J. P. CLEAL.

ELECTRIC CASH REGISTER.

APPLICATION FILED MAR. 20, 1909.

982,938.

Patented Jan. 31, 1911.

6 SHEETS—SHEET 1.

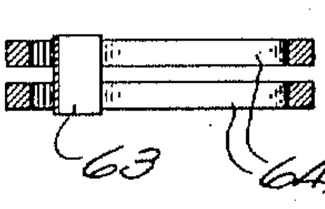

FIG. 7.

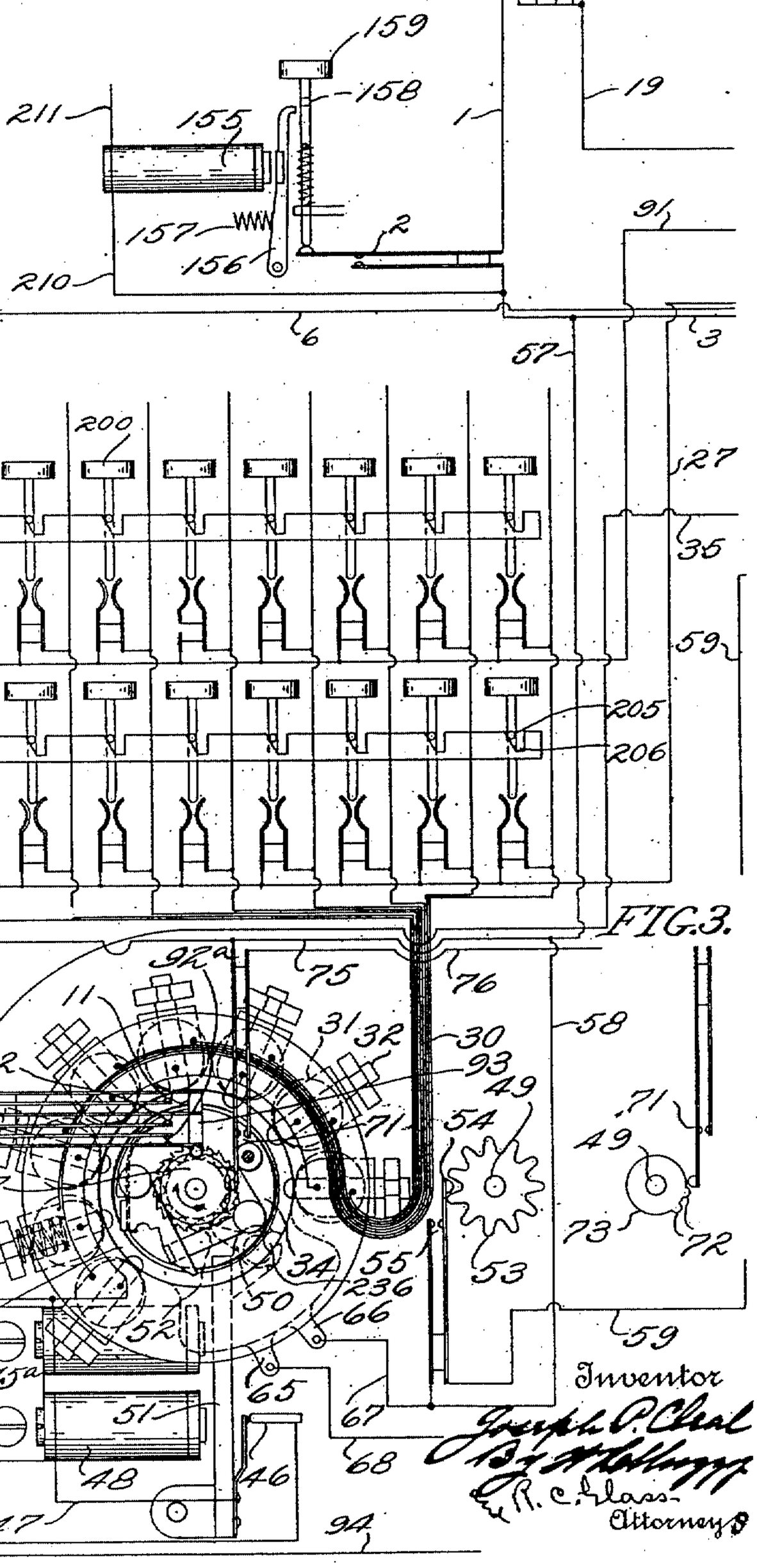

FIG. 1

FIG. 3.

FIG. 2.

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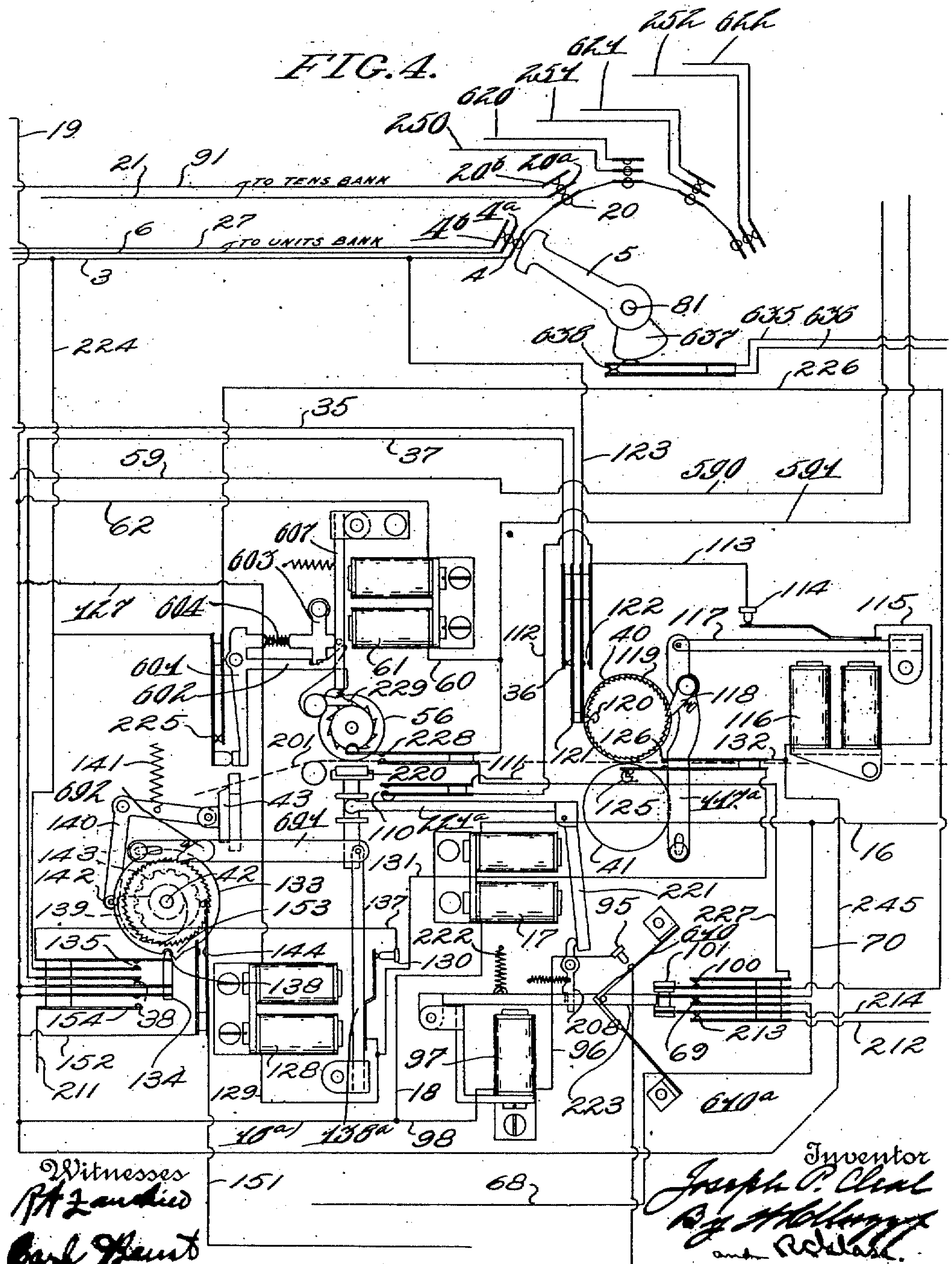
6 SHEETS—SHEET 2.

FIG. 4.



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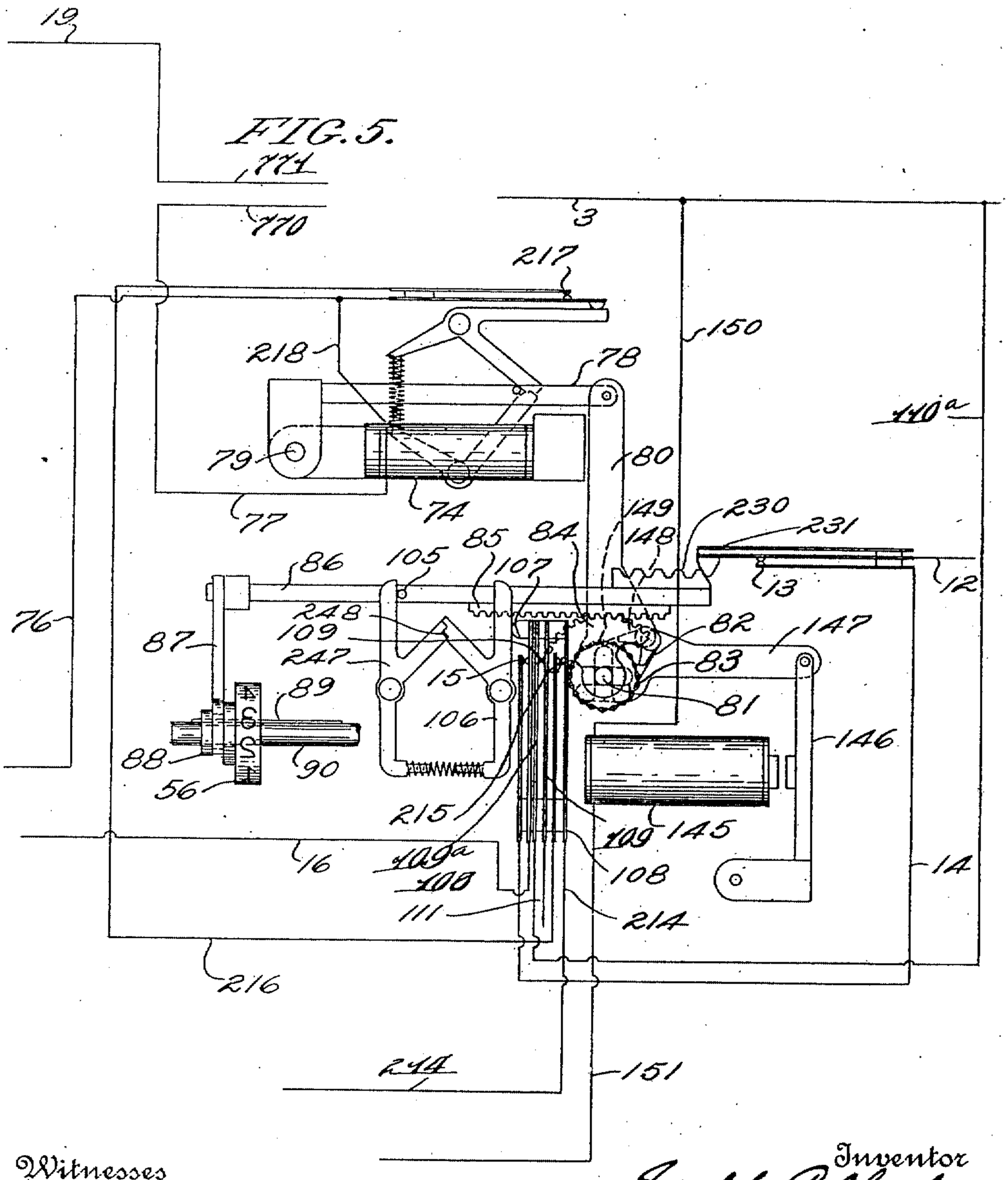
6 SHEETS—SHEET 3.

FIG. 5.



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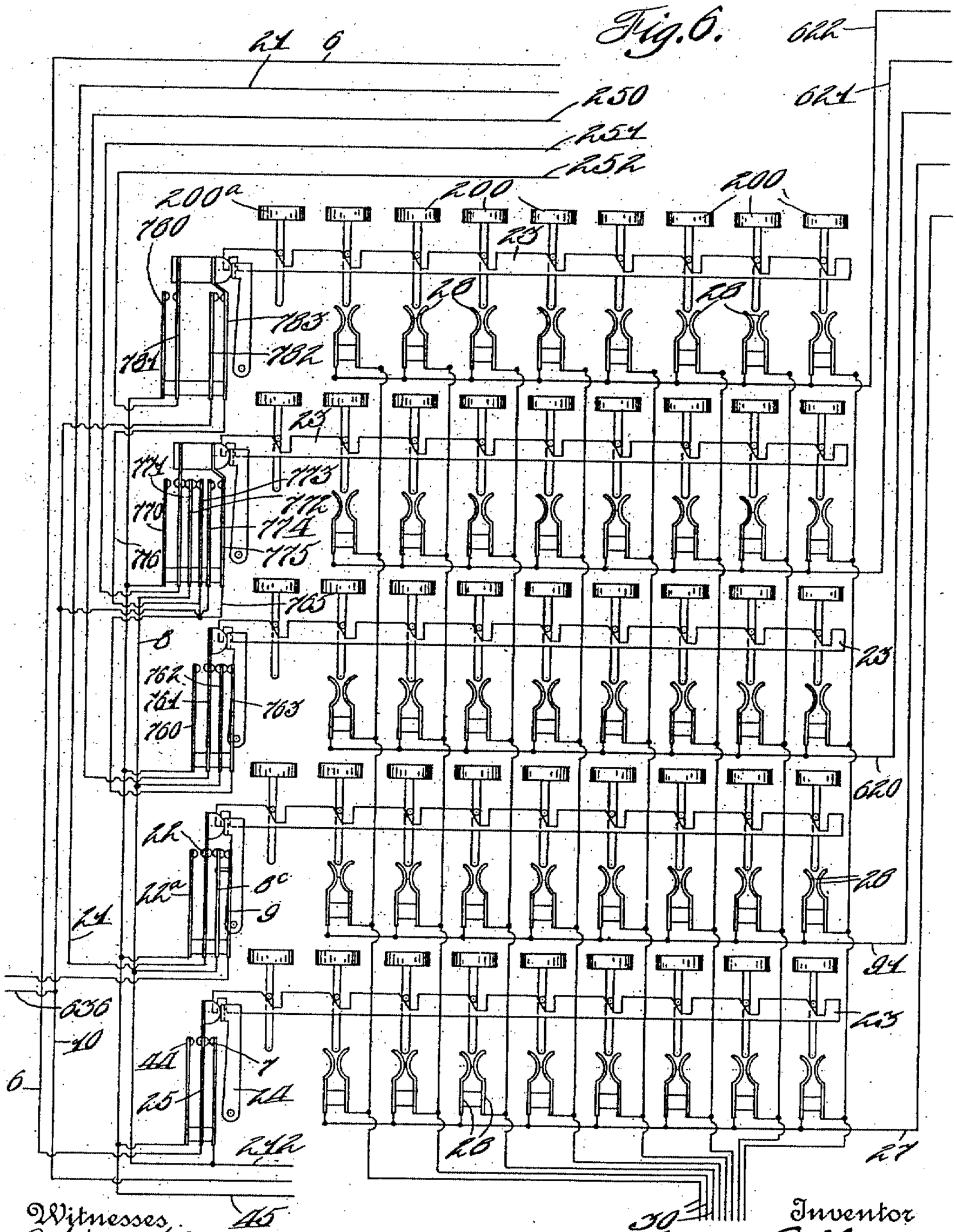
6 SHEETS—SHEET 4.

Fig. 6.



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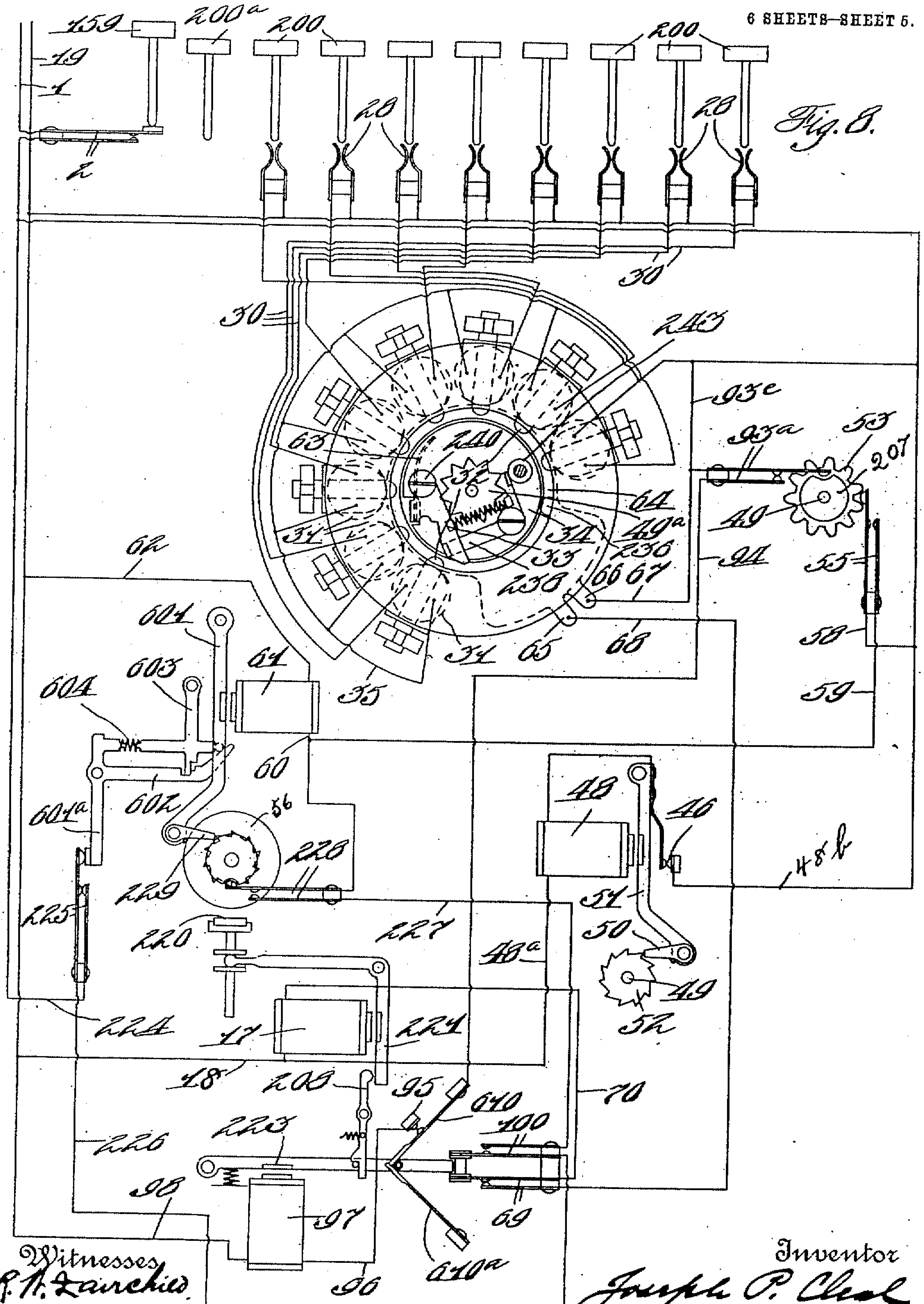
6 SHEETS—SHEET 5.



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APPLICATION FILED MAR. 20, 1909.

982,938.

Patented Jan. 31, 1911.

6 SHEETS—SHEET 6.

Fig. 9.

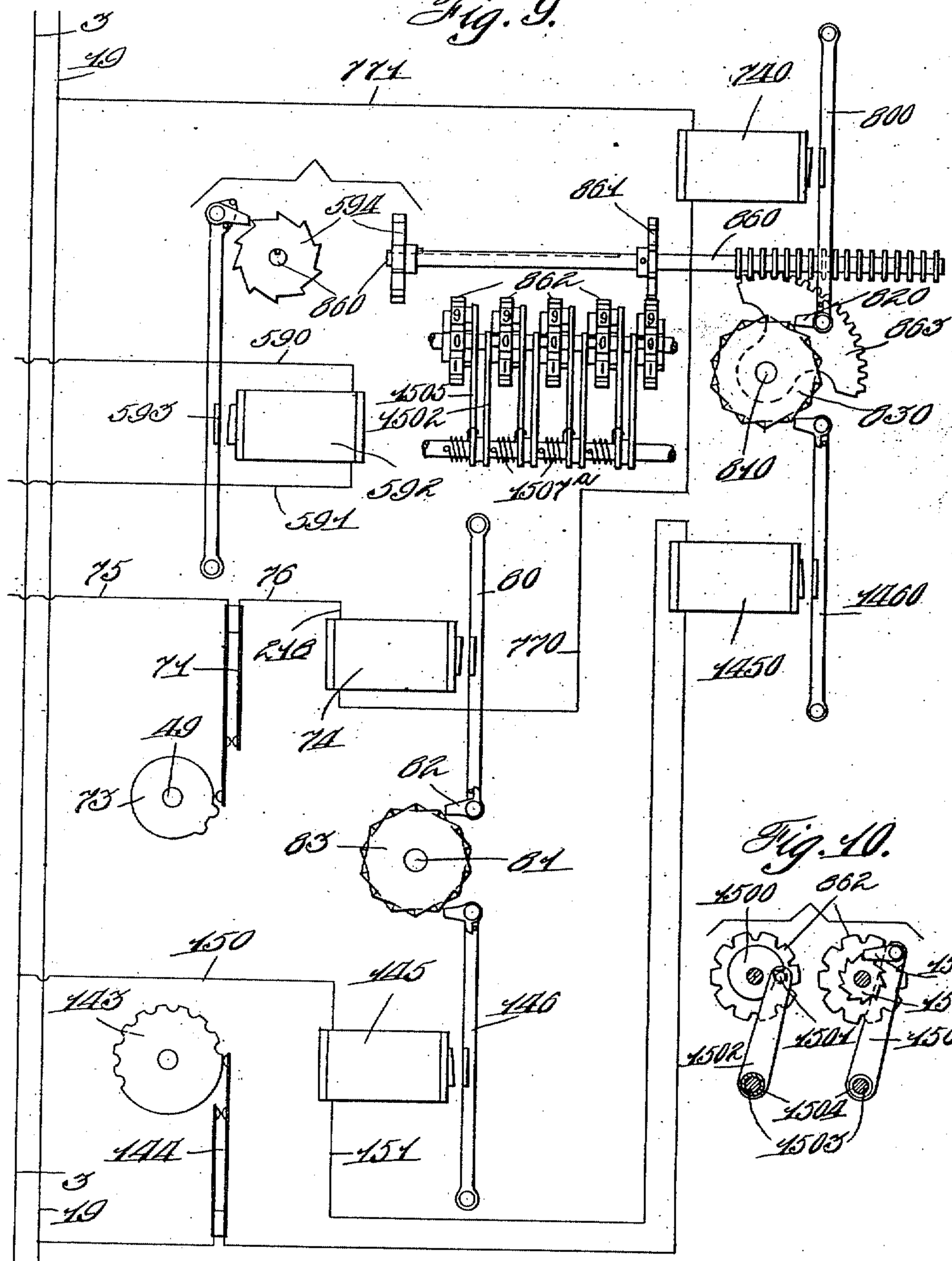

Fig. 10.

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UNITED STATES PATENT OFFICE.

JOSEPH P. CLEAL, OF TORONTO, ONTARIO, CANADA, ASSIGNOR TO THE NATIONAL CASH REGISTER COMPANY, OF DAYTON, OHIO, A CORPORATION OF OHIO, (INCORPORATED IN 1906.)

ELECTRIC CASH-REGISTER.

982,938. Specification of Letters Patent. **Patented Jan. 31, 1911.**

Application filed March 20, 1909. Serial No. 484,709.

To all whom it may concern:

Be it known that I, JOSEPH P. CLEAL, a citizen of the United States, residing at Toronto, in the Province of Ontario, Canada, have invented certain new and useful Improvements in Electric Cash-Registers, of which I declare the following to be a full, clear, and exact description.

This invention relates to cash registers or accounting devices and is intended to provide a mechanism of the class described in which practically all of the moving parts are electrically controlled, whereby the accounting elements comprising in the present case a printing device and a totalizer, may be situated in any desired distance from the key board and transmitting mechanism. The electrically controlled mechanism as herein set forth, has the advantage of being light operating, of being capable of quick action and being practically noiseless, together with the advantage of having a much smaller number of parts than the usual cash register, whereby a low priced machine may result.

Another object is to provide an improved distant printing and adding mechanism having electrical connections therefrom to a transmitting device, whereby the accounting elements may be situated at points remote from the transmitting mechanism.

The invention comprises a plurality of sets of keys and a single transmitting mechanism adapted to be brought under the control of each of said banks of keys successively, and the further object of simplifying the construction is thereby attained, inasmuch as one set of connections only is necessary between the transmitter and the accounting mechanisms.

The printing mechanism comprises a single type carrier, and a further object of the construction is to provide for shifting this type carrier after each positioning movement thereof under the control of one of the banks of keys, to a position such that the succeeding positioning movement thereof will provide for printing in another column whereby one type carrier only may be employed in place of the series of type carriers, which machines of this general type have heretofore found necessary.

A further object is to provide for the printing of zeros to the right of a number, that is, in lower denominations in which no key is depressed, but without compelling a movement of the transmitter or the positioning movement of the printing wheel.

A further object is to provide an improved check feeding and separating mechanism having a proper sequence of operation, whereby a check or receipt may be printed and finally severed from the strip carried out of the machine.

The object of simplicity in a registering mechanism is attained by providing only one master gear or driver, with connections for shifting it in accordance with the shift of the type carrier, previously referred to, thereby permitting the movement of a plurality of totalizer elements from one master gear.

With these and incidental objects in view, the invention consists in certain novel features of construction and combinations of parts, the essential elements of which are set forth in appended claims and a preferred form of embodiment of which is hereinafter described with reference to the drawings which accompany and form part of the specification.

Of said drawings: Figure 1 is a diagrammatic view of the key board and transmission mechanism. Fig. 2 is a separate top plan of the transmitter. Fig. 3 is a detail of the switch at the transmitter, controlling the denominational shifting of the type wheel. Fig. 4 is a diagrammatic view of the receiving part of the printing device serving to record the actuations of the transmitter. Fig. 5 is a side elevation of the parts shown in Fig. 4. Fig. 6 is a diagram of the key board showing five banks of keys and the construction whereby the printing of zeros in lower order banks is accomplished solely by the depression of a key in a higher bank Fig. 7 is a sectional view of a contact device for controlling the circuit including the platen magnet. Fig. 8 is a simplified explanatory diagram of the system as applied to one bank of keys. Fig. 9 is a diagram illustrating one arrangement of connections for driving the totalizer in accordance with the printing mechanism. Fig. 10 is a detail view of a totalizer element and the driving mechanism therefor.

The construction described herein includes a plurality of manipulative devices herein shown as a series of groups of keys and a single transmitting mechanism adapted to

be controlled by the shifting of certain contacts so as to be brought successively under the control of the groups of keys. When the proper keys are depressed and the main operating key adjusted, the transmitting mechanism will first move in accordance with the depressed key of the units or lowest bank and will have its controlling mechanism successively shifted so as to be positioned in accordance with the depressed keys in each of the higher banks in order from lowest to highest. The transmitting mechanism includes a rotary device comprising a movable part including a circuit closer and an additional element which serves to control the actuating circuit for the distant printing and totalizing mechanism, whereby the printing element and the master gear for the totalizer are each adjusted in accordance with the movement of the transmitter. The keys serve to place obstructions at various points in the path of the said movable part, the result being that when the movable part in its rotation strikes the obstruction, it is moved in such a manner that the circuit closer carried therewith, closes a circuit to the platen magnet, and, it being remembered that the printing element has meanwhile been set to the proper position, an impression is then made on the record material of the amount by which the printing element has been moved. After the positioning movement the rotary transmitter is returned to its normal or zero position and the control thereof is then shifted to the next bank of keys, this shifting also serving to move the printing element and the totalizer master gear in such a manner that they also are adapted to respectively print and add in the next higher column. This operation is repeated for each bank in which a key has been depressed and when all of the banks have in succession caused a control of the rotary transmitter, the printing wheels and master gear of the totalizer are then returned to their normal zero position, in which they control the units place both in the printing and the adding mechanism. After the printing and adding in the highest denominations have taken place, a mechanism is caused to operate which first feeds a check or receipt strip on which the amount has been printed and finally severs it from the strip into a detached receipt.

In many operations of the machine less than all of the banks of keys will be employed and under these conditions the connections are such that if a key in a higher bank has been depressed, no movement of the rotary transmitter or of the printing wheel or of the master gear for the totalizer will take place, but in each bank a platen will be operated to print a zero for that bank and the shifting mechanism will be brought into play, thereby causing a lateral shift of the printing element and the master gear to the next higher bank, this operation being repeated until a bank in which a key has been depressed is reached.

With this general statement of the mode of operation the particular description may be entered upon, and reference will be first made to Fig. 8 showing a simplified explanatory diagram of the construction as applied to one bank of keys. A consideration of this diagram and the description will render the mode of operation clear, and a further discussion of the additional elements necessitated by the use of a plurality of banks of keys will be given thereafter. Fig. 8 shows a bank of keys 200 including a 9-key 200[a], the keys being adapted separately to close the contacts 28 when the keys are depressed. Any desired mechanism for retaining the key depressed may be employed. The keys when depressed close the contacts 28 and one of a plurality of circuits 30 is then made through a set of magnets 31, these magnets being eight in number, none being necessary in connection with the 9-key and being spaced equidistantly around the movable parts of the transmitter. The magnets 31 are each provided with depressible plungers 32, which when the circuits through the magnets are closed, are caused to move into the path of a movable part 33 of the rotary transmitter, the said part being mounted on a disk 34, and being arranged to be given a complete rotation at each operation of the machine. In order to give this complete rotation or invariable excursion to the transmitting mechanism, a magnet 48 is provided having an armature 51, which armature carries a pawl 50 engaging a ratchet 52 rigidly mounted to move with the disk 34. In Fig. 8, the magnet 48 is shown as connected to the main line wires 1 and 19 by lead wires 48[a] and 48[b] and as having an interrupter 46 to permit a repeated movement of the armature 51. It will be understood, however, that for the sake of simplicity in this diagram, the wires 48[a] and 48[b] have been shown as permanently connected to the main line wires, so that if this construction were really employed, a continuous movement of armature 51 and the rotary transmitter would result. In the other figures, however, a means for controlling the movement of armature 51 is shown. It was stated that the disk 34 and the movable part 33 were given a complete rotation at each operation and it remains to be disclosed how this may be applied to furnish a differential movement of the accounting elements. Also carried by disk 34 is a bell crank lever 238, one arm of which is positioned to engage a notch in the movable part 33. When the disk 34 in its rotation carries the arm 33 into engagement with the depressed plunger 32, the arm 33 will be there-

by rocked around its pivot pin 240, enough so that the latching bell crank 238 may move slightly under the action of the compression spring 237 interposed between the lugs formed on the arm 33 and bell crank 238 thereby to retain the arm 33 in its adjusted position.

Mounted loosely on the transmitter shaft 49 is a star shaped disk 49ª together with a serrated element or disk 53, these two elements being movable together. When the latching arm 238 moves to latching position the other arm thereof will be withdrawn from the notches in the star shaped disk 49ª, and this disk together with the serrated element 53 may then be permitted to remain stationary, it being evident from the diagram that the previous movement of the transmitting disk 34 has carried with it the two serrated elements. Inasmuch as the point of obstruction of arm 33 depends on the key which has been depressed, it will be evident that this mechanism provides for the proper differential movement of the printing element, it being necessary merely to provide a circuit closer actuated by the serrated element 53 for driving the printing wheel. To accomplish this function a pair of contacts 55 are provided which are adapted to be closed and opened by the serrations of wheel 53. These contacts are connected to two wires, one numbered 58 running to main wire 1, and the other numbered 59 running to magnet 61, and thence by wire 62 to main line 19. The magnet 61 is adapted to drive the type wheel and clearly will attract its armature 601 each time a serration of disk 53 passes the contacts 55. When the two serrated elements are detached from the transmitting disk 34, the printing wheel 56 which is driven from armature 601 by a pawl 229 mounted thereon, has been set to a position to print a number indicated by the depressed key 200. It then becomes necessary to first print from the type wheel and later reset it to normal or zero position to return it to synchronism with the transmitting mechanism. To accomplish the first of these functions, the arm 33 is provided with a contact piece 63 adapted to contact with two rings 64, which completely surround the rotating parts of the transmitter and are electrically insulated from each other and connected respectively through wires 67 and 93ᵉ to main line 1 and through wires 68, pair of contacts 69 and wire 70 to the platen magnet 17, the current thence passing over wire 18 to the other main line 19. Neglect for the meantime the function of contacts 69; it will be seen that when the arm 33 strikes the depressed plunger, contact between the two rings 64 will then be made by arm 63 and the circuit through magnet 17 then completed. This magnet is provided with an armature 221 for actuating the printing hammer 220 and will immediately force the hammer against the type wheel to take an impression therefrom on a record material, which is shown in the other drawings. A momentary blow is, of course, only necessary for printing, and it is then desired to reset the printing hammer. To accomplish this function is an object of the pair of contacts 69. When the armature 221 is attracted to magnet 17 it engages a latch 208, which normally holds depressed the armature 223 of an automatic switch magnet 97. The armature 223 is provided with a spring normally tending to raise the armature and thereby break the pair of contacts 69, at the same time causing contact of a pair of contacts 100. It being remembered that the pair of contacts 69 are in the circuit for platen magnet 17, it will be evident that the operation of the armature 221 of that magnet permits the spring to raise the armature 223 of the automatic switch, thereby breaking contacts 69 and deenergizing the platen magnet 17, so that the platen of printing hammer 220 immediately falls back to its normal position.

It will be remembered that the transmitting serrated elements including the disk 53 are detached from the driving disk 34 when a point has been reached corresponding to the depressed key. These parts are permitted to remain in that position until a succeeding operation, inasmuch as they have no particular normal or zero position, though the disk 34 is carried on until it does reach its normal position. It is necessary also to return the printing wheel to a normal or zero position, and mechanism is provided to accomplish this function. In order to do this, an independent returning device is provided which invariably will return the printing element to normal position from its previously adjusted differential position, the said mechanism being independent of the transmitter, and being in fact controlled by the printing element itself, so that no matter what condition the transmitter was in, the printing element will nevertheless be restored to zero position. This provision of an independent returning means accomplishes the important result of providing a synchronizing device, which, at the end of each operation, will invariably compel both the transmitter and the printing element to be in synchronism at that point. The returning mechanism for the printing wheel employs the same magnet 61 but a shunt circuit through the magnet is provided, this shunt including an interrupter 225 and a pair of contacts 228, which contacts are broken when the printing wheel 56 is in normal position but which are brought together and remain together whenever the printing element is out of such normal position. When the platen magnet 17 attracts its

armature 221, it will be remembered that the armature 223 of the automatic switch is released and contacts 100 thereby closed. These contacts are in the returning or synchronizing circuit and serve finally to close the same, it being remembered that contacts 228 are engaged as soon as the printing element is out of normal position. This circuit is shown on Fig. 8 and includes main wire 1 and wire 224 leading to the interrupter 225 from which a wire 226 leads to the pair of contacts 100. Returning, the wire 227 leads from the pair of contacts 100 to the pair 228 from which a shunt wire, as shown, runs to the regular printing magnet circuit, returning to main line 19 by wire 62. It will be clear that this circuit is in shunt to the regular driving circuit for magnet 61 and is closed by the operation of the platen mechanism. When the circuit has been closed, the operation of the armature 601 moves the interrupter 225 until the circuit is finally broken at contacts 228 by the complete restoration of the printing wheel 56 to normal position.

The interrupter 225 is controlled by a bell crank comprising arms 601[a] and 602, this bell crank having a projecting outer end adapted to be engaged and moved in one direction by a pin on armature 601 and in the other direction by the compression spring 604 which is interposed between a part of the bell crank and the latching arm 603. Arm 602 of the bell crank is provided with two notches, as shown, in either of which the depending projection of arm 603 may rest; this arm being also provided with a part positioned to be engaged by the pin on armature 601. When the armature is attracted and moves toward the right in this figure, the pin thereon will engage and move arm 602 thereby depressing said arm enough to break the contact 225 and also that the projection of latch 603 will engage one of the aforesaid notches. This takes place at the extreme end of the attractive stroke of armature 601. When the circuit is broken at 225, the armature then moves away from the magnet, its pin engaging latching arms 603 at the very end of the rearward stroke of the armature and permitting the spring 604 to restore the original position of the parts, again making contacts 225. It will be seen that this provides a full stroke device compelling full movement of the armature lever and consequently of the printing wheel 56. The mechanism shown in this figure has now been described, except that the armature 223 must be restored to its normal position before another operation may be given. To accomplish this function disk 207 is provided having a notch in which one of a pair of contacts 93[a] is adapted to engage, this disk being driven by and rigidly connected to the transmitting disk 34.

It will be seen that in the normal position of the parts, contacts 93[a] are connected, inasmuch as the notch in disk 93 is then adjacent one of the contacts, but, as soon as the transmitter starts to move, the contact 93[a] is broken. One of these contacts 93[a] is connected to main line 1 and the other through wire 94 is connected to a switch arm 610 controlled by the armature 223. It will be remembered that as the impression is taken from the printing wheel, armature 223 is permitted to rise, thus causing the switch arm 610 to engage a stationary contact 95, from which a wire 96 runs to the shift magnet 97, main line 19 being reached from said magnet over the wire 98. In the normal position of the parts the circuit for magnet 97 is broken between switch arm 610 and stationary contact 95, so that although contact 93[a] is closed, no circuit results. When, however, the armature 223 rises, the contacts 610 and 95 are then closed, but this happens only when the transmitter is rotated at least one step and therefore contact 93[a] will have been previously broken so that still no circuit results. When the transmitter is finally returned to normal position, the last step of its movement closes contacts 93[a] and as contact 610 then engages contact 95, the circuit through magnet 97 is completed and it is momentarily energized, thereby drawing down its armature 223 and permitting latch 208 to snap back into position to retain the armature depressed. A second spring arm 610[a] is provided, so positioned as to retain the switch arm 610 in contact making position until the armature 223 reaches its attracted position, when the lower spring arm 610[a] is withdrawn so that the switch arm 610 may move away from contact 95. The mechanism is shown in this figure as controlled by an operating key 159 closing a pair of contacts 2 and in the other figures mechanism is shown for retaining this key in depressed position until a complete operation of the machine has been had.

It will be seen that the construction as described in this simplified diagram provides for a rotary transmitter having a movable part including a circuit closer 63 with magnet plungers for obstructing the movable part in various differential positions, as controlled by the keys 200. The movable part is not stopped, but is shifted so as to close the printing circuit and is moved continuously until it again reaches its normal position, or, in other words, is given invariable excursions at all operations of the machine. Each step of movement given the transmitter before the obstruction takes place is transmitted to the printing element, but no movement of the transmitter after obstruction is transmitted, though the separate independent synchronizing mechanism is provided for returning the printing wheel.

This mechanism is controlled by the automatic switch magnet 97, which is itself returned to normal position after all the other operations have taken place.

With this simplified description, the mode of operation will generally be clear and a reference to the specific construction in which a plurality of banks are employed, and in which the printing element is constructed to be shifted to print in different columns in accordance with the banks of keys, may be given.

As previously stated, the mechanism is so designed that the accounting elements comprising the recording device and the totalizer may be placed at any desired distance from the transmitting mechanism and key board. In view of this fact, the description may be divided along the structural line indicated, and attention will first be given to the transmitting mechanism and key board. The key board may be of any desired form and may include any desired number of banks or groups of manipulative devices. As shown in Fig. 6, five banks of keys may be employed, but this may be increased or diminished at pleasure by a mere change in the number of connections. It is to be noted that mechanism is provided whereby the printing of zeros to the right may be accomplished, but superfluous zeros to the left will not be printed. This part of the mechanism may be omitted if desired, and will be omitted during the first part of the description. The keys 200, Figs. 1 and 6) are arranged to shift a bar 23, one of such bars being provided for each bank of keys. The keys when depressed may be retained in any desired way, no particular means being herein shown, but it is necessary to retain them depressed in order that the bars 23 may be held in adjusted position, thereby closing the circuit controlling contacts for the transmitter. The contacts 28 are adapted to be closed by the keys when depressed and are all connected in parallel in two separate respects. The main line wire 1, is connected to a bank selector indicated on Fig. 4 by the numeral 5 to which reference will hereafter be made, this device providing for the successive control of the transmitter by the respective groups of keys. The normal position of the bank selector is shown in Fig. 4, and in this position, it will be seen that the lead wire 3 running from main line 1 connects with a series of contacts 4, 20 etc., one for each bank of keys. The contact 4 is adapted to engage two other contacts 4^a and 4^b, from the first of which runs a wire 6 and from the other of which runs a wire 27, as shown on Fig. 4. The wire 27, see Fig. 1, includes one of each pair of contacts 28 for the lower or units bank of keys, the other of the pair of contacts for said bank being connected to one of a set of wires 30, passing to the several magnets 31 of the rotary transmitter. From the magnets 31, a common wire 35 shown on Fig. 1, leads to a pair of contacts 36, on Fig. 4, from whence a wire 37 connects through a pair of contacts 38 with the other main line 19. Passing by the function of contacts 36 and 38, it will be seen that the depression of any key in the units bank will energize the proper magnet 31, thereby attracting its armature and plunger 32, the said plunger being projected into the path of the rotary transmitter. The wire 6 leads from contact 4^b, and is the lead wire for the driving magnet 48 of the rotary transmitter. It will be seen that this wire leads to a contact 7^a, which is carried by an arm 25 having a projection positioned to be engaged by the arm 24, this latter arm being moved by the key controlled plate or bar 23 so that when a units key is depressed, the contact 7^a will engage contact 44. When this contact is made, the current passes from wire 6 through contacts 7^a and 44, and from thence over a wire 45 to an interrupter 46 carried by the armature 51 of the driving magnet 48. From the interrupter, a wire 47 leads to magnet 48 from whence the return circuit is over wire 35, as was previously described. It will be evident from this description that the depression of a units key both energizes the proper one of the transmitter magnets 31 and completes a circuit through the driving magnet 48 for the transmitter, it being assumed that operating key 159, on Fig. 1, has been depressed. The tens bank of keys which is the upper bank in Fig. 1, may be depressed at the same time as is the units bank, but no circuits will be made thereby, even if the operating key 159 is depressed, inasmuch as the bank selector 5 does not at this time connect contact 20 with contacts 20^a and 20^b, this being accomplished only after the operation of the transmitter under control of the units bank of keys.

The previous description of the transmitter need not be repeated here, it being sufficient to state in addition that a stationary projection 236 is provided, which, if the 9-key is depressed, will obstruct the movable part 33 carried by the rotary disk 34 of the transmitter when the printing wheel has been set to the 9-position. It will be seen that no pair of contacts 28 is provided for the 9-keys, the sole function of the said keys being to close the transmitter driving contacts. The movable parts of the rotary transmitter are mainly intended to make a complete rotation at every operation, irrespective of what key is depressed, and, for this reason, an auxiliary shunt circuit is provided which is closed by the first step of movement of the transmitter and which

serves to then actuate the driving magnet 48 until a complete rotation has been given. This function is provided by the contacts 92^a, one of which is connected to the main line 1 by wires 57 and 75, on Fig. 1, the other of which is connected through wire 45^a to the wire 45, which runs to interrupter 46. The contacts 92^a are normally separated but are adapted to be brought together on the first step of movement of the rotary transmitter, which, for this purpose, is provided with a disk 207 having a depression in which an insulated bar 93 is adapted to rest. This bar carries one of the contacts 92^a and also carries one each of pairs of contacts 92 and 11, which will be hereafter referred to. When magnet 48 is first energized and the notched disk 207 given one step of rotation, the shunt circuit through magnet 48, as previously described, will be closed, it being understood that from the interrupter 46 the circuit is over wires 35 and 37, as previously described. This shunt circuit does not depend on the key remaining depressed, nor anything else in fact, except the continued closure of contacts 92^a. The result therefore is that the interrupter 46 continues to send impulses through magnet 48 resulting in a complete rotation of the transmitter, after which the notch in disk 207 is again under the insulated piece 93, when contacts 92^a will again be broken.

Although the rotary transmitter is given a complete rotation for each bank of keys, the devices for controlling the printing elements and the totalizer are nevertheless permitted to stop when the movable part 33 engages an obstruction formed by any one of the plungers 32. At the end of each complete rotation of the transmitter, mechanism hereinafter described serves to move the bank selector 5 so as to connect contacts 20, 20^a and 20^b for permitting a control of the transmitter by the tens bank of keys in its turn. When a tens key has been depressed and the selector 5 moved to the tens position, contact 22 on Fig. 1 will then move to engage contact 22^a. From contact 20^a, a wire 21, corresponding to wire 6, leads to the contact 22 for the tens bank and a wire 91, corresponding in function to wire 27, leads to the parallel contacts 28 closed by the tens keys. It will be seen from Figs. 1 and 6 that the other of the pair of contacts 28 leads in parallel for all the banks through the wires 30 to the rotary transmitter magnets. Contact 22 is also connected to wire 45 for driving the transmitter and it will be seen that when selector 5 engages contact 20 a second complete rotation of the rotary transmitter will be given, but this time under the control of the tens bank of keys. It was stated that when movable part 33 of the transmitter engages the depressed plunger 32, that the latching arm 238 was rotated enough to cause its other end to release the stepped disk shown on Fig. 2, thereby permitting it and the serrated disk 53 to remain at rest. It is necessary again to connect these disks with the transmitter proper for the succeeding operation and this is provided for by a stationary pin or roller 243 which, as shown in Fig. 2, will engage a flange 242 on arm 238 and force it into position connecting said disk with the latching arm 238 and again unlatching the movable part 33.

The operation of the transmitter would be the same for succeeding banks of keys, the mechanism providing for giving a rotation to the transmitter from the units bank of keys first and then transferring the control to each of the other banks in succession, a further complete rotation to the transmitter being given after each transfer to a higher order bank.

For the sake of simplicity, the printing mechanism is comprised in a single type wheel and means is provided for shifting the type wheel axially after each complete rotation of the transmitter, so that a succeeding operation will permit the printing in a higher column. The provision of this mechanism provides a very low priced construction, inasmuch as only one set of power wires for the type wheels is necessary, and no means for stopping the type wheel when it reaches its position, corresponding to the depressed key, is requisite, nor is any differential mechanism required for restoring the type wheel to its normal position.

It will be remembered that the serrated disk 53, on Fig. 1, is given a differential movement at each rotation of the transmitter corresponding to the depressed keys, and this differential movement accomplishes the differential setting of the printing wheel. A pair of contacts 55 are arranged in position such that the serrations of disks 53 will connect the said contacts once for each projection of the disk which passes. One of this pair of contacts is connected through wires 58 and 57 to main line 1, while the other of the pair is connected through wire 59, on Fig. 4, and a short wire 60 to the printing magnet 61 from whence a wire 62 leads to the other main line 19. This mechanism clearly provides for differentially setting the type wheel in accordance with the movement of the stepped disk 53, and when the movable part 33 of the transmitter is obstructed by a depressed plunger 32, the contact arm 63 connects the pair of rings 64, which were previously described, to close the printing platen circuit. These rings 64 are provided with projections 65 and 66, and projection 66 is connected to main line 1 through the wires 57 and 58, previously referred to. From projection 65 a wire 68, on Fig. 4, leads through a pair

of contacts 69 and wire 70 to the platen magnet 17. The result is that when the rotary transmitter has reached the differential position depending on the key and the printing wheel also has been differentially set, the platen 220 will be forced against the type wheel to take an impression on the check or receipt paper 201. The further movement of the type wheel to synchronizing zero position is accomplished by the interrupter 225 thrown into operation when contact 100 is closed, on Fig. 4, by the movement of the armature 223 of the automatic switch magnet 97. It will be remembered that the printing platen armature 221 trips the latch 208, which permits the armature 223 of this automatic switch magnet to close contacts 100, the closing of which contacts completes the shunt circuit for the printing magnet, this circuit including wire 224, connected with lead wire 3, on Fig. 4, the interrupter 225, a wire 226, leading to contacts 100, and a wire 227 leading from thence through a pair of contacts 228 to the regular printing magnet circuit wire 60. The first step of movement from normal zero position given type wheel 56 closes the contacts 228, as shown on Fig. 4, so that the printing wheel return circuit, including interrupter 225 will be completed until the printing wheel reaches zero position. The plunger 93 is not shown on Fig. 8, but it will be readily understood from the description of the said figure that on the return of the rotary transmitter to its normal position, the plunger 93 drops into a notch in disk 207, whereupon the contact 92 is completed. Contact 92 is in the circuit for the automatic switch magnet 97 so that this magnet is energized when the transmitter reaches its zero position, this circuit including a wire 57 connected to main line 1, wire 75 leading to one of a pair of contacts 92 from the other of which a wire 94, on Fig. 4, leads to the switch arm 610, the circuit from thence being through stationary contact 95, wire 96, switch magnet 97 and wire 98 back to main line 19. The completion of this circuit by the return of the rotary transmitter, draws down the armature 223 thereby breaking contacts 100 which are in the returning circuit for the printing wheel. After each rotation of the transmitter and each corresponding rotation of the printing wheel, the printing wheel must be shifted laterally so as to print in the column of next higher order. This result is attained by the provision of a disk 73, shown in Figs. 3 and 9, which is rigidly attached to the transmitter shaft 49 and is provided with two projections 72. These projections are so situated that near the end of the rotation of the disk they engage one of a pair of contacts 71 and connect the two said contacts twice. As shown on Fig. 1, one of this pair of contacts is connected to wire 75, and so to main line 1, the other of the contacts being connected to a wire 76, from whence the circuit passes, as shown on Fig. 5, through a wire 218 to the shift magnet 74 and from thence by wires 77 and 770 to the shifting device for the totalizer, returning over wires 771 to main line 19. It will thus be seen that at each rotation of the transmitter two impulses are sent through shift magnet 74, and this magnet is utilized to shift the printing wheel. Referring to Fig. 5, the armature 78 of this magnet 74 is pivoted at 79 and is provided with a downwardly extending part 80 on which is a driving pawl 82 adapted to engage one of two oppositely arranged ratchets 83. These ratchets are rigidly mounted on a shaft 81 also rigidly carrying a segment gear 84 which meshes with a gear 85 on a shift bar 86. Bar 86 is provided at one end thereof with a depending bifurcated arm 87. The printing wheel 56 is provided with a collar 88 in the groove of which the bifurcation of arm 87 rests. It will be seen from this description that the two impulses of magnet 74 will twice attract armature 78, thereby rotating the ratchets and moving the bar 86 and the printing wheel 56 so as to print in the next higher column. The bank selector 5, on Fig. 4, is also fast to shaft 81 and it will be seen that this mechanism provides for also shifting the bank selector after each rotation of the transmitter, so that the next higher bank of keys may control the transmitter operation.

It will now be clear from the preceding description that the general objects first stated are well attained by this construction. The transmitter is given a complete rotation at each operation under control of each of the banks of keys, and, during each rotation thereof, the printing wheel 56 is differentially positioned and an impression taken therefrom. Near the end of the rotation, the control of the transmitter is shifted to the next higher bank of keys and the printing wheel is also shifted so as to print in the next higher column. After the operation of the parts under control of the highest bank of keys, mechanism yet to be described provides for feeding and separating the check and for restoring the printing wheel to its lowest bank position, but, before describing these parts and certain contacts for preventing misoperation, a short description of the totalizer or registering mechanism may be given. This registering or totalizer mechanism is shown merely in diagram for the most part and many other forms of device besides that indicated may be employed. With the construction shown a series of totalizer wheels are employed having transfer devices between them, and a single master gear is used with connections

for both rotating it differentially and for shifting it axially to bring it into operative relation with any one of the totalizer elements. As a differential number of impulses are sent to the printing wheel magnet 61, advantage may be taken of this fact to drive the master gear for the totalizer. On Fig. 4, the wires 590 and 591 are shown in the printing magnet circuit and these wires lead to a driving magnet 592 for a ratchet wheel 594 of the totalizer, as shown on Fig. 9. The armature 593 of magnet 592 is arranged to drive a ratchet wheel and will clearly move it in synchronism with the printing wheel up to the time that the printing impression is taken, though the circuit for returning the printing wheel to normal position does not pass through the driving magnet 592. The ratchet wheel 594 is not mounted rigidly but is splined on a shaft 860 on which the driving master gear 861 is rigidly mounted. The totalizer wheels 862 are arranged on a shaft parallel to shaft 860, which latter shaft is given an axial movement by a rack 863 engaging the same, this rack being driven by an armature 800 of magnet 740, the circuit for which is in series with that of magnet 74. It will be remembered that two impulses pass through magnet 74 due to the two projections 72 on the disk 73 for each rotation of the transmitter, and as magnet 74 is in series therewith, being connected thereto by wire 770 and 771, two impulses will thus be given to magnet 740 for each rotation of the transmitter and the master gear 861, and shaft 860 will thereby be shifted so that the said gear is in operative relation with the totalizer wheels of next higher order. The operating pawl 593ª for the driving ratchet 594 is mounted at one end of the armature and plays between two pins projecting from the armature. As the armature 593 is attracted by the magnet 592, the pawl 593ª will engage one of the teeth of the ratchet wheel and move the latter one step. As the pawl completes its movement the upper side of it will contact with one of the pins and thereby prevent overthrow of the ratchet wheel 594 and consequently the master gear 861.

A well known type of transfer between the wheels of the totalizer is shown in Fig. 10 and comprises a cam 1500 secured to the side of each of the wheels with which a roller 1501 mounted upon the upper end of an arm 1502 engages. This arm is pivotally mounted upon a shaft 1503 located directly beneath the totalizer shaft and is connected by a short sleeve 1504 surrounding the shaft to a similar arm 1505 which carries a pawl 1506 that engages with the teeth of a ratchet wheel 1507 secured to the wheels of next higher denomination. A coil spring 1507ª keeps the roller 1501 in engagement with its cam 1500 so as to insure a reciprocation of the arms 1502 and 1505 during a rotation of one of the totalizer wheels (see Fig. 9). This is a well known form of transfer and any other desired form may be substituted therefor. It will thus be seen that the master gear of the totalizer moves in correspondence with the printing wheel during the differential movement so that the amounts printed or set up by the printing wheel are also added on the proper elements of the totalizer.

To operate the feeding mechanism for the check and for separating the same, magnets are employed, the circuits for which are controlled by the shifting mechanism for the type wheel, whereby when the fifth bank position is reached, or the highest bank position where other banks are employed, then the said feeding and separating mechanisms will be operated. A pair of contacts 110, as shown in Fig. 4, are provided which are adapted to be closed at each actuation of the printing hammer. The circuit for these contacts, however, includes a contact 109, which, in the normal position of the printing wheel and associated parts, is broken, so that, during nearly all operations of the printing hammer, the circuit including contact 110, is not finally completed. When the printing wheel reaches the highest bank position, the last movement thereof causes the pin 105, on bar 86, to engage a lever 106, against which presses an insulated bar 107, carrying one each of three pairs of contacts. Wire 111, running from one of the contacts 110 connects with a contact 109. When the movement of the lever 106 takes place, the contact 109ª is connected to contact 109, and from this contact a wire 110ª leads to wire 3 and so to main line 1. From this construction it follows that when the printing wheel is in the highest bank position and contacts 109 and 109ª are connected, a circuit will be made for starting the magnet which drives the feeding device for the check strip. This circuit starting from lead wire 3, on Fig. 5, runs through wire 110ª, contact 109ª, contact 109, wire 111, on Fig. 4, the pair of contacts 110, wire 112, and wire 113 to an interrupter 114 for the magnet 116. From the interrupter, a wire 115 leads to the magnet and from thence a circuit reaches main line 19 over wire 245. As before stated, the printing hammer drops immediately after its printing stroke so that this circuit is closed only momentarily but the closing thereof serves to throw in an auxiliary circuit for the said magnet 116.

The magnet 116 is provided with an armature 117 to which is connected a link 117ª, having mounted thereon a pawl 118. This pawl 118 engages a ratchet 119 for a feeding and electro roller for the check strip and carries a peculiarly shaped projection 120, on the outer point of which an insulated

bar 121 is normally positioned, the said bar carrying one each of two pairs of contacts 36 and 122. The position shown in Fig. 4, is the normal position, and it will be seen that the first impulse through magnet 116 will rotate the ratchet 119 one tooth, thereby carrying the high point of projection 120 from in front of the plunger or insulating piece 121. The part 121 immediately moves toward the right in Fig. 4, forced by the contact springs, thereby closing contact 122. From the lead wire 3, a wire 123 runs to one of the pair of contacts 122, the other of the pair being connected to wire 113 in the check feed magnet circuit, so that after one impulse of magnet 116 is given, an auxiliary circuit including wire 123 and the pair of spring contacts 122 is made through this magnet, and this circuit will cause a complete rotation of the electro check roller 40 to cause the proper extent of feed of the check strip. As the feed roller 40 nears its home position again, projection 120 engages the insulated piece 121, breaking the contact 122 and thereby causing the check feeding mechanism to remain in its normal position until a succeeding operation of the machine. This mechanism provides for feeding a receipt and it will be seen that the circuit through the magnet is closed only when the type wheel reaches the highest bank position, and after the type wheel has been printed from in that position, though after the circuit for feed magnet 116 has been closed, it retains its own circuit in operative condition until a complete rotation has been made. After the check has been fed, it is desired to separate the printed portion thereof, and an additional magnet is provided for this purpose, the circuit for which is controlled from the electro feeding device. A second feed roller 41, on Fig. 4, is geared to the feed roller 40, as is common in cash registers, this feed roller 41 being provided with a projection 125 having a high point.

It will be seen that the projection 125 is normally under one of a pair of contacts 126 which are separated except for a momentary contact at the extreme end of the rotation of feed roller 41. When this contact is made, a circuit is momentarily closed through the knife cam magnet 128, this circuit running from lead wire 3, through wire 123, contacts 122, wire 113, interrupter 114, wire 115, wire 132 to the contacts 126, from thence running over wire 131 to magnet 128, thence back to main line 19, over wire 127. One impulse of magnet 128 will therefore be given as the electro and feeding mechanism nears its normal position, thereby attracting armature 138[a], which, through a link 691 carrying a pawl 692 gives one step of rotation of a ratchet disk 133. This ratchet disk carries a cam 139, engaging a roller 142 mounted on a bell crank lever 140 and normally drawn against the cam by the spring 141. The bell crank lever 140 carries one blade 43 of a knife mechanism for cutting off the check. A complete rotation of ratchet disk 133 first tensions spring 141 by rocking the bell crank 140, and then, as the high point of the cam passes from in front of roller 142, the spring 141 may restore the bell crank lever and knife 43 to their normal positions, thereby cutting off the check. It was stated that a single impulse was sent through magnet 128 by the projection 125 of the electro roller 41, and the first step of movement of the ratchet disk 133 serves to close a pair of contacts 135 by moving the insulating arm 138 carrying one of said pair through a notch, as shown, in disk 133. The first step of movement of this disk will thereby close contacts 135, and a shunt circuit is thereby made through the driving magnet 128, this circuit running from main lead wire 3 by wire 224 and 224[a] through the pair of contacts 135 and thence over wire 137 to the interrupter 130 for magnet 128, so that this magnet is made operative until a complete rotation has been given ratchet disk 133, and therefore a complete operation of the knife cam.

With the operation of the knife for cutting the check, the actuation of the machine is complete except for the resetting of the totalizer actuating device and the printer wheel, and finally the release of the main operating key 159. After the printing for the highest bank and the corresponding addition has been made, the printing wheel and totalizer master gear must be reset to the units position. This is accomplished by a contact device controlled by the knife cam, so that during the operation of the knife mechanism, the resetting referred to, takes place. As shown on Fig. 4, the knife cam disk 133 has integral therewith a notched disk 143, the notches of which are adapted to permit connection of a pair of contacts 144. It will be seen from this figure that a sufficient number of notches is provided to cause a plurality of impulses over the connected wires, these impulses passing through a magnet 145, on Fig. 5, for the printing wheel, and through a return magnet 1450, shown on Fig. 9, for the totalizer master gear mechanism. On Figs. 1 and 5, the circuit for resetting the printer gear includes a wire 150, running from lead wire 3, to magnet 145, from whence a wire 151 leads to the pair of contacts 144, the circuit reaching return main line 19 over wire 152. On Fig. 9, this resetting circuit is shown as including the magnet 1450 together with the magnet 145, so as thereby to reset the totalizer master gear 861 as well as the printing wheel 56. To cause the resetting the magnets 145 and 1450 are provided with armatures 146 and 1460, which through links 147

and 1470 operate pawls 148 and 1480 driving on the reverse ratchets on shafts 81 and 810. The result of this construction is that as the knife cam disk 133 is rotated a plurality of impulses will be sent over the circuit, previously described, causing a succession of actuations of the two resetting pawls and thereby restoring to normal position both the printing wheel and the totalizer master gear 861.

As shown on Fig. 1, the operating key 159 is provided with a notch 158 in which a locking lever 156 is held by the spring 157 when the key is depressed. Latch 156 carries an armature for magnet 155, the circuit for this magnet running from main line wire 1, over a wire 210 to the magnet 155 from whence a wire 211, shown near the bottom of Fig. 4, runs to one of a pair of contacts 154, the other of which is connected to main line 19. This pair of contacts 154 is normally separated, but the knife cam disk 133 is provided with a projection 153, which at practically the end of the rotation of said disk, engages the bar 138 and depresses it enough to close contacts 154 momentarily. When this closure occurs the magnet 155 is energized and the lever 156 thereby moved so that the operating key may be restored to normal position by its spring.

The machine is complete as thus far described, but certain contacts for the prevention of misoperations of various kinds are desirable, and these may be next described. It will be remembered that it was before stated that it was desirable to provide means whereby superfluous zeros to the left of an operated bank would not be printed, but that zeros to the right of an operated bank would be printed, whether a key in that bank was depressed or not. This mechanism is not essential to the operation, and its description has been therefore deferred until after the statement regarding the misoperation contacts.

The transmission circuit, as before stated, includes the pair of contacts 36, these being normally closed and thereby having no effect on the transmitter circuit. It will be seen from Fig. 4, that this pair of contacts is open when the insulating arm 121 moves to the right, so that any operation of the transmitter while the check feeding device is in operation, is prevented. The transmitter circuit also runs through the pair of contacts 38 near the bottom of Fig. 4, and this pair will be open during the complete operation of the knife cam mechanism, so that although ordinarily the operation of the transmitter is possible, it will not be possible while the knife is being operated.

The platen circuit includes the pair of contacts 69 which are ordinarily closed, but are broken when the platen operates, by the release of the automatic switch armature 223. This circuit also includes the pair of contacts 13, on Fig. 5, the pair of contacts 15 on this figure, and a pair of contacts 11 on Fig. 1. Contacts 13 are arranged to be separated by a stepped rack 230, carried by the printer wheel shifting bar 86, so that the platen circuit cannot be completed when the printing wheel is out of position or while it is being moved from one position to the other. Contacts 15 in this circuit are closed except when the printing wheel is in the fifth bank position, it being clear that no printing should take place in this position unless a number has been registered on the keys; in which case, a further means for operating the platen is provided. The pair of contacts 11, on Fig. 1, are opened by the transmitter and therefore prevent an operation of the platen magnet over this circuit when the transmitter is out of normal position. The utility of these latter two pairs of contacts will be evident when the devices for preventing the printing of zeros, are described.

Turning now to the devices for preventing the printing of zeros. This part of the machine is best shown on Fig. 6, and comprises certain contacts controlled by the separate key banks, whereby zeros may be printed even if the transmitter is at normal position, provided a key in the higher bank has been pressed. It will be seen from this figure and from Fig. 4, showing the bank selector and contacts, that each bank of keys is provided with a driving circuit wire for the transmitter. These banks being numbered on Fig. 6, respectively 6, 21, 250, 251 and 252, running to the banks from lowest to highest in the order named. It was stated in the previous description that when keys in either of the two lower banks were moved, the contacts 7^a and 44, 22 and 22^a were respectively closed. All operations of the machine would not necessitate the use of these banks, and when not in use, means must be provided for causing the shift of the type wheel and in most cases the printing of zeros therefrom. For this purpose, banks are each provided with additional contacts; that for the units bank being numbered 7 and for the tens bank being numbered 9. In the normal position, contact 7 engages contact 7^a, and contact 9 engages contact 22 through an intervening contact in this latter case.

Assume first that a key in the tens bank, but no units key has been depressed. Under these conditions, when the operating key 159 is adjusted, the circuit is made over wire 6 to the contact 7^a, but then instead of going over contact 44, the circuit will lead through contact 7 and wire 212 to the pair of contacts 213, on Fig. 4, running from thence over wire 214, on Fig. 5, to a pair of contacts 215 and from thence over wire 216 to

the interrupter 217 of the shift magnet 74. When keys in the bank are depressed the shift magnet 74 is connected twice by the projection 72 of disk 73, but it will be seen that two impulses through magnet 74 may also be given over the circuit just described, including the interrupter 217. Two impulses only will be sent through wire 74, inasmuch as the shaft 81, which is driven by the said magnet, carries bank selector 5, so that the second of the two impulses will move the selector 5 from engagement with contact 4 of the units bank to engagement with contact 20 of the tens bank, thereby breaking the circle irrespective of the interrupter 217. The zero printing in this case will take place provided a key in the tens bank has been depressed, inasmuch as the circuit over contact 7 is made also over wire 8 and 8^a to the intervening contact 8^c for the tens bank, from whence the circuit will run through contact 9 and wire 10 to the pair of contacts 11 and from thence over wire 12, on Fig. 5, contact 13, wire 14, contact 15, wire 16, on Fig. 4, through the platen magnet 17 and back to the main line. It will be seen that under these conditions, viz., the depression of a key in the tens bank, but of no key in the units bank, that the zero will be printed in the units column, although no units key is depressed and the shifting mechanism will then immediately move the printing wheel to the next higher position. Assuming further that a key in the dollars bank and in the units bank, but no others, are depressed, a zero will be printed in the tens bank but none in the fourth or fifth banks. The slide 23 for the dollars bank controls a set of contacts 760, 761, 762 and 763, and, as shown on Fig. 6, contacts 761, 762 and 763 are normally connected, but, when the slide 23 moves to the left of this figure, contact 761 will be engaged with contact 760 but disengaged from the other two. Under these conditions, when the bank selector is in the units position, the circuits will be, as previously described, for the units and tens printing, the dollar printing taking place in the usual way after the transmitter has set the printing wheel to the desired position. It will be noted however, that when the shift from the third to the fourth bank takes place, thereby bringing the line wire 251 into the circuit, that although contact 771 for the fourth bank engages contact 772 and 773, nevertheless no circuit through the platen is made. From contact 772, wire 8 leads to cause the denominational shift of the printing wheel, while from contact 773, a wire 776 leads to contact 783 for the fifth bank. In the operation assumed, no key in this bank is depressed and the circuit will be broken at contact 783, so that, although the denomination shift from third to fourth bank takes place, no printing occurs in the fourth bank, nor will it occur in the fifth bank unless a key in that bank is depressed. Assume now that a key in the fifth bank only is employed; it will be seen that zero will be printed in all four of the lower banks. The zero printing in the units and tens denomination takes place irrespective of the depresison of keys in higher banks, but when the bank selector is shifted to the third position, thereby bringing wire 250 into the circuit, no connection to the platen circuit, will be made except through the fifth bank contacts. At this point in the operation, viz., when the bank selector engages the third bank contacts, the circuit will run through wire 250 to contact 761 for the third bank, running over contact 763 and wire 764 to the short wire 765 in the fourth bank. If in this fourth bank a key is depressed, contacts 774 and 775 will have been engaged and the current may then pass from wire 764 to contact 765, going from thence from contact 774 over wire 777 to the wire 10 for the platen magnet, so that if a key in the fourth bank had been depressed, zero would be printed in the third bank position. If, however, no key in the fourth bank had been depressed, the current from wire 764 passes over wire 765 and to the fifth bank by wire 776, from whence, remembering that contacts 783 and 782 are connected by a depression of a fifth bank key, the current runs over wire 10 to the platen. It will thus be seen, however, that if a fourth or fifth bank key is depressed, a zero will be printed in the third bank, although no key in that bank has been operated. After the printing of zero in the third bank, the bank selector is shifted to connect the fourth bank devices and the current then runs over wire 251 to contact 771. If a key in the fourth bank has been depressed, contacts 770 and 771 are engaged, and the circuit to the transmitter made, but if no key in the fourth bank is depressed, the circuit from contact 771 runs over contact 773 and wire 776 to the fifth bank contact 783, from whence, if a fifth bank key is depressed, the circuit through to the platen is made. Thus it follows that zero will be printed in the fourth bank although no key in that bank is depressed, if the fifth bank key has been operated. When the selector moves to the fifth bank position, the wire 253 is then in circuit and from contact 781, to which this wire is connected, a circuit including contact 780 is made to the transmitter, as usual. It will be seen that in any case zeros are printed for the units and tens banks in the absence of the depression of keys in those or any other banks, but as to the third and fourth bank, zeros will not be printed therein unless keys in a higher

bank are employed. It is also true that in the fifth bank no zeros will be printed unless a key in that bank is depressed.

With the connections shown to cause a printing in the tens bank when the units key is depressed, an auxiliary circuit is required, shown on Figs. 4 and 6. If a units key is depressed, the circuit from wire 6 includes contact 7, wire 8, running thereby to contact 8^c for the tens bank. If no tens key is depressed, contact 8^c engages contact 753 from whence wire 754 is intended to reach the platen circuit. This wire, however, is not connected directly to the platen circuit, but runs to a pair of contacts 638 and back over wire 636 to the platen wire 10. These contacts 638, as shown on Fig. 4, are normally closed and are held closed until the selector 5 reaches the third bank position, by a cam 637, so that, in either the units or tens position, contacts 638 are closed, and the circuit referred to completed. For banks higher than the tens bank, this particular control is not desired, and therefore the contacts 638 are separated when selector 5 reaches the third bank position so that in this position zero will not be printed unless a higher bank key is employed.

It will be seen that the mechanism described is well adapted to attain the objects first set forth. The single transmitter is brought under the control of the banks of keys successively and is adapted to control the movement of the accounting devices comprising the printing wheel and the totalizer mechanism, which wheel and mechanism are shifted for accounting in different banks, as the control of the transmitter changes from one key bank to the next.

Many changes of construction may readily be made without departing from the spirit of the invention. The keys shown, are only one of many types of manipulative devices which are known in the art, and which may be substituted in place of the particular type shown. The totalizer is of a well known form, but is susceptible of many modifications, all coming within the general scope of the invention.

It will be seen that although both the totalizer and the printing mechanisms are shown, that either may be used without the addition of the other and the mechanism will operate in entirely the same manner, whether the totalizer or the printing device or both, are employed.

While the form of mechanism herein shown and described is admirably adapted to fulfil the objects primarily stated, it is to be understood that it is not intended to confine the invention to the one form of embodiment herein disclosed, for it is susceptible of embodiment in various forms, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. In an accounting machine, the combination with a type wheel of a key board, an electric circuit which is controlled by the key board and effects rotation of the type wheel, automatic means for causing the current to be controlled by different banks of keys successively, a platen, means under the control of the keys of each bank for operating the platen when the type wheel has rotated certain degrees, and means for shifting the type wheel a regular amount in the direction of its axis after each rotation.

2. In an accounting machine, the combination with an accounting device, of a key board for the same, an electric circuit, a magnet in said circuit for operating the accounting device, and means controlled by the key board for shifting the accounting device in an axial direction regular distances between each operation of the same.

3. In an accounting machine, the combination with manipulative devices, of a type wheel rotatable and axially shiftable and electrically controlled by the manipulative devices, means controlled by the type wheel for causing the shift of the type wheel in an axial direction after each rotation of the type wheel, and means controlled by the type wheel for returning the wheel to its initial position after it has been shifted a definite number of times.

4. In an accounting machine, the combination with manipulative devices, of printing devices, magnets for operating the printing devices, said magnets being controlled by the manipulative devices, magnetically operated means for feeding a record material after each printing operation, and magnetically operated means for then severing the printed part of the record material from the remainder.

5. In an accounting machine, the combination with a key board comprising a plurality of banks of keys, of a type wheel, means for rotating the type wheel, a platen, an electric circuit controlled by the key board, magnetic means in the circuit for operating the platen, means for automatically shifting the type wheel a regular distance after each rotation of the same, said means also changing the circuit connections so that the circuit will be successively under the control of different banks of keys.

6. In an accounting machine, the combination with a type wheel and means for rotating the same, a platen for the type wheel, an electric circuit, means included in the electric circuit for operating the platen, a keyboard which controls the electric circuit so that the platen may be operated at any position of the type wheel and means for shifting the type wheel in an axial direction after each operation of said platen.

7. In an accounting machine, the combina-

tion with a bank of keys, of an electrically driven transmitting member, given excursions under control of said keys, a plurality of plungers arranged adjacent said transmitting member, means controlled by said keys for projecting said plungers into the path of said transmitting member, a type wheel, and connections for driving said wheel step by step from said transmitting member, a platen for said type wheel, a circuit closer carried by said transmitting member, and positioned to be actuated by said plungers when the same have been projected, and a circuit operating said platen and which is controlled by said circuit closer.

8. In an accounting machine, the combination with a key board of a rotating switch device, a type wheel, means for rotating the switch device and the type wheel in synchronism, means for shifting the type wheel in an axial direction after each rotation of the same, an electric circuit, a platen for the type wheel, means included in the electric circuit for operating the platen, means under the control of the key board for operating the switch device and closing the electric circuit so as to operate the platen at any desired extent of rotation of the switch device.

9. In a machine of the class described, the combination with a plurality of banks of keys, of a transmitting device, circuits including connections whereby said transmitting device is controlled by said banks successively, and a distant accounting device with connections for actuating it in accordance with the movement of said transmitting device.

10. In a machine of the class described, the combination with a plurality of banks of value keys, of a movable transmitter, circuits including connections whereby said transmitter is brought under control of said banks of keys successively, distant accounting mechanism, and connections from said transmitter to said accounting mechanism whereby the movements of said transmitter are reproduced in said accounting mechanism.

11. In a machine of the class described, the combination with banks of keys, of a movable transmitter. circuits including connections whereby said transmitter is brought under control of said banks of keys successively, a distant accounting mechanism including a single accounting element, and means controlled by said transmitter for operating said element.

12. In a machine of the class described, the combination with banks of keys, of a rotary transmitter and means for actuating it, circuits including connections whereby said transmitter is brought under control of said banks of keys successively, a distant accounting mechanism, connections from said rotary transmitter for actuating said accounting mechanism, and means for positioning the accounting mechanism differently as the banks of keys successively control said transmitter.

13. In a machine of the class described, the combination with banks of keys, of a transmitter, and means for actuating it, circuits including connections whereby said transmitter is brought under control of said banks of keys successively, a distant accounting device comprising a single accounting element, connections from said transmitter for actuating said accounting element, and means for shifting said element as the transmitter is brought under the control of different banks of keys.

14. In a machine of the class described, the combination with groups of manipulative devices, of a transmitter and means for actuating it, devices including circuit connections whereby said transmitter is brought under control of said groups of manipulative devices successively, distant accounting mechanism and connections for said transmitter comprising a single working circuit for actuating said accounting mechanism in accordance with the movement of said transmitter.

15. In a machine of the class described, the combination with banks of keys, of a transmitter and means for actuating it, circuit connections for controlling said transmitter by said banks of keys in succession, a distant accounting device comprising a single printing element, circuit connections from said transmitter for actuating said element in accordance with the movements of said transmitter, and means for shifting said printing element as the control of said transmitter changes from one to another bank of keys.

16. In a machine of the class described, the combination with a transmitting mechanism, and means for variously actuating it, of a distant accounting device comprising a printing element, circuit connections from said transmitting mechanism for actuating the printing element, and means for shifting the printing element to print in different columns.

17. In a machine of the class described, the combination with a transmitting mechanism and means for variously actuating it, of a distant accounting device comprising a printing element, circuits including connections from said transmitting mechanism for determining the movement of said printing element, and circuit connections for automatically shifting said printing element after each actuation of said transmitting mechanism.

18. In a machine of the class described, the combination with a plurality of banks of keys, and a single printing element, of

means automatically acting to cause said printing element to be positioned variously under the control of said banks of keys successively, with connections for automatically shifting said printing element after each positioning movement thereof to an extent such that a succeeding positioning movement will cause said element to print in a different column.

19. In a machine of the class described, the combination with a plurality of banks of depressible keys and a single printing element, of means automatically actuated to cause said printing element to be positioned in accordance with each depressed key in succession, and mechanism acting after each positioning movement of said printing element to shift said element laterally.

20. In a machine of the class described, the combination with a transmitter having movable parts, and means for giving it invariable excursions, of devices projectable into the path of one of said movable parts, a circuit closed a plurality of times by excursions of said transmitter, a printing element driven by said circuit, and a platen for taking impressions from said printing element with connections controlled by said movable part for operating said platen.

21. In a machine of the class described, the combination with a transmitter having a movable part comprising a circuit closer, and means for giving the transmitter invariable excursions, of devices projectable into the path of said movable part, a circuit closed by said transmitter, a printing element driven by said circuit, means for taking impressions from said printing element, and circuit connections controlled by said circuit closer for operating said impression taking means.

22. In a machine of the class described, the combination with a rotary transmitter having a movable part comprising a circuit closer, and means for giving the transmitter invariable excursions, of manipulatively controlled devices movable into the path of said movable part at different points, a distant accounting element, with circuit connections for driving the same from said transmitter, a circuit completed by said circuit closer when said movable part engages any of the manipulatively controlled devices, and means operated by completion of said circuit for recording the degree of movement then given said accounting element.

23. In a machine of the class described, the combination with a transmitter, comprising a movable part including a circuit closer, and a serrated element, of devices projectable into the path of said movable part for obstructing the same at different points, a distant accounting mechanism, means for giving said transmitter invariable excursions, a circuit closed by the serrations of said element, and controlling the movement of said accounting mechanism, and means caused to operate by said circuit closer when the movable part is obstructed for recording the extent of movement of said accounting mechanism.

24. In a machine of the class described, a transmitter comprising a movable part including a circuit closer, and a serrated element driven through said movable part, in combination with means for actuating said transmitter, a circuit closed by said serrations, devices for obstructing said movable part, and a circuit closed by said circuit closer when the movable part is obstructed.

25. In a machine of the class described, the combination with a printing element and means for differentially moving it from a normal zero position, of impression means, and mechanism thrown into operation by said impression means for automatically restoring said printing element from its differentially moved to its normal zero position.

26. In a machine of the class described, the combination with groups of manipulative devices, of a transmitting mechanism with connections for controlling said mechanism from said groups of manipulative devices successively, a single printing element with means controlled by said transmitting mechanism for moving it, and mechanism for shifting said printing element to print in different columns and also to shift said connections to bring said transmitting mechanism under control of the different groups of manipulative devices.

27. In a machine of the class described, the combination with groups of manipulative devices, of a printing device adapted to be brought under control of said groups of manipulative devices successively, means for taking impressions from said printing device when said device has been positioned under control of any group of manipulative devices, and means controlled by the manipulative devices of a lower order, for shifting the control of said printing device to a higher order group, operable when no manipulative device of the lower order group has been actuated.

28. In a machine of the class described, the combination with groups of keys, of a transmitter controlled thereby with connections for bringing said transmitter under the control of said groups successively, devices controlled by the transmitter for shifting the control thereof from a first group of keys to a second group, and means disabled by operation of a key in the first group, for causing such shifting of control to a second group when no key in said first group is depressed.

29. In a machine of the class described, the combination with a printing element,

and means for differentially positioning it, of means for taking impressions from said printing element, devices set in operation by said impression means for restoring said printing element to normal zero position, with means whereby said restoring means is disabled by the printing element as it reaches normal position.

30. In an accounting machine, the combination with a bank of keys, of a transmitter comprising; a disk, a serrated wheel, with devices for latching said wheel to said disk, and an electromotor for driving said disk; a driving circuit for said motor controlled by any of said keys, plungers projectable into the path of said keys, and an accounting device controlled by said serrated wheel.

31. In an accounting machine, the combination with a bank of keys, of a transmitter comprising; a disk, a serrated wheel, devices for latching said wheel to said disk, and an electromagnet connected to drive said disk step by step, of a circuit for said magnet closed by any of said keys, plungers connected separately to said keys and positioned to be projected into the path of said latching device, and an accounting device with a circuit therefor controlled by said serrated wheel.

32. In an accounting machine, the combination with a bank of keys, of a transmitter, including a transmitting wheel and an electromotor for driving said wheel, a circuit for said motor closed by any of said keys, plungers controlled separately by said keys, and positioned to disconnect said transmitting wheel from said electromotor, and an accounting device controlled by said transmitting wheel.

33. In an accounting machine, the combination with a bank of keys, of a transmitter including a transmitting wheel and an electromagnet connected to drive said wheel step by step, of a circuit for said magnet closed by any key in said bank, plungers controlled separately by said keys and positioned to disconnect said transmitting wheel from said magnet after a number of steps of said wheel corresponding to the key actuated, and an accounting device controlled by said transmitting wheel.

34. In an accounting machine, a transmitter comprising a disk, a serrated wheel, means for latching said wheel to said disk, an electromotor constructed to give said disk invariable excursions, in combination with a bank of keys, and connections for controlling said latching means by said keys.

35. In an accounting machine, a transmitter comprising a disk, a serrated wheel, means for latching said wheel to said disk, and an electromagnet having connections to give said disk step by step excursions of invariable extent, in combination with a bank of keys, and connections from said keys for disconnecting said latching devices after any desired number of steps of said disk.

36. In an accounting machine, the combination with a type wheel and means for moving it to different printing positions, of a platen for taking impressions from said type wheel, and an automatic restoring device for said type wheel, constructed to be made operative by said platen, and acting independently to restore said type wheel to normal zero position.

37. In an accounting machine, the combination with a type wheel, and an electromagnet having connections to move said type wheel to different printing positions, of a platen for said type wheel, and a circuit for said electromagnet, constructed to be closed by said platen, and acting independently to restore said type wheel to normal zero position.

In testimony whereof I affix my signature in the presence of two witnesses.

JOSEPH P. CLEAL.

Witnesses:

E. MARNER,

R. S. CHILTON, JR.