E. A. REED, E. L. RELLER, W. L. SWIFT & A. J. MEIER.

CALCULATING MACHINE.

APPLICATION FILED APR. 3, 1911.

1,118,682. Patented Nov. 24, 1914.

14 SHEETS—SHEET 1.

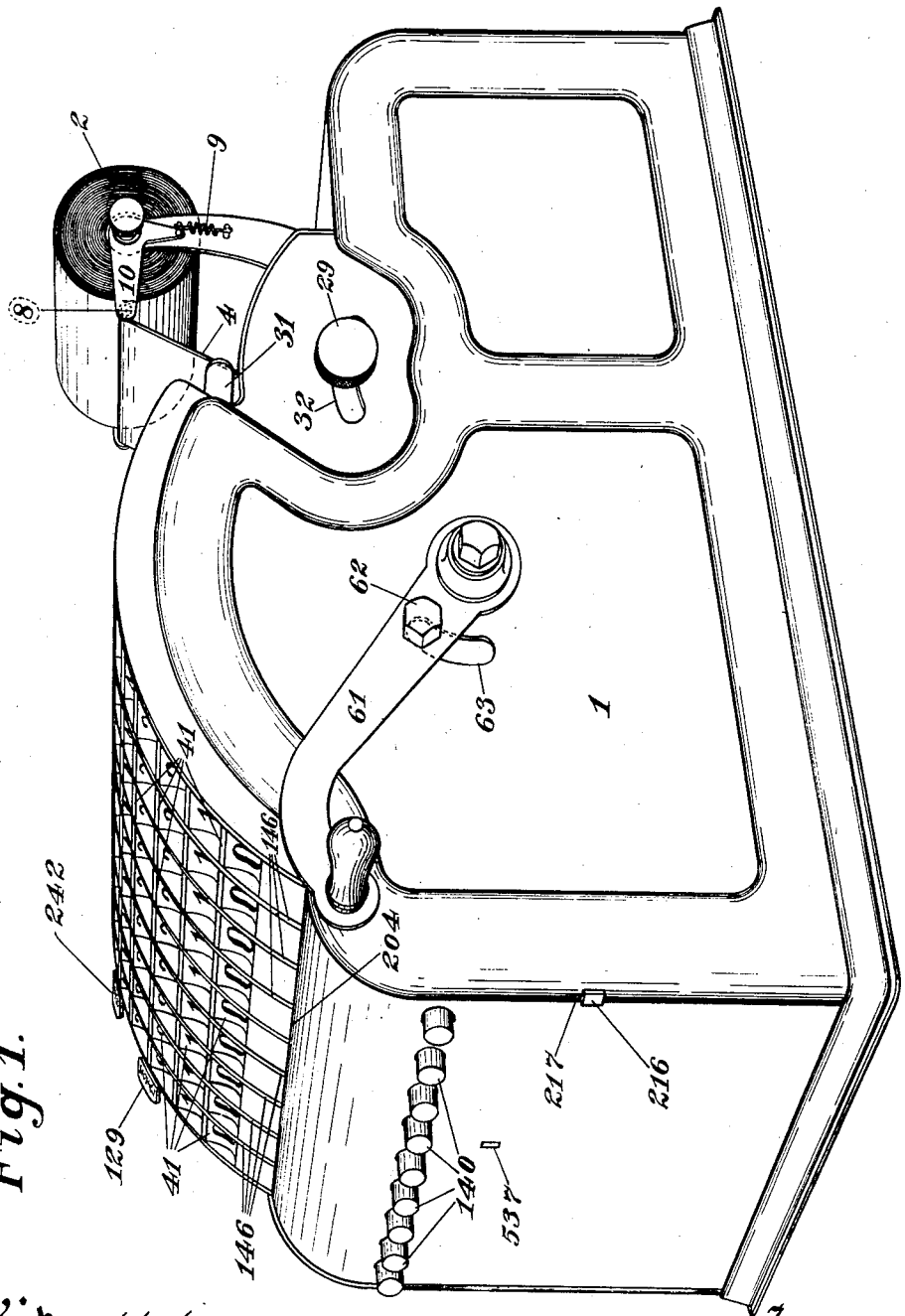

Fig. 1.

Witnesses:

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Inventors:

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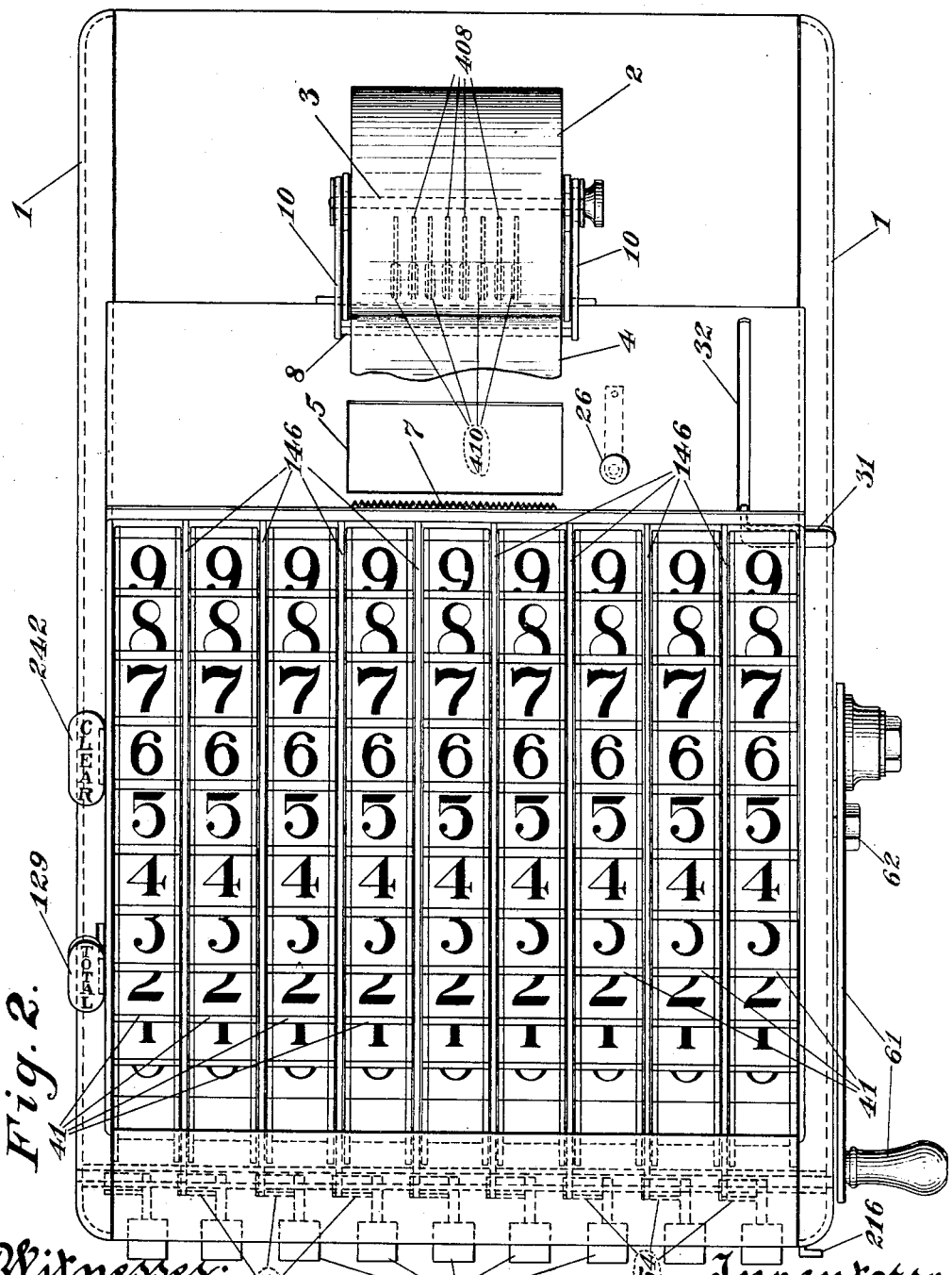

Fig. 2.

Witnesses:

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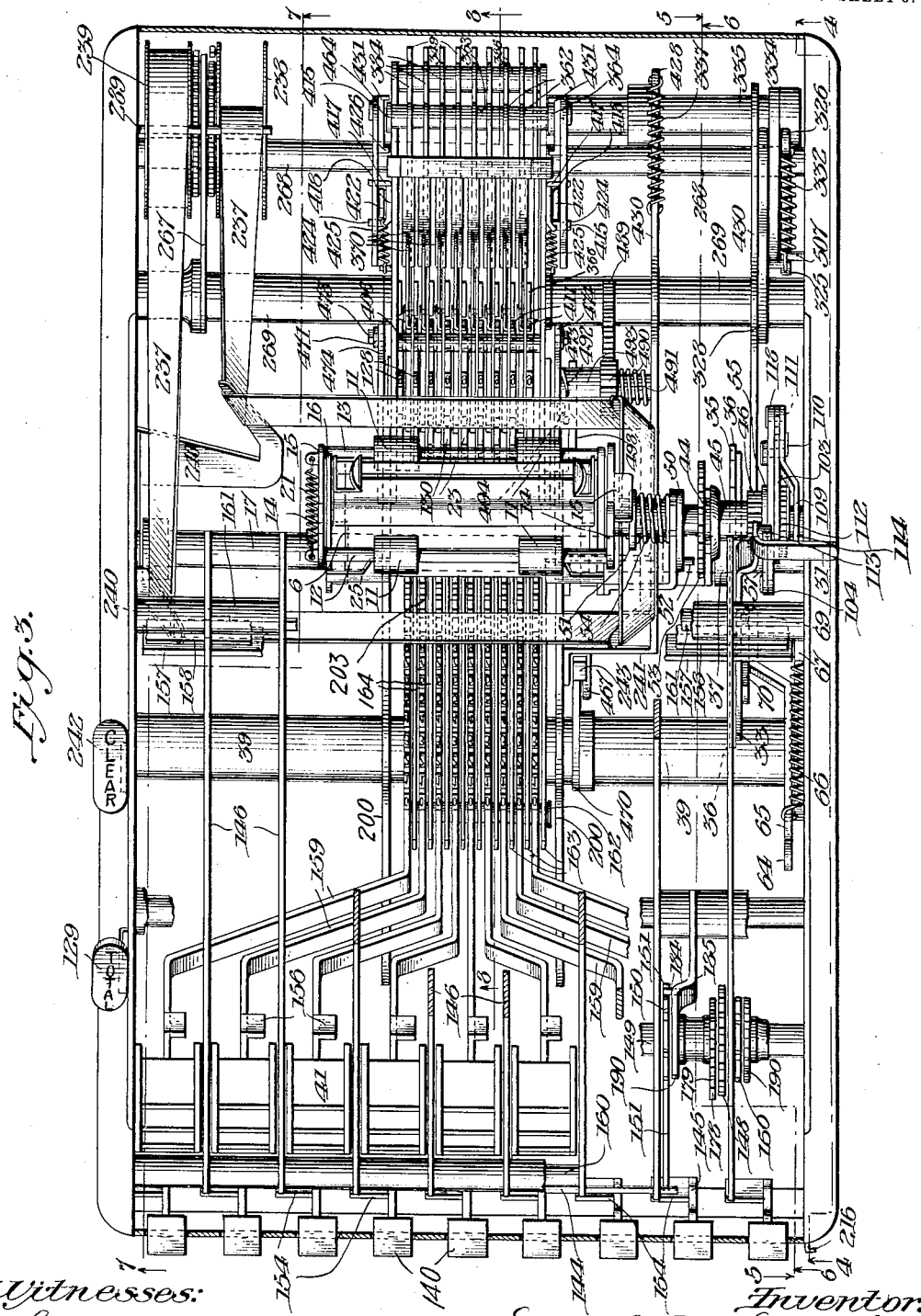

Fig. 3.

Witnesses:
Lottie M. Fox.
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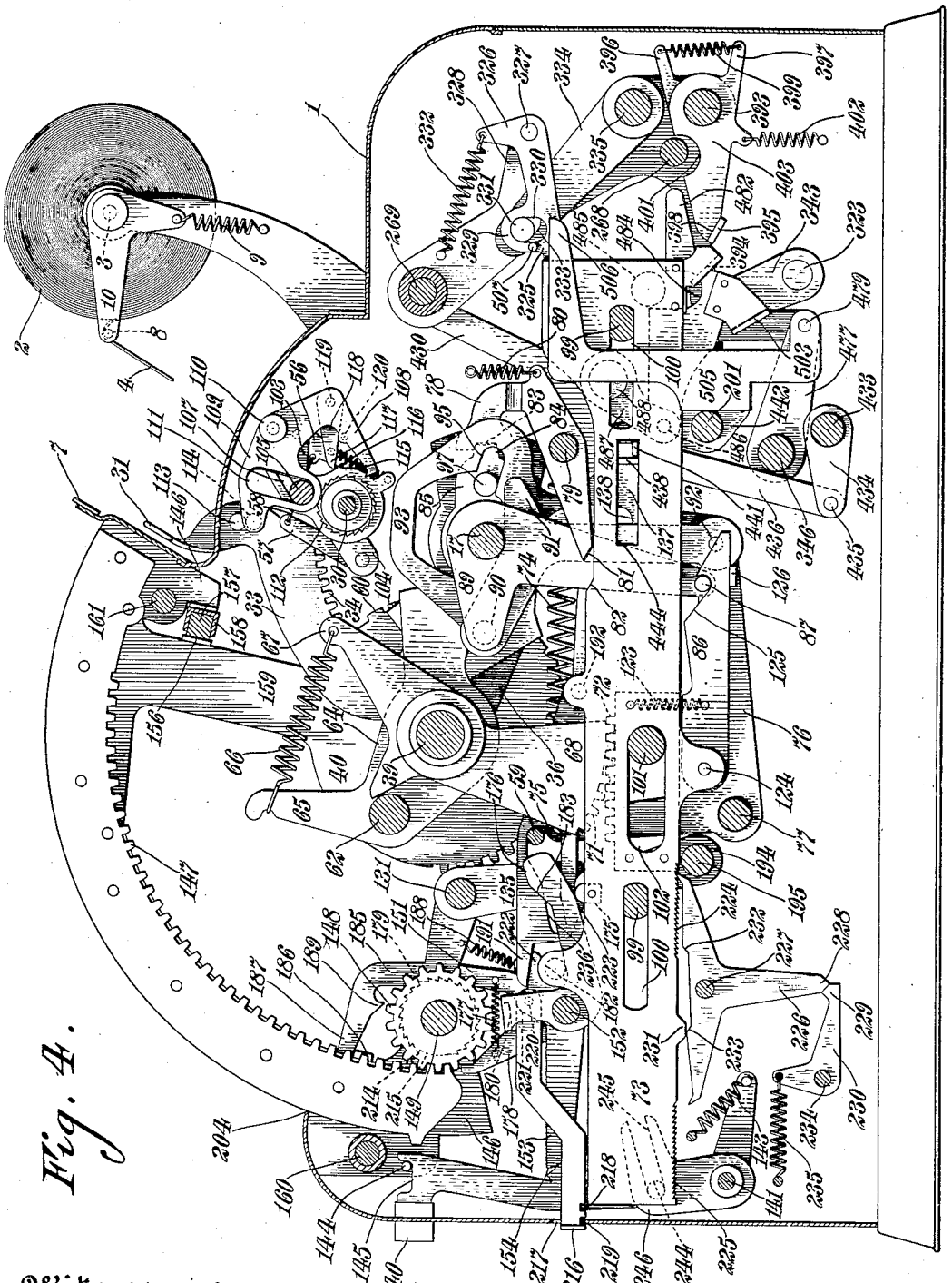

Fig. 4.

Witnesses:
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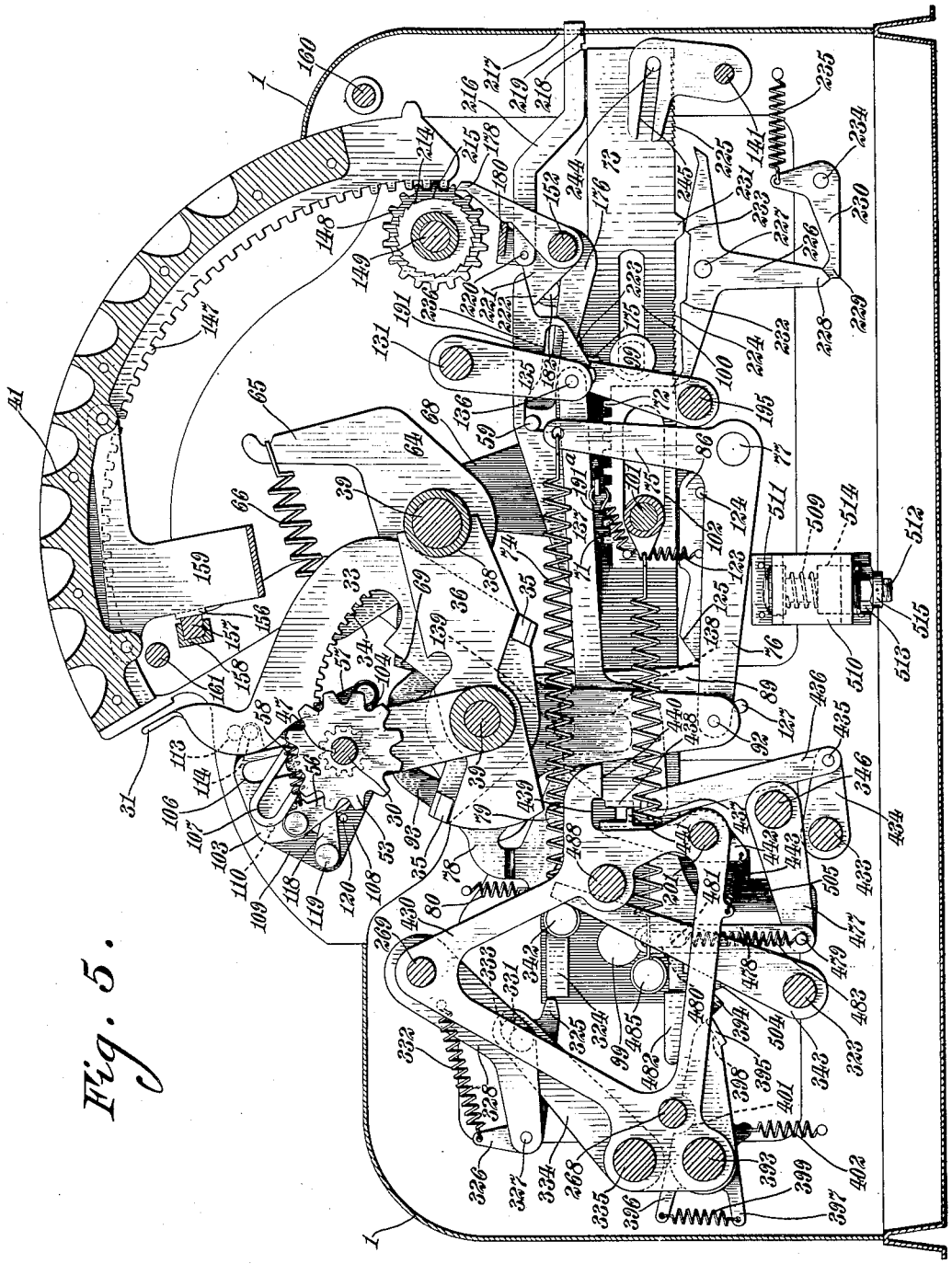

Fig. 5.

Witnesses:

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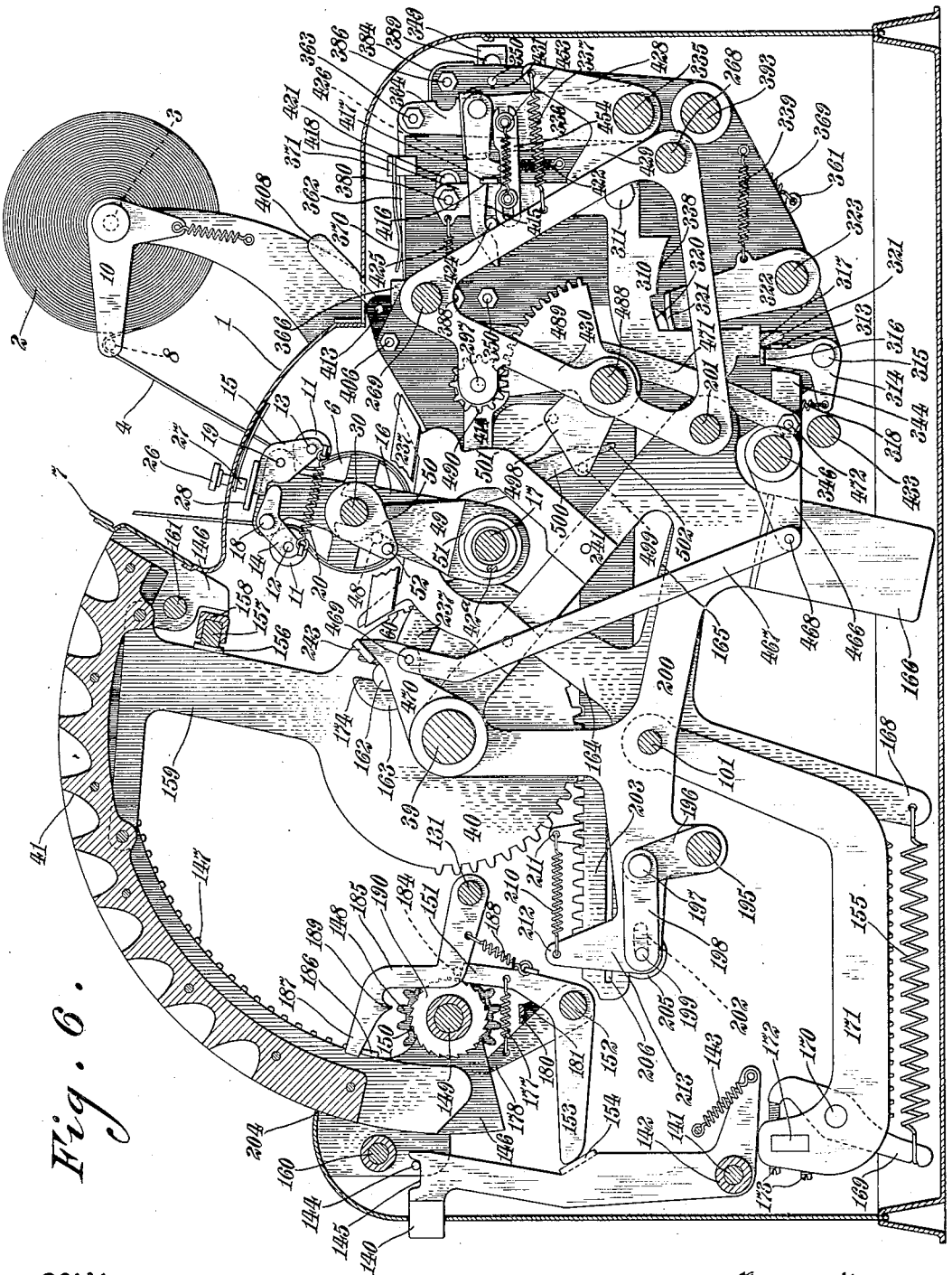

Fig. 6.

Witnesses:
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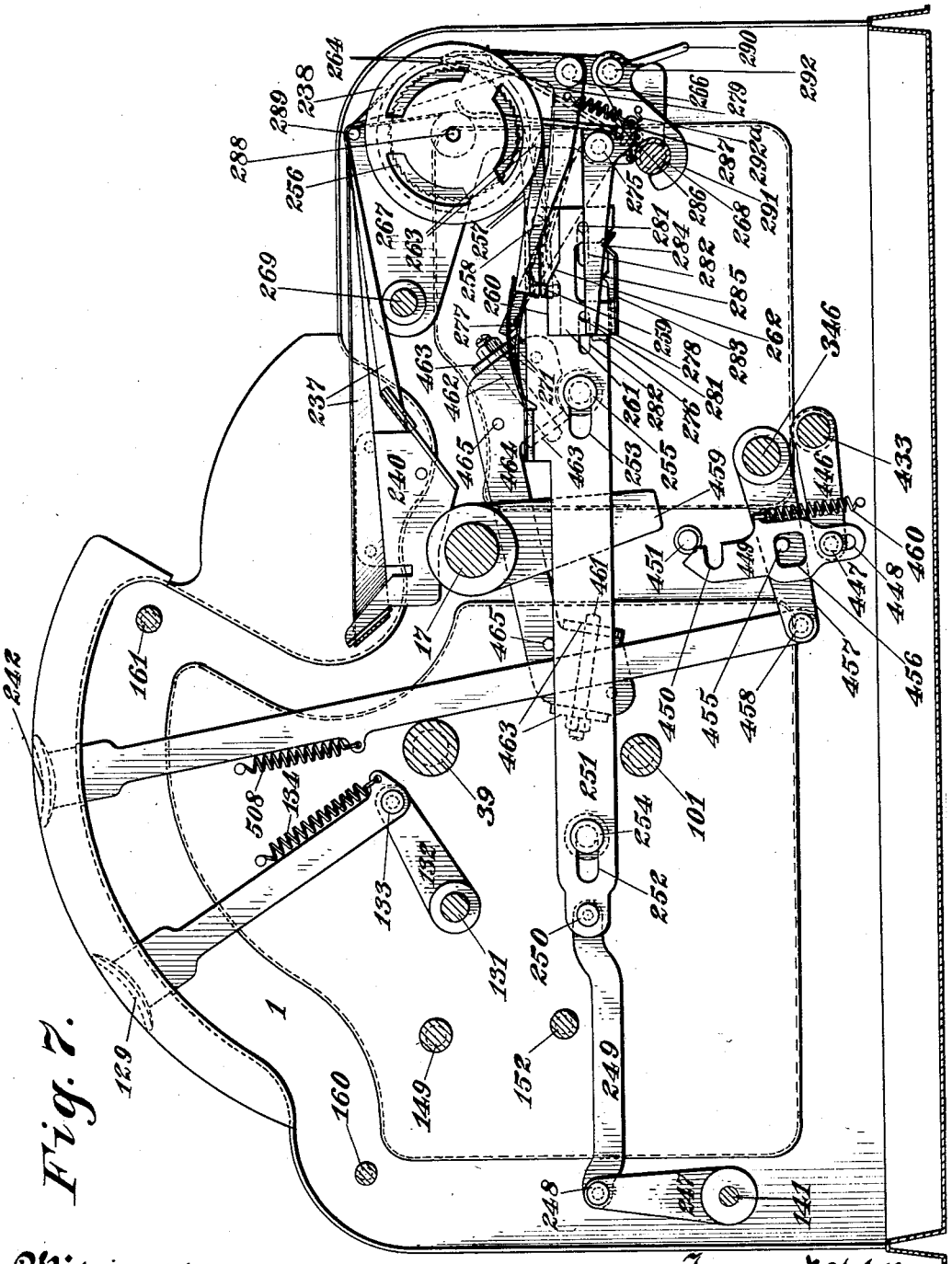

Fig. 7.

Witnesses:
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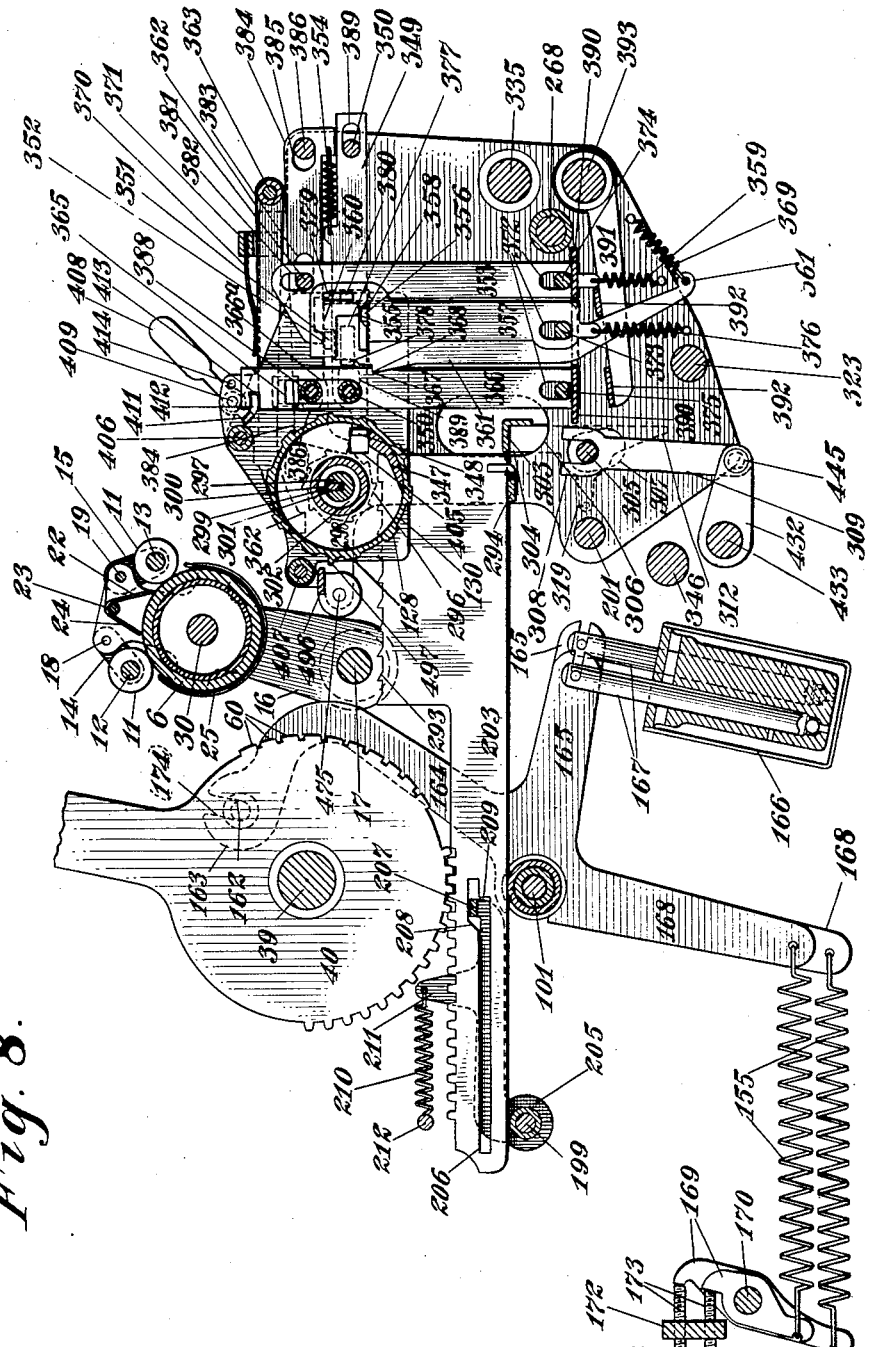

Fig. 8.

Witnesses:
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14 SHEETS—SHEET 9.

Fig. 9.

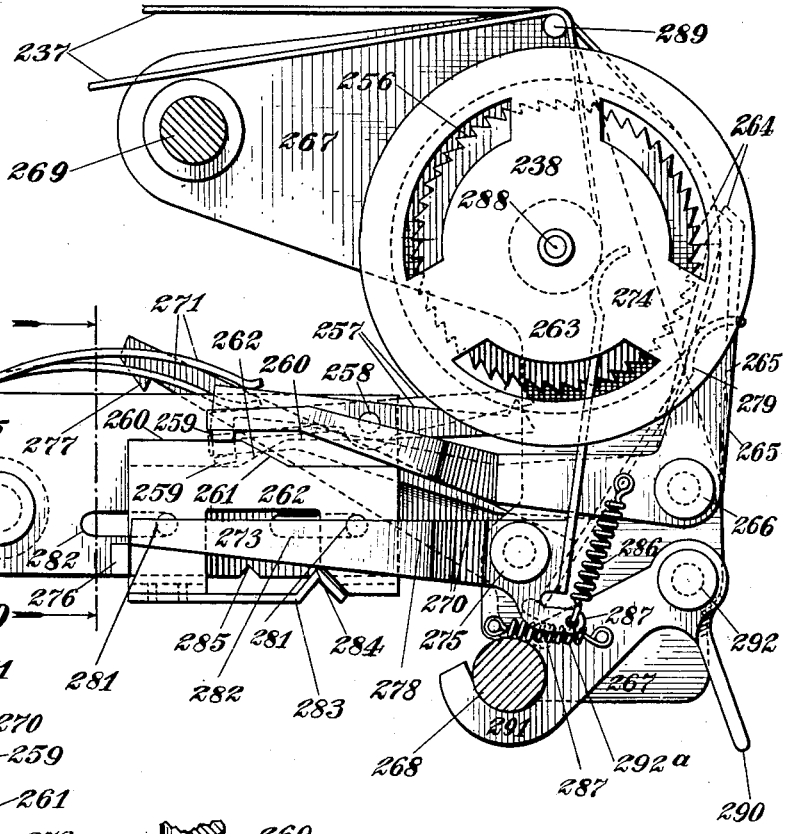

Fig. 20

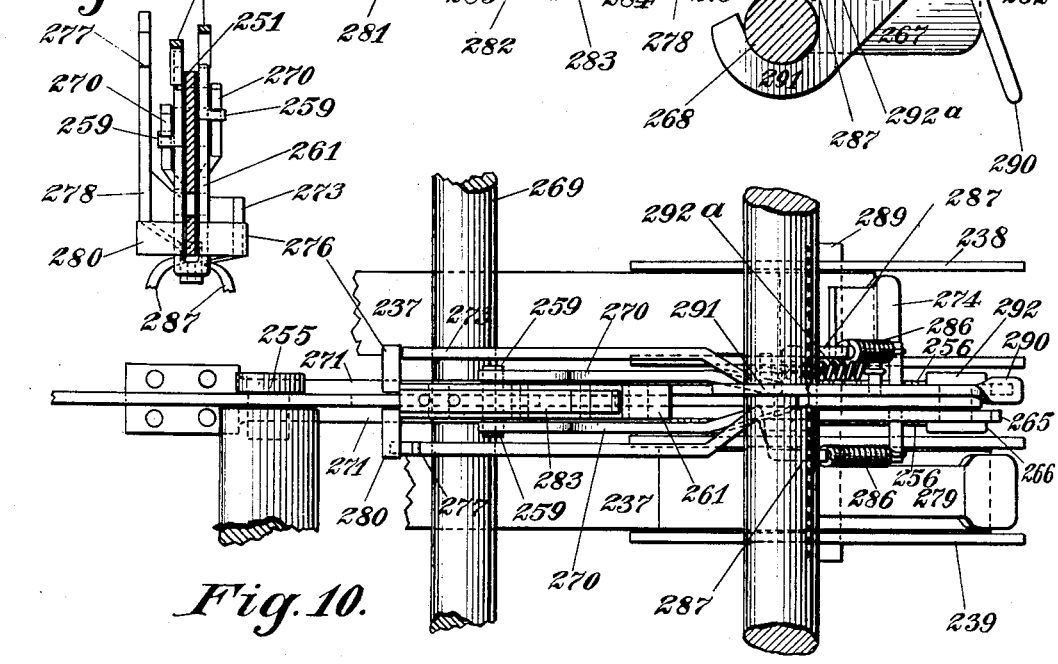

Fig. 10.

Witnesses:

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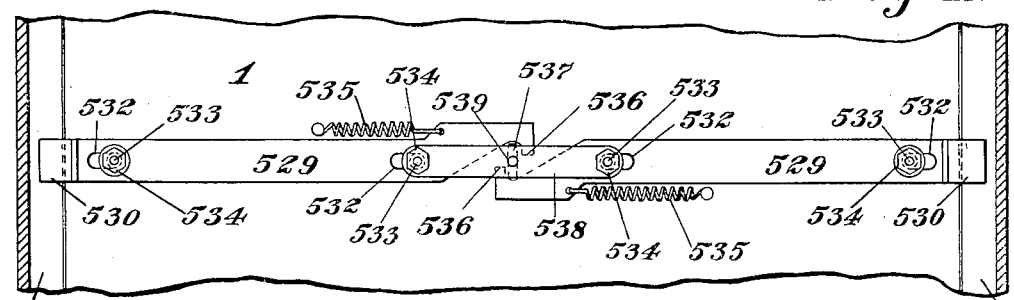
14 SHEETS—SHEET 10.

Fig. 11.



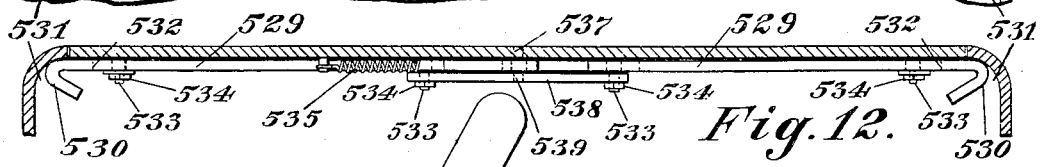


Fig. 12.

Fig. 13.

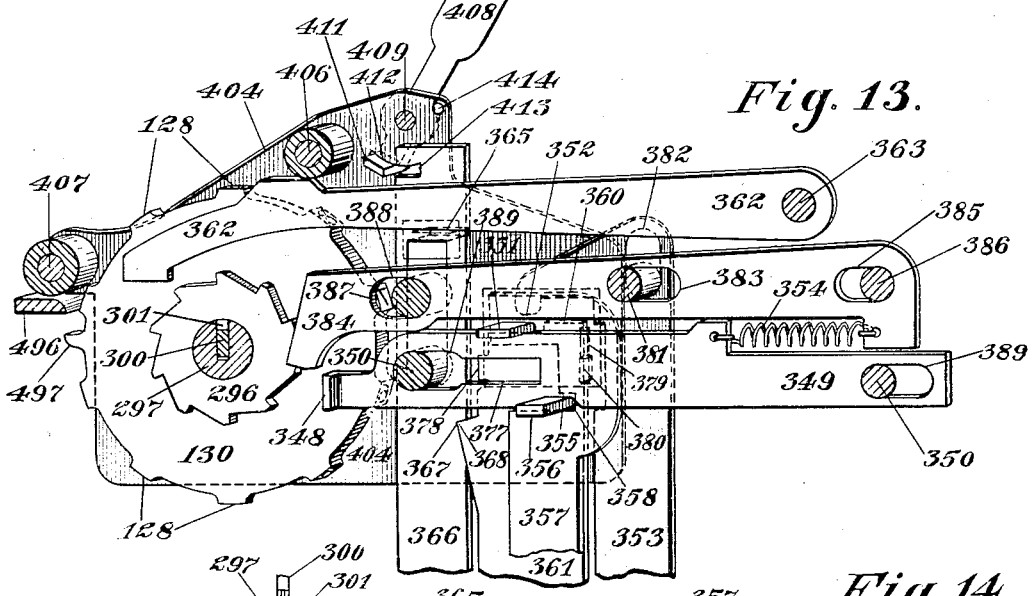
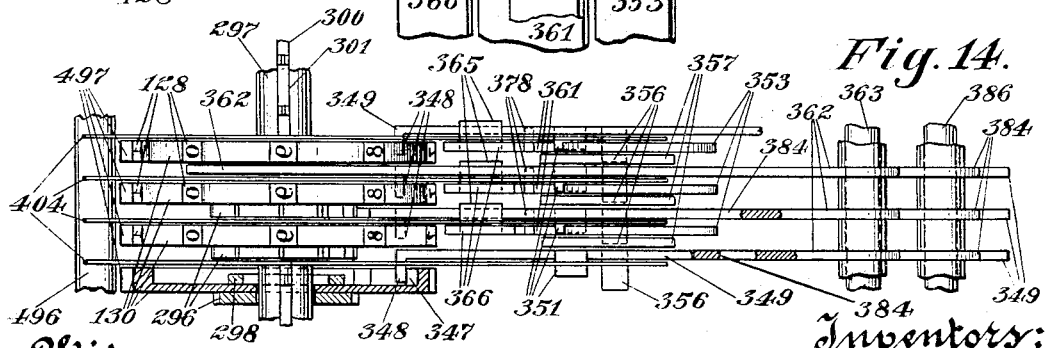


Fig. 14.



Witnesses:

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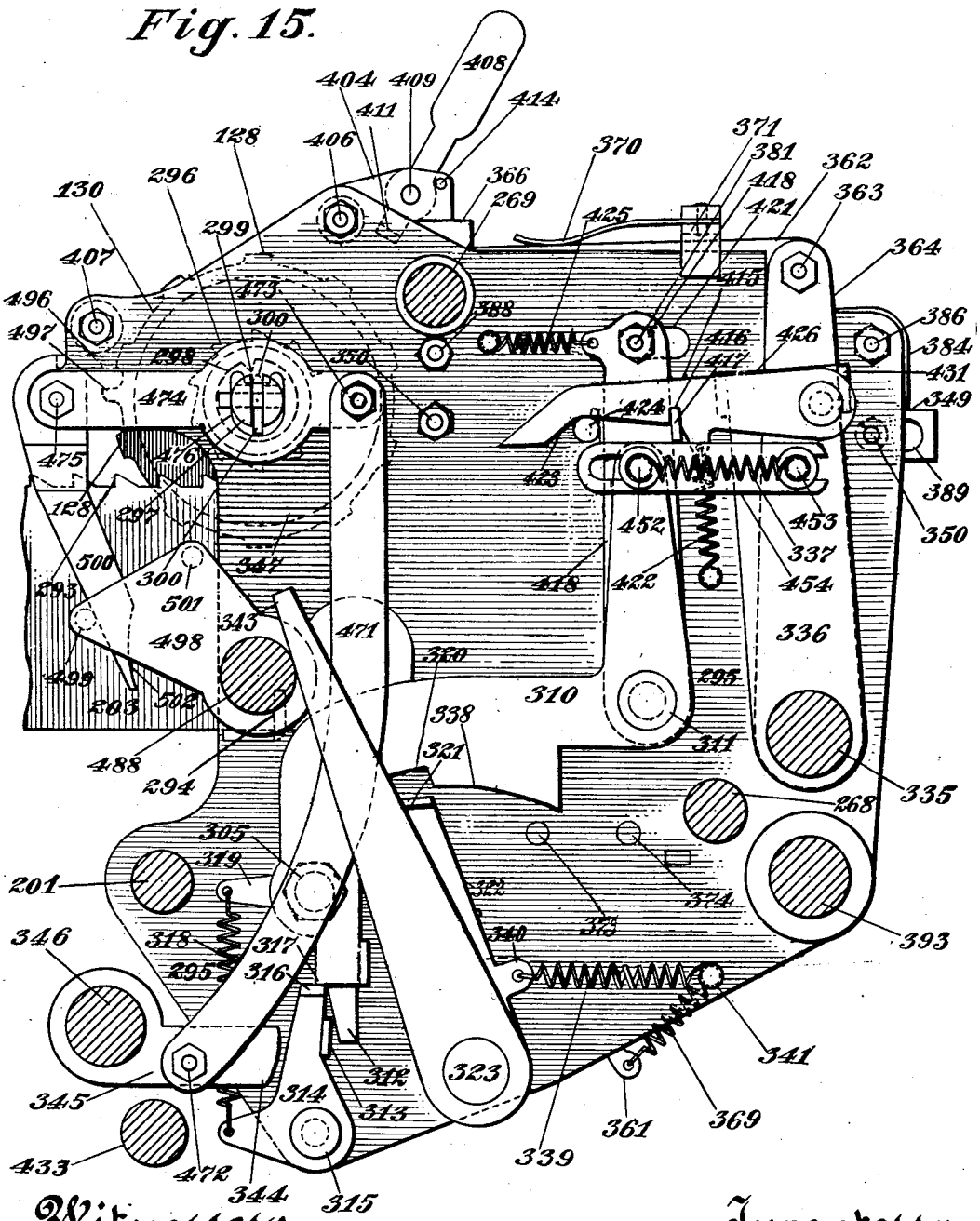
14 SHEETS—SHEET 11.

Fig. 15.



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CALCULATING MACHINE.

APPLICATION FILED APR. 3, 1911.

1,118,682. Patented Nov. 24, 1914.

14 SHEETS—SHEET 12.

Fig. 16.

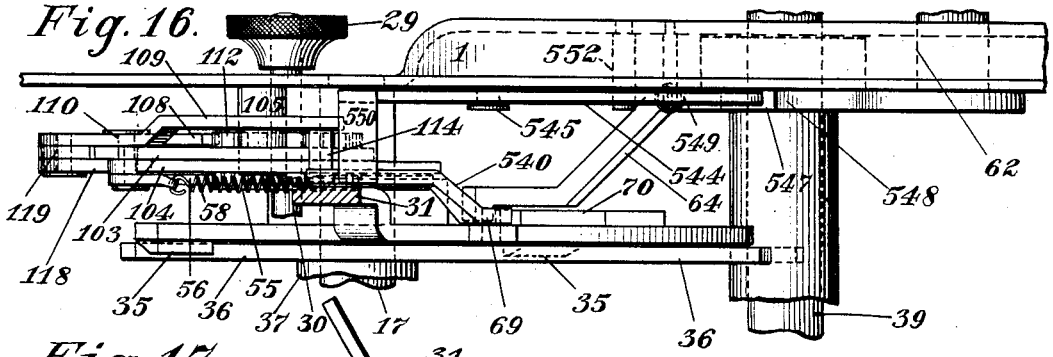
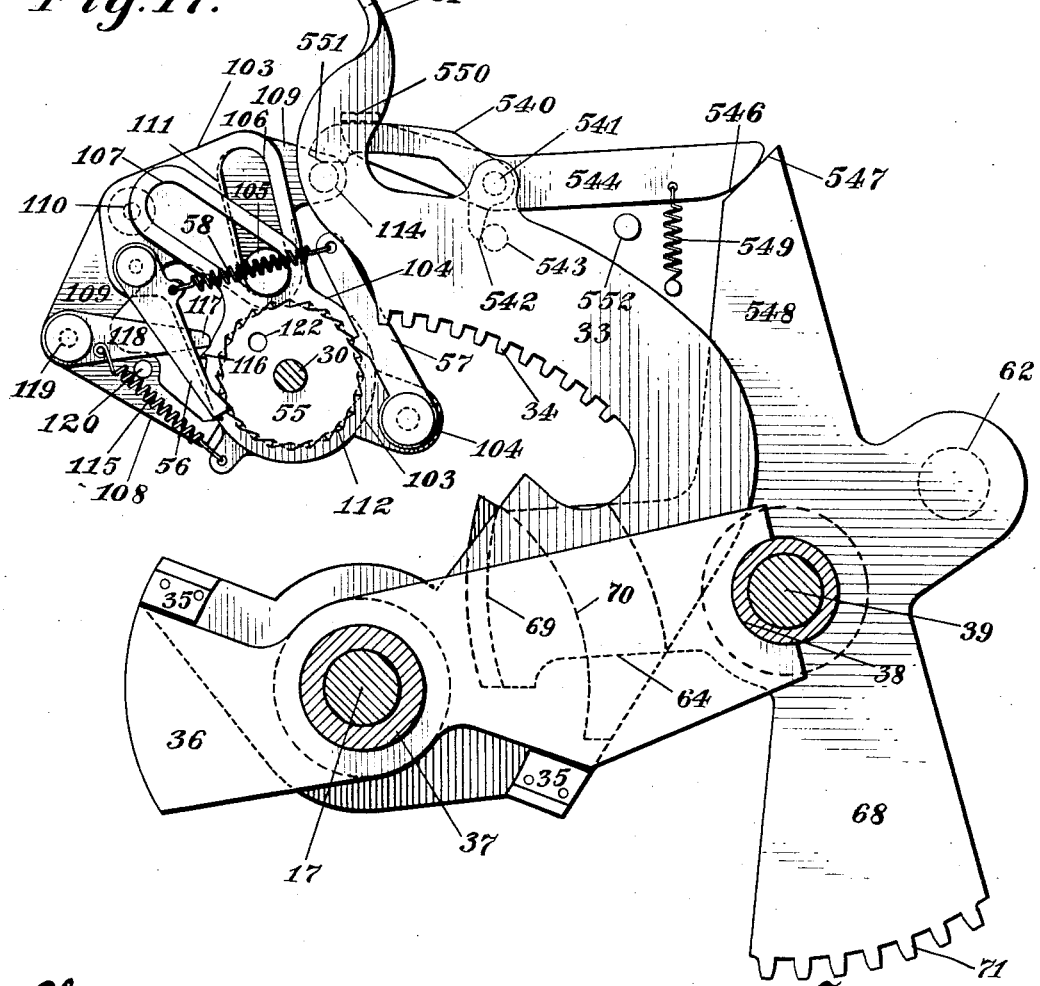


Fig. 17.



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14 SHEETS—SHEET 13.

Fig. 18.

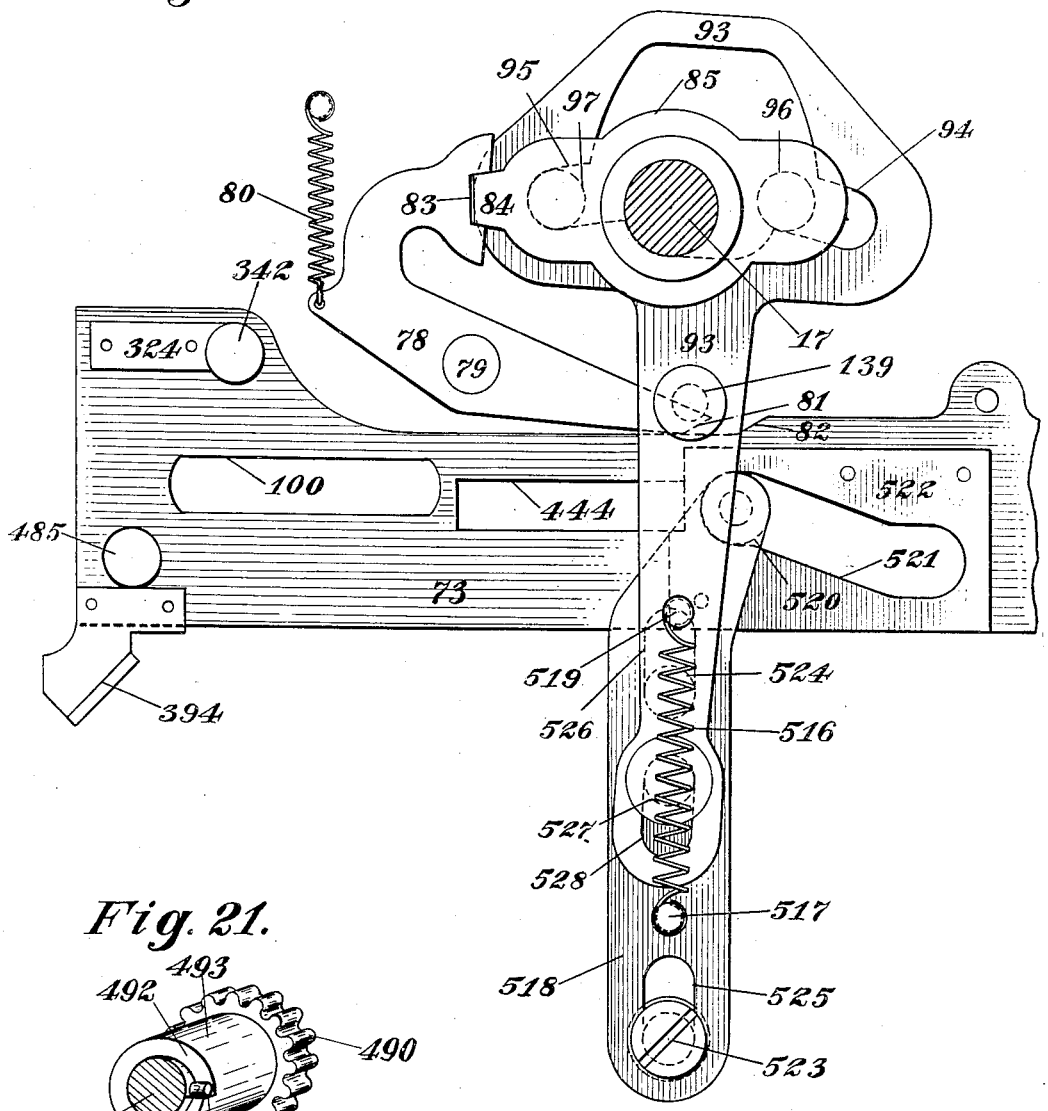

Fig. 21.

Witnesses:

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CALCULATING MACHINE.

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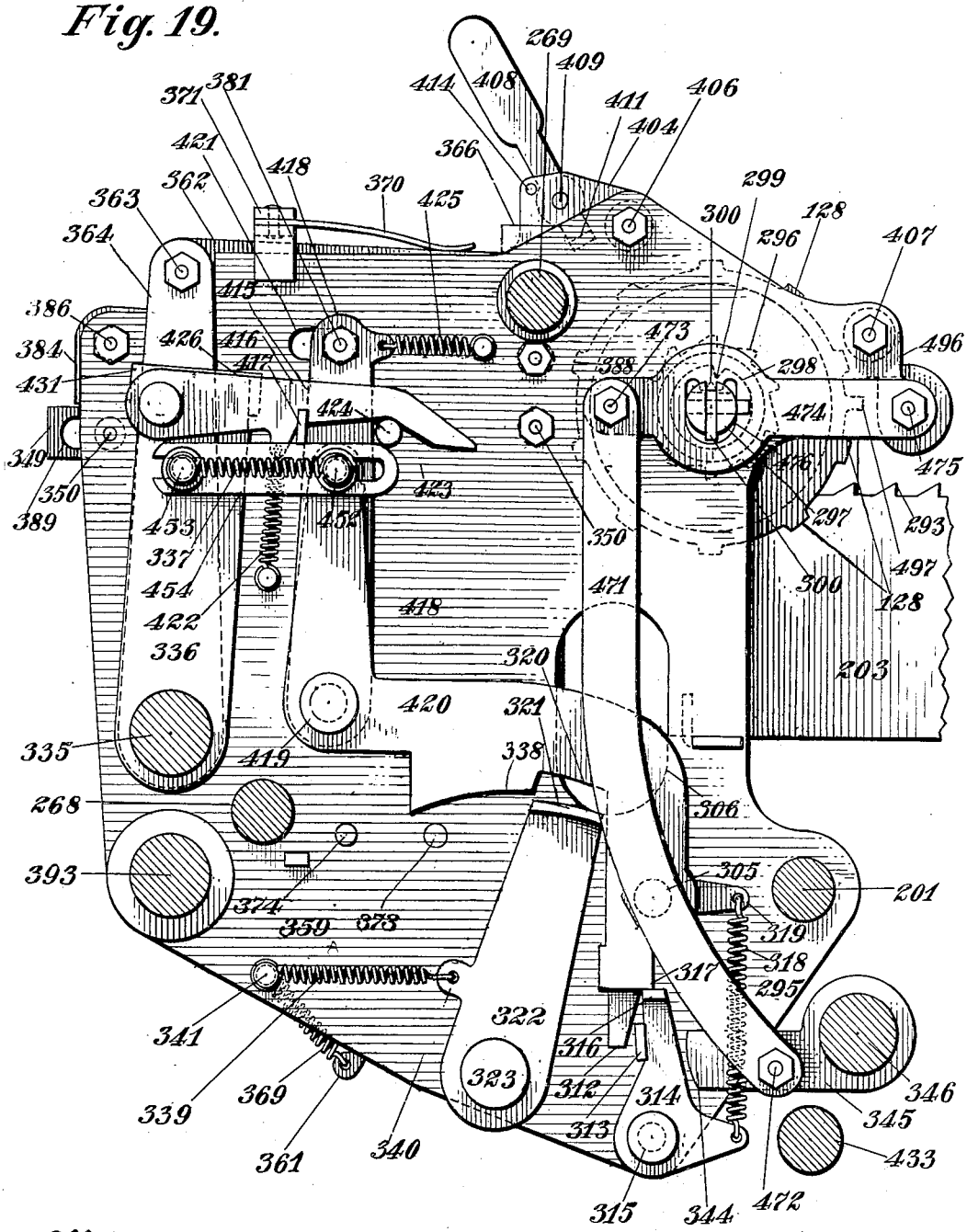
Patented Nov. 24, 1914.

14 SHEETS—SHEET 14.

Fig. 19.



Witnesses:

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George G. Anderson.

Inventors:

Edwin A. Reed, Edwin L. Reller,

William L. Swift, and Albert J. Meier,

By Hugh K. Wagner

Their Attorney.

UNITED STATES PATENT OFFICE.

EDWIN A. REED, EDWIN L. RELLER, AND WILLIAM L. SWIFT, OF ST. LOUIS, AND ALBERT J. MEIER, OF GLENDALE, MISSOURI, ASSIGNORS TO THE DUPLEX ADDING MACHINE COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

CALCULATING-MACHINE.

1,118,682. Specification of Letters Patent. Patented Nov. 24, 1914.

Application filed April 3, 1911. Serial No. 618,655.

To all whom it may concern:

Be it known that we, EDWIN A. REED, EDWIN L. RELLER, WILLIAM L. SWIFT, and ALBERT J. MEIER, citizens of the United States, said EDWIN A. REED, EDWIN L. RELLER, and WILLIAM L. SWIFT residing at the city of St. Louis, State of Missouri, and said ALBERT J. MEIER residing at Glendale, in the county of St. Louis, State of Missouri, have invented certain new and useful Improvements in Calculating-Machines, of which the following is a specification.

This invention relates to calculating machines, and embodies improvements of the apparatus described and illustrated in United States Patents Nos. 929,317; 928,873; and 924,256, granted, respectively, to Adolphus G. Meier, Albert J. Meier, and Albert J. Meier, and dated, respectively, July 27, 1909; July 20, 1909; and June 8, 1909.

The several objects of the invention are briefly, to provide a calculating machine, wherein the impression mechanism is locked against actuation to print a total until each of the items to be printed has been added to the accumulator; wherein, in the same connection, the total key and the totalizing mechanism are controlled by the item printing mechanism; wherein the item printing mechanism may be restored without actuating the accumulator; and wherein error keys individual to the respective item printing mechanisms for permitting restoration thereof are employed.

The invention further comprehends the employment of a particular form of item printing devices, and of improved devices for cushioning the return movement of the first-mentioned devices; of an improved cipher printing device associated with the impression mechanism; and of an improved device for operating the platen and also of improved means or mechanism for insuring a full stroke of this operating device and for preventing its actuation toward printing position until after it has been completely restored to normal position.

The invention still further resides in the provision of an improved form of accumulator which embodies printing wheels and actuating wheels for the same, and actuating members that are operative by the printing means, and, when moved in one direction, are operatively connected with the corresponding actuating wheels, and disconnected therefrom when moved in the opposite direction.

In connection with the accumulator, the invention comprehends the employment of an improved carrying or transfer mechanism, associated with the accumulator wheels, of means associated with such mechanism whereby the aforesaid wheels may be divided into separate series, and of means for controlling the operation of the mechanism specified.

In connection with the impression mechanism, which is used in connection with both item and total printing mechanisms, the invention resides in the employment of a platen which is movable into printing position with relation to either of said mechanisms and is cushioned in either movement.

It also resides in the provision of an improved pressure device coöperative with the platen and of improved controlling means for such device, and it contemplates the further employment of devices or mechanism by means whereof the platen may be rotated so as to expose to view a printed item on the paper thereon.

As further regards the item printing mechanisms and the accumulator, the invention contemplates certain additional improved devices or means which serve to lock the printing device from subsequent operation until after it has completely returned to initial position; to operate the accumulator for adding an item thereto during the return of the printing devices to initial position, and to prevent the printing of a total while the printing devices are in actuated position.

In the drawings, like numbers of reference denote like parts wherever they occur, and Figure 1 is an external perspective view; Fig. 2 is a top plan view; Fig. 3 is a top plan view, after removal of the top plate, of some of the interior mechanism; Fig. 4 is a longitudinal section on the line 4—4, Fig. 3; Fig. 5 is a longitudinal section on the line 5—5, Fig. 3; Fig. 6 is a longitudinal section on the line 6—6, Fig. 3; Fig. 7 is a longitudinal section on the line 7—7, Fig. 3; Fig. 8 is a longitudinal section on the line 8—8, Fig. 3; Fig. 9 is a detail

view (on an enlarged scale), in side elevation, of the ribbon-operating mechanism; Fig. 10 is a bottom plan view of Fig. 9; Fig. 11 is an elevation, from the inside of the casing, of means for locking the end plates to the casing; Fig. 12 is a top plan view of Fig. 11; Fig. 13 is a fragmental view (on an enlarged scale) of parts of the accumulator; Fig. 14 is a plan view of the same; Fig. 15 is a right side elevation of the accumulator; Fig. 16 is a detail (on an enlarged scale), in top plan view, of an alternate form of a device connected with the paper feed; Fig. 17 is an elevation of the same; Fig. 18 is an alternate form (on an enlarged scale) of a spring stretcher connected with the means for operating the platen; Fig. 19 is a left side elevation of the accumulator; Fig. 20 is a sectional view on the line 20—20, Fig. 9; and Fig. 21 is a perspective view of the means for rotating the shaft on which the accumulator wheels revolve.

The casing 1 incloses nearly all of the moving parts, and internally affords bearings for various shafts and support for other parts and means for binding all the parts of the machine together.

As in the machine shown and described in the above-mentioned patents, the roll 2 of paper is preferably mounted above the machine on a suitable shaft 3, and the paper 4 feeds through slot 5 to platen 6, and around same, and out through the same slot to a point adjacent to knife 7, which is mounted on casing 1. Pieces of paper, bearing separate amounts, tabulations, or totals can be torn off strip 4 by pulling said strip against knife 7.

In order to keep the paper 4 taut, an idler rod 8 is kept pressed against same by the tension of springs 9 on bell-cranks 10, or equivalent means, said rod 8 being shown in the drawings as mounted on such bell-cranks, which are borne by shaft 3.

The paper 4 is pressed against platen 6 by two pairs of rollers 11, Figs. 3 and 8, a rod 12 extending between one of said pairs and a rod 13 between the other pair, and each of said rods extending through and beyond its pair of rollers 11. Beyond rollers 11, rod 12 is journaled in a pair of members 14, and rod 13 is, in like manner, journaled in a pair of members 15. The platen 6 is supported by, and adapted to swing with, a pair of arms 16, rigidly mounted on shaft 17 and adapted to be operated thereby. Members 14 are pivoted at 18 to arms 16, respectively, and members 15 are likewise pivoted at 19, respectively, to arms 16. A spring 20 holds one of the members 14 and its coöperating member 15 together, and spring 21 does the same for the other member 14 and its corresponding member 15, and thus rollers 11 are held in pressing engagement with the paper on the platen 6. One wing 22 of paper guide 23 directs the course of the paper toward the platen 6 at the time when paper 4 reaches same, and another wing 24 directs the paper as it leaves platen 6 toward knife 7. While passing around platen 6, the paper is held in contact therewith and directed by a pair of guides 25.

When it is desired to place a fresh roll 2 of paper on shaft 3, and on some other occasions, it is convenient to be able to release the pressure of rollers 11 from paper 4, and for this purpose button 26 is provided. Its shank 27 is adapted to engage projection 28 on one of the members 15 and to depress same, thus forcing said projection into contact with the heel of its coöperating member 14, by which movement said members 14 and 15 are caused to rock on their pivotal points, whereby the rollers are spread apart, and paper 4 freed from their pressure.

A knob 29 on the end of platen-shaft 30 enables the rotation of platen 6 for any necessary purposes, such, for instance, as when it is desired to feed the paper forward to a certain position where a particular item or total will be presented in such position that it can be torn off by knife 7, or when a new roll of paper has just been placed on shaft 3.

To make a particular item printed on paper 4 visible when desired, mechanism is provided, which is controlled by a lever 31 that protrudes through slot 32 in casing 1. Said lever 31 as shown in Fig. 5 is borne by member 33, which is loosely mounted on shaft 17, a segmental rack 34 being formed thereon. When lever 31 is pushed in the direction away from where the operator normally stands in front of the machine, member 33 rotates on shaft 17, causing wedges 35 borne by member 33 to engage plate 36, which is, also, loosely mounted on shaft 17 by being fixed to hub 37, which rides loosely on said shaft. See Fig. 17. To prevent rotation of plate 36, same is notched at 38, so that it partly encircles shaft 39, on which are mounted the sectors 40, operated by the finger pieces 41. The engagement of wedges 35 with plate 36 forces hub 37, bearing arm 42, in the direction of the platen and against the pressure of spring 42^a, Fig. 6, which returns said plate when the lever 31 is returned to its initial position. The upper part of arm 42 is notched or cut away so as to enable it to fit into a groove 44 in collar 45, said collar being slidably mounted on shaft 30. The pinion 46 is carried with collar 45 into the plane of travel of the segmental rack 34 upon member 33. The relation of wedges 35 to the actuation of arm 42, collar 45, and pinion 46 is such that pinion 46 will be in

the plane of travel of segmental rack 34 at the time when lever 31 has moved sufficiently rearward to place the first tooth of the rack 34 in engagement with the pinion 46. Collar 45, being keyed on shaft 30, is adapted to rotate same when pinion 46 is driven by rack 34. Thus, the rearward movement of lever 31 causes rotation of platen 6 to such extent as is necessary to disclose any item printed on paper 4, and, thereafter, to retract the paper, which, however, leaves the paper loose between guide wing 22 and rod 8. Naturally, it will be unnecessary to feed the paper by means of lever 31 farther forward than to display to the operator the last item printed, and, therefore, a device is provided which automatically limits the forward feed of the paper to the extent just mentioned and which, likewise, determines the return of the paper to its original position from which it was moved, both operations being governed by lever 31. This limiting device consists of the following parts: A pin 48 is adapted to strike arm 49 on one side thereof when the platen 6 is traveling in one direction far enough to expose to the operator's view the last printed item, and upon the other side of said arm when the movement of lever 31 in the opposite direction has caused segment 34 to rotate pinion 46 in the reverse direction, so as to restore paper 4 to its former position. Platen 6 can not travel in either direction, by actuation of lever 31, after said pin 48 strikes arm 49. Pin 48 is mounted on arm 50, which is fixed to hub 51 loosely mounted on shaft 30. Pin 52 projects from the opposite side of arm 50, and is adapted to enter between two teeth of gear 53, which is fixed to collar 45 and slides and rotates therewith. Thus, when collar 45 is rotated by pinion 46, gear 53 is, also, rotated in the same direction, and causes pin 48 to move as hereinbefore described. Spring 54, which encircles hub 51, tends to return arm 50 to its initial position as soon as the engagement of pinion 46 and rack 34 ceases, and thus pin 48 is normally held against arm 49, as depicted in Fig. 6.

The normal paper-feeding operation, which follows each printing impact upon paper 4, is produced by the actuation of shaft 30 by means of ratchet 55, which is actuated by pawls 56 and 57, best shown in Fig. 17. Both these pawls are, from time to time, so actuated as to drive ratchet 55 forward and with it platen 6, so as to feed the paper 4, and both pawls 56 and 57 are in constant engagement with ratchet 55, so as to prevent its retraction, said pawls being held in said engagement by spring 58. The paper 4 is fed forward by degrees, each movement of same occurring immediately after the platen 6 has been swung toward the type-faces. The operation of swinging platen 6 toward the type-faces is as follows.

When the finger piece or finger pieces 41 have been pulled down so as to set the desired item type 60, the handle 61 is depressed, carrying with it pin 62, the movement of which is limited by slot 63 in casing 1. This movement of pin 62 causes same to rock member 64, to which it is attached. As shown in Fig. 4, member 64 bears an arm 65, which pulls spring 66 connected thereto and, also, connected to arm 67 on plate 68, which is loosely mounted on shaft 39. When member 64 is rocked toward the operator, plate 68 is similarly rocked, and on said member is caused curved flange or lip 69 to move across the path of travel of projection 70 on member 33, thus preventing, for the time being, the use of lever 31 and the accompanying movement and exhibition of printed items. In the alternate form shown in Figs. 16 and 17, member 64 and plate 68 are shown made in one piece, thus obviating the necessity of using the spring 66. Simultaneously with the operation thus described, which renders lever 31 temporarily inoperative, the aforesaid movement of handle 61 causes segmental rack 71 on plate 68 to actuate rack 72 on bar 73. This movement of segmental rack 71 causes bar 73 to travel in the direction away from the operator, thereby stretching spring 74, Figs. 4 and 5, one end of which spring is fastened to said bar 73 and the other to an arm 75 of bell crank 76, which is pivoted at 77 to one side of the casing 1. Said bell crank 76 is, during the first part of movement of bar 73, held stationary by latch 78, which is pivoted at 79 to one side of casing 1. Spring 80 holds the toe 81 of latch 78 normally in the path of travel of bevel 82 on operating bar 73 and, also, the notched end 83 of latch 78 in engagement with projection 84 on yoke 85, as shown in detail in Fig. 18. Prior to the release of yoke 85 and of bell crank 76 from the retention of latch 78, however, the movement of the bar 73 releases the return hook 86 from being held by pin 87, said pin being borne by arm 88, which is loosely mounted on shaft 17 and which is, also, provided with the arm 89. To said arm is pivoted at 90 an arm of plate 91, the latter being pivoted at 92 to the bell crank 76. The link 93 is, also, pivoted at the same point to bell crank 76, and, in its upper part, encircles shaft 17, the interior of its encircling opening being provided with cam slots 94 and 95, in which pins 96 and 97 ride, said pins being borne by yoke 85. Said yoke 85 is fixed to shaft 17, and acts, by means of said pins 96 and 97, as a lever to rotate the same. When the movement of handle 61 has caused bar 73 to travel so far that bevel 82 thereon engaging the toe 81 of latch 78 causes its notched end 83 to

release the projection 84 on yoke 85, the spring 74, being under tension, drives arm 75 of bell crank 76 backward, which depresses the other arm of said bell crank, pulling with it link 93, whereby pin 96 is pressed downward by the side of slot 94 in link 93, with the result that yoke 85 is tilted or moved in such manner as to rotate shaft 17 and with it plates 16, thus rocking platen 6 toward the type-faces 60. At the same time that link 93 is drawn downward by bell crank 76, plate 91 is, also, carried downward, with the effect that arm 88, which is in pivotal connection with plate 91, is carried to such position that pin 87 on said arm 88 is put in readiness to engage with hook 86 on the return of the operating bar 73 to its initial position. The rocking of the platen as just described causes an impact of paper 4 against type-faces 60 and consequent printing thereon of the last item set by means of the finger pieces 41. When the printing operation has been completed, as just described, handle 61 is released by the operator, and, thereupon, spring 98 exerts its force to return operating bar 73 to its first position, said bar being guided by pins 99 passing through slots 100 in said operating bar 73. The return movement of bar 73 to its original position causes reverse movement of yoke 85, with the result of rocking platen 6 back to its initial position.

While the platen 6 is rocking to printing position, the pawls 56 and 57 ride over the teeth of ratchet 55, so as to be advanced one notch or any other desired distance thereon. While the above-mentioned return movement of the platen to its first position is taking place, the pawls 56 and 57 press against the teeth of ratchet 55 and cause same to rotate forward a predetermined distance, with the result of feeding the paper 4 forward. Pawl 56 Fig. 17 is mounted on plate 103, and pawl 57 is mounted on plate 104, said plates being loosely mounted on the hub of ratchet 55 that is loosely mounted on shaft 30, and said pawls are actuated by pin 105, which is stationarily attached to one of the side walls of casing 1 and extends through slot 106 in plate 103 and slot 107 in plate 104. The pawl-carrying plates are, therefore, caused to bear the relation of rotation to platen 6 when same is swung back and forth, thus causing pawls 56 and 57 to travel relative to the teeth of ratchet 55. To prevent forward feed of the paper during the time when the platen is being rocked toward printing position, an additional pawl 108 is provided, same being borne by plate 109, which is pivoted at 110 to plate 103, said plate 109 containing a slot 111 through which, also, pin 105 passes. Said pawl 108 coacts with a ratchet 112, and is normally held out of engagement therewith by the engagement of pin 113 borne by lever 31 with pin 114 borne by plate 109 Fig. 4; but, as soon as platen 6 begins to move toward the printing position, pin 114 becomes disengaged from pin 113, with the result that pawl 108 on plate 109 is allowed to swing into restraining contact with ratchet 112, being induced thereto by spring 115, said ratchet 112 being loosely mounted on shaft 30 and fastened to the hub of ratchet 55. This retention continues until the rotation of plate 104 around shaft 30 has brought projection 116 into engagement with the beveled toe 117 of pawl 118 Fig. 17, and causes same to ride thereover, said pawl 118 being pivoted at 119 to plate 109, the action of said pawl 118 in riding over projection 116 lifting pawl 108 out of engagement with ratchet 112, by reason of the engagement of pawl 118 with pin 120 on pawl 108. A pin 121 projects from pinion 46 into aperture 122 in ratchet 55, and, when said ratchet is rotated in the direction to cause the paper 4 to feed forwardly in the manner hereinabove described, said pinion is caused to rotate, and with same shaft 30, thereby rotating platen 6 and causing paper 4 to move forwardly to allow the next item or total to be printed.

As hereinabove stated, the release of handle 61 by the operator causes the return of platen 6 to its non-printing or initial position, this being due to the pull of spring 98. In the forward movement of bar 73, produced by the depression of handle 61, hook 86 travels with bar 73 and is normally pulled toward bar 73 by spring 123, and, by the same means, into engagement with pin 87, which is borne by arm 88. Hook 86 Figs. 4 and 5 is pivoted at 124 to a projecting lug on bar 73, and, as said hook travels forward, its beveled part 125 rides underneath pin 87, thereby disengaging the hook proper from said pin and causing a projection 126 thereon to pass underneath pin 127 which projects from one side wall of the casing 1. While projection 126 thus underlies pin 127, during which time hook 86 is not held by pin 87, the rocking of the platen to printing position occurs. A slight further movement in the same direction by bar 73 completing the rocking of the platen causes projection 126 to pass beyond pin 127, whereupon spring 123 immediately exerts a pull upwardly on hook 86, which throws the hook portion thereof into such path of travel that it will be caught by pin 87 when it moves in the reverse direction with bar 73 under the impulsion of spring 98. During the return movement of bar 73, the engagement of hook 86 with pin 87 causes the latter to rock plate 88 toward its initial position, whereby arm 89 is raised and with it plate 91, which causes link 93 to rise, thus producing a movement of pin 96 in cam slot 94 and consequent rotation of yoke 85 and shaft 17

and, therefore, of arms 16, which are fixed to shaft 17. By this means platen 6 is returned to its first position.

The description of the rocking of the platen up to the present point has been of its movement for the purpose of printing items on paper 4. At any time, however, it may be desirable to print the total of a series of items, and for this purpose mechanism is provided for rocking the platen 6 to printing engagement with the "total type" 128, Fig. 8. The printing of totals is controlled by the total key 129. The mechanism for rocking the platen 6 to print totals is locked against movement by the depression of one of the finger pieces 41, and remains so until after the item set by said finger piece has been printed. It will be perceived that the item-printing motion of the platen 6 is controlled by handle 61, and the total-printing movement of said platen by total key 129.

The total for the machine at any particular time will appear on the type-face on wheel 130 located at the point at which one particular total type-face is marked 128. It will, of course, be understood that there are on said wheel 130 a plurality of such type-faces, but that the total at any particular time appears at that particular point, where it is most convenient to impact by the paper borne by platen 6. The mode of reaching such total will be hereinafter described, but, for the time being, the description will be confined to the rocking of platen 6 to printing impact with said particular total type-face 128.

When total key 129, Fig. 7, is pressed, it rocks shaft 131 by means of arm 132, fixed thereto, the shank of total key 129 being pivoted at 133 to said arm 132, and spring 134 normally holding total key 129 in its upper position. Shaft 131 is journaled in the side walls of casing 1. The rocking of shaft 131 by the depression of total key 129 rocks arm 135, Fig. 5, which is pivoted at 136 to link 137, and draws said link 137 toward the operator. Notch 138 in the upper surface of link 137 loops over pin 139, which projects from link 93. Forward movement of link 137 will, therefore, rock link 93 forwardly, said link 93 being pivoted at 92, with the result that cam slot 94 moves away from pin 96 while, simultaneously, cam slot 95 moves into engagement with pin 97, which tilts or rotates yoke 85 when link 93 is pulled downwardly by the arm of bell crank 76 when printing handle 61 is depressed, said tilting of yoke 85 on shaft 17 being in the direction opposite to that in which it is tilted or rotated when platen 6 is to be moved toward the item-printing type-faces, and, as yoke 85 is fixed to shaft 17 and arms 16 project upward from shaft 17 and support platen 6, the latter is rocked toward the total type-printing face 128. In order that this operation may be carried out, the total key 129 must be kept depressed during the time when the handle 61 is being pressed down. The return of the platen to the intermediate or non-printing position is accomplished as follows: When handle 61 and the total key 129 are released, same return to their initial positions under the impulsion, respectively, of springs 66 and 134. The movement of total key 129 to its initial position rotates shaft 131 forwardly, which, by means of arm 135, causes link 137 to travel toward the rear, thus rocking link 93 in such manner as to cause pin 97 to ride out of cam slot 95 and pin 96 to ride into cam slot 94, said link 93 being simultaneously raised by the action of hook 86 actuated by operating bar 73, as hereinbefore described, by which means yoke 85 causes shaft 17 and platen 6 to move away from the total type printing face 128.

In order that a total may not be printed until the last registration, by means of a finger piece 41, has indubitably been added in the accumulator and printed in the list of items, the depression of a finger piece 41 to any extent locks the total key 129 until after the item has been printed. In case of accidental or erroneous depression of one of the finger pieces 41, the use of one of the error keys 140 will not release the total key 129, but such release can be effected only by the depression of the printing handle 61 and consequent movement of connected parts.

Each error key 140 Figs. 4 and 6 is loosely mounted on the shaft 141, is spaced apart on said shaft by collars 142, and is provided with a spring 143 which not only holds it in its normal position but returns it thereto after operation. The movement of each error key in either direction is limited by a pin 144 resting in a notch 145 in said key, said pin projecting from a spacing plate 146 located between finger pieces 41. When a finger piece 41 is depressed, the internal segmental rack 147 rotates gear 148, loosely mounted on shaft 149, said gear carrying with it ratchet 150, over which latter, in this direction of rotation, finger-piece-retaining pawl 151 freely rides. Said pawl operates, however, with said ratchet 150 to prevent the return of its finger piece 41 until after the item designated thereby has been printed. Retaining pawl 151 is loosely mounted on shaft 152, and is provided with an arm 153, which extends into contact with beveled shoulder 154 on its respective error key 140. When error key 140 is pressed inwardly, shoulder 154 presses against the rounded heel of arm 153, and moves pawl 151 out of engagement with ratchet 150, which allows finger piece 41 immediately to return to its initial position under the impulsion of its respective spring 155, each

finger piece 41 being provided with such a spring. After an item is printed by the depression of handle 61, each finger piece 41 that is depressed is released in the manner hereinafter described, and is returned to its initial position, during which return movement each of said finger pieces actuates its accumulator wheel 130, in order to add the item in the accumulator. If it is desired to remove an item from the machine before being printed and thus prevent it from being added in the accumulator, the error key 140 of each depressed finger piece 41 is pressed inwardly before the handle 61 is depressed, for the reason that such actuation of said error keys at this time allows each of said finger pieces to return to its initial position without actuating its accumulator wheel 130.

The normal operation of finger pieces 41 is that they are pulled down the desired distance in the manner and for the purpose described in the above-mentioned patent to A. G. Meier, No. 927,317, and that the retaining pawls 151 hold same in the position to which same are thus moved until after the item-printing operation has been performed. When the printing of an item has been completed, spring or springs 155 tend to return each finger piece 41 to its initial position. To save jar upon such return, a projection 156 Fig. 6 strikes a buffer 157 made of felt or other resilient material located in cup 158, each projection 156 being borne by an arm 159 of sector 40. The cup 158 extends from one side wall of casing 1 to the other, and is supported by the plates 146, which separate the finger pieces 41, said plates being themselves supported by shafts 160 and 161, which are borne by the side walls of casing 1. Each sector 40 bears a pin 162, which fits into a slot 174 in the upper end 163 of a member 164, Fig. 8 which is pivoted on shaft 101. Said member 164 has two arms, one of which 165 extends toward a dash-pot 166, the piston 167 of which is actuated by a piston rod borne by said arm 165. When a finger piece 41 is pulled forward and, after the item has been printed, released, the dash-pot 166 absorbs part of the jar arising from the spring return of finger pieces 41 to their initial positions. Spring 155 is attached at one end to the other arm 168 of the member 164, and at the other end to finger 169, which is pivoted to rod 170, that connects the two members 171 located on opposite sides of the machine. A plate 172 is received in the slotted ends of members 171, and an adjustable screw 173 for each of the plurality of fingers 169 allows of the suitable adjustment of the tension of each spring 155. When a sector 40 is pulled down to register an item, pin 162 travels with it and pulls the hooked or slotted end 163 of member 164 with it, necessarily rocking member 164 on shaft 101 and raising piston 167 in dash-pot 166 and distending spring 155. Due to the path of travel of pin 162, it slides upward in slot 174 in member 164, but never becomes disengaged therefrom. Whenever retaining pawl 151 is released, either by the use of an error key 140 or by the operation of printing an item, the detention of finger pieces 41 is discontinued and the tension of spring 155 pulling on arm 168 causes member 164 to pull on pin 162 so as to rotate its respective sector 40 backward on shaft 39, and thus to return its respective finger piece 41 to its initial position, the jar of such return being mitigated by dash-pot 166 and cushion 157.

Since the items are printed from the typefaces borne by sectors 40, and as each sector 40 moves synchronously with its respective finger piece 41, each finger piece 41 must be retained in its depressed position until the item that it has been depressed to indicate has been printed, and such retention is performed by the retaining pawl 151. The mechanism for releasing pawl 151 after the performance of the item-printing operation is shown in Figs. 5 and 6 and is as follows: As operating bar 73 travels forward to actuate the item-printing mechanism, lug 175 borne by said bar 73 moves from underneath trigger 176, which is pivoted on shaft 152, thus allowing spring 177 to pull pawl 178 into engagement with ratchet 179, due to the movement of plate 180 out of contact with said pawl 178, said plate 180 extending from one side of the machine to the other and engaging all the pawls 178 and being supported by arms 181, one of which is integral with trigger 176. The engagement of said pawls 178, of which there is one for each ratchet 179, and one such ratchet 179 for each of the finger pieces 41, results in preventing further downward movement of the finger pieces after the movement of the printing handle 61 has been commenced for the performance of the item-printing operation. Further movement of plate 180 away from pawls 178 toward retaining pawls 151 disengages said pawls 151 from ratchets 150, such movement taking place after the printing operation, and being caused by the further travel of operating bar 73. During this movement of bar 73, a pin 182 thereon is caused to ride on the beveled surface 183 on trigger 176 Fig. 4, which rocks trigger 176 on shaft 152 and thus pulls arm 181 farther toward pawl 151. This release of ratchets 150 from the detention of their respective retaining pawls 151 allows finger pieces 41 to return to their normal position under the impulsion of their respective springs 155. Pin 184, borne by a pawl 185, which is pivoted on shaft 131, drops in front of pawl 151 when the latter is moved out of engagement with ratchet

150 by the pressure of plate 180 thereagainst, and said pin 184 remains between said pawl 151 and said ratchet 150 until the respective finger piece 41 controlled thereby has returned to its normal position. Then projection 186 on said finger pieces 41 strikes the arm 187 of pawl 185, and again raises pin 184 to the position of resting on top of pawl 151. When pin 184 moves in front of pawl 151, spring 188 pulls tooth 189 of pawl 185 into engagement with ratchet 190, for the purpose of preventing accidental or other depression, to any extent, of finger piece 41 after the printing operation has been completed and prior to complete return of the finger piece to its initial position. It should be understood that there are as many ratchets 190, pawls 185, and connected parts as there are finger pieces 41.

As the registration of "1" in the tens column is equivalent to "0" in the units column, and "1" in the tens column equals "10", it is obviously unnecessary labor on the part of the operator to pull zero in the units column every time he desires to register "10". *Mutatis mutandis*, the same remarks apply to "1" in either the hundreds, thousands, or any of the other columns. The zeros in each column add nothing to the total, and, the depression of a finger piece in any column higher than the units column being a perfect registration of its value, which is governed by which particular finger piece is depressed, it is immaterial for arithmetical purposes whether or not the finger pieces are pulled to print zeros. On the printed slip 4, however, it is desirable that the zeros shall appear in their appropriate places, as otherwise doubt might exist as to whether or not some other significant numeral had been omitted from either the registration or the printing. In order that the cipher or zero spaces in a printed list may be filled in with the appropriate sign, provision is made for automatically printing such ciphers or zeros wherever they should occur, said automatic cipher-printing device being connected with the operating bar 73, and thus being actuated by handle 61, which governs all printing operations. By means of this device, if the thousands finger piece has been pulled so as to register "9" in thousands, the printed "9" will be followed by three zeros automatically printed without the use of the hundreds, tens, or units finger pieces. Thus, great saving of time of the operator is effected. If, however, a number such as "9,189" has been registered by depressing the units finger piece to register "9", the tens finger piece to register "8", the hundreds finger piece to register "1", and the thousands finger piece to register "9", no cipher entering into the composition of the number "9,189", the automatic cipher-printing attachment has no function in such case, but the printing is performed in the ordinary manner from type-faces appearing on sectors 40. The operation of printing from type-faces 60 has been referred to above, and is more fully described in the above-mentioned Patent No. 929,317, and this description will not be repeated here. Suffice it to say that, when characters other than zero are to be printed, same are moved to the printing position by the individual movement of the finger pieces 41, so as to place any particular figure in printing position. When, however, zeros are to be printed, they are printed from said sectors 40, but said sectors are moved to such printing position automatically by means of the automatic cipher-printing device about to be described. Such automatic movement of the sectors 40 produces simultaneously an automatic movement of the attached finger pieces 41, since sectors 40 can not move without simultaneous movement of their respective finger pieces 41.

When handle 61 is depressed, operating bar 73 travels away from the operator, carrying with it a hook 191, Fig. 4, which is pivoted thereto at 192, the nose 223 of said hook immediately pulling on pin 193 fixed to arm 194, which is tightly mounted on shaft 195, said nose being held normally in engagement with said pin 193 by means of spring 191[a]. Shaft 195 is thus rocked, and, therewith, a pair of arms 196 which are fast on said shaft, each arm having pivoted to it at 197 a link 198, these links being connected to the ends of a transverse rod 199. In the machine, there are two arms 196 and a pair of links 198, each being located next to an arm 200, Fig. 6, mounted on shafts 101, 39, and 201, and in each of said arms is formed a slot 202, through both of which slots rod 199 passes. Said rod 199 is adapted to be pulled forward by the pair of links 198 when shaft 195 is rotated, the pair of slots 202 limiting this movement. As in the construction described and illustrated in the above-mentioned Patent No. 929,317, a rack bar 203 is provided for each sector 40, the segmental rack on each sector 40 engaging with the rack on its respective rack bar 203. When a finger piece 41 is depressed, the segmental rack on its attached sector 40 causes said rack bar 203 to travel away from the operator. Simultaneously, one of the ten type-faces 60 marked on said sector 40 will be turned to printing position, which one being dependent upon which finger indentation in finger piece 41 is used in moving said finger piece and its attached sector, as the limitation of movement thereof is gaged by the finger of the operator striking surface 204. When, however, a cipher is to be automatically printed, the appropriate type-face 60 upon

the appropriate sector 40 must be turned to printing position, and this is accomplished by rod 199 moving, as hereinbefore described as pulled by links 198, in the direction away from the operator and carrying with it the member 205, Fig. 8, there being one such member located between each pair of rack bars 203. Each rack bar contains a slot 206, into which enters from the lefthand side a projection 207, borne by the member 205, each of said projections extending so far beyond the slot 206, through which it passes and from which it protrudes, as partially to overlap the next projection 207. This overlapping of projections 207 results in each one to the right of any other moving in unison with the projection 207 that thus overlaps it. When a finger piece 41 has been moved and its sector 40 and coöperating rack bar 203 have, in consequence, also moved, bevel 208 in slot 206 will have ridden on projection 207 passing through said rack bar 203, so as to depress said projection 207, and all such projections for finger pieces to the right are simultaneously depressed, so that each one will be moved in front of shoulder 209. The depressed finger pieces, which are in this position when members 205 are moved rearward by the corresponding movement of rod 199, are thus caused to push on shoulders 209, with the result that each sector 40 governed by a depressed projection 207 will so move as to present its zero type-face in printing position. Spring 210, fastened to arm 211 of member 205 and, also, to rod 212 which extends between brackets 213 fixed to arm 200, tends to pull member 205 and rod 199 back to initial position as soon as the printing operation has been completed. Pin 59, Figs. 4 and 5, attached to the side casing, rides in cam slot 236 located in hook 191, and thereby causes hook 191 to rise as it nears the end of its forward thrust, thereby disengaging the nose 223 of hook 191 from pin 193 after arm 194 has been rocked by means of the engagement of said nose 223 with said pin 193. The action of said cam slot 236 as just described allows the return of hook 191 to its initial position when operating bar 73 returns home.

In order that each sector 40 may be moved exactly the right distance by the automatic cipher-printing mechanism to present its zero type-face in precisely the right printing position, the teeth on ratchet 179 are predeterminedly and accurately spaced apart, so that pawl 178 will come into contact with tooth 214, Fig. 5, when the depression of sector 40 has so rotated gear 148, loosely mounted on shaft 149, as to have caused ratchet 179, fixed to the hub of said gear to rotate to the extent that the non-serrated space 215 thereon has passed by the tooth of pawl 178, plate 180 having in the meantime been moved, as hereinbefore described, away from engagement with pawl 178, thus allowing spring 177 to draw pawl 178 into the path of travel of tooth 214. When pawl 178 thus engages tooth 214, further movement of the particular sector 40 in engagement with gear 148 is prevented. As hereinbefore described, the rotation of ratchet 179 so as to cause said tooth 214 to engage pawl 178 is produced by depression of the handle 61. It is to be understood that each finger piece 41 is associated with a gear 148 that engages its internal rack 147, and, furthermore, that each gear 148 is associated with a ratchet 179, all of said gears 148 and ratchets 179 being loosely mounted upon shaft 149. Since said movement of the finger pieces 41 for the purpose of automatically printing zeros from sectors 40 is automatically performed upon actuation of handle 61, such means, as, for instance, pawl 178 is a necessary adjunct to limit the travel of said sectors to the distance merely sufficient to place the first type-face thereon, namely, the zero type-face, in printing position.

When, for any reason, it may be undesirable or, at least, not desired thus automatically to print the zeros, key 216 Figs. 1, 4 and 5 is raised in slot 217 in the casing 1 and pulled out so that the casing wall will fit into the notch 218 instead of in the notch 219, which latter is the position in which key 216 is stationed when the automatic cipher-printing parts are intended to operate. Key 216 is pivoted at 220 to plate 221, Fig. 5, loosely mounted on shaft 152, the lip 222 of plate 221 engaging hook 191 when the automatic cipher-printing mechanism is in operative position. When key 216 is drawn out, it rocks plate 221 on shaft 152 and thereby raises hook 191. The raising of said hook 191 causes lug 223 on the lower part of same to ride over pin 193 when operating bar 73 travels away from the operator upon being actuated by handle 61. It will be observed that that part of hook 191 that rests on lip 222 is beveled, so as to ride upon same when returning to the position shown in Fig. 5.

In order to insure a full stroke of the operating bar 73 in each direction, a rack 224 and another rack 225 Figs. 4 and 5 are located thereon adapted to be engaged thereon by a compound pawl 226 having three arms, said pawl being pivoted at 227 to the side of casing 1. When operating bar 73 is traveling away from the operator, one tooth of said pawl 226 engages rack 224 on said bar, while the detent arm 228 of said pawl 226 rests in the position shown in Fig. 4 in engagement with one side of nose 229 on stop 230. When operating bar 73 has trav-

eled the full distance forward, the beveled projection 231 on said bar engages shoulder 232 on pawl 226, and trips the tooth out of engagement with rack 224, throwing the other tooth of said pawl 226 into engagement with rack 225, over which same rides, until operating bar 73 has completely returned to its initial position, at which time projection 231 engages shoulder 233 and rocks pawl 226 to the position shown in Fig. 4. While said tooth is in engagement with rack 225, the detent 228 is held by the other beveled surface of nose 229 on stop 230, which is pivoted at 234 to the side of casing 1, and pulled by spring 235. The alternate engagement of pawl 226 with, respectively, racks 224 and 225 makes it impossible for operating bar 73 to return to its initial position before it has made a full forward stroke, as during such stroke it is held from return by the engagement of pawl 226 with rack 224, which pawl is not tripped out of such engagement until projection 231 rides on shoulder 232, said projection and shoulder being so located as to produce this operation at the completion of the full forward stroke, while the other tooth of pawl 226, by its engagement with rack 225, similarly prevents said operating bar 73 from traveling forward until it has made a complete return to the initial position, for the reason that projection 231 does not engage shoulder 233 and thus trip pawl 226 out of engagement with rack 225 until operating bar 73 has fully returned to the said initial position.

The ribbon 237 is preferably wound on spools 238 and 239 Fig. 3 and passes over ribbon guides 240 and 241, one of which is fastened to one of the sides of the casing 1 and the other to stationary arm 200. One end of said ribbon 237 is attached to one of said spools and the other end of said ribbon is attached to the other of said spools, and same feeds alternately from one spool to the other, and its direction of travel is automatically reversed. In its travel, it passes horizontally adjacent to the type-faces 60 of all the sectors 40 and the type-faces 128 of all the accumulator wheels 130, its greatest width being presented toward said type-faces. Said ribbon may be of any color or be bichrome or polychrome. When a bichrome ribbon is used, the items will be printed from the type-faces 60 in one color and the totals will be printed from type-faces 128 in the other color. The clearing key 242 is indirectly connected with a type-face 243, which is arranged to print some sign that the machine has been cleared, as, for instance, the abbreviation "Cl.", and, in order that said type-face 243 may print, the ribbon 237 passes adjacent to same as well as adjacent to the group of type-faces 60 and the other group of type-faces 128. The feeding of the ribbon is preferably intermittent in character rather than continuous, and each movement of the ribbon is preferably timed to occur immediately after a printing operation has been performed, the twofold object of this arrangement being that a fresh part of the ribbon may be presented for the next printing operation and that the ribbon shall not be moving while the printing operation is taking place, as movement at that time would produce a blurred type impression.

The travel of the ribbon 237 is produced by the rotation of the spool upon which same is being wound, which is alternately spool 238 and spool 239. Each of said spools is provided at one end thereof with actuating devices adapted to rotate same, said actuating devices on each spool operating only at the time when the ribbon is being wound upon the particular spool, during which time said actuating devices on the other spool are inoperative. This results in alternately rendering each of said spools a puller and a follower. The time of actuation of either spool as a puller for the ribbon is when the operating bar 73 has traveled so far forward in its forward or operating stroke that pin 244, fixed to operating bar 73, has ridden nearly to the mouth of inclined notch 245 in arm 246 fixed to shaft 141, which will be at the time when operating bar 73 has reached nearly the limit of its forward thrust. Shaft 141 extends from one side of the casing to the other, and rocks with and by means of arm 246. Shaft 141 thus rocks arm 247, Fig. 7, which is, also, fixed thereto at the other end thereof. Arm 247 is pivoted at 248 to link 249, which is pivoted at 250 to bar 251, which contains slots 252 and 253, in which pins 254 and 255 ride, said pins 254 and 255 projecting from the adjacent side of the casing 1. Said pins serve as supports for bar 251 and, also, as guides therefor, and, furthermore, by reason of their location in slots 252 and 253, limit the travel of bar 251. Each spool 238 and 239 is provided with a ratchet 256, Fig. 9, which is engaged by a pawl 257, said pawls being pivoted at 258 to bar 251, and each being provided with a heel 259, which rides on the upper surface 260 of the arm of U-shaped plate 261, Figs. 9 and 20, that is located on its side of the bar 251, said U-shaped plate 261 extending underneath the bottom of bar 251 and upwardly on each side thereof. Each surface or edge 260 of plate 261 is beveled at 262, with which, for automatic reversing purposes, as hereinafter described, the heels 259 of pawls 257 engage. The feed of the ribbon 237 in one direction is caused by the engagement with a ratchet 256 of either pawl 257, one of which engages one ratchet 256 and the other pawl 257 the other ratchet 256. While one pawl 257 is engaged with the

ratchet 256 adjacent to same, the other pawl 257 is held out of engagement with its ratchet 256 by its heel 259 resting upon the high part of the surface 260 of its side of the U-shaped plate 261. When the forward motion of the operating bar 73 causes shaft 141 to rock and, through the intermediation of arm 247 and link 249, causes bar 251 to move it forward, carrying with it both pawls 257, but particularly that one which is in engagement with one of the ratchets 256, the tooth 263 of said engaging pawl 257 rides loosely over the teeth of its ratchet 256 until the limit of forward travel of bar 251 has been reached (said ratchet 256, while tooth 263 is riding loosely thereover, being held from reverse rotation by retaining pawl 264), and, when said bar 251 begins automatically to return to its initial position, by reason of the action of spring 98 on operating bar 73, the tooth 253 of the engaging pawl 257 bites in one of the notches of its ratchet 256 and rotates same forward as many notches as said tooth has slipped over while bar 251 was traveling forward, the number of notches and consequent degree of rotation of said ratchet 256 and consequently the amount of ribbon fed forward being a matter of adjustment. A pair of retaining pawls 264 is provided, one such pawl being adapted to engage one ratchet 256 and the other of said pawls 264 being arranged to engage the other ratchet 256. Each of said pawls is formed on an arm 265 of a bell crank pivoted at 266 to a division plate 267, which is supported by shafts 268 and 269 which run from one side of the casing to the other, the other arm 270 of said bell crank resting upon the heel 259 of its pawl 257, said heel being bent out of alinement with its pawl, so as to be adapted to be engaged by the extremity of said arm 270. It is to be understood that both pawls 264 are constructed and arranged in like manner, but that one is arranged relative to the ratchet 256 on spool 238 and the other relative to ratchet 256 on spool 239. Springs 271 are fastened to plate 272, borne by bar 251, and rest, respectively, upon the ends of pawls 257 and press same into engagement with the upper surface 260 of U-shaped plate 261, so as to cause the ends of said pawls 257 to engage at all times said surface 260 and to rise thereon alternately on the low and high part of said surface 260.

When most of the ribbon has fed from one of the spools to the other, plate 261 is caused automatically to move relative to bar 251 through the agency of one arm 273 of a bell crank whose other arm 274 is formed as a spring, said bell crank being pivoted at 275 to the division plate 267. The extremity of said arm 273 is arranged to push against a projection 276 on U-shaped plate 261, to effect the movement of plate 251 in one direction, its movement in the opposite direction being effected by the pulling engagement of hook 277 on the extremity of arm 278 with projection 280 on U-shaped plate 261. In this forward or backward movement of said plate 261, same is held by pins 281, projecting through slots 282 in bar 251, said pins 281 passing through holes in the arms of U-shaped plate 261. Until actuated by arm 273, U-shaped plate 261 is held in the position indicated in Fig. 9 by means of the detent spring 283, same fitting into notch 284 in bar 251, said spring being attached to the U-shaped plate 261. When said detent spring 283 rests in notch 285 in bar 251, said U-shaped plate 261 is similarly held until actuated by arm 278. Arms 273 and 278 are, respectively, caused to move into engagement with projections 276 and 280 by being rocked downwardly on pivot 275 by the pull of springs 286 on the projections 287, which are provided, respectively, on said arms 273 and 278, such movement of arms 273 and 278 being possible alternately when so much of the ribbon 237 has fed off of spool 238 that spring arm 274 has reached a position adjacent to the axis 288 of spool 238 or when spring arm 279 has closely approached the axis of spool 239 by reason of most of the ribbon having been fed off said spool 239. Simultaneously with the depression of either arm 273 or arm 278 into position for engagement with, respectively, either projection 276 or projection 280, the respective spring 286 will pull its retaining pawl 264 into operative position relative to the ratchet 256 upon spool 238 when arm 273 is depressed, or upon spool 239 when arm 278 is depressed. It will be observed that the actuation of U-shaped plate 261 forward is thus automatically caused by the roll of ribbon 237 becoming low upon the axis of spool 238, and that the actuation of said plate 261 toward the rear of the machine is caused by the same condition upon spool 239, the automatic reversal in direction of the travel of the ribbon 237 being produced alternately by the approach of spring arm 274 or spring arm 279 toward the axis, respectively, of spools 238 and 239, due to the ribbon 237 having fed thereoff. Guide rod 289 is so located as to direct the course of travel of ribbon 237 adjacent to spools 238 and 239. When, for any reason, it is desirable to render the ribbon feed inoperative, as, for instance, for the purpose of cleaning or repairing the parts, pressure applied to arm 290 will disengage latch 291 from shaft 268, thus enabling the rocking of division plate 267 on shaft 269. Latch 291 thus forms a clamp for said division plate, said latch being pivoted at 292 to the division plate 267, and being held normally in engagement with shaft 268 by means of spring 292a.

The accumulator is actuated by the racks 293 on rack bars 203, there being one such rack bar for each sector 40 and finger piece 41. The rear end of each bar 203 rides in a notch in plate 294, which extends from one side of the accumulator casing 295 Fig. 15 to the other. The teeth of each rack 293 are so arranged that when the bars 203 move away from the operator they ride without engagement past the teeth of the accumulator ratchets 296, but when rack bars 203 are returning toward the initial position same are raised by mechanism about to be described, so that during such return movement racks 293 will engage with ratchets 296 and thus actuate the accumulator wheels 130 and thus produce the usual accumulator results. Such actuation of the ratchets 296 by the racks 293 causes the rotation of the accumulator wheels 130, which are loosely mounted on shaft 297. Each of the ten ratchets 296 is fastened to a wheel 130, of which there are ten, as is, also, each of the ten rings 298. Each of said rings is provided with a projection 299 protruding into the path of rotation of a tooth upon comb 300 when said comb is moved out of groove 301 by the depression of the clearing key 242. When clearing key 242 is depressed, it actuates intermediate parts which raise comb 300 into space 302, so that projections 299 will be in the path of travel of the teeth of comb 300 when the same is rotated with shaft 297, which occurs after clearing key 242 has been depressed and handle 61, also, has been depressed. The raising of said comb and rotation of shaft 297 will be presently described. The raising of the racks 293, as hereinabove indicated, into engagement with their respective ratchets 296 is produced by the raising of the jack 303, which in rising presses against the underside of the rack bar 203. When rack bar 203 is moved forward, it impinges against jack 303, which, by means of its pair of arms 304, is pivoted to rod 305, said arms being on the outside of the accumulator casing, each side of which is provided with the slot 306 to allow for the connection of the arms 304 with jack 303 and thus to accommodate the movement of said jack.

The rod 305 passes through slots 307 in the sides of the accumulator casing and rests at about its center in the fork 308 Fig. 8 at the end of arm 309, said rod being adapted freely to rotate therein and in the slots 307 in the sides of the accumulator casing. Such rotation extends through only an arc of a circle and takes place at the time when a rack bar 203, or a plurality of said rack bars, impinges against jack 303, producing such movement of same out of the path of travel of the rack bars as will allow said rack bars in their continued forward movement to ride over the jack 303. The jack arms 304 are loosely attached to rod 305, and said rod is rigidly attached, also, to bell crank 310, which is pivoted at 311 to one side of the accumulator casing 295, being located preferably on the outside of accumulator casing 295 and preferably on the side adjacent to operating bar 73. When the jack 303 is moved backward from the position shown in Fig. 8, the lower extremity 312 Fig. 15 of one of the jack arms 304 moves forward into engagement with projection 313 on trigger 314, pivoted at 315 to one side of the accumulator casing 295, and releases projection 316 on said trigger from engagement with the corner 317 of bell crank 310. This release allows spring 318 to pull upon projection 319 on one arm 304, thus tending to rotate arms 304 on rod 305 while simultaneously tending to rotate trigger 314 on its pivot 315 so as to cause projection 313 to engage the end 312 of one arm 304, and likewise tending to move projection 316 into position for reëngagement with the corner 317 of the bell crank 310. Such reëngagement is, however, impossible until the jack 303 has been raised, it having been lowered by the pull of spring 318. When jack 303 falls, as just described, the pull of spring 318 also causes bell crank 310 to rock so as to cause corner 317, or its lower end, to rest upon projection 313, thus limiting its travel and the fall of the jack 303. When the bell crank 310 thus rocks, the notch 320 therein Fig. 15 seats over the adjacent flanged end 321 of arm 322, which is on the outside of but next to the accumulator casing 295 and rigidly fixed to shaft 323, which shaft extends through both sides of the accumulator casing 295 to the right-hand side of casing 1. The engagement of flange 321 in notch 320 prevents the raising of the jack 303 until the operating bar 73 moves forward. In order to raise the jack 303 so as to elevate such of the rack bars 203 as have been pushed into the accumulator by the depression of certain finger pieces 41 and consequent actuation of certain sectors 40, in order that the racks 293 on such rack bars 203 may be in line to engage their respective ratchets 296 and thus to rotate their respective accumulator wheels 130, the handle 61 must be depressed, by which movement not only said jack 303 is raised, but, also, the printing of the item will be accomplished slightly after the jack is raised. When handle 61 is depressed by the operator, operating bar 73, as hereinbefore described, travels away from the operator in the direction heretofore designated forward. A plate or projection 324, Figs. 4 and 5, carried by the operating bar 73, normally engages foot 325 on bell crank 326, pivoted at 327 to arm 328, which is loosely mounted on shaft 269. A lug 329 on bell crank 326 is slotted at 330, so as to receive pin 331,

which projects thereinto from arm 328, to which same is fixed. Said pin 331 which also passes through a similar slot in an arm 334 fixed to shaft 335, limits the downward movement of the long arm of the bell crank 326 under the impulsion of spring 332. Thus, the normal contact is preserved between foot 325 and projection 324, so that, when operating bar 73 travels forward, its pressure on foot 325 rocks arm 328 on shaft 269, which results in pin 331, causing arm 334 to rock toward the rear of the machine, thus rotating shaft 335, which extends from the righthand side of the casing 1 through the accumulator and to the opposite side of the accumulator casing 295. To shaft 335 is, also, fixed arm 336 Figs. 15 and 19, which, by said rotation of said shaft 335, is caused to move toward the rear of the machine, thus pulling spring 337, which is adjustably fastened thereto and, also, adjustably fastened to an arm of bell crank 310, rotation of said shaft 335 thus rocking bell crank 310 so as to raise notch 320 off flange 321 of arm 322 and, also, to raise corner 317 off projection 313 and cause same again to rest upon projection 316 in the manner shown in Fig. 15, by which movement, the jack 303 is, also, raised to its normal position. The flange 321 on arm 322 is arranged to ride upon cam surface 338 on bell crank 310, being impelled to such movement by spring 339 fastened thereto at 340 and at 341 to the accumulator casing 295. Said action of the cam surface 338 insures the raising of corner 317 to the full height necessary to seat upon the projection 316. Simultaneously with the rocking of arm 336 toward the rear of the machine and the consequent release of flange 321 from notch 320, pin 342, which is carried by operating bar 73, is moved away from arm 343, which allows said arm to rotate with shaft 323, to which both it and arm 322 are fixed, when arm 322 is pulled toward the rear by spring 339. The return of operating bar 73 to its initial position results in pin 342 pushing upon arm 343 and thus returning arm 322 to the position where it is ready to fit into notch 320 on the next occasion when bell crank 310 drops. Extension 344 of arm 345 fixed to shaft 346 limits movement of trigger 314.

As hereinbefore stated, the return to initial position of each rack bar 203 occurs at a time when the jack 303 has been raised to such height that it will cause each rack 293 upon such rack bars 203 as have been pushed into the accumulator to engage its respective ratchet 296 and during its forward movement toward initial position to rotate its ratchet 296. The degree of rotation of each ratchet 296 depends upon how far its rack bar 203 has entered the accumulator and, therefore, how much of its respective rack 293 travels in engagement with said ratchet 296. If, for instance, the finger has been placed in the finger indentation for "2" in any column, the connected rack bar 203 will have entered the accumulator to the extent only of two notches, and in the return movement of said rack bar 203 its rack 293 will have an opportunity to engage only two teeth of its ratchet 296, thus giving to said ratchet 296 a relatively small rotation, and moving the "2" on its connected accumulator wheel 130 to printing position for totals. Similar use of finger indentation for "9" will result in imparting to the respective connected ratchet 296 and companion accumulator wheel movement through the furthest amount of rotation possible at any one operation, resulting in presenting the "9" on the companion accumulator wheel to the printing position for totals. The accumulator wheels 130 are arranged in series so as to have the arithmetical value of units, tens, hundreds, thousands, and so on, and each of said wheels bears ten type-faces 128, as hereinbefore set forth. The accumulator wheels 130 are so arranged relative to connected parts that the carry-over hereinafter to be described occurs after each accumulator wheel has traveled the full distance from "1" to "9" and before same turns the zero into printing position.

In Fig. 8, the ordinary or initial position of type wheels 130 is indicated with the zero-printing surface 128 in the printing position and with cam 347 just past tripping engagement with projection 348 on slidable member 349, held by rods 350 which run from one side of the accumulator casing 295 to the other. When an accumulator wheel 130 is rotated from "0" to "8," inclusive, cam 347 is out of engagement with projection 348, but during the movement of an accumulator wheel 130 to place "9" in the printing position, cam 347 rides in contact with projection 348 so as to move same longitudinally forward, the extreme forward movement of projection 348 being not reached, however, until the highest part of cam 347 is in engagement therewith, which is at the time when the "9" type-face of the accumulator wheel is moving past printing position. At this time projection 351 Fig. 13 has moved out of engagement with nose 352 of bar 353, slidable member 349 instantly returning to its initial position under the impulsion of spring 354 as soon as cam 347 has passed projection 348. Slidable member 349 is held in its forward position so long as cam 347 engages projection 348, and said slidable member 349 is likewise held from returning to its initial position by the engagement of shoulder 355 with projection 356, carried by member 349, said shoulder 355 being located on bar 357,

which bar, at one end, carries the notch 358 as a seat for projection 356. The forward movement of slidable member 349 is gradual, being dependent upon cam 347, and said forward movement gradually moves projection 351 on member 349 so as to detach same from engagement with nose 352 at the time when the "9" type-face on an accumulator wheel has passed printing position. The disengagement of projection 351 from nose 352 allows bar 353 to drop under impulsion of spring 359, fastened to the accumulator casing 295. Said movement of bar 353 carries shoulder 355 behind projection 356, and thus assists in holding slidable member 349 in its extreme forward position. When bar 353 drops, it carries with it nose 352 into position in front of a shoulder 360 borne by latch 361, which indirectly governs the carry-over pawl 362. This pawl is mounted on rod 363 that extends across the top of the accumulator from one side thereof to the other, and is journaled in a pair of arms 364, Figs. 15 and 19, loosely mounted on shaft 335, said pawl being normally held out of engagement with ratchet 296 by a projection 365 on plate 366. Said plate has a notch 367 therein in which a shoulder 368 on latch 361 normally seats under the impulsion of springs 369 Fig. 8. The descent of bar 353, as hereinbefore mentioned, carries nose 352 in front of projection 360 on latch 361. The spring 370, mounted on crosspiece 371 that extends from one side of the accumulator casing to the other, normally presses upon carry-over pawl 362 and with it plate 366, so as to cause notch 367 to press upon shoulder 368. When nose 352 moves toward the rear, as hereinafter described, it pushes upon projection 360 on latch 361 and causes shoulder 368 to move out of notch 367, and, as carry-over pawl 362 normally rests on projection 365, and is itself pressed downward by the spring 370, the plate 366, which bears projection 365, is naturally caused to drop when disengagement of shoulder 368 and notch 367 is effected, the order of movement of bars 357 and 353 and latch 361 and plate 366 being the order in which same have just been named.

Bars 357 and 353 and the plate 366 are slotted at 372 Fig. 8 to receive rods 373, 374, and 375, respectively, which extend from one side to the other of the accumulator casing. Spring 376 assists the descent of bar 357 when the shoulder 355 is released from projection 356. When bars 357 and 353 have descended and latch 361 has rocked and plate 366 has descended, carry-over pawl 362 is in engagement with the teeth on ratchet 296 so as to be adapted to rotate same and the connected accumulator wheel 130 clockwise when impelled thereto by the rocking of rod 363 by arms 364, which are actuated by the arms 336 mounted on shaft 335. In order to assist in guiding member 349 in its travel, same is slotted at 377 Fig. 13, a projection 378 borne by latch 361 fitting therein. Bar 357 is slotted at 379 to receive a projection 380 borne by latch 361, which assists in guiding bar 357 in its travel, same riding in its lower portion on rod 373. Bar 353 in its lower portion rides on rod 374, which passes through slot 372, and in its upper portion on rod 381, which passes through slot 382 in the upper part of bar 353 and from one side of the accumulator casing to the other, said rod 381 passing, also, through slot 383 in the detent pawl 384. The detent pawl 384 is kept in engagement with ratchet 296 by means of spring 354, which is fastened to said pawl and, also, to slidable member 349. In addition to slot 383 in detent pawl 384, same is provided with slots 385 and 387 through which rods 386 and 388 pass, said rods extending from one side to the other of the accumulator casing, and serving to guide and support detent pawl 384, which pawl 384 is adapted to move forward and backward as it rides over the teeth of ratchet 296 when same is rotated clockwise, the engagement of said pawl 384 with ratchet 296 preventing same from spinning. Slot 383 in detent pawl 384 merely allows rod 381 to move therein when bar 353 is rocked. Rods 350, which guide slidable member 349, pass through slots 389 therein and, also, through slot 366ª in plate 366. A plate 390, Fig. 8, which contains slots for the passage of bars 357 and 353, plate 366 and latch 361, extends from one side to the other of the accumulator casing, being fastened thereto. A jack 391, having thereon a plurality of hammers 392, is adapted to return plate 366 and bars 357 and 353 to their elevated positions after the carry-over pawl 362 has moved toward ratchet 296 of accumulator wheel 130. Said jack 391 is raised to replace bars 357 and 353 and plate 366 by shaft 393, which extends from the lefthand side of the accumulator casing 295 to the righthand side of casing 1, and to which said jack 391 is fixed, so as to rotate therewith. Said shaft 393 is rocked so as to raise jack 391 by means of beveled projection 394 Figs. 4 and 5, borne by the rear end of the operating bar 73, which engages a beveled surface 395 on member 396, which is loosely mounted on shaft 393 and side by side with a similar member 397 tightly mounted on shaft 393, the end 398 of member 397 engaging beveled surface 395 by means of spring 399. The members 396 and 397 extend beneath shaft 268, and are notched at 401, to allow said shaft to enter said notches when said members are moved toward same. A spring 402, which is attached to member 397 and, also, to an adjacent side of casing 1, holds said member in

position to cause corner 403 of notch 401 to rest against shaft 268, whereby the end 398 of member 397 holds beveled surface 395 on member 396 in the path of travel of beveled projection 394 on operating bar 73. When the operating bar 73 is moved forwardly, the beveled projection 394 engages and raises beveled surface 395, with the result that member 397 rocks shaft 393 in the direction to cause jack 391 to raise bars 357 and 353 and plate 366 to their normal positions. Before the bar 73 reaches the end of its forward travel, beveled projection 394 rides out of engagement with beveled surface 395 and allows spring 402 to return members 396 and 397 to their normal positions, thereby causing shaft 393 to lower jack 391 from engagement with bars 357 and 353 and plate 366. As the operating bar 73 returns to its initial position, the beveled projection 394 engages and rides past beveled surface 395 and causes the member 396 to rock upon shaft 393 without rocking said shaft.

Counting from the righthand side of the machine, certain members are arranged in the following order: In one vertical plane, slidable member 349 and detent pawl 384; bar 357; and bar 353, latch 361, and plate 366, in alinement with each other. No carry-over pawl 362 nor projection 348 is necessary for the first or units accumulator wheel, and, consequently, same are omitted. One of each is provided for each of the other accumulator wheels 130. In the order above mentioned, a division plate 404 Figs. 13 and 14 is located next to the bar 353, plate 366, and latch 361, said division plate extending forward between the units accumulator wheel and the ratchet 296 for the second or tens accumulator wheel. The projection 348 on the second slidable member 349 extends through a slot 405 in the first division plate 404. One such division plate is located between each pair of accumulator wheels 130, and all said division plates 404 are supported by the rods 350, 388, 406, and 407, which extend from one side of the accumulator casing 295 to the other.

The group of parts, hereinbefore described, by means of which an accumulator wheel 130 actuates the carry-over pawl 362 to engage and rotate the ratchet 296 for the next higher accumulator wheel 130 is provided for each accumulator wheel. Likewise, a plurality of levers 408 is mounted on rod 409, which extends from one end division plate 404 to the other end division plate, there being one such lever 408 for each carry-over pawl 362 except the carry-over pawl for the units wheel. Said lever 408 for each carry-over pawl 362 provided with same when set will prevent the carrying over to the next accumulator wheel in series, and thus the machine may, when for any reason desired, be divided into groups of adding mechanisms adapted to handle relatively small numbers. This may be further explained by saying that the machine depicted in the drawings for purposes of illustration is shown as adapted to add cents and up to "9,999,999", or, if same is to be used for other purposes than adding money reckoned with two decimal places, it may be said to be arranged to add to the *finale* of hundreds of millions, *i. e.*, up to "999,999,999". If a country bank or other user found it unnecessary to utilize the machine for additions in such large numbers, however, but desired the equivalent of several adding machines for the purpose of making calculations relating to different subjects-matter, such user is enabled, by use of the levers 408, to divide the accumulator mechanism in such manner as to have in effect a plurality of adding machines, each one being adapted to make additions only up to such limit as such user predetermines. This division of the machine is accomplished by the selection and setting of such particular lever 408 or plurality of same as will divide the machine in the manner desired. Thus, in the illustrative machine depicted in the drawings, the user may, by setting the first lever 408, which is located between the tens and units accumulator wheels, prevent the carrying over of an amount above "99". By not setting said lever, but setting the next one to the left, namely, the one between the hundreds and thousands column, he may prevent the carrying over of a total higher than "999". By setting the second lever 408 so as to produce this result, he will have in effect one adding machine adapted to add to "999" and another adding machine adapted to add to "999,999". It is obvious that many variations of such arrangements may be made. The levers 408 enter the accumulator through slots 410 Fig. 2 in the main casing 1 of the machine. Each lever 408 is provided with a projection 411, which fits into the curved slot 412 in a division plate 404, and, when it is desired to keep a particular carry-over pawl 362 from carrying over, the particular lever 408 is pulled toward the operator, which causes projection 411 to enter notch 413 in plate 366, which will prevent the latter descending when shoulder 368 is pulled out of engagement with notch 367 when the remaining parts of the carry-over mechanism are actuated by cam 347. A rod 414 is provided as a rest for the levers 408 when same are in position not to render their respective carry-over pawls 362 inoperative, said rod 414 extending from one end division plate 404 to the other.

From the foregoing description, it will be observed that the function of cam 347 is to set up various parts ready to actuate

carry-over pawl 362, but the actual movement of the carry-over pawl 362 for the purpose of carrying over the total from one wheel 130 to the next accumulator wheel is produced by the depression of handle 61, when said handle causes operating bar 73 to move forward, as hereinbefore described, which movement of operating bar 73 rocks shaft 335, as hereinbefore set forth. The movement of carry-over pawl 362 for the purpose of carrying the total to the next accumulator wheel, as just mentioned, is produced by said rocking of shaft 335 through the instrumentality of arm 336, which, when rocked forward, draws with it hook 415 Figs. 15 and 19 containing notch 416, which engages with projection 417 carried by plate 418 loosely mounted on pivot 311. The arm 336 is located near each side of the accumulator casing 295. One plate 418 is located at one side of the accumulator casing 295, and another plate 418 is located at the opposite side of the accumulator, being fastened to pivot 419 in bell crank 420, which is the same in construction and function as bell crank 310 heretofore described. Rod 381 is supported and moved by plates 418, the movement of rod 381 being limited by slot 421 in casing 295. When hook 415 pulls projection 417 (there being one such projection on each plate 418, and there being a pair of hooks 415), rod 381 travels forward in slot 421 and rocks bar 353 on rod 374, which operation, relative to accumulator wheels 130 that have been rotated past "9", will find nose 352 ready to push on shoulder 360, the movement of rod 381 and consequent rocking of bar 353 thus pushing the shoulder 368 out of notch 367, inasmuch as shoulder 360 is borne by latch 361. Spring 422 holds notches 416 in engagement with projections 417 until the forward movement of rod 381 has caused the forward beveled part 423 of each hook 415 to ride on pins 424 extending from the casing 295 of the accumulator. This has the effect of raising hooks 415 and thereby releasing notches 416 from engagement with projections 417 and allows rod 381, under impulsion of spring 425, to return to its initial position, while the further rotation of shaft 335 by operating bar 73 results in projection 426 on arm 336 engaging arm 364, to which the carry-over pawls 362 are pivoted at 363, pulling said pawls 362 forward and rotating each accumulator wheel thus engaged by a carry-over pawl 362 one notch.

The movements hereinbefore described result from the movement forward to a certain degree of operating bar 73, but after said movements have occurred the operating bar 73 continues to travel forward, thereby causing beveled projection 394, Figs. 4 and 5, to engage the beveled surface 395 on member 396, and thus to rock shaft 393, which causes jack 391 to rise, thus bringing its hammers 392 into engagement with the foot of plate 366, the foot of bar 357, and the foot of bar 353, thereby raising plate 366 and bars 357 and 353 to their initial positions. Prior to the lifting of jack 391, as just described, however, said forward movement of operating bar 73 has caused plate 324 to move out of engagement with foot 325, which allows spring 427, Fig. 6, fastened to one of the arms 428 of a bell crank rigidly attached to shaft 335, to rotate shaft 335 to its initial position, said return rotation of shaft 335 being stopped by the engagement of the other arm 429 of said bell crank with part of one of the pair of triangular frames 430, or other suitable stop. Said return of shaft 335 to its initial position rocks arms 336 to their initial positions, and, by means of projections 431, Figs. 15 and 19, on arms 336, which engage arms 364, also returns the carry-over pawls 362 to their initial positions. Said rocking of arms 336 also allows the return of hook 415 to its initial position in engagement with projection 417. Spring 337 is attached at one end to pin 452 that projects from an arm of bell crank 310 and at the other end to pin 453 borne by arm 336, and tends to rotate arm 336 toward bell crank 310, but this movement is limited by means of a link 454, one end of said link being grooved to receive pin 452 and the other end of said link being notched to receive pin 453. Thereupon, as heretofore described, jack 391 raises bars 353 and 357 and plate 366 to their initial positions, the eight plates 366 being held in their upward or initial positions by the engagement of shoulders 368 with their respective notches 367. There are nine bars 357, and, when same have been raised by jack 391 to their initial positions, projection 356 is at a position ready to reënter notch 358, which holds bars 357 in their upward positions. There are nine bars 353, and, when same have been raised to their upward or initial positions, projection 351 is at a position ready to return underneath nose 352, whereby said bars 353 are held in their elevated or initial positions. The synchronism of movement of projection 356 relative to notch 358 and of projection 351 relative to nose 352 is produced by the riding of projection 348 on cam 347, said projection 348, as hereinbefore fully described, being borne by slidable member 349, the return movement of which—forward—is produced by spring 354. With these various parts in their initial positions and properly locked therein, the return movement of operating bar 73 commences, immediately allowing jack 391 to drop under the impulsion of spring 402, as hereinbefore described.

The total key 199 is locked, so as to prevent the printing of a total before the last

item has been included in the total, said locking taking place as follows. When a rack bar 203 is, by the pulling of a finger piece 41, caused to travel forward, it engages jack 303, as hereinbefore described, causing said jack 303 to drop. When jack 303 drops, the rod 305 pushes downwardly in fork 308, thus pushing arm 309 downwardly and rocking arm 432 Fig. 8 fixed on shaft 433. Also fixed to said shaft is arm 434, which is pivoted at 435 to link 436, which, at its upper end, is pivoted at 437 to link 137. When arm 432 is rotated downwardly, arm 434 is rotated upwardly and pushes link 436 and thereby link 137 upwardly, thereby causing projection 438 Fig. 5 borne by link 137 to rise into notch 439 behind hook 440 borne by one of the triangular frames 430. When said projection 438 is thus seated in notch 439 behind hook 440, projection 441 passes underneath projection 438, so as to hold same in said notch 439. said projection 441 being actuated to assume said holding position by the member 442 loosely mounted on shaft 201 and normally pulled by spring 443 into engagement with the side of projection 438 and thus passing under same as soon as projection 438 is raised out of the way. One end of projection 441 is at all times within slot 444 in operating bar 73, and, when operating bar 73 begins to travel forward upon actuation by depression of the handle 61, the sides of said slot 444 engage projection 441 and push same from underneath projection 438, and thus unlock the total key 129, without the depression of which no total can be printed. While projection 438 is in engagement with hook 440, link 137 can not be pulled toward the operator by pressure upon the total key 129, but forward movement of operating bar 73, as just mentioned, pushes projection 441 from beneath projection 438, thus unlocking same from engagement with hook 440, thereby rendering link 137 free to move toward the operator when the total key 129 is pushed inwardly. As heretofore described, link 137 governs the movement of the platen 6 toward either the total type or the item type, directing same toward the total type when the total key 129 is depressed.

The separate operations of pulling down finger pieces 41 and consequent actuation by means of sectors 40 of rack bars 203 and the subsequent actuation of the accumulator wheels 130 by the return movement of said rack bars after the printing operation results in the gradual and more or less steady and rapid, and it may happen, rotation of each such accumulator wheel, with the result that each accumulator wheel occupies an idiosyncratic position as to degree of rotation between its initial zero and its terminal "9." Thus, at any moment, the units accumulator wheel may have rotated as far as "7" by, for example, three actuations. Similarly, the tens accumulator wheel may have rotated as far as "9" by two actuations. Similarly, the hundreds accumulator wheel may have reached "3" by three actuations. When, however, each accumulator wheel 130 has been actuated far enough to have rotated it to the extent of nine notches of its ratchet 296, one more actuation (received either directly from its rack bar 203 or from its carry-over pawl actuated by the accumulator wheel of next lower denomination) will move same to zero, meaning that "1" will simultaneously be carried over from it to the accumulator wheel of next higher denomination. It should be understood that the degree of rotation of each accumulator wheel 130 is determined by the number of teeth of rack 293 on its rack bar 203 that at any one movement actuate its ratchet 296. Thus, if a certain finger piece has been pulled by the insertion of the finger in the "1" finger indentation, only one tooth of rack 293 will engage its corresponding ratchet 296, and the consequent rotation of the accumulator wheel 130 will be very small. On the other hand, if the finger has been inserted in the finger place for "9," nine teeth of the connected rack 293 will be actuated to engage nine teeth of the appropriate ratchet 296, and the resultant rotation of the respective accumulator wheel 130 will be through nearly its entire circumference, *i. e.*, through nine-tenths of a revolution. No accumulator wheel 130 can, however, be moved through more than one-tenth of its revolution at one time by its carry-over pawl bringing to it the "carry" from the accumulator wheel of next lower denomination.

The clearing key 242 is locked by the operation of registering the first item, and remains locked until the total has been printed. The use of the clearing key 242 removes all results from the accumulator, allowing each accumulator wheel 130 to return to its initial position of zero. The movement of any one of the finger pieces 41 at the beginning of any particular use of the machine causes its respective rack bar 203 to travel forward, and thus to engage jack 303 Fig. 8, which latter is pressed downwardly and caused to drop, and, by reason of arms 304, rod 305, fork 308 and arm 309, arm 432, pivoted at 445 to arm 309, causes shaft 433 to rock, thus carrying upward with it arm 446 Fig. 7, which is connected by pin 447 in slot 448 in plate 449, so as to cause hook 450 to latch over pin 451, which projects from the lefthand side of the side casing 1. Pin 455 is located in opening 456 in plate 449 projecting thereinto from arm 457, which is pivoted at 458 to clearing key 242. The raising of arm 446 causes opening 456 in plate

449 to rise, so that its lower edge will engage pin 455, immediately after which hook 450 latches on pin 451, and pin 455 then rests on the lower edge of opening 456, and can not be moved further downwardly by pressure upon clearing key 242, because said lower edge of opening 456, being then at its highest point, is held in such position by the retention of hook 450 by pin 451. After hook 450 has been latched on pin 451, the clearing key 242 obviously is locked from operation until such future time when hook 450 is unlatched from pin 451, which occurs when the platen 6 is rocked toward the total type 128. Thus, after the printing of the total, clearing key 242 can be depressed and the machine cleared. In the meantime and while hook 450 is latched on pin 451, rod 433 partially rotates from time to time (at each occasion when an item is entered in the machine), but the pivot 447 slides in slot 448 in plate 449, and thus does not pull on plate 449 or hook 450. Thus, the normal entering of items and printing of items continues to take place while the clearing key is locked against actuation, but, when platen 6 has been rocked so as to print a total, arm 459 Fig. 7 has been simultaneously rocked by shaft 17, on which it is rigidly mounted, platen 6 being, also, in rigid connection with shaft 17, and said movement of arm 459 will push hook 450 off pin 451, allowing spring 460 to pull said hook 450 to its lower position and to engage pin 455 with the upper edge of opening 456 in plate 449. The movement of arm 459 is in one direction limited by bolt 461, and in the opposite direction by a similar bolt 462, said bolts 461 and 462 being supported by arms 463 of plate 464, attached by rivets 465 to the lefthand side of casing 1. Thus has been described the locking and unlocking of the clearing key 242.

The connected parts for clearing the accumulator will next be described. When clearing key 242 is depressed, it rocks shaft 346, to which arm 457 is rigidly attached, thus causing arm 466 Fig. 6, rigidly mounted thereon, to rock downwardly a link 467 pivoted at 468 thereto, the other end of said link being pivoted at 469 to an arm 470 which is loosely attached to shaft 39. The clearing type, "Cl.", 243 is carried by said arm 470 and when link 467 is lowered as aforesaid, is held in printing position, while handle 61 is depressed, by continuation of pressure on clearing key 242. Thus, the depression of clearing key 242 prepares the parts in the accumulator and in connection therewith to be cleared; depression of handle 61 operates to clear the accumulator; and the retention of clearing key 242 in its depressed position while the operation of clearing takes place holds the "Cl." type 243 in printing position, so that the depression of handle 61 will not only clear the accumulator but also rock platen 6 so as to print "Cl." on the paper 4.

The rocking of shaft 346 as aforesaid raises the pair of arms 345, thereby causing links 471 Fig. 19, pivoted at 472 to each of the arms 345, respectively, to rise, the upper ends of each of said links 471 being pivoted at 473 to a pair of yokes 474, said yokes being pivoted at 475 to the outside of the accumulator casing 295. Each of said yokes 474 contains an opening 476, the upper edge of which normally rests on comb 300, which fits in groove 301 in shaft 297, and, by the pressure of yokes 474, is caused normally to hold the teeth of comb 300 out of space 302, by which means the accumulator wheels 130 are allowed to rotate without interference by engagement of projections 299 with comb 300 until such time as the clearing key 242 is pushed in. This movement of said key, as aforesaid, results in raising links 471 and yokes 474 and thereby comb 300 into space 302, where same meets projections 299, when shaft 297 is rotated by the handle 61 for clearing purposes. Said shaft 297 is rotated to clear the machine by depression of handle 61 in the following manner: When shaft 346 is rocked as aforesaid, it raises arm 477, Fig. 4, which raises link 478 pivoted to the end thereof, there being a slot 480 in the upper end of said link 478, and a pin 481 projecting into said slot 480 from a hook 482. Pin 481 is normally held in engagement with the lower end of slot 480 by means of spring 483, which position keeps notch 484 Fig. 5 in said hook 482 from engagement with pin 485, to which pin 485 the spring 98 is attached, the other end of said spring 98 being attached to shaft 101, said pin 485 being borne by the operating bar 73. Hook 482 is pivoted at 486 to arm 487 Fig. 4 rigidly attached to shaft 488. When shaft 346 is rocked so as to raise arm 477 and thereby link 478, it will thus push on pin 481 in such manner as to rock hook 482 upwardly so that pin 485 will seat in notch 484, and when the operating bar 73 travels forwardly, pin 485 will pull hook 482 with it, said hook thus pulling on arm 487, causing same to rock shaft 488. A segmental rack 489 Fig. 6 is rigidly mounted on shaft 488, and is thus rotated therewith, said rack meshing with the pinion 490 Figs. 6 and 21 loosely mounted on shaft 297. Shaft 297 extends from the lefthand side of the accumulator through the accumulator and is journaled in one of the triangular frames 430. A spring 491 Fig. 18 engages said triangular frame 430 and is coiled around shaft 297 and presses against pinion 490, thereby causing the cam face 492 Fig. 21 on hub 493 of pinion 490 to press against pin 494. When, as aforesaid, pinion 490 is rotated clockwise by segmental rack 489, shoulder 495 presses against pin 494 projecting from

shaft 297, and thereby rotates shaft 297 in such manner as to cause the teeth of the comb 300 to engage the projections 299 within the space 302, said projections 299 being on the rings 298 fastened to the accumulator wheels 130, by which engagement of the teeth of comb 300 with said projections 299, all the accumulator wheels 130 are rotated to zero. The rotation of shaft 297 is limited to one revolution, in order that said accumulator wheels may stop at zero, said limitation being produced by the length of arc of segmental rack 489, same being prearranged exactly so as to impart a single revolution to pinion 490 and thereby, as just described, to shaft 297. In order to prevent accumulator wheels 130 spinning past the zero position by reason of mere momentum, a plate 496 Fig. 15 engages projections 497, there being one such projection 497 on each accumulator wheel 130, and said projections 497 being so located as to stop the accumulator wheels at zero. When shaft 488 that rocks segmental rack 489 is rotated, it, also, rocks plate 498 rigidly mounted thereon, thereby causing pin 499 to move out of engagement with arm 500 pivoted at 475 to accumulator casing 295. Said arm 500 is in rigid connection with plate 496. At the opposite side of the accumulator, plate 496 is attached to the side casing of the accumulator on the pivot 475, said plate 496 thus extending from one side of the accumulator casing to the other. When pin 499 moves out of engagement with arm 500, another pin 501, also borne by plate 498, moves into engagement with the cam surface 502, thereby causing arm 500 to rock on pivot 475, so as to force plate 496 into the path of travel of projections 497. After pinion 490 has been actuated by segmental rack 489, as above described, the return of operating bar 73 to its initial position causes shaft 488 to rotate in the opposite direction, thus producing a return movement of segmental rack 489 and a consequent rotation of pinion 490 in an anti-clockwise direction, during which anti-clockwise rotation of pinion 490 cam surface 492 rides underneath pin 494 until pin 494 has reached the top of shoulder 495 and drops to its initial and lowest position, being pushed into said lowest position by spring 491.

The rotation of shaft 297 in the manner above described clears the machine by causing all the accumulator wheels 130 to rotate to zero position, where they are stopped by plate 496. The raising of the jack 391, as hereinbefore described, is intended to return plate 366 and bars 357 and 353 to their initial positions, but, to insure that this has been accomplished, said jack 391 is again raised for the same purpose after the accumulator wheels have been returned to zero, this second lifting of jack 391 being accomplished by the engagement of beveled projection 503 Fig. 4 on plate 504 borne by hook 482 with beveled surface 395, said beveled projection 503 thus engaging beveled surface 395 by the forward movement of the operating bar 73 when same has reached nearly the extremity of its forward stroke. As it is necessary to prevent the carry-over pawls 362 from being actuated while the accumulator wheels 130 are rotated to zero, the shaft 335 is prevented from rotating by means of the following: A plate 505 is pivoted at 479 to arm 477 and is provided with an arm 506 that is arranged to extend beneath a pin 507 borne by bell crank 326, and, when arm 477 is rocked upwardly by the depression of the clearing key 242, arm 506 raises pin 507 with the result that bell crank 326 is rocked upwardly on pivot 327 so that foot 325 is raised out of the path of travel of plate 324 on operating bar 73, thereby allowing said operating bar to move forwardly without rocking shaft 335. After the operating bar 73 reaches the end of its forward stroke, it returns to its normal position, as hereinabove described, and draws with it hook 482, and, when pressure is released from clearing key 242, spring 508 Fig. 7 returns said key to its initial position; whereby shaft 346 rocks arm 477 downwardly with the result that plate 505 is lowered to its initial position to allow spring 332 to rock bell crank 326 to its initial position and, also, that spring 483 is stretched, which draws hook 482 out of operative engagement with pin 485.

In order that the stoppage of the movement of the platen 6 toward either printing position may be easy and without jar, a cushion is provided consisting of a spring 509 Fig. 5 supported by plate 510, fastened to the righthand side of casing 1, said spring normally keeping button 511, borne by rod 512, in a raised position. Said rod 512 slides in sleeve 513, which is externally screw-threaded so as to be threaded into an internally-threaded opening 514 in plate 510. To prevent spring 509 from raising rod 512 by pressing on button 511 too high, a lock nut 515 is threaded on the lower end of said rod 512. When bell crank 76 is rocked by the pull thereon of spring 74, when the operating bar 73 moves forward and thereby allows latch 78 to release the projection 84 on yoke 85, one arm of bell crank 76 is thereby caused to impinge upon button 511 and, pressing thereon, to depress same against spring 509, with the result that the rocking of bell crank 76 is gently stopped, and thus the termination of movement of platen 6 is cushioned.

One form of mechanism for rocking platen 6 has hereinbefore been described, but an alternate form is depicted in Fig. 18, in which spring 74 and bell crank 76 are omit-

ted, but, as a substitute therefor, there is provided a spring 516, fastened by a pin 517 to plate 518 and by pin 519 to link 93. A pin 520, borne by plate 518, passes through slot 521 in plate 522, borne by operating bar 73, and normally holds plate 518 in such position that pin 523 and pin 524, both projecting from one side of the casing 1, are seated at the lowest points, respectively, of slots 525 and 526 in plate 518, the pull of spring 516 tending, also, to retain plate 518 in said position. The pull of spring 516 on pin 519 tends to depress link 93 and thereby to hold same down upon pin 527, which projects through slot 528 in link 93, said pin 527 being borne by plate 518. When operating bar 73 moves forward, the cam slot 521 presses on pin 520 an thereby moves plate 518 downwardly, thereby extending spring 516 and thus increasing its tension on link 93, and when beveled surface 82 engages toe 81 on latch 78, said latch 78 is rocked on pivot 79 and notch 83 is thereby disengaged from projection 84 on yoke 85 and spring 516 draws link 93 bearing yoke 85 downwardly, thereby causing platen 6 to rock.

To lock the end plates to the side plates of the casing 1, each end plate is provided with a pair of plates 529, Fig. 11, attached thereto. Each of said plates 529 has an inwardly-bent hooklike end 530 which seats in a corner 531 of a side plate. Said plates are slotted at 532, and bolts 533 pass therethrough, nuts 534 retaining said plates 529 in position adapted to slide longitudinally, though attached to the end plate. Springs 535 tend normally to hold plates 529 in the position of engaging the side plates of the casing 1. The inner ends of the plates 529 overlap and bear projections 536, respectively, that extend adjacent a key-hole 537 in the end plate. The bolts 533 that support the inner ends of plates 529 support a plate 538, which extends across key-hole 537, said plate 538 containing an aperture 539 that affords a means for centering a key (not shown in the drawings) within key-hole 537. When a key is inserted through the key-hole 537 and turned therein, the sides of said key engage and spread the projections 536 apart, with the result that plates 529 slide toward each other against the tension of springs 535, thereby drawing the bent ends 530 out of corners 531 and allowing the end plate to be removed.

In Figs. 16 and 17 an alternate form of the device for holding pawl 108 normally out of engagement with ratchet 112 is depicted. In this form, the pin 113 is omitted entirely and a member 540 is substituted therefor, said member being pivoted at 541 to curved member 33 and bearing a projection 542 that normally engages a pin 543 attached to member 33. A lever 544 is pivoted at 545 to one side of casing 1 and is provided with a rounded end 546 that is normally held in engagement with the beveled surface 547 of arm 548 by means of spring 549, said arm being borne by plate 68. A projection 550 borne by the other end of lever 544 holds the end 551 of member 540 normally in engagement with pin 114 borne by plate 109 and thereby holds pawl 108 out of engagement with ratchet 112, as long as beveled surface 547 remains in engagement with the rounded end 546 of lever 544. When the operating bar 73 is moved away from the operator, the rack 72 actuates the segmental rack 71 borne by plate 68 and thereby causes said plate to rotate on shaft 39, with the result that beveled surface 547 moves away from the rounded end 546 of lever 544, whereupon spring 549 draws said rounded end of lever 544 downwardly until said lever engages pin 552 that projects from one side of casing 1, in order to limit the downward movement of the rounded end 546. As lever 544 moves into engagement with pin 552, the projection 550 moves out of engagement with member 544 and thereby releases its pressure upon pin 114, so as to allow spring 115 to pull pawl 108 into engagement with ratchet 112. The upper surface of member 540 is rounded so that, when the visible item lever 31 is moved, as hereinabove described, said member moves with same without exerting an upward pressure against projection 550.

The operation of the machine, in so far as it has not already been described, is as follows: The particular digit of each denomination to be added is determined by the extent to which the proper finger piece 41 is depressed, and the extent of such depression depends, in turn, upon the particular finger indentation of said finger piece, in which the finger of the operator is placed. This depression of a finger piece 41 causes its segmental rack 147 to rotate the particular gear 148 Figs. 5 and 6 in mesh therewith and, also, the ratchets 179, 190, and 150 attached to said gear and moves its projection 186 away from the end 187 of a pawl 185, in order to allow the spring 188 that is attached to said pawl to draw the tooth 189 of same into engagement with the ratchet 190, after the printing operation takes place, or when an error key 140 is pressed to allow said finger piece to return to its initial position, as hereinabove described. As fast as each finger piece 41 is depressed to the limit permitted with the finger placed in any particular finger indentation, and the sector 40 to which it is secured thereby rotated, one of the pawls 151 locks the ratchet 150, so that the sector and attached parts are locked against return movement. By the rotation of the sector, the item types 60 carried thereon are raised until the proper type-face is

set at a point opposite the ribbon 237, and, simultaneously therewith, the rack-bar 203 engaging said sector is driven forward, said rack-bar in turn causing the same number of teeth of its rack 293 to move into the accumulator as is represented by the figure on the particular type-face occupying the printing position. The bevel 208 Fig. 6 in the slot 206 in the lefthand rack-bar 203, which is moved forward, rides on and depresses the projection 207 passing through said rack-bar, and all such projections for rack-bars to the right are simultaneously depressed, so that each one will be moved in front of a shoulder 209, in order to be in position to move an unmoved rack-bar 203 forward to cause the sector 40 in mesh therewith to present its zero type-face 60 in printing position. The forward movement of the rack-bar 203 Fig. 8 causes the jack 303 to drop, as hereinabove described, whereby the rod 305 forces the arms 309 and 432 downwardly, so as to rock shaft 433 in a clockwise direction, Fig. 8. This rocking of shaft 433 causes the arm 434 Fig. 5 to rotate therewith, and said arm raises the link 436, which, in turn, raises link 137 sufficiently to cause projection 438 on said link 137 to enter notch 439 in hook 440 and, also, to allow the projection 441 on member 442 to move underneath the projection 438, in order to hold the latter in said notch, thereby locking the total key 129 from depression until after the platen is rocked toward the type-faces 60. The arm 446 Fig. 7, also, rocks with shaft 433 and raises plate 449 until the spring 460 causes the hook 450 to latch over pin 451, thus locking the clearing key 242 from depression and maintaining same locked until the platen 6 is rocked to print the total represented upon the type-faces 128 of the accumulator wheels 130 that occupy the printing position. When all the necessary finger pieces 41 have been depressed, it is obvious that the proper type 60, which will then be in a position opposite the ribbon 237, will represent the desired number to be printed.

To print the numbers, the operator depresses the handle 61, thus causing the operating bar 73 to move forward. When the operating bar 73 travels forward, the lug 175 Fig. 5 moves away from trigger 176, and the pin 182 depresses said trigger, so as to move plate 180 away from the pawls 178, so that the springs 177 pull said pawls into engagement with their respective ratchets 179 and hold same in such engagement until the operating bar returns to its initial position, whereby the depressed finger pieces are locked from further depression and the movement of each sector which is automatically depressed to present its zero type-face 60 in printing position is limited. When pawls 178 move into engagement with ratchets 179, the hook 191 draws arm 194 forward and thereby rocks the shaft 195, with the result that the arms 196 Fig. 6 borne by said shaft pull the links 198 and rod 199 forward, whereby members 205 travel forward in order to cause each sector governed by a depressed projection 207 so to move as to present its zero type-face in printing position. Then pin 59 Fig. 5 raises the hook 191 out of engagement with lug 193 on arm 194 so as to allow springs 210 to return members 205 to their initial positions. Simultaneously the beveled part 125 of hook 86 rides underneath pin 87 Fig. 4, so as to cause the projection 126 to pass underneath pin 127 Fig. 5, whereby hook 86 releases pin 87. While projection 126 thus underlies pin 127, the bevel 82 Fig. 18 rocks latch 78 and causes same to release yoke 85, whereby the pull of spring 74 causes bell-crank 76 to rock suddenly so as to pull the link 93 downwardly, and said link, in turn, causes yoke 85 to rock shaft 17 counter-clockwise, Fig. 4, with the result that arms 16 rock with said shaft and cause the platen 6 to move and strike the type 60, which thereupon print their respective figures on the paper carried by the platen. During the first part of the forward movement of the operating bar 73, the pin 244 Fig. 5 rocks arm 246 and thereby causes shaft 141 and arm 247 Fig. 7 to rock, with the result that said arm 247 forces the bar 251 forward, whereby the pawls 257 travel forward with said bar 251, and the particular pawl 257 that engages one of the ratchets 256 rides loosely over the teeth of same, so as to be in position to cause the ribbon 237 to feed from spool 238 to spool 239, or vice versa, when the bar 251 returns to its initial position. Just previous to the printing operation just described, the pin 342 Fig. 5 borne by the operating bar 73 moves away from arm 343, and the plate 324 which moves with said bar presses against the foot 325 of bell-crank 326 and thereby causes the arm 328 to rock toward the rear of the machine, thus rocking shaft 335. While the shaft 335 is being rocked, as just described, the beveled projection 394 on the operating bar 73 rides beneath the beveled surface 395 on member 396, whereby the shaft 393 rocks and causes the jack 391 Fig. 8 to raise bars 353 and 357 and plate 366 after the shaft 335 completes its rocking movement in a clockwise direction, Fig. 4. The plates 336 Fig. 15 rock with shaft 335 and stretch springs 337, whereby the latter cause the bell-cranks 310 and 420 to rock, so as to raise the notches 320 in said bell-cranks sufficiently to release flanges 321 of arms 322, at which time the springs 339 draw the arms 322 toward the rear of the machine so that the flanges 321 press upwardly against the cam surfaces 338 of said bell-cranks, thus raising jack 303 to its normal

position, so as to raise the racks 293 into engagement with their respective ratchets 296.

Immediately after the raising of the racks 293 into engagement with their respective ratchets 296, the operation of printing the item takes place, as hereinabove described, and then, during the remainder of the forward movement of the operating bar, the pin 182 rides on the beveled surface 183 of trigger 176 Fig. 4 and thereby causes plate 180 to move the pawls 151 out of engagement with ratchets 150, in order to allow each depressed finger piece to return to its initial position by the pull of its spring 155 and, also, to allow the pawls 185 for the depressed finger pieces to engage their respective ratchets 190, whereby each depressed finger piece is prevented from being again depressed until same returns to its initial position. This return movement of each depressed finger piece draws its rack-bar 203 Fig. 8 toward the front of the machine, whereby the rack 293 on said rack-bar causes its accumulator wheel 130 to rotate the distance necessary to make the type 128 which is then left exposed to the ribbon 237 represent the sum of the number at which the accumulator wheel last stood and the new digit that has been added in. When the operating bar 73 nears the end of its forward movement, the end of slot 444 Fig. 4 pushes the projection 441 from supporting engagement with projection 438 and thereby allows the link 137 to descend to withdraw projection 438 from notch 439 Fig. 5 and, also, to rock shaft 433. The total key 129 is thus unlocked so that same can be depressed, and the plate 309 Fig. 8 is raised to its normal position.

After the completion of the forward movement of the operating bar 73, the handle 61 is released, and the spring 98 causes the operating bar and parts connected therewith to return to their normal positions, whereby the hook 86 rocks the platen 6 to its initial position in the manner hereinabove described, and the lug 175 raises trigger 176 so that plate 180 moves the pawls 178 out of engagement with the ratchets 179. When the operating bar 73 approaches the end of its return movement, the pin 244 rocks arm 246 toward the front of the machine and thereby causes the arm 247 Fig. 7 to return the bar 251 to its normal position, which results in producing the ribbon-feeding operation, as hereinabove described.

After a sufficient amount of numbers has been printed and added to cause an accumulator wheel 130 to rotate the distance necessary to carry its "8" and "9" type-faces past printing position, the cam 347 borne by said wheel draws a member 349 Fig. 13 toward the front of the machine, so that, when the "8" type-face moves away from printing position, the projection 356 moves from beneath shoulder 355 on bar 357, whereby said bar drops, as hereinabove described, and prevents the member 349 from returning to its initial position until the bars 353 and 357 and plates 366 that drop in the manner about to be described are raised and restored to their initial positions after the carry-over operation takes place. When the "9" type-face on said wheel moves away from the printing position, the cam 247 draws the member 349 farther toward the front of the machine, with the result that projection 351 on said member moves from beneath nose 352 on bar 353, and thereby allows said nose to drop in front of shoulder 360 on latch 361 below said nose. The operations just described take place while the accumulator wheel 130 moves its "8" and "9" type-face past printing position during the return movement of its rack-bar 203. When the shaft 335 is rocked by the next forward movement of the operating bar 73 in the manner hereinabove described, the plates 418 Figs. 15 and 19 rock toward the rear of the machine and thereby rock the bars 353 in the same direction, with the result that each nose 352 that has dropped in front of shoulder 360 on associated latch 361 pulls said latch toward the rear of the machine, so as to withdraw the projection 368 on said latch from the notch 367 in plate 366, whereby said plate drops and allows a carry-over pawl 362 to engage the ratchet 296 borne by the next accumulator wheel 130 to the left of the particular accumulator wheel 130 that moved its "9" type-face past printing position as hereinabove described. The arms 364 then rock toward the rear of the machine and thereby cause the carry-over pawls 362 that have been lowered, as just described, to rotate their respective accumulator wheels 130 through one-tenth of a revolution, thus producing the carry-over operation in the accumulator before the printing of the next item or a total takes place. After the carry-over operation takes place as just described, the jack raises and restores the bars 353 and 357 and plates 366 to their initial position and thereby not only allows the members 349 and the carry-over pawls 362 that took part in the carry-over operation to return to their normal positions, but permits same to remain in their normal position until again actuated to produce a carry-over operation in the manner hereinabove described.

The operation hereinabove described may be repeated *ad libitum*, so long as there are numbers to be printed and added, and, when the platen 6 is rocked from its normal position to a position to print an item, the pawls 56 and 57 ride loosely over the teeth of ratchet 55 and, simultaneously therewith, the detent pawl 108 engages and remains in

engagement with ratchet 112, so as to prevent the platen from being rotated to advance the paper thereon until after the printing operation takes place. While the pawls 56 and 57 Fig. 17 ride loosely over the teeth of ratchet 55, the projection 116 on plate 104 rides past the beveled toe 117 on pawl 118, so that, when the platen returns from the printing position to its normal position, said projection presses against the beveled toe 117 of pawl 118 and thereby forces the pawl 108 out of engagement with ratchet 112, with the result that the pawls 56 and 57 give the platen a particular revolution, thereby moving the paper forward to allow the next item or a total to be printed. In like manner, after the platen is rocked to print a total, the paper is advanced so that either the clearing sign, namely, "Cl.," or the next item can be printed, in case the total just obtained be a sub-total. Finally, when all the numbers to be added have been printed and added as hereinabove described, the total key 129 is depressed which results in drawing the link 137 toward the front of the machine. The link 137 rocks the link 93 toward the front of the machine, whereby the cam slot 94 Fig. 18 releases pin 96 and the pin 97 enters cam slot 95. The handle 61 is depressed in order to move the operating bar 73 forward, which results in producing the last carry-over operation in the accumulator, and then in rocking shaft 17 in a clockwise direction, Fig. 4, as hereinabove described, whereby the platen is rocked and caused to strike the type-faces 128, which thereupon print the sum or total of the column of items upon the paper 4. When the shaft 17 is rocked as just described, the arm 459 Fig. 7 rocks therewith and causes the hook 450 on plate 449 to release pin 451, whereby spring 460 lowers said plate to its initial position, in order to unlock the clearing key 242, which may then be depressed. After a total is printed as just described, the total key 129 and handle 61 are released, whereby same return to their initial positions. When the total key 129 returns to its initial position, the link 137 returns the link 93 to its normal position, so that the latter will rock the platen toward the type 60 during the next depression of handle 61. If it is then desired to clear the machine, the clearing key 242 is depressed, whereby the shaft 346 rocks in a counter-clockwise direction, Fig. 4, and thereby lowers the type-face 243 to printing position through the medium of arm 466 and link 467 Fig. 6 and, at the same time, raises the yokes 474 through the intermediation of arms 345 and links 471 Fig. 19, said yokes, in turn, raising comb 300 into space 302. The arm 477 Fig. 4 rocks with shaft 346 and raises the link 478, thereby lifting the hook 482, so as to cause the pin 485 borne by the operating bar to enter notch 484 in said hook, and, simultaneously therewith, the arm 506 of plate 505 presses upwardly against the pin 507 on bell-crank 326, with the result that said bell-crank is rocked upwardly so that foot 325 is raised out of the path of travel of the plate 324 on operating bar 73, thereby allowing said operating bar to move forwardly without rocking shaft 335. The handle 61 is then depressed to cause the operating bar 73 to travel forward, so as to cause the platen 6 to rock toward the type-face 243, which prints the clearing sign "Cl." upon the paper on said platen, and, also, to cause the hook 482 to travel forward with said operating bar and thereby causes the shaft 488 to rock in a counter-clockwise direction, Figs. 4 and 5. This rocking of shaft 488 rotates shaft 297, which, in turn, rotates comb 300 in such manner as to cause the teeth of said comb to engage the projection 299 within space 302, thereby rotating all the accumulator wheels 130 to zero, as hereinabove described, after which the operating bar completes its forward movement and causes the beveled projection 503 on hook 482 to engage the beveled surface 395 on member 396, so as to raise jack 391 in order to restore the parts within the accumulator to their initial positions, as hereinabove described. After the machine is cleared, the clearing key 242 and handle 61 are released in order to allow same and the parts connected therewith to return to their initial positions in the manner hereinabove described, thus leaving the machine clear for the next column of numbers to be printed and added.

Sub-totals may be obtained at any desired intermediate point, and the adding operation resumed, because the machine is not cleared by merely printing a total, since the clearing requires the independent and distinct operations hereinbefore described.

We claim:

1. In a calculating machine, the combination of item printing means, impression mechanism coöperative therewith, and means controlled by the impression mechanism for holding the printing means in actuated position.

2. In a calculating machine, the combination of item printing means, impression mechanism coöperative therewith, and means controlled by the impression mechanism for preventing return of the printing means to normal position until the impression mechanism has operated.

3. In a calculating machine, the combination of item printing means, impression mechanism coöperative therewith, and means releasable by the impression mechanism for locking the printing means in actuated position.

4. In a calculating machine, the combina-

tion of item printing means, an accumulator for totalizing the items, impression mechanism coöperative with the accumulator, and means for locking the impression mechanism from operation until after each item has been added to the accumulator.

5. In a calculating machine, the combination of item printing means, an accumulator for adding and printing the totals thereof, a platen coöperative with the accumulator, and means for locking the platen from printing operation until after each item has been added in the accumulator.

6. In a calculating machine, the combination of item printing means, an accumulator for adding and printing the totals thereof, impression mechanism coöperative with both printing means, locking means for holding the item printing means in actuated position, and means for releasing said locking means and permitting restoration of the item printing means without actuating the accumulator.

7. In a calculating machine, the combination of item printing devices, impression mechanism coöperative therewith, and means controlled by the impression mechanism for limiting the motion of said printing devices.

8. In a calculating machine, the combination of item printing devices, impression mechanism coöperative therewith, and embodying a platen and an operating member therefor, and means controlled by said member for preventing movement of said printing devices beyond actuated position.

9. In a calculating machine, the combination of a plurality of item printing devices, impression mechanism coöperative therewith, and means controlled by the impression mechanism and operative thereby after the beginning of the printing operation to lock the printing devices from movement.

10. In a calculating machine, the combination of item printing devices, impression mechanism coöperative therewith, and means controlled by the impression mechanism for preventing movement of the printing devices beyond actuated position.

11. In a calculating machine, the combination of item printing devices, impression mechanism coöperative therewith, means controlled by the impression mechanism for preventing movement of the item printing devices beyond actuated position, and means releasable by the impression mechanism for holding the printing devices in actuated position until after the printing operation has been completed.

12. In a calculating machine, the combination of item printing devices, a platen coöperative therewith, and means for locking each printing device from movement beyond actuated position and releasable by its respective printing device after the latter has completely returned to normal position.

13. In a calculating machine, the combination of item printing means, impression mechanism coöperative therewith, and embodying a platen and its operating mechanism, and a cipher printing device controlled by the platen operating mechanism.

14. In a calculating machine, the combination of item printing means, a platen coöperative therewith and provided with operating mechanism, and means operative automatically by the platen operating mechanism, for setting the item printing means in cipher printing position.

15. In a calculating machine, the combination of item printing means, a platen coöperative therewith, a platen operating mechanism, and cipher mechanism actuated by the platen operating mechanism, and operative to set the item printing devices in cipher printing position.

16. In a calculating machine, the combination of item printing devices, a platen coöperative therewith, platen operating mechanism, cipher mechanism actuated by the platen operating mechanism and operative to set the item printing devices in cipher printing position, and means for setting the cipher mechanism in inoperative position.

17. In a calculating machine, the combination of item printing means, an accumulator for adding and printing the totals thereof and embodying printing wheels, actuating wheels therefor, actuating members operative by the item printing means and coöperative with the actuating wheels of the accumulator, impression mechanism including a platen and a platen operating member, and means under the control of the platen operating member for setting the actuating members for the accumulator in operative relation to the corresponding actuating wheels of the accumulator.

18. In a calculating machine, the combination of item printing means, an accumulator for adding and printing the totals thereof, and embodying a set of printing wheels, reciprocatory members operative by the item printing means, impression mechanism, and a jack common to all of said members and controlled by the impression mechanism for setting said members in operative relation to the accumulator when said members are moved in one direction.

19. In a calculating machine, the combination of item printing means, a movable platen coöperative therewith, an accumulator for adding and printing totals and including printing wheels, members actuated by the item printing means, and coöperative with the accumulator, and means under the control of the item printing mechanism for setting said members in condition to actuate the accumulator.

20. In a calculating machine, an accumulator, embodying in combination, a plurality

of accumulator and printing wheels, means for actuating said wheels, printing mechanism coöperative with the impression wheels of the accumulator, and carry-over pawls between the accumulator wheels and under the control of the impression mechanism.

21. In a calculating machine, the combination of item printing means, an accumulator embodying a plurality of accumulator and printing wheels, impression mechanism embodying a platen coöperative with the item printing means, and the accumulator, means operative by the item printing means for actuating the accumulator wheels, and transfer pawls between the accumulator wheels and actuated by the impression mechanism.

22. In a calculating machine, the combination of item printing means, an accumulator embodying printing wheels, means controlled by the item printing means for actuating the accumulator, impression mechanism coöperative with the accumulator, and means for locking the impression mechanism from operation with respect to the accumulator until after the accumulator has added the item thereto.

23. In a calculating machine, the combination of item printing means, an accumulator operatively connected thereto for adding the totals of the items and embodying printing wheels, impression mechanism embodying a platen, and means for moving it into printing relation to the accumulator wheels, and a total key for setting the platen into total printing condition.

24. In a calculating machine, the combination of item printing means, an accumulator operative thereby for totalizing the items and embodying printing wheels, impression mechanism embodying a platen and means for moving it into printing relation either to the item printing means or the accumulator wheels, a total key for setting the platen into total printing condition, and means for locking the total key from operation.

25. In a calculating machine, the combination of item printing means, an accumulator embodying printing wheels, impression mechanism embodying a platen and means for moving it into printing relation to the item printing means and the accumulator, a total key for setting the platen in total printing condition, and a clearing device for restoring the accumulator to starting or zero position.

26. In a calculating machine, the combination of item listing and printing means, an accumulator, coöperative therewith and embodying printing wheels, printing mechanism coöperative with the item printing means and with the printing wheels of the accumulator, means for setting the platen into total printing condition, a clearing device for restoring the accumulator to starting position, and means for locking the clearing device from operation until after a total registered by the accumulator has been printed.

27. In a calculating machine, the combination of item printing means, an accumulator coöperative therewith and embodying total printing wheels, impression mechanism coöperative with the item printing means and with the printing wheels of the accumulator, and a clearing device for restoring the accumulator to starting position and under the control of the printing mechanism.

28. In a calculating machine, the combination of item printing means, an accumulator having total printing wheels, a rotatable platen provided with an actuating ratchet wheel, means for moving the platen into printing position with respect to either the item printing means or the printing wheels of the accumulator, and means for rotating the ratchet wheel to rotate the platen and feed the paper during the return movement of the platen with respect to the item printing means or the accumulator.

29. In a calculator, a casing having a removable panel, and means for locking it in position, comprising a pair of oppositely movable locking bars guided on said panel and coöperative at their ends with the casing, springs for normally holding said bars in locked position and a pair of reversely arranged retracting members pivotally connected to the adjacent ends of the respective bars and adapted to be actuated by a key inserted into said panel.

30. In a calculating machine, the combination of item printing means, an accumulator for adding and printing totals thereof, a platen, a member capable of moving the platen into printing position with respect either to the item listing and printing means or the accumulator, and means for controlling the direction of motion of the platen.

31. In a calculating machine, the combination of item printing means, an accumulator for adding and printing the totals of the items, a platen capable of movement in two directions to print the items and the totals, and actuating member capable of moving the platen into either of said printing positions and a total key for controlling the movement of the platen to total printing position.

32. In a calculating machine, the combination of item printing means, means for adding and printing totals, a platen mounted to move into a position to print the items or the totals, a reciprocatory member, an actuator operative by said member and capable of moving the platen into a position to print the items or into a position to

print the totals, and means for controlling the actuator to move the platen into item or total printing position.

33. In a calculating machine, the combination of item printing means, means for adding and printing the totals thereof, a platen, a rock shaft supporting said platen for swinging movement and having operating projections connected thereto, a reciprocatory operating member, and an actuator operative by said member, and adjustable to engage one or another of said projections to move the platen into item or total printing position.

34. In a calculating machine, the combination of item printing means, means for adding and printing the totals of the items, a platen, a rock shaft supporting the platen and carrying a pair of projections, a reciprocatory operating member, an actuator operative by said member and adjustable to engage one or the other of said projections, and a controlling device for said actuator.

35. In a calculating machine, the combination of item printing means, means for adding and printing the totals of the items, a platen movable in opposite directions to print items or totals, an operating member, an actuator operative by said member and capable of moving the platen into item and total printing positions, and a latch for normally holding the platen in neutral position.

36. In a calculating machine, the combination of item printing means, means for adding and printing totals, a platen, a reciprocatory bar operatively connected with said platen to move the same into item or total printing position, and a latch controlled by said bar for normally locking the platen in neutral position.

37. In a calculating machine, the combination of item printing means, means for adding and printing totals, a platen, a rock shaft for supporting the platen and carrying a pair of actuating pins, a reciprocatory operating bar, an actuator operative thereby and adjustable to engage one or the other of said pins to move the platen into item or total printing position, and a latch controlled by said bar and operative to normally retain the platen in neutral position.

38. In an accumulator, the combination of item printing means, means for adding and printing totals, a platen movable into item and total printing positions, a total key for controlling the movement of the platen toward total printing position, and means for locking the total key from operation until after the platen has moved into item printing position.

39. In a calculating machine, the combination of item printing means, means for adding and printing totals, a platen having means for moving it into item and total printing positions, a total key to control the total printing movement of the platen, and means controlled by the platen operating means for locking the total key.

40. In a calculating machine, the combination of item printing means, an accumulator for adding and printing totals, a platen operative to print items and totals, and clearing means for the accumulator capable of being locked until after the platen has moved into total printing position.

41. In a calculating machine, the combination of item printing means, an accumulator for adding the totals and embodying actuating wheels, reciprocatory actuating bars operatively connected to the printing means and coöperative with the respective actuating wheels of the accumulator, a jack operative to engage the actuating bars and the respective actuating wheels of the accumulator, printing mechanism, and means for actuating the jack from the printing mechanism.

42. In a calculating machine, the combination of item printing means, an accumulator for totalizing the items and embodying actuating wheels, reciprocatory actuating bars operative by the printing means and corresponding to the actuating wheels of the accumulator, and means for engaging said actuating bars with the corresponding actuating wheels of the accumulator only when said bars are moved in one direction.

43. In a calculating machine, the combination of item printing devices, an accumulator for adding and printing totals, a platen movable into item and total printing positions, a member for actuating the platen, accumulator actuating bars operatively connected to the item printing devices, and means under the control of the platen operating member for operatively connecting said actuating bars to the accumulator.

44. In a calculating machine, the combination of item printing devices, an accumulator for adding and printing totals thereof, actuating bars operatively connected to the item impression devices, printing mechanism, and means under the control of the impression mechanism for setting said bars in condition to actuate the accumulator.

45. In a calculating machine, the combination of item printing devices, an accumulator, impression mechanism coöperative with the item printing devices and with the accumulator actuating bars operatively connected to the item printing devices, and normally disconnected from the accumulator, and means under the control of the printing mechanism for setting said bars in condition to actuate the accumulator during the return of the item printing means to initial position.

46. In a calculating machine, the combination of item printing means, an accumulator for adding and printing totals, means operative by the item printing means for actuating the accumulator, impression mechanism, and means for preventing operation of the impression mechanism to print a total until after the item has been added in the accumulator.

47. In a calculating machine, the combination of item printing means, an accumulator coöperative therewith, and embodying means for adding and printing totals, a platen coöperative with the accumulator, and means for preventing operation of the platen to print a total while the item printing means is in actuated condition.

48. In a calculating machine, the combination of item printing means, an accumulator coöperative therewith and embodying adding and printing devices, a platen adapted to coöperate with the accumulator to print a total and means releasable by the item printing means for controlling total printing operation of the platen.

49. In a calculating machine, the combination of a plurality of item printing devices, an accumulator operative by said devices and embodying adding and printing devices, a platen adapted to coöperate with the accumulator to print a total, and means for preventing total printing operation of the platen except when all of said printing devices are in completely restored condition.

50. In a calculating machine, the combination of a plurality of item printing devices, an accumulator embodying adding and printing devices, a platen adapted to coöperate with the accumulator to print a total, members operative by the item printing devices during the restoring movement thereof for actuating the accumulator to add an item thereto, and means for locking the platen from total printing operation until all of said listing devices have been completely restored.

51. In a calculating machine, the combination of item printing means, an accumulator embodying devices for adding and printing totals, a platen having means for operating it to print items and totals, means for locking the item printing means in actuated position until after an item has been printed, and means for preventing total printing operation of the platen until the item printing means have been completely returned to initial position.

52. In a calculating machine, the combination of item printing means, an accumulator coöperative therewith, and embodying adding and printing means, a platen having means for operating it to print items and totals, means releasable by the platen operating mechanism for locking the item printing means in actuated position, and means releasable by the item printing means for permitting total printing operation of the platen.

53. In a calculating machine, the combination of a plurality of item printing devices, an accumulator embodying adding and total printing devices, means operative by the item printing devices during their return movement for actuating the accumulator to add an item thereto, a platen having means for operating it to print items and totals, means releasable by the platen operating means for retaining the item printing devices in actuated position until after an item has been printed, and means releasable by the item printing devices to permit total printing operation of the platen after the item printing devices have been completely restored.

54. In a calculating machine, the combination of item printing means, impression mechanism coöperative therewith to print an item, and means for holding the item listing and printing means in actuated position until after an item has been printed, said holding means being releasable by said impression mechanism.

55. In a calculating machine, the combination of item printing means, an accumulator operative thereby to add and print totals, a platen having means for moving it into printing relation to the accumulator, means for locking the platen from total printing operation until after the item printing means have been completely restored to initial position, means for holding the item printing means in actuated position, and means for releasing the item printing means from said holding means to permit restoration of the same without adding an item to the accumulator.

56. In a calculating machine, the combination of item printing means, an accumulator operative thereby and embodying adding and total printing devices, a platen having means for operating it to print items and totals, means for locking the item printing means in actuated position until after said platen has been operated to print an item therefrom, means for releasing the item printing means from said locking means to permit restoration of the same without adding an item to the accumulator, and means for preventing total printing operation of the platen until after the item has been added to the accumulator.

57. In a calculating machine, the combination of item printing means, an accumulator operative thereby and embodying adding and total printing devices, a platen having means for operating it to print items and totals, means for actuating the accumu-

lator to add an item thereto during the restoring movement of the item printing means, means for holding the item printing means in actuated position until after an item has been printed, means operable by the platen operating means for releasing said holding means, means for locking the platen from total printing operation until after complete restoration of the item printing means, and additional means for releasing the item printing means from said holding means to permit restoration of the same without affecting the accumulator.

58. In a calculating machine, the combination of item printing means, a platen having mechanism for operating it to print an item, means for holding the item printing means in actuated position and means operative by the platen operating mechanism for releasing the item printing means.

59. In a calculating machine, the combination of item printing means, an accumulator having means for actuating it during restoration of the item printing means and embodying adding and total printing devices, a platen having mechanism for operating it to print items and totals, means controlled by the platen operating mechanism for preventing further movement of the item printing means after the item printing operation has commenced, means controlled by the platen operating mechanism for preventing restoration of the item printing means, means for adding an item to the accumulator during restoration of the item printing means, and means for preventing subsequent actuation of the item printing means until after complete restoration thereof.

60. In a calculating machine, the combination of item printing means, an accumulator operative thereby and embodying adding and total printing devices, means coöperative with the accumulator for printing totals, clearing mechanism for the accumulator, and means for locking the clearing mechanism from operation until after a total has been printed.

61. In a calculating machine, the combination of item printing means, an accumulator operative thereby and embodying adding and total printing devices, a platen having mechanism for operating it to print totals from the accumulator, clearing mechanism including a clearing key for restoring the accumulator to starting condition, and means for locking the clearing mechanism from operation until after a total has been printed.

62. In a calculating machine, the combination of item printing means, an accumulator embodying adding and total printing devices, impression mechanism coöperative with the accumulator, clearing mechanism for restoring the accumulator to starting condition after a total has been printed, and a clearing type having means for operating it after the accumulator has been cleared.

63. In a calculating machine, the combination of item printing means, an accumulator embodying adding and total printing devices, clearing mechanism for restoring the accumulator to starting condition and embodying a clearing type, a platen, and means for operating the platen to print a total from the accumulator and to receive an impression from the clearing type.

64. In a calculating machine, the combination of item printing means, an accumulator embodying adding and total printing devices, clearing mechanism for restoring the accumulator to starting condition, a platen having mechanism for operating it to print a total from the accumulator, and means for locking the clearing mechanism from operation until after a total has been printed, said locking means being releasable by the platen operating mechanism.

65. In a calculating machine, the combination of item printing means, an accumulator operative thereby embodying adding and total printing devices, a platen having mechanism for operating it to print totals from the accumulator, clearing mechanism for restoring the accumulator to starting condition, means releasable by the platen operating mechanism for preventing operation of the clearing mechanism until after a total has been printed and means controlled by the clearing mechanism for printing a clearing impression.

66. In an adding machine, the combination of a plurality of rotatably-mounted printing sectors, finger pieces attached thereto by means of which said sectors are rotated, means for locking each sector in the position to which it may have been rotated, means for releasing all of the sectors in series to permit the return thereof, a ratchet wheel actuated by each finger piece, pawls held normally out of engagement with said ratchet wheels by said locking means, and means for moving said pawls into engagement with said ratchet wheels when same are released by said locking means, thereby to prevent subsequent rotation of each sector until same returns to its initial position.

67. In an adding machine, the combination of a plurality of printing sectors, selective finger pieces secured thereto, a ratchet wheel actuated by each finger piece, and pawls engaging said ratchet wheels, thereby to lock said sectors in position.

68. In an adding machine, the combination of a plurality of printing sectors, selective finger pieces secured thereto, a ratchet wheel actuated by each finger piece, pawls engaging said ratchet wheels for locking

said sectors in position, and means for simultaneously moving said pawls out of engagement with said ratchet wheels.

69. In an adding machine, the combination of a plurality of printing sectors, selective finger pieces secured thereto, a rack secured to each finger piece, gears meshing with said racks, a ratchet wheel secured to each gear, and pawls engaging said ratchet wheels for locking said sectors in position.

70. In an adding machine, the combination of a plurality of printing sectors, selective finger pieces secured thereto, a rack secured to each finger piece, gears meshing with said racks, a ratchet wheel secured to each gear, pawls engaging said ratchet wheels for locking said sectors in position, springs to hold said pawls normally in engagement with said ratchet wheels, and means for simultaneously moving said pawls out of engagement with said ratchet wheels.

71. In an adding machine, the combination of a plurality of rotatably-mounted printing sectors, finger pieces attached thereto by means of which said sectors are rotated, a segmental rack secured to each finger piece, gears meshing with said racks, means for locking each gear in position to hold its sector in the position to which same may have been rotated, and means for releasing all of the gears in series simultaneously, thereby permitting the return of same and said sectors.

72. In an adding machine, the combination of a plurality of printing sectors, finger pieces secured thereto by means of which said sectors are actuated, a ratchet wheel actuated by each finger piece, pawls engaging said ratchet wheels for locking said sectors in position, and individual keys for moving said pawls out of engagement with said ratchet wheels.

73. In an adding machine, the combination of a plurality of printing sectors, finger pieces attached thereto by means of which said sectors are actuated, a ratchet wheel actuated by each finger piece, pawls engaging said ratchet wheels for locking said sectors in position, an arm borne by each pawl, and pivoted members engaging said arms for actuating said pawls, thereby to release said ratchet wheels separately.

74. In an adding machine, the combination of a plurality of printing sectors, finger pieces attached thereto by means of which said sectors are actuated, a ratchet wheel actuated by each finger piece, pawls engaging said ratchet wheels for locking said sectors in position, a plurality of pivotally-mounted notched members for separately actuating said pawls, and a cross-rod extending through the notches in said members, thereby to limit the movement of said members.

75. In an adding machine, the combination of a plurality of rotatably-mounted printing sectors, finger pieces attached thereto by means of which said sectors are rotated, means for locking each sector in the position to which it may have been rotated, impression mechanism coöperative with the sectors, means for preventing the rotation of each sector during the operation of the impression mechanism, and means for releasing all of the sectors in series simultaneously after such operation, thereby permitting the return of same.

76. In an adding machine, the combination of a plurality of rotatably-mounted printing sectors, finger pieces attached thereto by means of which said sectors are rotated, means for locking each sector in the position to which it may have been rotated, impression mechanism coöperative with the sectors, a rack secured to each finger piece, gears meshing with said racks, a ratchet wheel secured to each gear, pawls normally disengaging said ratchet wheels, and means for moving said pawls into engagement with said ratchet wheels, thereby preventing the rotation of each sector during the operation of the impression mechanism.

77. In an adding machine, the combination of a plurality of rotatably-mounted printing sectors, finger pieces attached thereto by means of which said sectors are rotated, means for locking each sector in the position to which it may have been rotated, impression mechanism coöperative with said sectors, a ratchet wheel actuated by each finger piece, pawls for said ratchet wheels, a pivoted member for holding said pawls normally out of engagement with said ratchet wheels, and springs for holding said pawls into engagement with said ratchet wheels during the operation of the impression mechanism.

78. In an adding machine, the combination of a plurality of rotatably-mounted printing sectors, finger pieces attached thereto by means of which said sectors are rotated, means for locking each sector in the position to which it may have been rotated, means for simultaneously releasing all of the sectors in series to permit the return thereof, and means for preventing subsequent rotation of each sector until same returns to its initial position.

79. In a calculating machine, an accumulator embodying, in combination, a plurality of accumulator wheels, actuating means associated with each of said wheels and including a notched member, carry-over pawls for said wheels, and a member engageable in the notch in one of the first-named members for setting the corresponding carry-over pawl in inoperative position, to divide the accumulator wheels into separate series.

80. In a calculating machine, an accumulator embodying, in combination, a plurality of accumulator wheels, actuating means associated with each wheel and including a vertically movable plate, carry-over pawls for said wheels, and a member engageable with one of said plates for preventing movement thereof, to set the corresponding carry-over pawl in inoperative position and thus divide the accumulator wheels into separate series.

81. In a calculating machine, the combination of item listing and printing means, a revoluble platen movable to and from printing position, operating means for moving said platen to and from printing position, means for rotating said platen to bring a printed item on the paper into view, and means controlled by said operating means for rendering said rotating means inoperative.

In testimony whereof we hereunto affix our signatures in the presence of two witnesses.

EDWIN A. REED.
EDWIN L. RELLER.
WILLIAM L. SWIFT.
ALBERT J. MEIER.

Witnesses:
GLADYS WALTON,
GEORGE G. ANDERSON.