means whereby the bell crank levers will be simultaneously moved to their engaging positions with the trigger bars during the interval that no card is passing beneath said index fingers.

18. In an apparatus of the character described an indexing mechanism for record cards comprising a table, an index finger disposed above the table adapted to engage upon the top surface of cards passed over said table, said record cards having openings or holes for index points and said finger being adapted to enter said openings when brought into registering relation therewith, an index trigger supported by the table beneath the index finger and adapted to be actuated when said index finger engages therewith for establishing an electrical circuit remote from said indexing mechanism, and means forward to the index trigger adapted to prevent the establishment of the electrical circuit upon cards ceasing to pass over said table.

19. An indexing mechanism for record cards comprising a table over which cards may be successively moved, said cards having openings or holes for index points, a frame swingingly supported above said table and adapted to be brought in close relation therewith, index fingers carried by said frame adapted to press upon cards passed there-beneath and trigger bars carried by said table adapted to be actuated by said index fingers when extending through openings in said cards, and means whereby upon either of the trigger bars being actuated an electric circuit will be established for the purpose described.

20. In a counter mechanism of the character described a continuous rotary shaft, counter members carried by the shaft, a spring-controlled latch for each counter member adapted to normally hold the same against rotation with the shaft, and an electro-magnet for each counter member adapted when energized to release the spring-controlled latch and permit the associated counter member to rotate with said shaft.

21. In a counter mechanism of the character described a continuous rotary shaft, counter members carried upon said shaft, a toothed wheel carried by each counter member, a spring-controlled latch for each counter member adapted to normally engage the toothed wheel and hold said counter member against rotation with the shaft, and an electromagnet for each counter member adapted when energized to release the associated spring-controlled latch and permit the counter member to rotate with said shaft.

22. In a counter mechanism, a continuous rotary shaft, a series of counter members carried upon the shaft, means for normally holding the counter members against rotation with the shaft, means for releasing the counter members individually and for timed intervals, and means associated with each counter member adapted to be directly actuated by said counter member for releasing the succeeding counter member and permitting a certain rotating movement thereof.

23. In a counter mechanism a continuous rotary shaft, a series of counter units carried upon the shaft, means for normally holding said counter units against rotation with the shaft, means for releasing the counter units individually and for timed intervals, and a transfer lever for each counter unit adapted to be actuated thereby for releasing the succeeding counter unit.

24. In a counter mechanism a continuous rotary shaft, a series of counter units carried upon the shaft, means for normally holding said counter units against rotation with the shaft, means for releasing the counter units individually and for timed intervals, a transfer lever for each counter unit adapted to be actuated after said counter unit has rotated a certain degree and to release the succeeding counter unit and permit a certain rotative movement of the last-named counter unit.

25. In a counter mechanism a continuous rotary shaft, a pair of counter units carried by the shaft, a latch for each counter unit whereby to hold the same normally against rotative movement with the shaft, means for individually releasing said latches for timed intervals and permitting rotation of the counter units with the shaft, and means interposed between the counter units whereby upon a complete rotation of one unit the

succeeding unit will be released and rotated a certain degree.

26. In a counter mechanism, a continuous rotary shaft, a pair of counter units carried by the shaft, a latch for each counter unit whereby to hold the same normally against rotative movement with the shaft, means for individually releasing said latches for timed intervals and permitting rotation of the counter units with the shaft, and a bell crank lever fulcrumed intermediate the pair of counter members having a prong engaging one counter member and another prong the succeeding counter member, and the first-named counter member being adapted to actuate said bell crank lever for releasing the succeeding counter member at a certain interval and permitting the last-named counter member to rotate a predetermined degree whereby to enable accumulative counting of said counter members.

27. In a counter mechanism a continuous rotary shaft, a counter unit carried thereby, an electro-magnet for said counter unit, a latch adapted to normally engage the counter unit and hold the same against rotation with said shaft, and also adapted upon the electro-magnet being energized to release said counter unit and permit rotation thereof with the shaft.

28. In a counter mechanism a continuous rotary shaft, a series of counter members carried upon the shaft, means for normally holding said counter members against rotation with the shaft, means for individually releasing said counter members to permit rotation with the shaft, a transfer lever associated with each counter unit, and means whereby upon each counter unit making one complete rotation the same will operate its transfer lever for releasing and permitting an adjacent counter member to rotate a predetermined degree and thereby to permit accumulative counting of said counter members.

29. In a counter mechanism a continuous rotary shaft, a series of counter members carried upon the shaft, means for normally holding said counter members against rotation with the shaft, means for individually releasing said counter members to permit rotation with the shaft, a transfer lever associated with each counter unit, means whereby upon each counter unit making one complete rotation the same will operate its transfer lever for releasing and permitting an adjacent counter member to rotate a predetermined degree and thereby to permit accumulative counting of said counter members, and means whereby the transfer operation of each of said counter members may occur simultaneously.

30. In a counter mechanism of the character described a continuous rotary shaft, counter members carried by the shaft, means whereby the rotation of the shaft may be employed for causing the counter members to assume different registering positions, said means being also adapted to permit the counter members, upon said shaft being rotated in the opposite direction, to assume their non-registering positions, and means for reversing said shaft.

31. In a counter mechanism of the character described a continuous rotary shaft, counter members carried by the shaft, means whereby the rotation of the shaft may be employed for causing the counter members to assume different registering positions, said means being also adapted to permit the counter members, upon said shaft being rotated in the opposite direction, to assume their non-registering positions, and automatic operative means adapted for reversing the rotation of said shaft.

32. In a counter mechanism a counter shaft, a continuously rotative power shaft, and means between said shafts whereby rotary movement in either direction may be transmitted to the counter shaft.

33. In a counter mechanism a continuous rotary power shaft, a counter shaft directly connected thereto, a rocker shaft and connecting means between the rocker shaft and counter shaft whereby with the rocker shaft being moved in one direction a predetermined degree the rotation of said counter shaft will be reversed.

34. In a counter mechanism a continuous rotary power shaft, a counter shaft directly connected thereto, a sleeve loosely mounted upon the continuous rotary shaft, a connection between the power shaft and counter shaft adapted to rotate the counter shaft in one direction, a connection between the sleeve and counter shaft adapted to rotate the counter shaft in the opposite direction when said sleeve is held to rotate with said power shaft, and automatic means adapted for holding said sleeve to rotate with said power shaft.

35. In a counter mechanism a continuous rotary power shaft, a counter shaft directly connected thereto, a sleeve loosely mounted upon the continuous rotary shaft, a connection between the power shaft and counter shaft adapted to rotate the counter shaft in one direction, a connection between the sleeve and counter shaft adapted to rotate the counter shaft in the opposite direction when said sleeve is held to rotate with said power shaft, and automatic means adapted for holding said sleeve to rotate with said power shaft for timed intervals.

36. A tabulating machine for record cards comprising an indexing mechanism adapted to operate successively upon record cards, said cards being provided with columns arranged in series relation, means whereby mechanical elements will be actuated

for establishing an electrical circuit remote from the indexing mechanism for each index point presented by a record card to said indexing mechanism, said indexing points occurring in said columns, a plurality of counter units, one for each of the columns upon a record card, and each counter unit adapted to be actuated by the associated electrical circuit when established, and means for interconnecting the individual counter units whereby the results recorded by said units may be accumulated.

37. A tabulating machine for record cards comprising an indexing mechanism adapted to operate successively upon record cards, said cards being provided with columns arranged in series relation, means whereby mechanical elements will be actuated for establishing an electrical circuit remote from the indexing mechanism for each index point presented by a record card to said indexing mechanism, said index points being arranged in said columns, a plurality of counter units, one for each of the columns upon a record card, and each counter unit adapted to be actuated by the associated electrical circuit when established, means for interconnecting the individual counter units whereby the results recorded by said units may be accumulated, a series of accumulative counter units interconnected with each other and with said individual counter units thereby enabling any degree of recordation by said counter units.

38. In an apparatus of the character described, a record card indexing mechanism comprising a table over which record cards may be moved successively and continuously, mechanical elements adapted to be actuated upon an indexing point of a card coming into registration therewith, means whereby said mechanical elements may be employed for registration of the index points of said cards, a hopper forward to the indexing mechanism and in alignment therewith and means interposed between said hopper and indexing mechanism whereby cards may be delivered from the indexing mechanism into said hopper and arranged in stacked relation.

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