

Sept. 29, 1936.

N. W. PERKINS

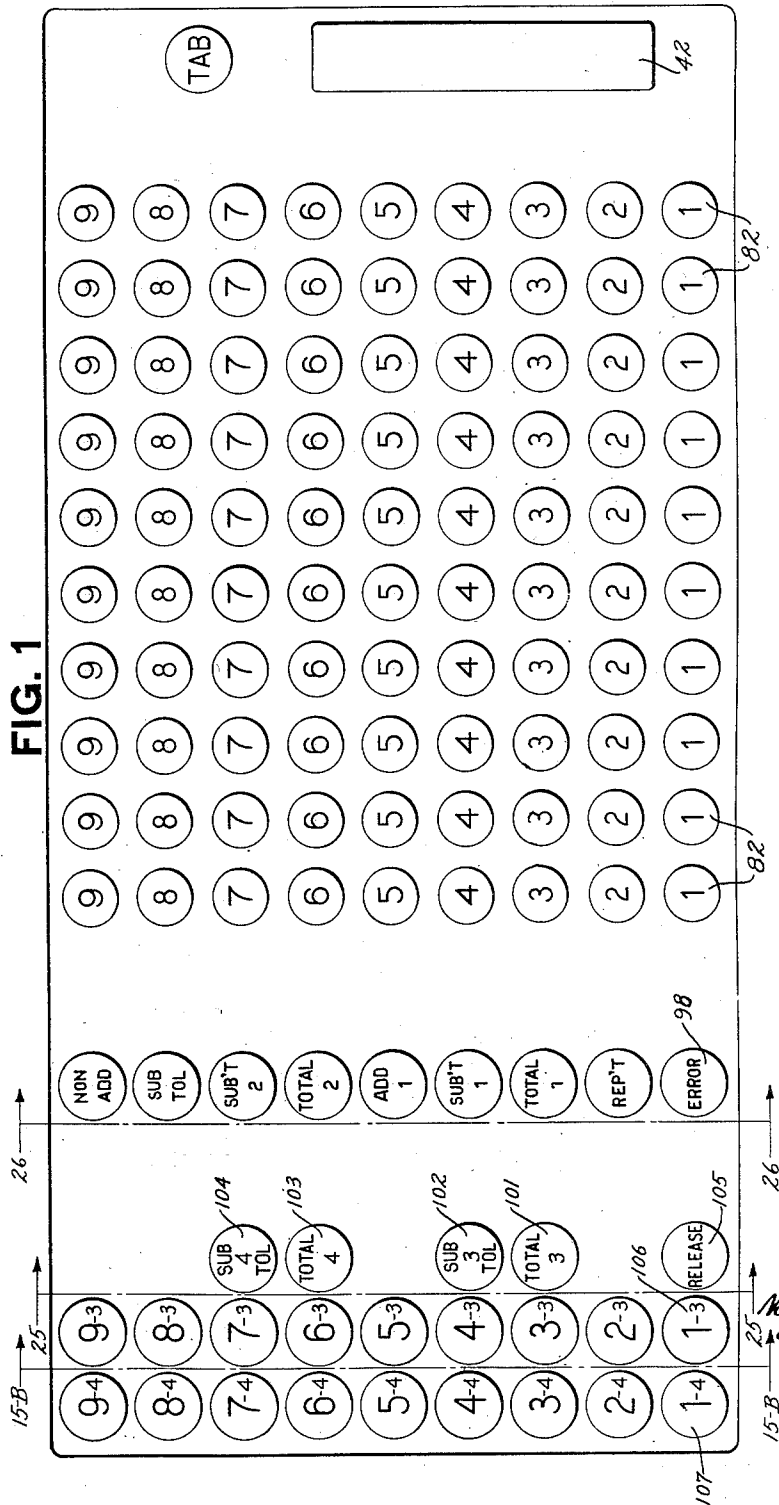
2,055,703

CALCULATING MACHINE

Filed Sept. 1, 1932

20 Sheets-Sheet 1

FIG. 1



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By *Ex'ors*

Harold Benoit

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Sept. 29, 1936.

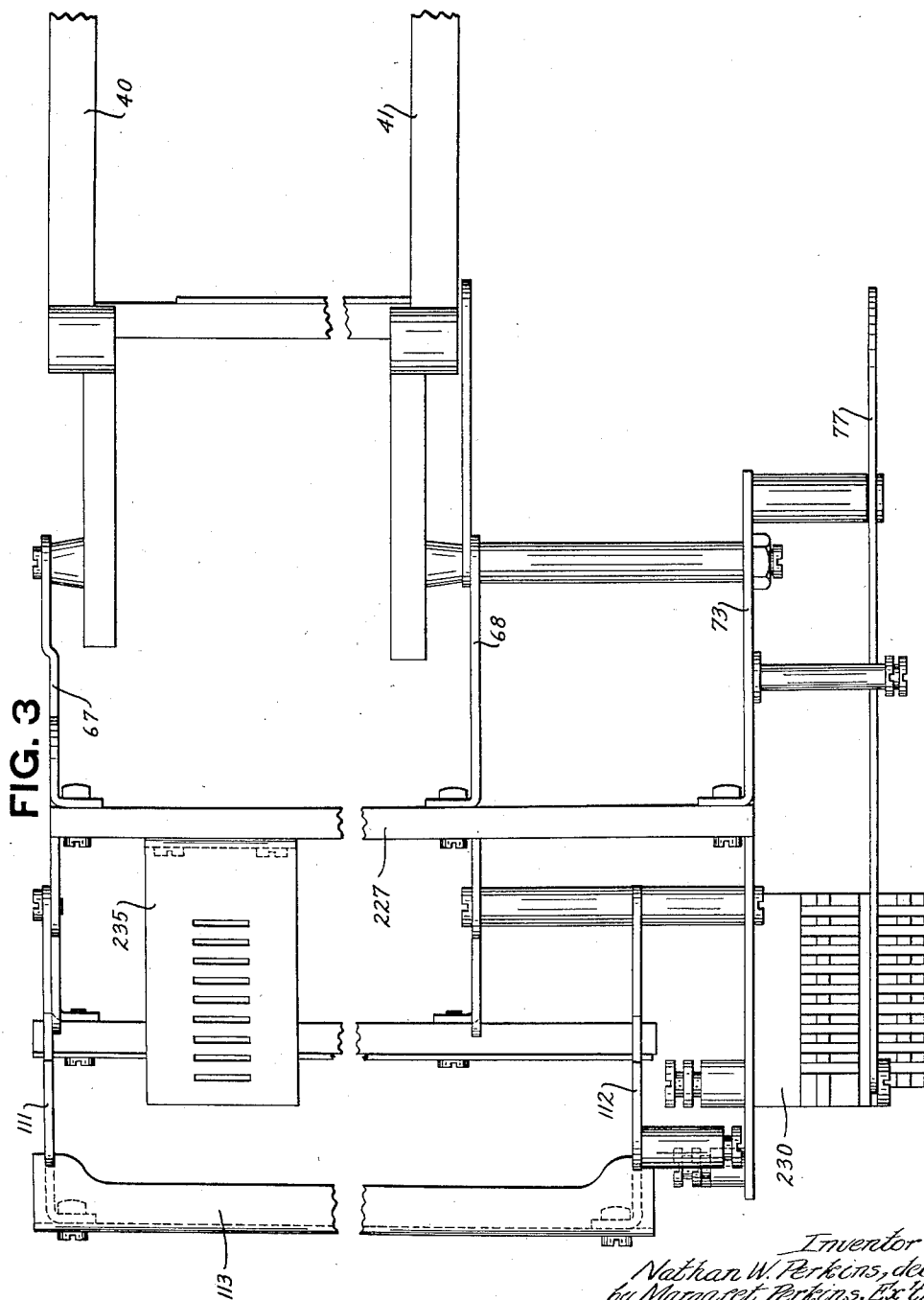
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2,055,703

CALCULATING MACHINE

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20 Sheets-Sheet 3



Inventor
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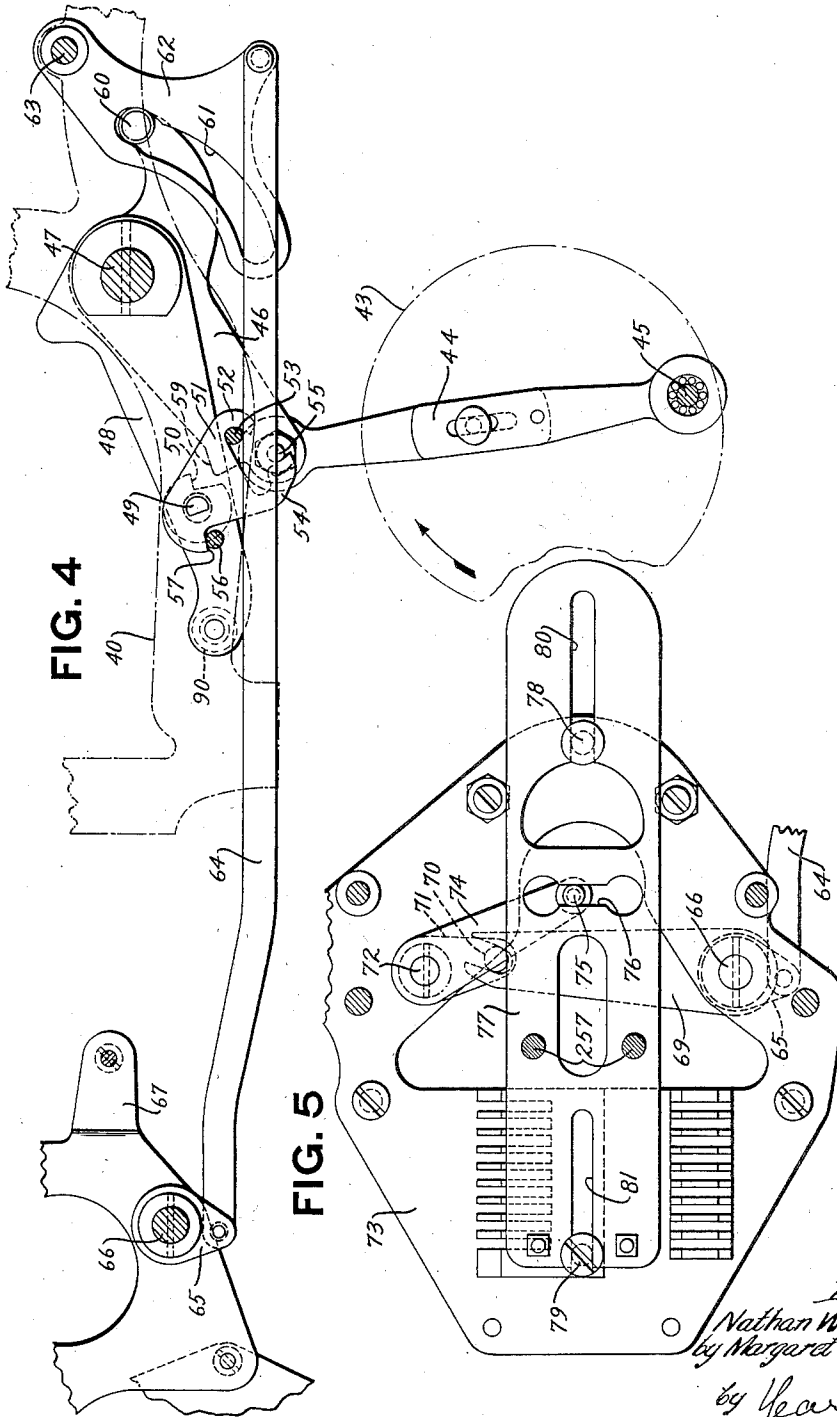
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N. W. PERKINS
CALCULATING MACHINE

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20 Sheets-Sheet 4



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CALCULATING MACHINE

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FIG. 8

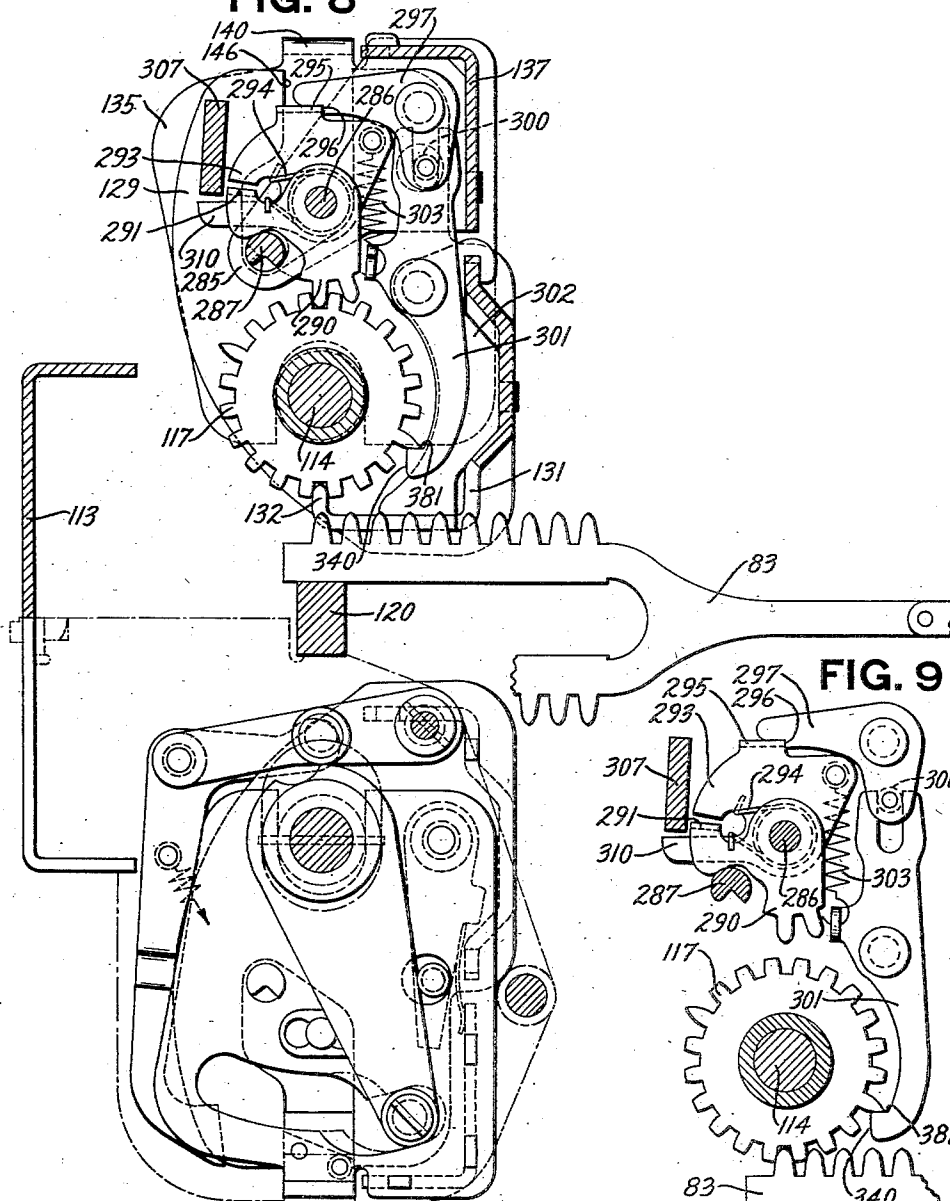
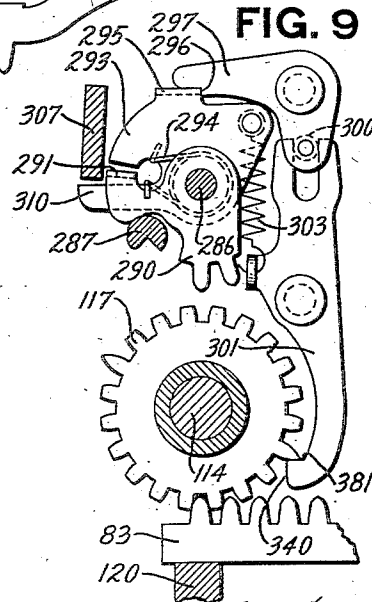


FIG. 9



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CALCULATING MACHINE

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FIG. 10

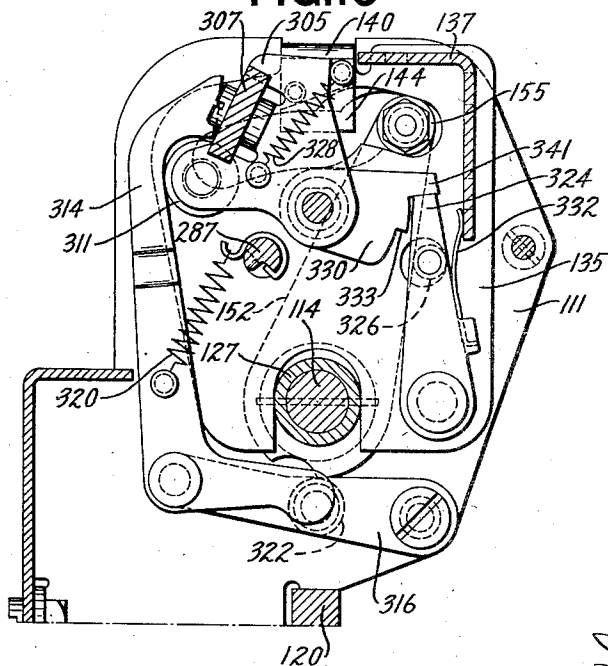


FIG. 11

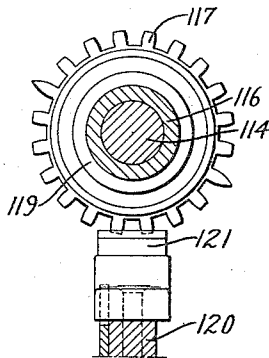
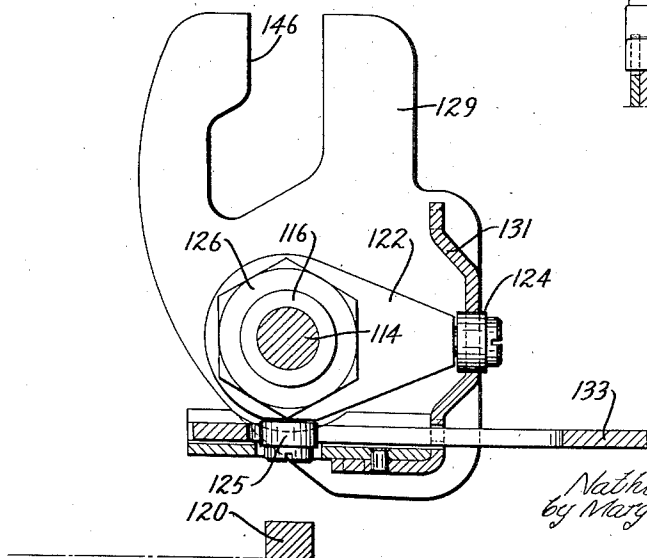


FIG. 12



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CALCULATING MACHINE

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FIG. 13

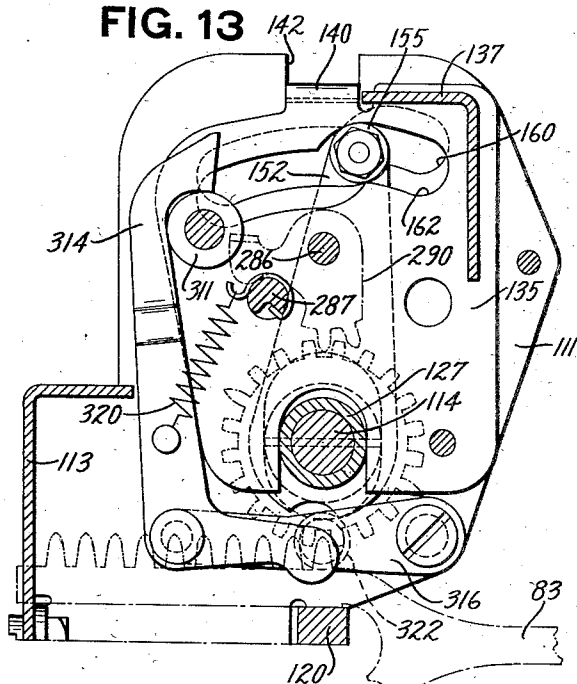
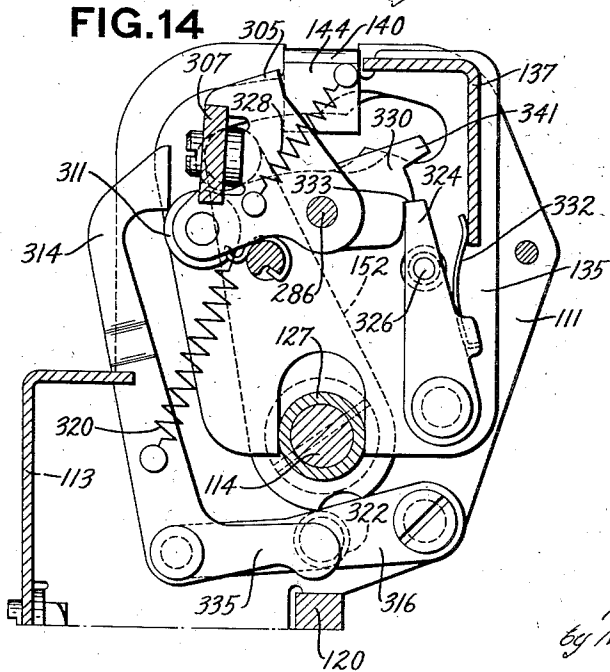


FIG. 14



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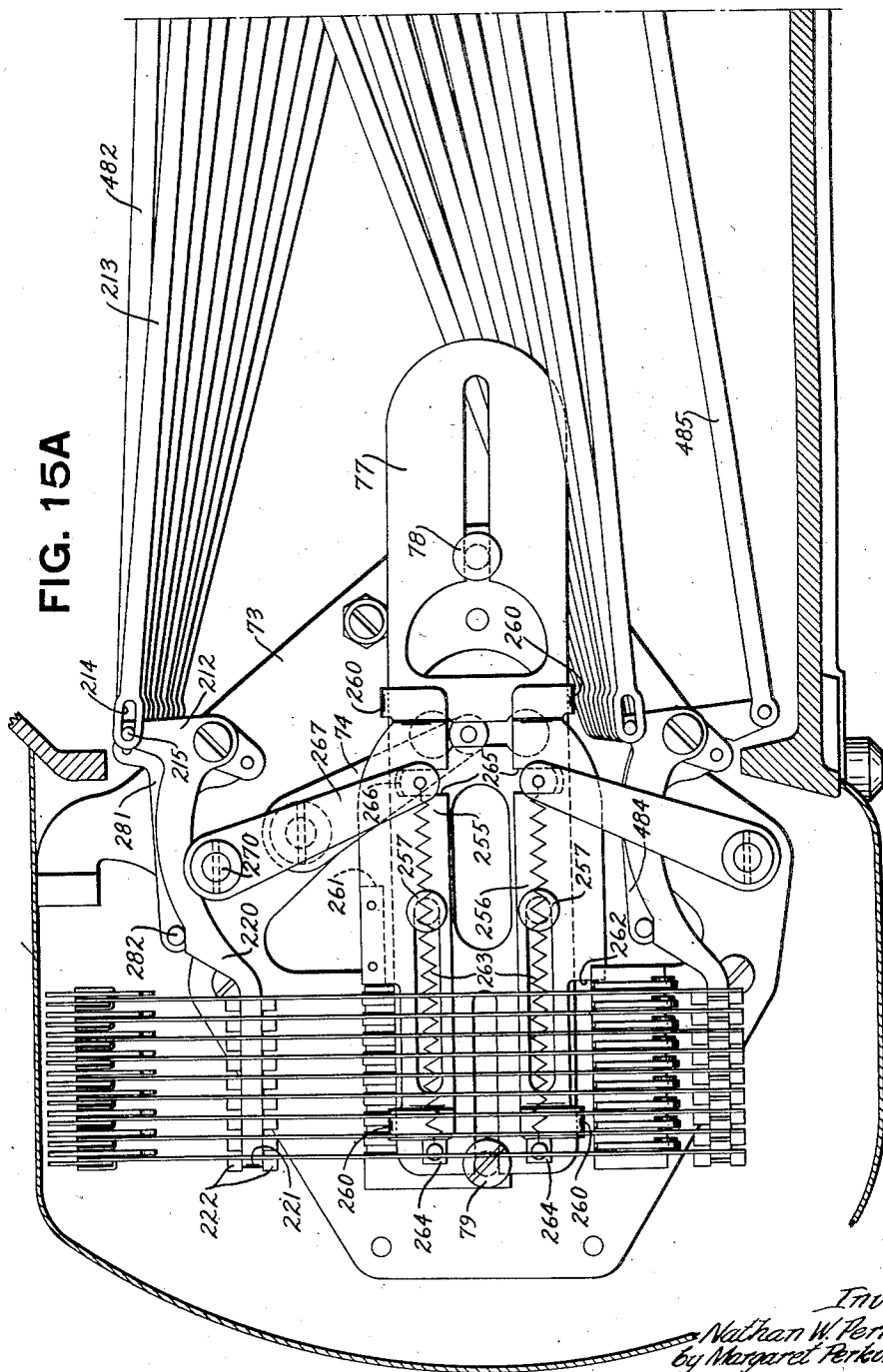
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CALCULATING MACHINE

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FIG. 15A



Inventor
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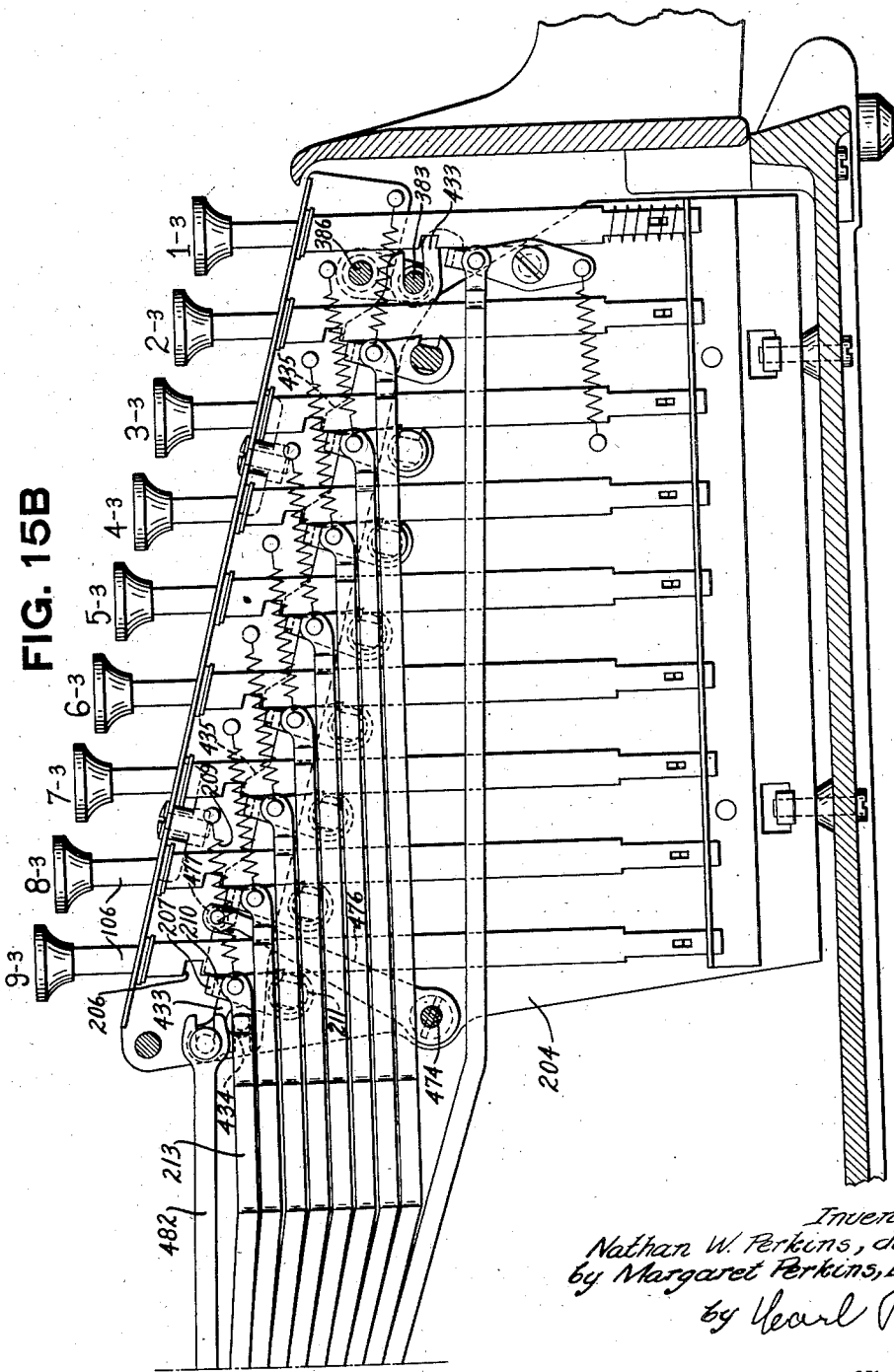
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CALCULATING MACHINE
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20 Sheets-Sheet 10



Inventor
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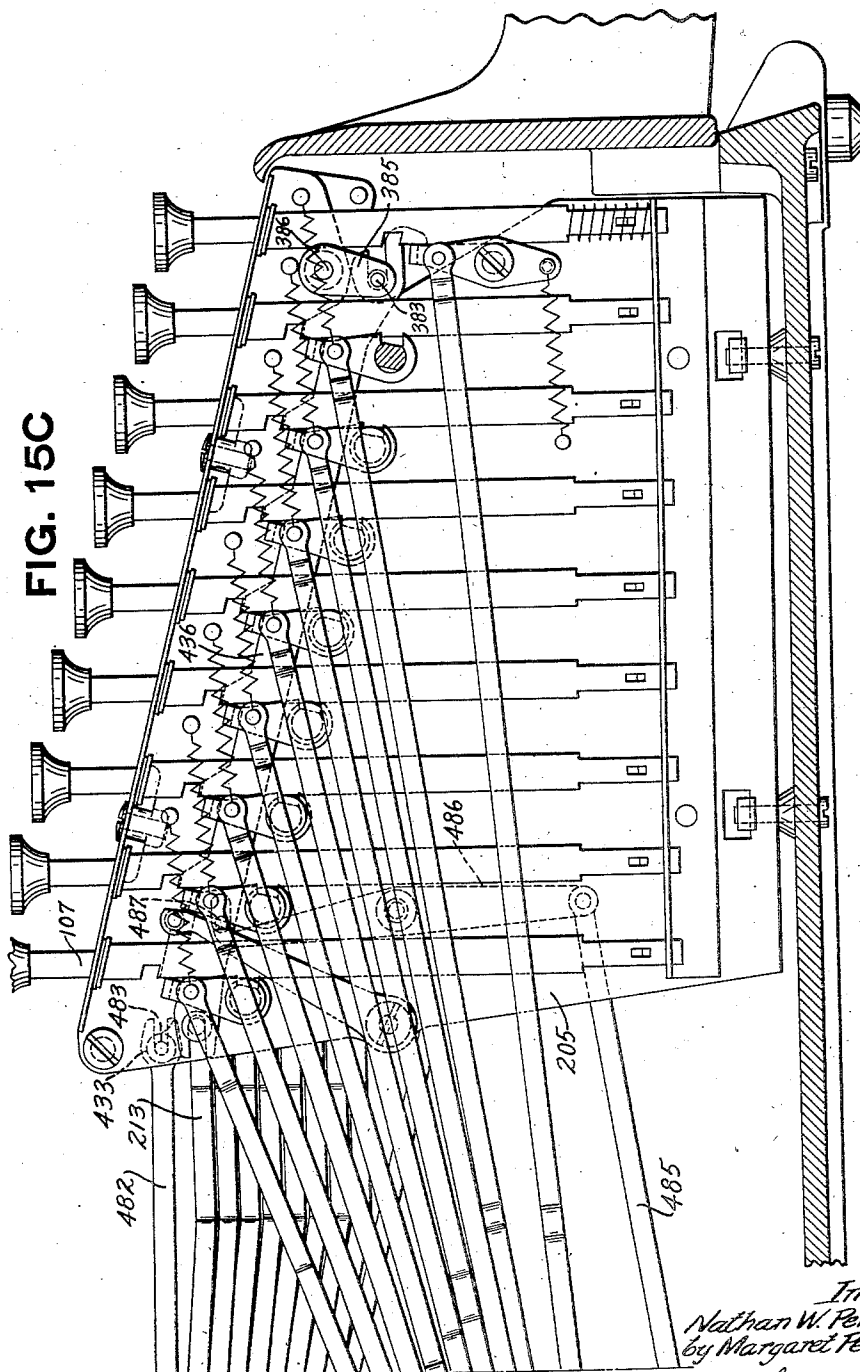
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N. W. PERKINS
CALCULATING MACHINE
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20 Sheets-Sheet 11



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CALCULATING MACHINE
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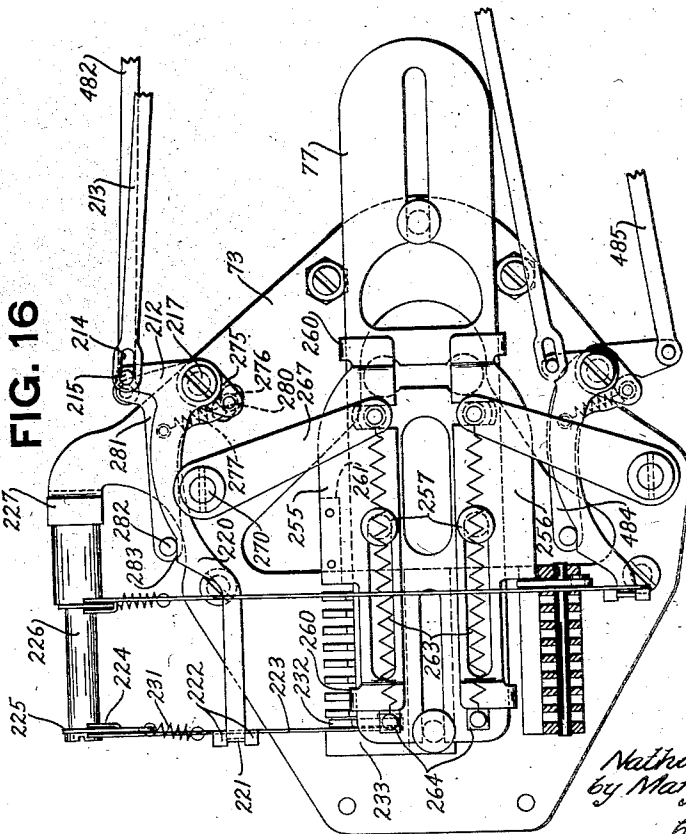


FIG. 16

FIG. 18A

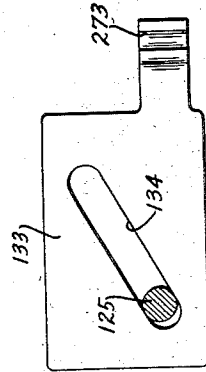


FIG. 18

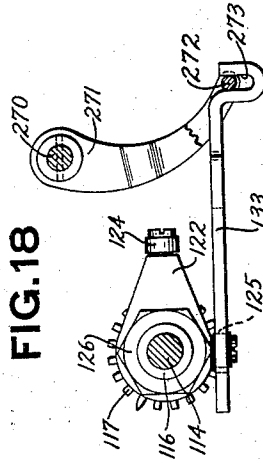
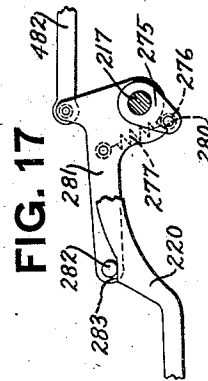


FIG. 17



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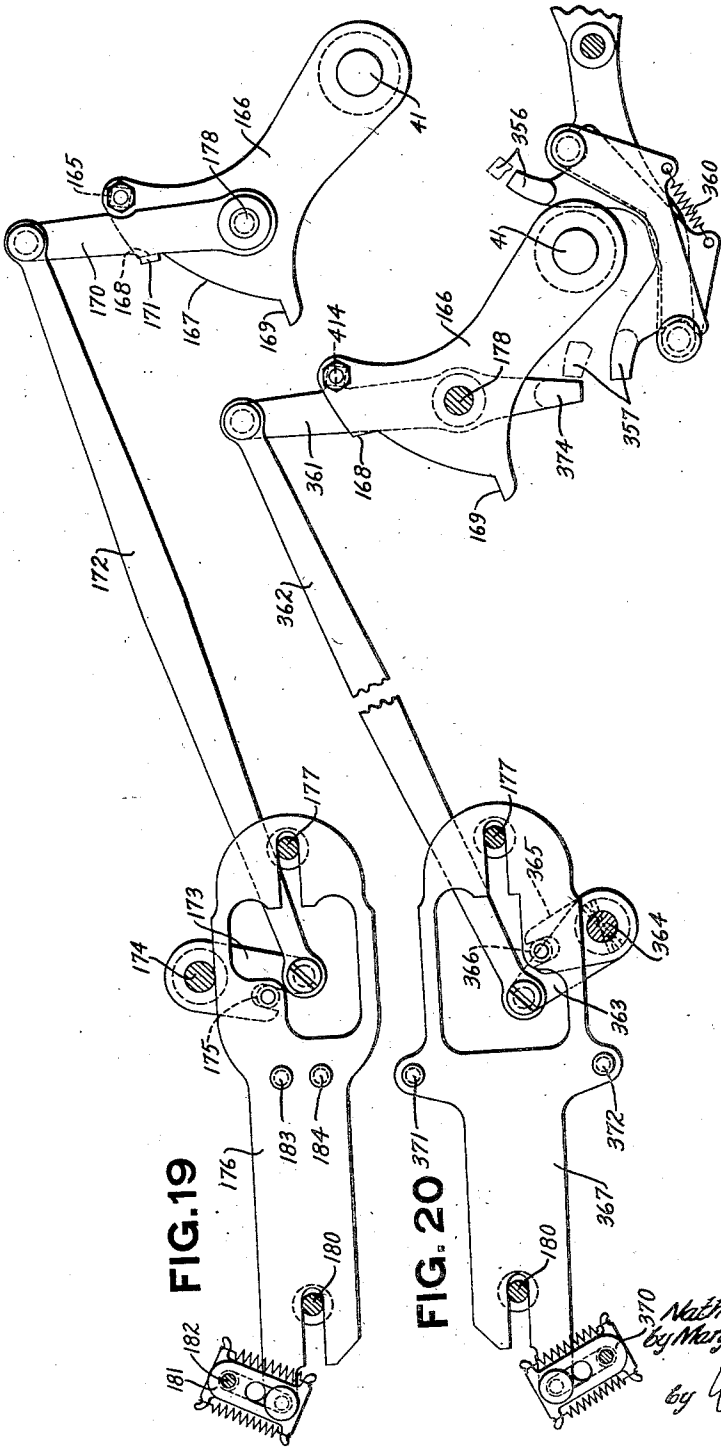
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N. W. PERKINS
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20 Sheets-Sheet 13



Inventor
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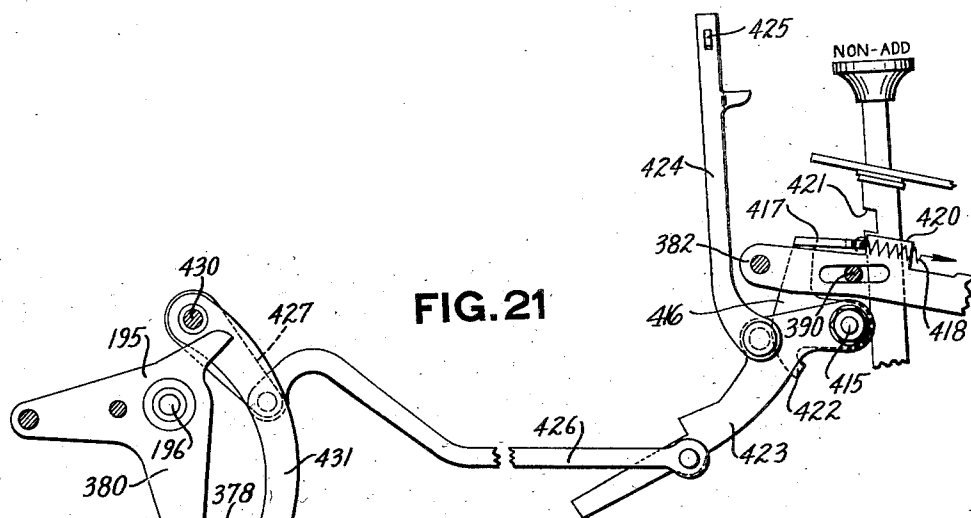


FIG. 21

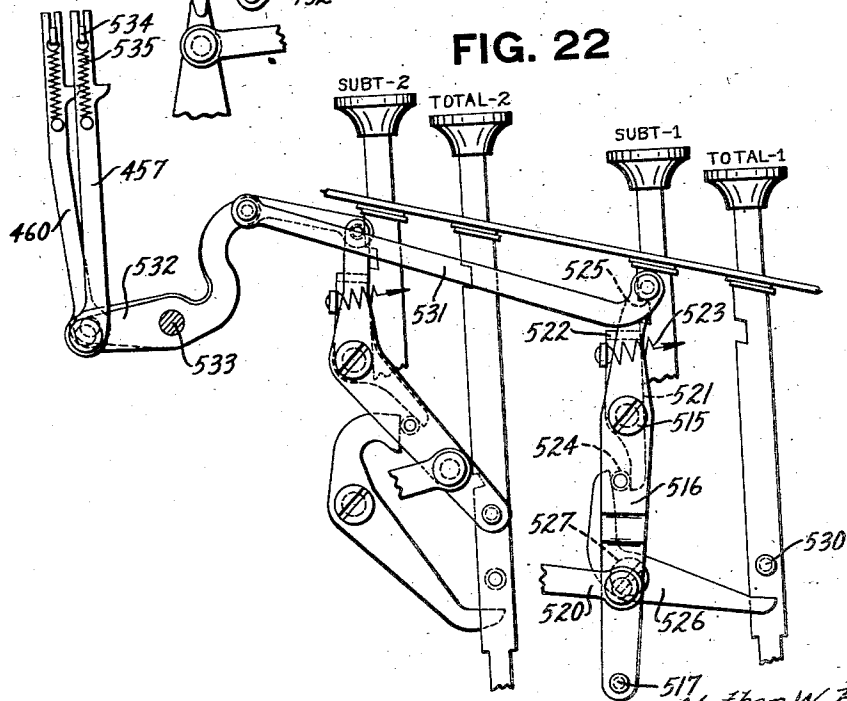


FIG. 22

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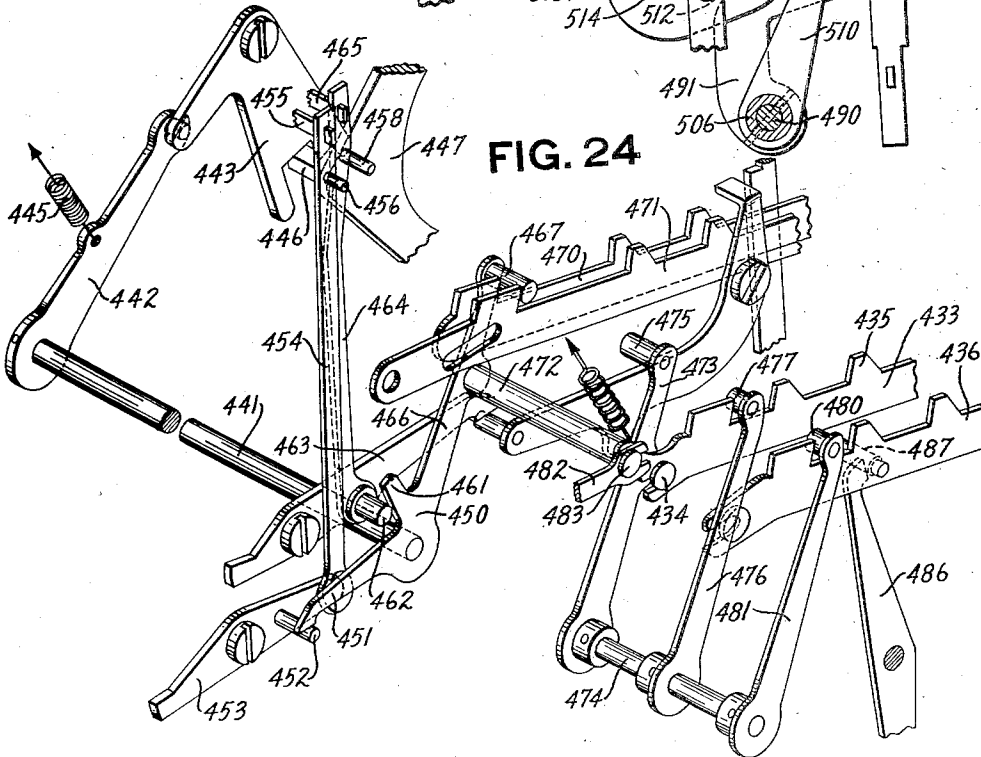
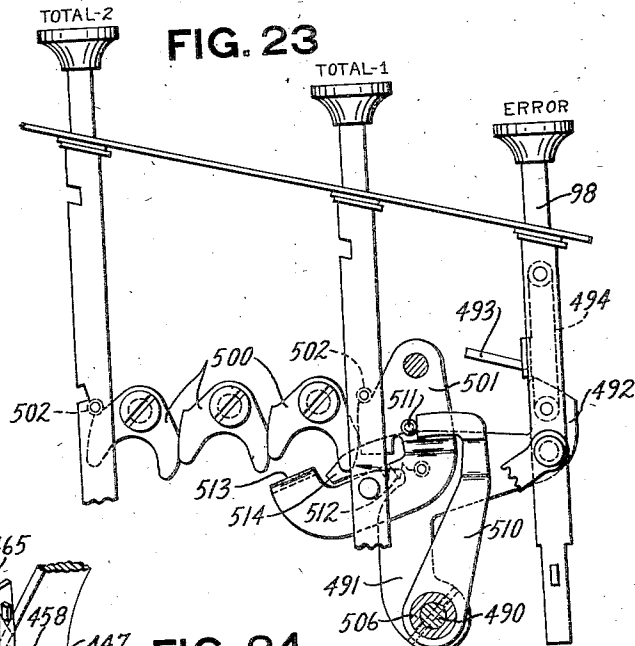
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N. W. PERKINS
CALCULATING MACHINE
Filed Sept. 1, 1932

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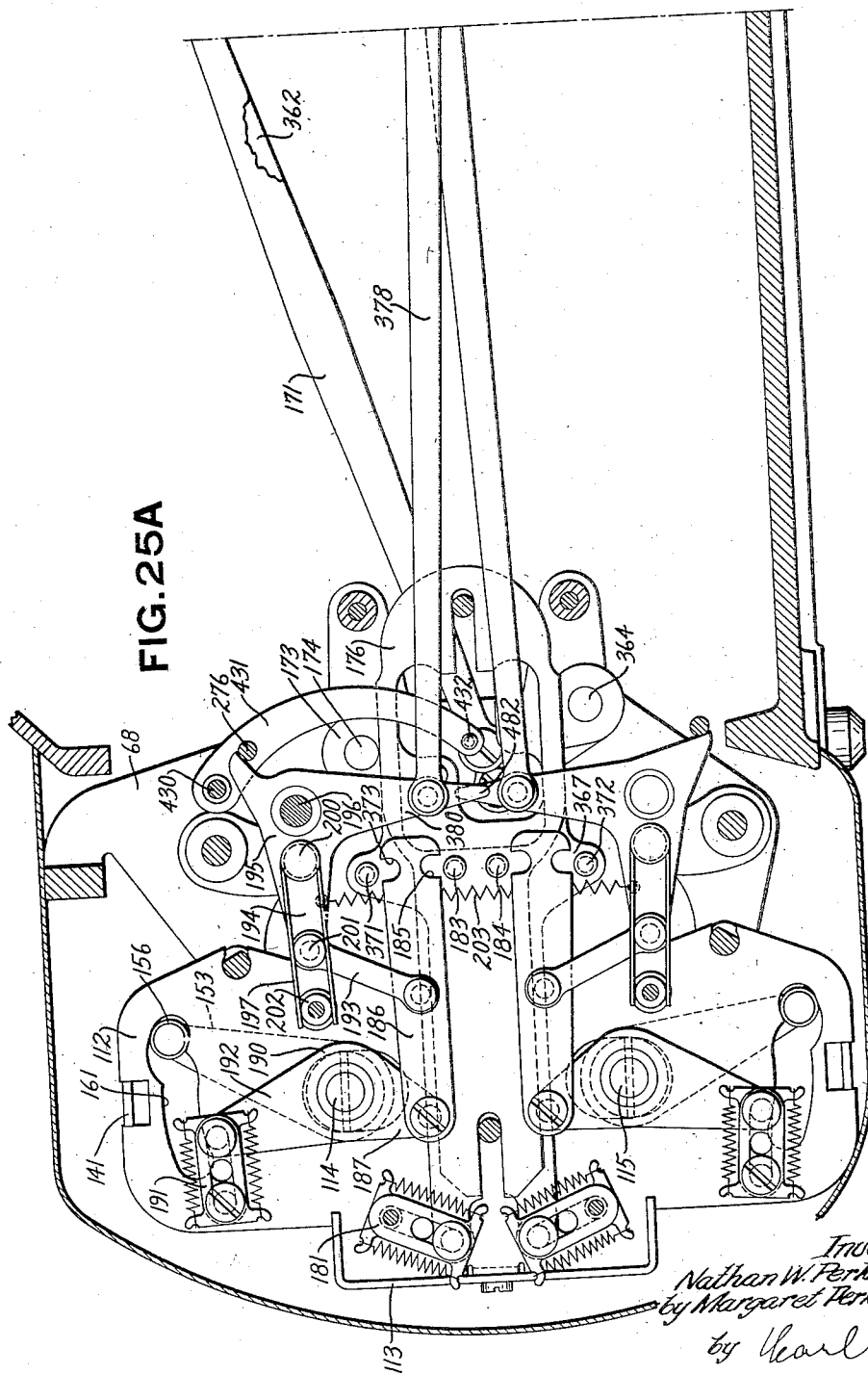
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N. W. PERKINS
CALCULATING MACHINE
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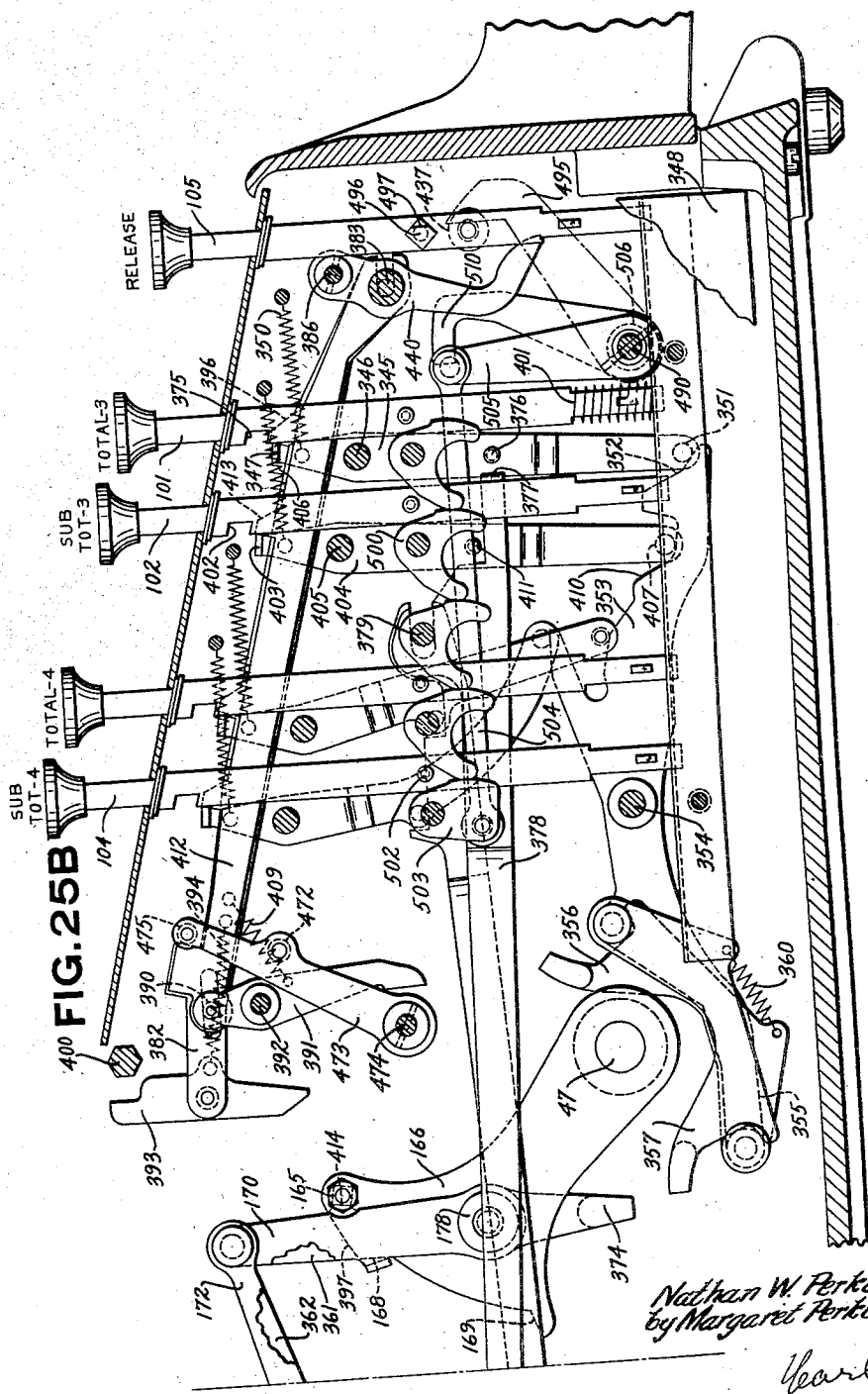


FIG. 25B

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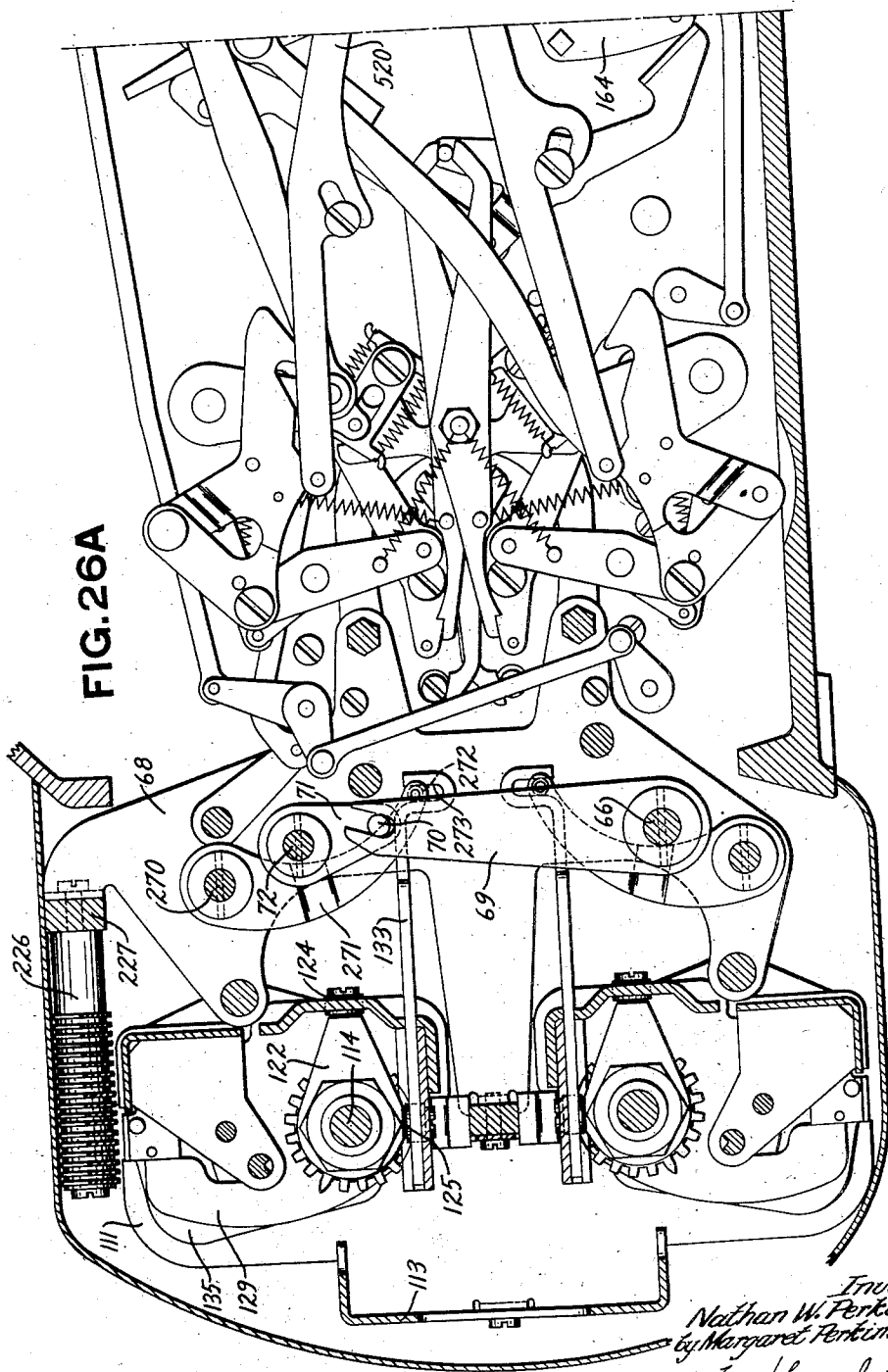
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CALCULATING MACHINE
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FIG. 26A



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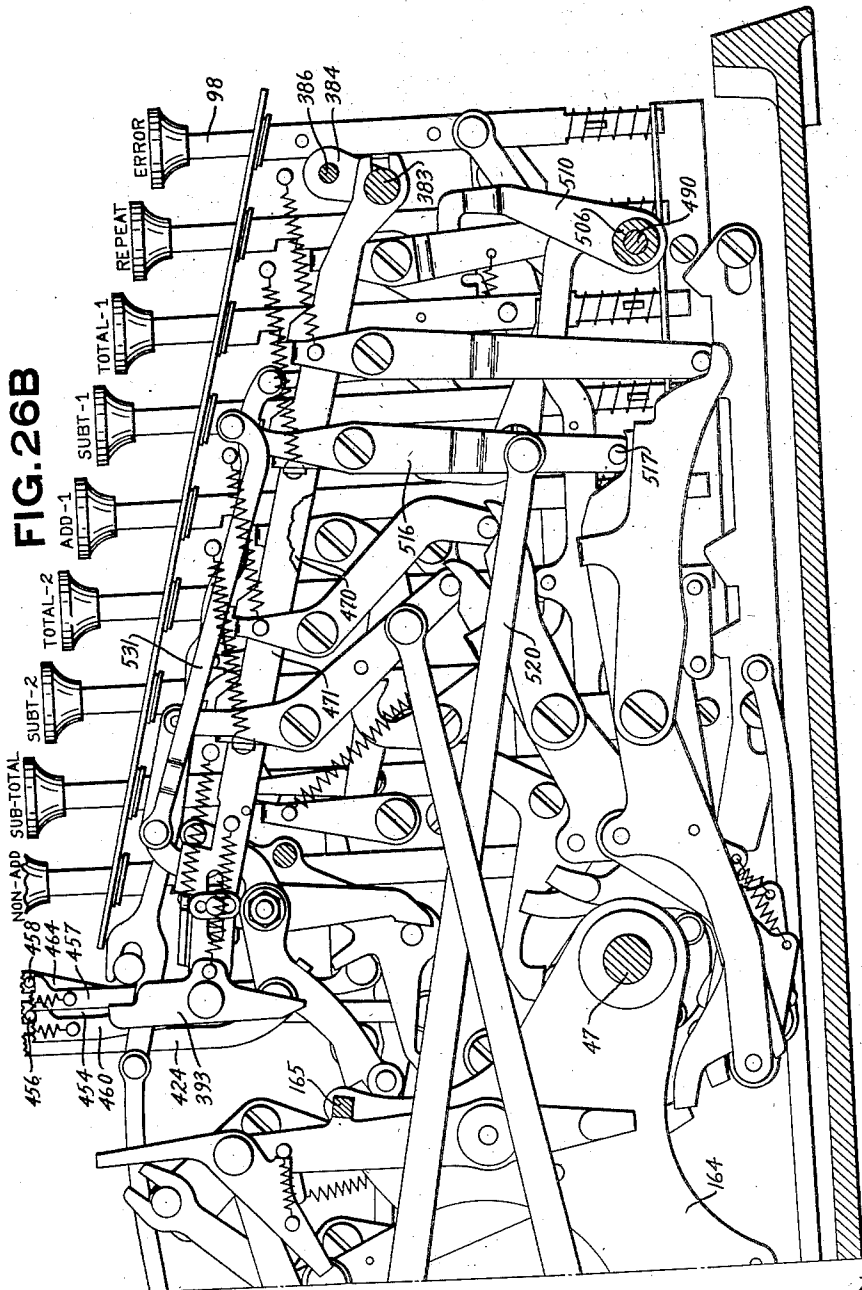
Sept. 29, 1936.

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FIG. 26B



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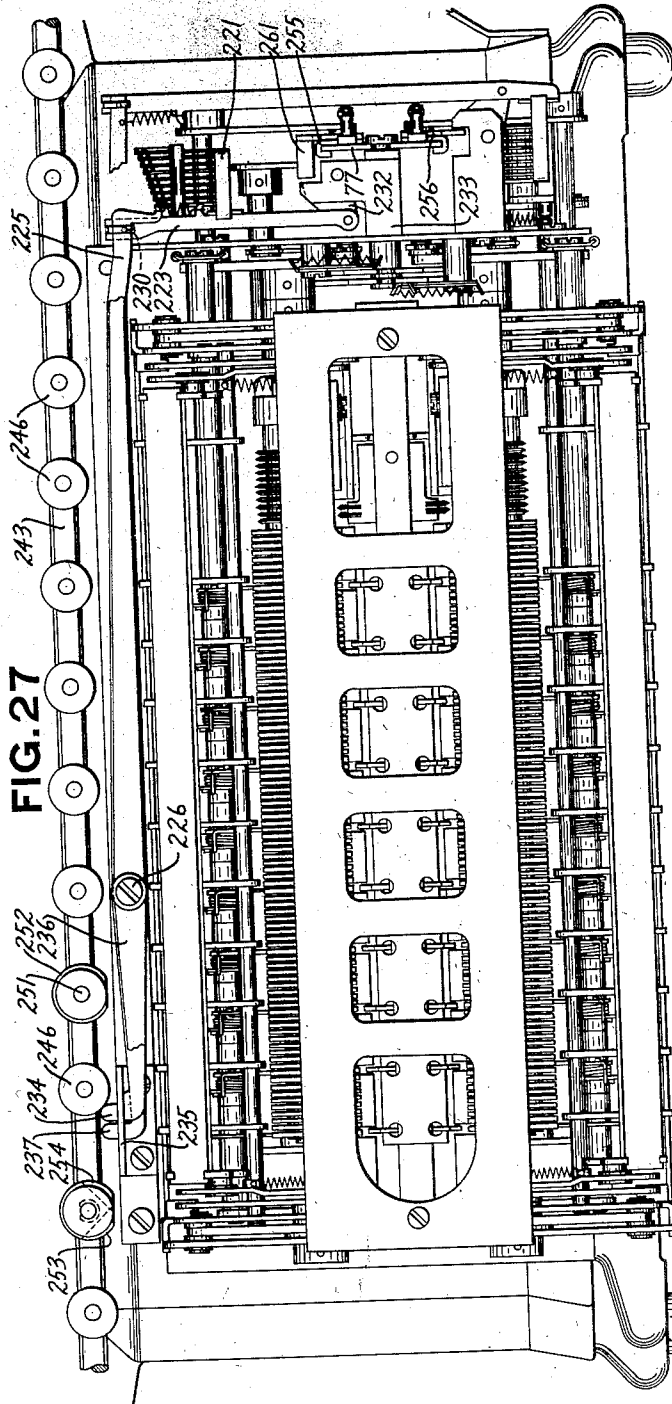
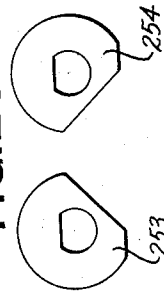


FIG. 28



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UNITED STATES PATENT OFFICE

2,055,703

CALCULATING MACHINE

Nathan W. Perkins, deceased, late of East Orange, N. J., by Margaret Perkins, administratrix, East Orange, N. J., assignor to The National Cash Register Company, Dayton, Ohio, a corporation of Maryland

Application September 1, 1932, Serial No. 631,378

19 Claims. (Cl. 235—60)

This invention relates to adding typewriters commonly known as accounting or bookkeeping machines and the like, but more particularly to the type of machine known as "Ellis," set out and described in Letters Patent of the United States No. 1,197,276, issued to Malcolm Ellis, September 5, 1916; No. 1,203,863, also issued to Malcolm Ellis, November 7, 1916; No. 1,536,757, issued May 5, 1925, to F. W. Bernau, and No. 1,819,084 granted to Emil John Ens on August 18, 1931.

An object of this invention is to provide an accounting machine of the Ellis type with multiple interspersed totalizers of the lateral shifting type.

Another object of the present invention is to provide means for selecting and controlling the interspersed totalizers.

Still another object of the present invention is to supply novel means for shifting the interspersed totalizers laterally, as distinguished from the selecting mechanism mentioned above.

A further object is to furnish novel means for engaging and disengaging the totalizer wheels with the actuators.

A still further object of this invention is to provide an improved carrying or transfer mechanism for the interspersed totalizers, which occupies little space.

Another object of this invention is to provide adjustable means on a traveling carriage for selecting any one totalizer of either or both groups of interspersed totalizers in any tabulated position of said traveling carriage.

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

Of said drawings:

Fig. 1 is a plan view showing the keyboard arrangement of the accounting machine which is the subject of this invention.

Fig. 2 is a sectional view taken just in front of an amount bank, showing the location of the totalizer line, the actuating means for the totalizer, the printing type, and the mechanism on the traveling carriage for automatically selecting the interspersed totalizers.

Fig. 3 is a fragmentary plan view of the plate and frame assemblies which support the interspersed totalizer mechanism.

Fig. 4 is a detail view showing the means for operating the totalizer selecting slide drive shaft.

Fig. 5 is an illustration showing in detail the totalizer selecting slide and the mechanism for operating it from its drive shaft.

Fig. 6 is a fragmentary view as observed from the front of the machine, showing the left hand end of the upper interspersed totalizer line and the engaging and aligning mechanism therefor.

Fig. 7 shows the righthand end of the upper interspersed totalizer line and the transfer and engaging mechanism therefor.

Fig. 8 is a side elevation taken from the left of the machine, showing the lateral shifting interspersed totalizer lines and the transfer engaging and actuating means therefor.

Fig. 9 is a detail view showing the transfer mechanism for one denominational unit.

Fig. 10 is a sectional view of the upper rear totalizer, showing the transfer restoring mechanism.

Fig. 11 is an end view showing in detail the aligning means for the upper rear totalizer line.

Fig. 12 is a detail sectional view showing the slide for positioning the upper rear totalizer line laterally.

Fig. 13 is a sectional view of the upper rear totalizer line illustrating the totalizer gears in the act of engaging an actuating rack; and also shows the transfer restoring mechanism.

Fig. 14 is a sectional view of the upper rear totalizer, showing the transfer restoring bar fully restored.

Figs. 15A and 15B constitute a side elevation of the left side of the machine, taken just to the left of the bank of selecting keys for the lower rear totalizer line.

Fig. 15C is a section taken along line 15C—15C of Fig. 1, looking in the direction of the arrows and shows the bank of selecting keys for the upper rear totalizer.

Fig. 16 is a detail view showing the selecting key mechanism for the first set of totalizer wheels for the lower rear group and the slide mechanism for positioning the totalizer line laterally.

Fig. 17 is a detail view of the totalizer latch operating lever for the upper rear totalizer line.

Fig. 18 is a detail of the totalizer shifting slide and its operating arm for the upper totalizer line.

Fig. 18A is a detail of the totalizer shifting slide associated with the upper rear totalizer line.

Fig. 19 is a detail of the totalizer engaging slide and its operating mechanism for both upper and lower rear lines during adding operations.

Fig. 20 is a detail of the totalizer engaging

slide and its operating mechanism for both upper and lower rear lines during total taking operations.

Fig. 21 is a view showing the non-add key and its mechanism in detail.

Fig. 22 is a detail illustration of the interlock between the total and subtract keys for the front totalizer lines.

Fig. 23 is an illustration of the interlocks between the total keys for the front and rear totalizer lines.

Fig. 24 is a view in perspective, showing the method of locking the machine against operation until certain controls are operated.

Figs. 25A and 25B constitute a section along line 25—25 of Fig. 1, looking in the direction of the arrows and shows the control key bank for the rear totalizer lines.

Figs. 26A and 26B constitute a section along line 26—26 of Fig. 1, looking in the direction of the arrows and shows the control bank of keys for the subtracting totalizer, the controlling mechanism for the front subtracting accumulator, and the lateral shifting mechanism for the rear interspersed totalizers.

Fig. 27 is a rear elevation of the machine, showing the lateral shifting interspersed totalizers and the means on the traveling carriage for selecting them.

Fig. 28 is an enlarged detail of two selecting disks.

GENERAL DESCRIPTION

In the present-day business world where accurate records are kept of all transactions relating to a particular business, it is necessary that accounting machines used in such business be so arranged that it is possible to add in a great number of columns, subtract in a lesser number, cross-add on many lines, obtain the correct totals of such columns and lines, and often the final result by the addition or subtraction of such separate totals. Also, it is desirable that it be possible to print the descriptions or designations of items, columns, totals and results included in such transactions as mentioned above.

It is, therefore, the main object of this invention to supply a machine with which the above results may be accomplished.

Described in general terms, the machine in which the present invention is incorporated is an accounting machine of the well-known Ellis type, consisting of an electrically-driven operating mechanism, a keyboard of conventional adding machine arrangement, a plurality of totalizers, actuating means for said totalizers, and a printer for recording the amount placed in the totalizers and for printing the condition of the totalizers.

If desired, the machine may be equipped with the usual typewriter keyboard and type to be used in conjunction with the adding machine printer for entering descriptive matter opposite amounts, etc., as stated above. This machine is also supplied with a traveling carriage similar to those used on typewriters, such carriage being arranged to exercise control over the different functions of the machine in the same manner as the control keys.

The driving mechanism may consist of an electric motor or other well known power means (not shown), for operating the main rock shaft from which all the mechanism of the machine is operated.

The present machine has four totalizer lines arranged vertically in pairs at the rear of the

machine. Each of the front lines carry a single totalizer only, while the two rear lines each carry a plurality of totalizers. The two front totalizers are of conventional Ellis construction with the exception that it is possible to carry on subtract operations in the lower front totalizer, while in the past only the upper front totalizer has been utilized as a subtract totalizer. Very little change was necessary to arrange the lower front totalizer or accumulator for subtracting operations, as the parts composing this totalizer are substantially duplicates of those in the upper, it being necessary in most instances merely to invert the parts for said upper subtracting totalizer to adapt them for use in the lower totalizer. However, minor changes and alterations have been made in certain parts of the machine that will be explained as the necessity arises.

The two rear totalizer lines are of the lateral-shifting interspersed type, such as illustrated and described in Letters Patent of the United States No. 1,242,170, issued October 9, 1917, to F. L. Fuller and Patent No. 1,230,864, issued June 26, 1917, to W. A. Chryst. Totalizers of this type are new in application to accounting machines such as disclosed in this application.

Each interspersed totalizer line has nine totalizers or accumulators, each consisting of ten denominational units. Mechanism has been devised which permits the selection of the different totalizers on the two rear totalizer lines either by keys or by means of adjustable stops, suitably arranged on the traveling carriage.

The keyboard is composed of a plurality of amount keys which position the accumulator actuating racks, and a plurality of control keys for selecting and controlling the operation of the different totalizers. In the instant case the Ellis machine has been widened to accommodate three additional rows of keys and connecting mechanism for controlling the selection and functions of the two new lines of interspersed totalizers.

In the pages that follow a detailed description will be given of all the mechanism composing the present invention. However, only so much of the conventional Ellis mechanism has been shown and described as is necessary to illustrate and explain this invention, and such mechanism will be treated briefly, as the occasion demands.

DETAILED DESCRIPTION

Operating mechanism

The mechanism of the machine proper is supported between two main frames 40 and 41, (Fig. 3), having attached thereto various auxiliary plates, braces and cross-members for supporting the mechanism constituting a part of the present invention, all of which will be described as the necessity demands.

The present machine is electrically operated by motor in a similar manner to most machines of this type, there being employed, therefore, a constantly running motor (not shown) geared to a driving member (not shown), which makes one revolution for each operation of the machine. Depression of a starting bar 42 (Fig. 1) causes a clutch member 43 (Fig. 4) shown in dot and dash, to be effectively coupled to the driving member. The clutch member 43 is carried one complete revolution to operate the machine before being automatically disengaged from the driving member, which movement also restores the starting bar to normal position. Further explanation of

this motor and drive is deemed unnecessary, as it is of conventional design and well-known in the art and shown in the United States Patent No. 1,136,165 issued to N. W. Perkins on April 20, 1915.

Again referring to Fig. 4, a drive link 44 has its lower end pivoted on a crank pin 45 fast in the clutch member 43. The upper end of said link is pivoted to an arm 46 loose on a main shaft 47 journaled in the main supporting frames 40 and 41. Fast on the shaft 47 is an arm 48 having journaled therein a stud 49 with a large head, which is notched to form a projection 50. Attached to the other end of the stud 49 in fixed relation to the projection 50 is a latch member 51 having a hook 52 adapted to engage a stud 53 fast in the machine frame 40. Another hook 54 on the arm 51 is arranged to be engaged by a stud 55 fast in the arm 46. A stud 56 fast in the machine frame 40 is arranged to contact a projection 57 on the latch 51.

The clutch 43 makes a complete revolution each time the machine is operated, thus rocking the arm 46 through an approximate angle of 75 degrees, the initial movement being clockwise. As the arm 46 is carried upwardly the stud 55 moves away from the outer end of the hook 54 and a nose 59 on the arm 46 engages the projection 50 rocking the latch 51 counter-clockwise until the hook 52 is disengaged from the stud 53 and the hook 54 is latched over the stud 55. Thus the arm 48 is operatively connected to the arm 46 and is rocked in unison therewith until the projection 57 strikes the stud 56 near the end of the return movement, thereby disengaging the hook 54 from the stud 55 and latching the hook 52 over the stud 53. The arm 48 is the main actuator for all the mechanism in the machine.

A roller 60 on the arm 46 extends through a cam slot 61 in an arm 62 pivoted at 63 to the machine frame 40. A link 64 (Figs. 4 and 5) pivotally connects the arm 62 to an arm 65 secured to a drive shaft 66 journaled on its right end in a plate 67 secured to the machine frame 40 (Fig. 3) and on its left end in another plate 68 secured to the frame 41. Fast on the shaft 66 is an arm 69 (Figs. 5 and 26A) bifurcated to embrace a stud 70 in an arm 71 secured to a shaft 72 pivoted between the plate 68 and a plate 73. Also fast on the shaft 72 is another arm 74 having a stud 75 therein adapted to extend into a vertical slot 76 in a totalizer selecting slide 77 slidably mounted on the plate 73 by a pair of shouldered studs 78 and 79 extending through lateral slots 80 and 81 in the slide 77 and secured in the plate 73.

The cam slot 61 in the arm 62 is so arranged that the initial movement of the arm 46 will rock the arm 62 its full counter-clockwise movement before the nose 59 contacts the projection 50. Thus the slide 77 through the connecting mechanism explained above makes its complete movement from right to left before the arm 48 receives any movement whatever. Likewise on the return movement of the arm 46 the arm 48 will be locked in its home position before the slide 77 is returned to its position of rest by the continued movement of the arm 46. The working of the slide 77 will be explained later in this specification.

Keyboard

As before stated, the keyboard of the regular Ellis machine has been widened in this instance to accommodate three additional rows of control keys for the interspersed totalizers, otherwise the keyboard is of conventional Ellis arrangement.

In the present machine there are ten rows of amount keys, two rows of control keys and two rows of selecting keys for the interspersed totalizers. The amount keys 82 (Figs. 1 and 2) are similar to those used on most machines of this type, and are known as flexible keys, arranged so that after one key in a denominational group is depressed, the depression of another key in that group releases the depressed key, and so on. For each row of amount keys there is an actuator rack 83 (Figs. 2 and 7) and a reducing arm 84. The rack 83 has a slot 85 which embraces a stud 86 fast in the reducing arm 84, which is coupled by a spring 87 to a leading frame 88 secured to a shaft 89 which is rocked each time the machine is operated by a roller 90 (Fig. 4) carried by the arm 48, engaging a cam slot in an arm (not shown) fast on the shaft 89, the first movement being clockwise, as viewed in Fig. 2.

The depression of an amount key 82 releases the rack 83 so that its reducing arm 84 is free to follow the leading frame 88 until the rearward movement of the rack and releasing arm is arrested by one of a series of steps 91 on the rack 83 contacting a square stud 92 in the depressed key, to position the rack 83 in accordance with the depressed key. An arm 93 on the reducing arm 84 is pivotally connected by a link 94 to a printing segment 95 so that in adding operations the rearward movement of the rack 83 positions the printing segment 95 in accordance with the amount key depressed. This printing segment is subsequently released to contact first an inking ribbon (not shown), and then paper wound around the platen roll 96 rotatably mounted in a traveling carriage 97, to print on said paper the value of the depressed amount key. There is one such printing segment 95 for each row of amount keys in the machine.

In adding operations, when the rack 83 reaches the end of its rearward movement the selected totalizer is carried into mesh with one of the four sets of teeth on said rack, to be actuated by the return movement of the rack 83.

To the left of the amount keys is a row of control keys 98, which exercise control over the two forward totalizers No. 1 and No. 2 in the usual manner to condition these totalizers for adding, subtracting, total and sub-total-taking and repeat operations. A "non-add" key is arranged to disable all four totalizers to prevent them meshing with the actuator racks, thereby controlling the non-add feature in all totalizer lines. An "error" key releases all depressed amount keys. The second row of control keys contains a total key 101 and a sub-total key 102 for the upper rear totalizer line No. 3, and a total key 103 and a sub-total key 104 for the lower rear totalizer line No. 4. The manner in which these keys operate to condition the interspersed totalizers for total and sub-total-taking operations will be treated in detail hereafter. A release key 105 is arranged to release all depressed control keys and the selecting keys for the interspersed totalizers.

At the extreme left of the keyboard are two rows of keys 106 and 107 (Fig. 1). The keys 106 are selecting keys for the totalizers on the upper rear interspersed totalizer line No. 3 and the keys 107 are selecting keys for the totalizers on the lower rear interspersed totalizer line No. 4. The manner in which these keys select the different totalizers will be hereinafter explained.

Totalizers

As stated above, the machine illustrated has four totalizer lines, their position in relation to the rest of the machine being well shown in Fig. 2. For convenience, the different totalizer lines will be numbered in the same manner as has heretofore been the custom. The upper front totalizer line will be called No. 1, the lower front line No. 2, the upper rear line No. 3, and the lower rear line No. 4.

As previously explained, the totalizer lines Nos. 1 and 2 are of conventional Ellis construction, with the exception that in the present machine the lower or No. 2 totalizer has been arranged for subtracting operations, making both the lines Nos. 1 and 2 subtracting totalizers. Further explanation of these two totalizers is deemed unnecessary as reference may be had to the patents referred to at the beginning of this specification for a complete description thereof.

The Nos. 3 and 4 totalizer lines are of the interspersed type mentioned previously in this specification and as they are substantially identical it is thought that a detailed description of the No. 3 totalizer line will be sufficient. The No. 3 and No. 4 totalizer lines are mounted in a frame formed by two end plates 111 and 112 (Figs. 3, 6, 7 and 25A) connected by a channel 113. The frame thus formed is supported by the main machine frames 40 and 41 by being attached to the plates 67, 68 and 73. Passing through vertical slots in the plates 111 and 112 and guided thereby, is a shaft 114. Slidably mounted on the shaft 114 is a sleeve 116 having loosely mounted thereon nine sets of totalizer gears or wheels 117 arranged to rotate independently, each set consisting of ten denominational units constituting one totalizer.

Each totalizer gear 117 has twenty teeth, adapted to cooperate with teeth on the extended ends of the actuator racks 83. Eighteen of these gear teeth are cut short, the two remaining long teeth being diametrically opposed to properly trip the carrying mechanism each time ten is accumulated on a gear wheel, and also serve to stop the gear wheels at zero in total and sub-total operations.

To prevent the multiplication of lost motion every ninth totalizer wheel 117 is counterbored to receive and retain a halved washer 118 (Figs. 6 and 7) composed of two equal parts inserted in grooves in the sleeve 116. On the left end of the sleeve 116 is a series of beveled aligning disks 119 (Figs. 6 and 11) properly spaced so that the distance between adjoining disks is the same as that of contiguous totalizer wheels 117. Mounted on a rack supporting bar 120 is a pair of stationary aligning members 121 arranged to cooperate with the aligning disks 119 to hold the selected set of totalizer gears in alignment with the actuator racks during the time that said gears are meshed with said racks. Mounted on the sleeve 116 to the left of the aligning disks is a totalizer shifting arm 122 (Figs. 6, 12 and 26A) carrying a roller 124. The arm 122 is flattened on its lower edge to receive another roller 125. The left end of the sleeve 116 is threaded to receive a nut 126 which clamps the arm 122, the aligning disks 119, and suitable spacing washers against the left hand halved washer 118.

Loosely mounted on the shaft 114 by means of two recessed hubs 127 and 128 (Figs. 6 and 7) are a pair of plates 129 and 130 connected to form a totalizer engaging frame by an angle bar 131

having therein a horizontal slot engaged by the roll 124 on the arm 122 to prevent rotation of the shifting arm 122. An upturned edge of the angle bar 131 is shaped to form a lining bar 132 (Fig. 8) adapted to engage the totalizer gears to prevent their rotation when not in position to be meshed with the actuator racks 83. The angle bar 131 and its upturned edge 132 are slotted at proper intervals (Fig. 6) to clear the racks 83 and permit the gears 117 in line with said actuator racks to mesh therewith.

A slide 133 (Figs. 6, 12, 18 and 26A) is mounted in the bar 131 to slide horizontally at right angles to the sleeve 116. An angular cam slot 134 in said slide 133 embraces the roller 125 on the shifting arm 122. The depression of one of the selecting keys 106 (Figs. 1 and 15B) or the setting of a stop on the traveling carriage positions the slide 133, in a manner to be later described, to shift the sleeve 116 laterally, to select the wheels of the totalizer corresponding to said depressed key or said carriage stop.

Totalizer engaging mechanism

In machines of this type the usual totalizer gear wheels are normally out of mesh with the actuator racks, which also holds true in the case of the two sets of interspersed totalizers incorporated in the present machine. It is therefore necessary to provide mechanism for engaging the selected interspersed totalizers with the actuators for the purpose of operating said totalizers. Such mechanism will now be explained.

A carrying frame composed of a pair of plates 135 and 136 (Figs. 6, 7 and 13) connected by an angle bar 137 is arranged to straddle the engaging frame formed by the plates 129, 130 and the formed bar 131. The plates 135 and 136 are bifurcated to embrace the recessed portions of the hubs 127 and 128. The upper ends of the plates 135 and 136 each have an ear 140 and 141 respectively, formed thereon at right angles thereto, and adapted to cooperate with slots 142 and 143 in the stationary end plates 111 and 112. Thus the carrying frame is arranged to slide vertically independent of the shaft 114 and the mechanism assembled thereon. Secured to the plates 135 and 136 are blocks 144 and 145 (Figs. 6, 10 and 14), arranged to cooperate with slots 146 and 147 in the plates 129 and 130 to maintain the totalizer engaging frame in a vertical position.

Secured to the shaft 114 is a pair of shouldered hubs 150 and 151 (Figs. 6, 7, 10, 13, 14 and 25A) and carrying arms 152 and 153 respectively. The arm 152 has mounted on opposite sides thereof rollers 154 and 155. The arm 153 likewise has mounted thereon rollers 156 and 157. The rollers 154 and 156 are adapted to cooperate with symmetrical cam slots 160 and 161 in the end plates 111 and 112. The rollers 155 and 157 are embraced by a pair of symmetrical cam slots 162 and 163 in the totalizer carrying frame plates 135 and 136. The shouldered hubs 150 and 151 extend through vertical slots in the end plates 111 and 112 in order that the shaft 114 may be free to slide vertically, the shoulders on said hubs serving to locate the shaft 114 between the plates 111 and 112.

Fast on the left end of the shaft 47 (Fig. 26B) is a driving plate 164 connected by a square stud 165 to an auxiliary driving plate 166 (Figs. 19, 20 and 25B) loose on the shaft 47 and having an arcuate surface 167 undercut in such a manner as to form two shoulders 168 and 169. Pivoted on the lefthand side of the driving plate 166 (Fig. 75

19) on a stud 178 is a flying lever 170 having an ear 171 bent to extend over the arcuate edge 167 and in the path of the shoulders 168 and 169. A link 172 pivotally connects the lever 170 to an arm 173 pivoted on a stud 174 fast in the supporting plate 68. The arm 173 is slotted to embrace a stud 175 fast in an adding slide 176 slidably mounted upon grooved pins 177 and 180 secured in the plate 73. A spring-coupled detent 181 is pivoted between the slide 176 and a stationary stud 182 fast in the plate 73, and functions in the usual manner to retain the slide 176 in either of its extreme positions.

Secured in the slide 176 are studs 183 and 184. The stud 183 is adapted to be engaged by a notch 185 (Fig. 25A) in a latch 186 pivoted on an arm 187 of a two-armed lever 190 fast on the shaft 114. Another spring detent 191 is pivoted between an arm 192 of the lever 190 and a stationary stud in the plate 73 to retain the lever 190 at the termination of its throw in either direction. A link 193 pivotally connects the latch 186 to an arm 194 of a totalizer control lever 195 pivoted on a stud 196 secured in the plate 73. A hairpin shaped spring 197 is coiled around a stud 200 in the arm 194, its two ends straddling a stud 201 in the arm 194 and a stud 202 in the plate 73 to retain the latch 186 in its normal position, as shown in Fig. 25A.

A spring 203 is tensioned to counteract the action of the hairpin spring sufficiently to enable the latch 186 to be hooked over the stud 183 without excessive strain. The depression of one of the keys 106 (Fig. 1) or the setting of a stop on the traveling carriage rocks the lever 195 (Fig. 25A) counter-clockwise in a manner to be later described, to hook the latch 186 over the stud 183.

The rocking of the shaft 47 (Figs. 19 and 26B) by mechanism heretofore explained, causes the driving plates 164 and 166 to rock in unison therewith, first in a clockwise direction. As the plate 166 is rocked clockwise, the flying lever 170 turns on its pivot stud 178 until the shoulder 169 contacts the ear 171, causing the lever 170 and the plate 166 to continue the clockwise movement as a unit. This through the link 172 and the arm 173 moves the slide 176 (Fig. 19) from its normal rear position (lefthand Fig. 19) to its front position (righthand Fig. 19) where it is retained by the detent 181 until, near the termination of the return or clockwise movement of the plate 166, the shoulder 168 engages the ear 171 to rock the arm 173, thereby returning the slide 176 to its home or lefthand position.

The lever 190 (Fig. 25A) being latched to the slide 176, as explained above, the movement of the slide 176 to the right rocks the shaft 114 and the arms 152 and 153 counter-clockwise, causing the rollers 154 and 156 to follow the cam slots 160 and 161 in the stationary plates 111 and 112, to move the totalizer gear wheels 117 into mesh with the actuator racks 83 after the racks have finished their movement to the rear of the machine, so that when the racks 83 are returned to their home positions the totalizer gear wheels will be actuated in accordance with the amount keys depressed.

Totalizer selecting mechanism

It is obvious that only one of the interspersed totalizers on a line can be actuated at one time, there being only one set of totalizer actuators. Therefore means is provided for selecting the different totalizers.

Selection of a particular totalizer may be ac-

complished in two ways; first by the depression of one of the totalizer selecting keys 106 or 107; second, by means of adjustable stops, suitably arranged on the traveling carriage.

An order plate 204 (Fig. 15B) carries the row of keys 106 which are selecting keys for the No. 3 interspersed totalizers, there being one key for each of the nine accumulators or totalizers on the No. 3 line. Likewise an order plate 205 (Fig. 15C) supports the row of keys 107 for selecting the different totalizers on the No. 4 line.

As the different totalizers are selected in a similar manner a description of the selection of one totalizer on the No. 3 totalizer line will be sufficient. For example, the "9" key for the No. 3 totalizer line has a notch 206 adapted to receive a lug 207 bent at right angles to a latch 210 pivoted on a stud 211 in the order plate 204. A spring 209 is tensioned to pull the latch 210 in a clockwise direction to normally hold the lug 207 against the left edge of the "nine" key 106. The latch 210 is connected to a lever 212 (Fig. 15A) by a link 213 pivoted on one end to the latch 210, said link having a slot 214 in its rear end through which extends a stud 215 fast in the lever 212. There is one such latch 210, link 213, and lever 212, for each of the nine totalizers on each of the totalizer lines Nos. 3 and 4.

The lever 212 is pivoted on a stud 217 secured in the rigid plate 73, and has an arm 220, the end of which is bent to form a finger 221, (Figs. 15A, 16 and 27) adapted to cooperate with bent-over lugs 222 on a hanging bar 223 the upper end of which is slotted to form a prong 224. The prong 224 is bent to form a guide and receptacle for a hanging bar lever 225 pivoted on a stud 226 secured in a supporting bar 227. A pin 230 (Fig. 27) in the lever 225 extends through the slot formed by the prong 224 to maintain the link 223 and lever 225 in proper relationship. A spring 231 (Fig. 16) is tensioned to form a flexible connection between the lever 225 and the link 223.

The lower end of the link 223 is pivotally connected to a stop pawl 232 pivoted in a slot of a multi-slotted block 233 secured to the plate 73. There is one such lever 225, link 223, and stop pawl 232, for each accumulator on the No. 3 line. The left ends of the levers 225 (as viewed in Fig. 27) are shaped to form vertical extensions 234 which extend through a series of slots in a guide plate 235 (Fig. 3) secured to the bar 227. Spaced alternately between the levers 225 and pivoted on the stud 226 is a plurality of hanging bar levers 236, one for each totalizer on the No. 4 totalizer line. Each lever 236 has an extension 237 which projects through the same slot in the guide plate 235 as each alternate lever 225. The levers 236 are lengthened so that the extension 237 will enter the slot to the left (as viewed in Fig. 27) of the extensions 234 to prevent interference. The levers 236 are connected by links to a series of stop pawls for the lower totalizer line No. 4, which operates to select the different totalizers on the No. 4 line in a manner identical to the mechanism for the No. 3 totalizer, which will be explained in detail hereafter.

Totalizer selecting by traveling carriage

Secured on opposite ends on the traveling carriage 97 is a pair of brackets 239 (Fig. 2) (only one here shown), having pivoted thereto at 240 a pair of plates 241, (one only illustrated), supported by rods 242 and 243 to form a pivoting frame. When the pivoting frame thus formed

is in its lowered position the rod 242 rests in notches in the ends of the brackets 239. Mounted in each plate 241 is a spring plunger 244 which locks the frame in its down position by contacting the lower edge of the bracket 240. The spring plunger 244 also prevents the frame falling when in the up position by contacting the upper edge of the bracket 239.

Mounted on the rod 243 is a plurality of bolts 245 each having a totalizer selecting disk 246 (Figs. 2 and 27) properly located thereon by means of a series of spacing washers 247 and firmly held in place by a knurled nut 250 which clamps the entire bolt assembly against a vertical flattened portion of the rod 243. As many bolt assemblies as necessary may be spaced as required along the rod 243. The disk 246 may also be positioned laterally to select any desired totalizer. This selecting mechanism is used in conjunction with the regular tabulating stop mechanism, a description of which may be obtained from the patents referred to at the beginning of this specification. The tabulating stops are so arranged as to stop the traveling carriage in its lateral travel in a position where one of the disks 246 will be directly over the extended end of one of the hanging bar levers 225 or 236 (Fig. 27) to rock said lever counter-clockwise to select the desired totalizer in a manner to be hereinafter described.

Special selecting disks are provided for use when it is desired to simultaneously select a totalizer on each of the lines Nos. 3 and 4. A bolt 251 is flattened to receive and hold stationary a disk 252 flattened on its lower edge to contact and simultaneously rock the levers 225 and 236 when their extended ends 234 and 237 are in alignment; that is, when they extend through the same slot in the guide plate 235. When the extended ends of the levers 225 and 236 are not in alignment, that is, when they extend through different slots in the guide plate 235, a pair of disks 253 and 254 (Fig. 28) are provided, having holes that fit the flattened bolts 251, and like the disks 252 are flattened on their lower edges. The disk 253 has an angular cut on its right side which forms an angle of 135 degrees with the lower flattened surface. This angular cut reduces the lower flattened surface to a degree where it will contact one only of the extensions 234 or 237 at a time. The disk 254 has a similar angular cut on its left side. The disks 253 and 254 may be spaced on the bolt 251 by use of the washers 247 to select any desired totalizer on each line Nos. 3 and 4, when the traveling carriage is tabulated to a position where the disks 253 will contact one of the extensions 237 and the disk 254 one of the extensions 234.

The reason for having the frame that supports the rod 243 and the totalizer disk bolt assembly pivotally mounted on the traveling carriage is in order that this frame may be raised to a position where the selecting disk bolt assemblies will not interfere with other mechanism of the machine when the traveling carriage is being removed therefrom.

Auxiliary slides

A pair of auxiliary slides 255 and 256 (Figs. 15A and 16) are slidably mounted on the selecting slide 77 by means of a pair of headed studs 257 fast in the slide 77 extending through horizontal slots in the auxiliary slides and by lugs 260 on each end of said auxiliary slide, bent to embrace the slide 77. The upper auxiliary slide

255 has a block 261 secured thereto, and the lower auxiliary slide 256 has a projection 262. Both, the block 261 and the projection 262 are adapted to contact their respective stop pawls 232 when the latter are positioned by the depression of keys 106 and 107 or the hanging bar levers 225 and 236. A pair of springs 263 one for each auxiliary slide, are tensioned to hold the slides against a stop stud 264 secured in the left end of the selecting slide 77. Each auxiliary slide has a notch 265, which embraces a stud 266 in an arm 267 secured to a shaft 270, journaled in the plates 68 and 73. Fast on the shaft 270 (Figs. 18 and 26A) is an arm 271 with a stud 272 adapted to cooperate with a notch 273 formed by bending the right end of the totalizer selecting slide 133.

The depression of the "9" key 106 (Figs. 15A and B) moves the recess 206 opposite the lug 207. The spring 209 forces the lug 207 into the recess 206 to retain the key in its depressed position and to rock the latch 210 clockwise, which through the link 213 rocks the lever 212 clockwise to lift the hanging bar 223 (Figs. 16 and 27) to rock the slide stop pawl 232 clockwise. Likewise the proper arranging of a tabulating stop will cause the carriage to stop in a position where a totalizer selecting disk 246 will contact the extension 234 to rock the lever 225 counter-clockwise to lift the link 233 thereby rocking the stop pawl 232 clockwise. When a totalizer is selected by means of the traveling carriage, as explained above, the lifting of the link 223 rocks the lever 212 (Fig. 15A) clockwise, independent of the link 213, the stud 215 moving freely in the slot 214.

Pivoted on the stud 217 (Figs. 15A, 16 and 17) is an arm 275 having therein a stud 276 held by a spring 277 against a projection 280 on a lever 281, also free on the stud 217. Fast in the lever 281 is a stud 282 which extends across the arms 220 of the levers 212, resting upon horizontal surfaces 283 on the upper edges of said arms 220. The rocking of the lever 212 clockwise, either by depressing a key 106 or by means of the selecting disks on the traveling carriage, through the stud 282 rocks the lever 281 and the arm 275 clockwise as a unit unless the arm 275 meets with sufficient resistance to overcome the tension of the spring 277. The stud 276 (Fig. 25A) is adapted to engage a projection 284 of the lever 195 to rock said lever counter-clockwise to engage the notch 185 in the latch 186 with the stud 183.

As previously explained, initial movement of the slide 77 (Figs. 5, 15A and 16) is toward the rear of the machine. The auxiliary slide 255 under the tension of the spring 263 moves as a unit with the slide 77, carrying therewith the arms 267 to rock the shaft 270 clockwise. The rocking of the shaft 270 clockwise through the arm 271 (Fig. 26A) moves the totalizer selecting slide 133 toward the rear of the machine. The diagonal slot 134 in the slide 133 co-operating with the roller 125 causes the sleeve 116, which carries the totalizer wheels 117 to slide on the shaft 114 to the right, as viewed in Figs. 6 and 7.

As heretofore explained the depression of the "9" key 106 or the proper setting of a selecting disk 246 rocks the stop pawl 232 (Fig. 27) clockwise to a position where the end of said pawl is in the path of the block 261 on the auxiliary slide 265. The auxiliary slide and connected mechanism continues to move with the slide 77

until the block 261 contacts the pawl 232, stopping the auxiliary slide 255 in a position where the wheels of the totalizer corresponding to the "9" key are located directly above the actuator racks 83. The slide 77 continues its rearward movement uninterrupted, flexing the spring 263.

Transfer mechanism

A transfer or carrying mechanism has been devised for the interspersed totalizers that is strong and reliable, yet occupies little space. In the following description this transfer mechanism will be treated in detail.

Supported between the carrying frame plates 129 and 130 (Figs. 6 to 10) and by a series of brackets 285, carried by the angle bar 137 is a transfer sector shaft 286 and a stop rod 287. Loose on the shaft 286 is a plurality of two-toothed transfer sectors 290, one for each denominational group of totalizer gear wheels, and so spaced as to be in alignment with the actuator racks 83. The sectors 290 are notched to fit over the stop rods 287, the notches having sufficient clearance to permit the sectors to rotate the equivalent of one tooth space. A portion of the sector 290 is bent to form an ear 291 arranged to extend through angular slots 292 in a plurality of latch plates 293 pivoted on the shaft 286. A spiral torsion spring 294 is tensioned between each latch plate 293 and sector 290 to hold the latter in its normal position against the stop rod 287, as shown in Fig. 9.

The latch plate 293 has an ear 295 bent thereon, arranged to cooperate with a shoulder 296 on a latch pawl 297 pivoted on the bracket 285 and having fast therein a stud 300 adapted to cooperate with an open-ended slot in a trip pawl 301 pivoted on a bracket 302 secured to the angle bar 131 of the engaging frame. There is a latch pawl 297 and a trip pawl 301 for each denomination of the totalizer. One set of pawls functions with the selected totalizer only. A spring 303 is tensioned between the latch plate 293 and the trip pawl 301 to urge the latch plate clockwise and the trip pawl counter-clockwise to normally hold the ear 295 and the shoulder 296 of the latch pawl 297 in contact with each other. The trip pawl 301 has on its lower end a nose adapted to be engaged by one of the two long teeth on the totalizer gears 117 for a purpose to be described later.

Pivotally mounted on the shaft 286 by a pair of brackets 305 and 306 (Figs. 6 and 7) is a transfer restoring bar 307 whose lower edge is arranged to cooperate with a projection 310 (Figs. 8 and 9) on the latch plate 293 to restore the latches to their normal positions, as shown in Fig. 8, at the beginning of each operation of the machine in a manner to be fully explained later. The brackets 305 and 306 have mounted thereon a pair of rollers 311 and 312 (Figs. 6, 7 and 10) adapted to be engaged by a pair of hooked levers 314 and 315 pivoted respectively on a pair of arms 316 and 317 pivoted on the stationary plates 111 and 112. Each lever 314 and 315 has a spring 320 tensioned to hold said levers in contact with the rollers 311 and 312. The arms 316 and 317 have mounted thereon rollers 322 and 323, which cooperate with cam surfaces on the lower edges of the arms 152 and 153 to restore all tripped latch pawls 297 in a manner to be later described.

Pivoted on the plates 135 and 136 of the carrying frames is a pair of pawls 324 and 325 (Figs. 6, 7, 10 and 14) having fast therein two studs

326 and 327 that extend through openings in the plates 135 and 136 into the path of the arms 152 and 153. The ends of the pawls 324 and 325 are arranged to cooperate with a series of steps cut on a pair of arms 330 and 331 secured to the brackets 305 and 306 respectively. A spring 328 (Fig. 14) urges the transfer restoring bar assembly counter-clockwise to hold the steps on the arms 330 and 331 in contact with the ends of the pawls 324 and 325. Each pawl 324 and 325 has attached thereto a spring 332 tensioned to hold said pawls in contact with the stepped surfaces of the arms 330 and 331.

Fig. 10 well shows the transfer restoring mechanism in its home or normal position. As previously stated, in adding operations the actuator racks 83 make their initial rearward movement to first be properly set by the depressed amount keys. The initial rocking of the shaft 114 counter-clockwise causes the rolls 154 and 156 on the engaging arms 152 and 153 to follow the cam slots 160 and 161 in the stationary plates 111 and 112, to slide the engaging frame downward, thereby engaging the totalizer gear wheels with the actuator racks after said racks have finished their rearward movement as shown in Fig. 9. The rolls 155 and 157 (Figs. 6, 7, 13 and 14) cooperate with the cam slots in the carrying frame plates 135 and 136 to cause the carrying frame to descend in unison with the engaging frame until the gear wheels are meshed with the actuator racks (Fig. 9), after which the carrying frames, by means of the aforementioned rolls and cam slots is raised to its normal position (Figs. 9 and 14) to disengage the carrying sectors 293 from the totalizer gears to enable the totalizer gears to be actuated and the carrying sectors reset.

The meshing of the totalizer gears with the racks and the disengaging of the carrying sectors therewith occupy about one-half the counter-clockwise movement of the arms 152 and 153. The continued counter-clockwise movement of said arms 152 and 153 causes the cam surfaces thereon to coact with rollers 322 and 323 to rock the arms 316 and 317 counter-clockwise, causing the hook levers 314 and 315, acting on the rolls 311 and 312, to rock the restoring bar 307 and parts connected thereto counter-clockwise. This restores all trip latch plates 293 to the position shown in Fig. 8, and causes the restoring bar to be latched in the down position by the pawls 324 and 325 (Fig. 14) engaging a pair of steps 333 and 334 on the arms 330 and 331, respectively. The final counter-clockwise movement of the arms 316 and 317 causes the rounded ends of arms 335 on the levers 314 and 316 to contact the rack supporting bar 120 whereupon said levers turn on their pivots and disengage their hooks from the rolls 311 and 312 thus stopping the downward movement of the restoring bar assembly.

While the selected totalizer gears are thus in mesh with the actuator racks said racks are returned toward the front of the machine to actuate the totalizer gears in accordance with the amount keys depressed. The trip pawls 301 (Figs. 8 and 9), being pivoted on the totalizer engaging frame, maintain a fixed relation to the gears 117, the studs 300 in the pawls 297 sliding in the vertical slots in said trip pawls when the carrying frame moves contrary to or independent of the engaging frame.

Referring to Figs. 8 and 9, the totalizer gear wheels on line No. 3 are rotated counter-clock-

wise while being actuated. By way of illustration, when ten is accumulated on the units of cents wheel, one of the long teeth thereon contacts a vertical surface 340 of the trip pawl 301, to rock said pawl counter-clockwise to disengage the latch pawl 297 from the latch plate 293 for the carrying sector 290 for the tens of cents wheel, which when released moves clockwise under tension of the spring 303 until the extension 310 contacts the restoring bar 307. Again referring to Fig. 13, after the totalizer gear wheels are actuated the carrying frame moves downwardly to engage the carrying sector 290 with said totalizer gears. The carrying frame and engaging frame then travel upward to disengage said totalizer wheels from the actuator racks, all of which is caused by the rollers on the arms 152 and 153 cooperating with their respective cam slots 160 and 161 during the return or clockwise movement of said arms 152 and 153.

It is necessary for the carrying sectors to remain in mesh with the selected totalizer gear wheels until they are meshed with the actuator racks to hold said wheels stationary as the lining bar 132 (Fig. 8) does not engage the teeth of the gear wheels in alignment with the racks, but is cut away opposite each rack to clear said racks and gear wheels to permit the actuation of selected totalizer wheels by the actuator racks.

Near the end of their clockwise movement the arms 152 and 153 (Fig. 10) engage the studs 326 and 327 in the pawls 324 and 325 to disengage said pawls from the steps 333 and 334 on the arms 330 and 331 to allow the restoring bar assembly under tension of the springs 328 to rock clockwise on the shaft 286 until stopped in its home position by a pair of steps 341 and 342 of the arms 330 and 331 contacting with the ends of the pawls 324 and 325. This clockwise movement of the restoring bar 307 allows all the trip latch plates 293 (Fig. 8) under tension of their respective springs 303 to rotate clockwise, carrying with them the carrying sector 290 for the next highest order totalizer gear wheel to add one on said wheel. The notch in the carrying sector limits its movement by contacting the stop rod 287. Whenever the rotation of a totalizer gear by a carrying sector causes said gear to trip its latch plate 293, said latch plate under tension of the spring 303 will immediately make its complete clockwise movement, carrying therewith its sector 290 to rotate the next highest order gear wheel 117 one tooth space.

55 *Totalizer engagement for total operations*

In total-taking operations the selection of a particular interspersed totalizer is accomplished in the same manner as in adding operations, that is, by the depression of one of the keys 106 or 107 or by means of stops suitably arranged on the traveling carriage. However, there is a distinct totalizer engaging mechanism for total and sub-total-taking operations which will be explained in the following description. As previously stated, the different interspersed totalizers operate identically, therefore, it is thought a description of how a total is taken of one of such interspersed totalizers will be sufficient.

For example, let it be assumed that it is desired to take a total of the ninth totalizer on the No. 3 or upper rear totalizer line. The selection of such totalizer on the No. 3 line is accomplished, as in adding operations, by depressing the "9" key 106 (Figs. 1 and 15B) or the setting of a stop on the traveling carriage to

contact the proper totalizer selecting lever 225 (Figs. 15A and 27) for the ninth totalizer.

A latch 345 (Fig. 25B) pivoted at 346 on an order plate 348 has its upper end bent to form a lug 347, normally held against the edge of the total key 101 by a spring 350. The lower end of the latch 345 has secured therein a stud 351 adapted to cooperate with a cam surface 352 on a total cam lever 353 pivoted on a stud 354 secured in the left machine frame 41. Pivoted on an arm 355 of the lever 353 is a pair of pawls 356 and 357, each having a projection adapted to be held against stop studs by a spring 360 thereby making said pawls flexible in one direction. Pivoted on the right side of the operating plate 166 on the stud 178 (Figs. 20 and 25B) is a total flying lever 361. A link 362 pivotally connects said flying lever to an arm 363 fast on a shaft 364 journaled in the plates 68 and 73. Secured to the shaft 364 is an arm 365 bifurcated to receive a stud 366 fast in a total slide 367 mounted, to slide horizontally adjacent the adding slide 176, upon the grooved pins 177 and 180. A spring detent 370 is pivoted between the slide 367 and the stationary plate 73 to retain said slide in either of its extreme positions. Fast in the slide 367 is a pair of studs 371 and 372, one of which 371 is arranged to be engaged by a notch 373 (Fig. 25A) in the latch 186. An arm 374 (Figs. 20 and 25B) on the lower end of the lever 361 is in a plane with the pawls 356 and 357, and is adapted to be engaged by the ends of said pawls to operate the slide 367 in a manner to be later described.

Depression of the total key 101 causes the lug 347 to enter a notch 375 in said key to retain the key in its depressed position and to rock the latch 345 clockwise. The stud 351 acting on the cam surface 352 rocks the lever 353 clockwise to place the pawls 356 and 357 in the path of the arm 374. A stud 376 in the latch 345 is adapted to engage a projection 377 of a link 378 bifurcated near its right end to embrace a stationary stud 379 fast in the order plate 348. The left end of the link 378 (Fig. 25A) is pivoted on an arm 380 of the lever 195. As previously stated the selection of a particular totalizer either by key or carriage stops, automatically conditions the selected totalizer for an add operation. However, the tension of the latch spring 350 is great enough to overcome the action of the spring 277 (Fig. 16). Consequently the subsequent depression of the total key 101 causes the stud 376 (Figs. 25A and B) to engage the projection 377 of the link 378 to force said link toward the rear of the machine thereby rocking the lever 195 clockwise to disengage the latch 186 from the add slide and cause the notch 373 in said latch to engage the stud 371 in the total slide 376.

When the machine is released for a total-taking operation the initial or clockwise movement of the plate 166 causes the arm 374 of the lever 361 to contact the pawl 357 to rock the shaft 364 clockwise thereby moving the total slide 367 from left to right (as viewed in Fig. 20) to rock the lever 190 counter-clockwise, thus engaging the selected totalizer wheels with the actuator racks 83 in the manner previously described before said racks start their initial rearward movement. Referring to Fig. 9, after the totalizer gears have been meshed with the actuator racks, as described above, the initial rearward movement of the actuator rack rotates the selected totalizer gear wheels 117 on the No. 3 line clock-

wise until one of the two long teeth on said totalizer wheels contacts a horizontal surface 381 on the lower end of the trip pawl 301, to stop the gear in its zero position. This arrests the rearward movement of the racks 82 and positions them and the printing segments 94 commensurate with the amount upon the totalizer gear wheels. While the printing segments are thus positioned, they are released to print the amount standing upon the selected totalizer upon suitable paper wound around the platen roll 95.

As the operating plate 166 (Fig. 20) nears the end of its clockwise movement the arm 374 on the flying lever 361 rides over the end of the pawl 356, pushing said pawl downward against the tension of the spring 360. When the flying lever 374 passes beyond the pawl 356, the spring 360 returns said pawl to its former position in the path of the arm 374. The return or counter-clockwise movement of the operating plate 166 causes the flying lever arm 374 to contact the pawl 356 to rock the flying lever 361 and the shaft 364 counter-clockwise, thereby moving the total slide 367 from right to left (as viewed in Fig. 20) to rock the lever 190 (Fig. 25A) clockwise. This disengages the totalizer wheels from the actuator racks before said racks begin their final movement toward the front of the machine and while the totalizer wheels are in their zero positions. Thus a total is obtained of a particular totalizer and such totalizer is cleared for subsequent operation.

Total key release

It is desirable that the total keys be automatically released near the end of a total-taking operation and means for accomplishing this end will be treated in the following description:

A release bar 382 (Fig. 25B) is bifurcated on its forward end to embrace a grooved portion of a release rod 383 mounted between arms 384 (Fig. 26B) and 385 (Fig. 15C) pivoted on a shaft 386 supported between the left side frame 41 and the order plate 205. The release bar 382 (Fig. 25B) is slotted near its rear end to embrace a stud 390 fast in a lever 391 pivoted on a stud 392 fast in the order plate 348. Pivoted on the extreme left end of the bar 382 is a flexible pawl 393, held in the position shown in Fig. 25B by a spring 394. The spring 394 is tensioned between the lever 391 and the release bar 382 to hold a projection 396 on the bar 382 constantly against the lug 347 on the latch 345. Consequently the depression of the total key 101 causes the release bar 382 to be shifted toward the front of the machine. An arcuate surface 397 of the plate 166 is in the path of the lower end of the flexible pawl 393. The clockwise movement of the plate 166 causes the arcuate surface 397 to engage and rock the pawl 393 counter-clockwise without disturbing the release bar 382. When the arcuate surface 397 passes beyond the pawl 393 the spring 394 returns said pawl to its normal position, as shown in Fig. 25B. On the return or counter-clockwise movement of the plate 166 the shoulder 168 (Fig. 20) engages and rotates the pawl 393 clockwise until the upper end of said pawl contacts a turned portion of a hexagon stud 400 fast in the left side frame 41. This moves the release bar 382 toward the rear of the machine to rock the latch 345 counter-clockwise, thereby disengaging the lug 347 from the notch 375 to release the total key 101 which is then restored to its normal position by a spring 401.

The foregoing description applies equally as well to the total key 104 for the No. 4 interspersed totalizer line, as this key operates in every respect like the total key 101 for the No. 3 totalizer line.

Totalizer engagement for sub-total operations

A sub-total-taking operation is similar to a total-taking operation with the following exception:

The totalizer gear wheels 117 are not disengaged from the actuator racks 83 when said wheels are in their zero positions, as in total operations, but remain in mesh therewith subsequent to the printing of the sub-total, so that when said racks are returned to their forward positions the wheels 117 will be rotated to their original positions to replace the total in the selected accumulator. Thus when it is desired to ascertain the amount or total standing in a certain totalizer, without destroying such total, a sub-total operation is made. A detailed description of such an operation will now be given.

Like total operations, the manner of taking sub-totals of the different interspersed totalizers is identical. Therefore, as an example, the taking of a sub-total of the ninth totalizer on the No. 3 or upper rear totalizer line will be described.

Referring to Figs. 1, 25A and 25B, depression of the "9" key 106 or the setting of a stop on the traveling carriage selects the ninth totalizer in the No. 3 line, in the same manner as for adding operations, which was described earlier in this specification. Depression of the sub-total key 102 places a notch 402 in said key opposite a bent lug 403 on a latch 404 pivoted at 405. A spring 406 forces the lug 403 into the notch 402 to retain the key 102 when depressed in such position and to rock the latch 405 clockwise. This causes a stud 407 in the latch 404 to engage a cam surface 410 on the total cam lever 353 to rock said cam lever clockwise, thus rocking the ends of the pawls 356 and 357 into the path of the arm 374 of the flying lever 361 in the same manner as for total operations. A stud 411 in the latch 404 is arranged to contact and shift the link 378 toward the rear of the machine to rock the lever 195 clockwise, thereby causing the notch 373 in the latch 186 to engage the stud 371.

As in total operations, the initial movement clockwise of the driving plate 166 (Figs. 20 and 25A) causes the arm 374 of the flying lever 361 to strike the pawl 357 to move the total slide 367 towards the front of the machine. This rocks the lever 190, the shaft 114 and arms 152 and 153 counter-clockwise to engage the selected totalizer with the actuator racks prior to the initial movement of said racks. The initial movement of the actuator racks 83 rotates the gear wheels 117 (Fig. 9) clockwise until a long tooth thereon contacts the trip pawl 301 to position the racks 83 and printing segments 94 (Fig. 2) in accordance with the amounts stored in that particular totalizer. The printing segments thus positioned are released to print the amounts stored in the totalizer on paper wound around the platen roll. Thus far a sub-total operation is identical to a total-taking operation.

A sub-total release bar 412 (Fig. 25B) is bifurcated on its front end to embrace an undercut portion of the release rod 383; the other end of said release bar is pivoted to the lever 391 by the stud 390. A spring 409 is tensioned to hold a nose 413 against the lug 403. Upon depression 75

of the sub-total key 102 the release bar 412 moves towards the front of the machine and rocks the lever 391 clockwise.

After the amounts stored in the totalizer have been printed, and near the end of the clockwise movement of the driving plate 166, an extended portion of the stud 178 contacts and rocks the lever 391 counter-clockwise to move the release bar 412 towards the rear to rock the latch 404 counter-clockwise. This releases the sub-total key 102, which is returned to its normal position by one of the springs 401, and restores the total cam lever 353 to its normal position, thus moving the pawl 356 (Figs. 20 and 25B) out of the path of the flying lever arm 374. The return or counter-clockwise movement of the driving plate 166 causes the flying lever 361 to pivot on the stud 178 until a projection 414 on said lever is engaged by the stud 165, causing the flying lever to move clockwise as a unit with the plate 166, which through the link 362, crank 363, and arm 365, moves the total slide 367 to the left (as viewed in Fig. 20), restoring it to its normal position.

The restoring of the latch 404 (Figs. 25A and 25B) to its normal position, as explained above, allows the lever 195 to rotate counter-clockwise under tension of the spring 277 (Figs. 16 and 17) to disengage the latch 186 (Figs. 20 and 25A) from the total slide 367 and engages the notch 185 in said latch with the stud 183 in the adding slide 176 while both slides are in the extreme forward positions and the studs 183 and 371 are in alignment. As before stated the adding slide 35 is not returned to its normal position until near the end of the operation of the machine. Thus, in sub-total operations the totalizer gears remain in mesh with the actuator racks while said racks make their final movement towards the front of the machine, which movement rotates said totalizer gears counter-clockwise to the positions they were in just prior to a sub-total operation, to preserve intact the amounts stored in this particular totalizer.

Non-add key mechanism

The non-add key located in the row of control keys 98 (Figs. 1, 21 and 26B) operates the same as in previous Ellis machines to prevent addition in the two front totalizers. However, changes have been made in the non-add latch which permits its use in conditioning the machine for non-add operations by means of the traveling carriage as well as by depression of the non-add key. Heretofore a separate latch was used for the carriage mechanism. Also mechanism has been provided for disabling the interspersed totalizers during a non-add operation to prevent their accidental selection for add operations by key or carriage. A description of the non-add mechanism is now in order.

Referring to Figs. 21, 25B and 26B, pivoted on a stud 415 in the frame 41 is a non-add latch 416 having a bent extension 417 which is normally held by a spring 418 against the left edge of the non-add key. The total key release bar 382 has a lug 420 which is normally held against the extension 417 by the spring 394 (Fig. 25B). Depression of the non-add key (Fig. 21) causes the extension 417 under tension of the spring 418 to enter a notch 421 in said key to rock the latch 416 clockwise, thereby moving the release bar 382 to the right. The total key release bar 382 is returned to its normal position near the end of the machine operation, by mechanism previ-

ously explained, to force the latch 416 counter-clockwise to release the non-add key and restore the non-add mechanism to its normal position. Upon being released, the non-add key is returned to its home position by one of the springs 401. An ear 422 formed on the latch 416 is adapted to contact the lower edge of a non-add lever 423 pivoted on the stud 415 to rock the lever 423 clockwise in unison with the latch 416. This connection also allows the lever 423 to rotate clockwise independently of said latch 416. Pivoted to the lever 423 is a non-add hanging bar 424 connected at its upper end to a non-add hanging bar lever 425 adapted to be engaged and rocked by adjustable stops suitably arranged on the traveling carriage 97. This rocking of the non-add hanging bar lever lifts the hanging bar 424 to rock the lever 423 clockwise independent of the latch 416, and consequently without disturbing the non-add key.

A link 426 (Fig. 21) pivotally connects the lever 423 to a crank 427 fast on a shaft 430 journaled at either end in the supporting plates 68 and 73 (Fig. 3). Also secured to the shaft 430 is an arm 431, (Figs. 21 and 25A) having in its lower end a stud 432. Rocking the non-add lever 423 clockwise, either by depression of the non-add key or by means of stops on the carriage, through the link 426 and crank 427 rotates the arm 431 clockwise, causing the stud 432 to contact tails on the arms 482 of the totalizer control levers 195 to retain the totalizer control latches 186 in their ineffective positions during non-add operations.

The tension of the spring 418 (Fig. 21) is great enough to force the levers 195 and latches 186 from the add position to their normal ineffective position, in case the totalizer selecting key has been accidentally depressed or the traveling carriage tabulated to a position where it selects one of the interspersed totalizers prior to a non-add operation.

Release key for control keys

The two rows of control keys (Fig. 1) and the two rows of selecting keys 106 and 107 for the Nos. 3 and 4 interspersed totalizers have release bars that cooperate with the latches for the several keys in these rows to unlock the machine starting bar and to provide means for releasing these keys manually and automatically. The selecting keys 106 and 107 are not flexible keys; neither are they automatically released during operation of the machine, but remain depressed until released manually by depression of the release key 105 (Figs. 1 and 25B). The release bar 433 (Figs. 15B, 15C and 24) for the No. 3 totalizer selecting keys 106 is bifurcated on its right end to embrace a grooved portion of the release rod 383 and is slotted on its left end to fit a stud 434 carried by the order plate 204. The said release bar 433 also has a series of projections 435 arranged to cooperate with the bent lugs 207 on the latches 210 so that depression of one of the keys 106 causes the release bar 433 to move forwardly. There is also a release bar 436 for the No. 4 totalizer selecting keys 107 which operates in every respect identical to the release bar 433.

As previously explained, the error key in the control bank 98 (Figs. 1 and 26B) in its adaptation to the present machine releases only the amount keys 82. The release key 105 is arranged to release all the control keys and the selecting keys for the interspersed totalizer lines. A de-

scription of the release key mechanism will now be given.

The release key 105 (Fig. 25B) carries a roller 437 adapted to cooperate with a release lever 440 pivoted on the shaft 386 and embracing the release rod 383. The bent ends of the latches for the various keys in the four rows mentioned above cooperate with projections on the several release bars. Depression of one of the control or totalizer selecting keys allows the bent end of its latch to enter a notch in said key to move one of the release bars forwardly, thus rocking the release lever 440 counterclockwise into the path of the roller 437. Depression of the release key 105 rocks the release lever 440 clockwise, moving the operated release bar rearwardly to force the bent ends of the latches out of the notches in the depressed keys so that said keys under spring tension will be returned to their home positions.

Release for starting bar

As in former Ellis machines, before the starting bar 42 (Fig. 1) can be depressed to release the machine, it is necessary to select and condition one or more of the totalizers for a particular operation. This is accomplished by depressing one or more of the keys in the four lefthand columns, or by properly arranging stops on the traveling carriage to accomplish the same purpose by means of hanging bars and levers.

All the keys in the four lefthand columns with the exception of the repeat and release keys control the depression of the starting bar 42 and one or more of these keys must be depressed before the machine can be released for operation. The mechanism for releasing the starting bar when selecting the No. 1 and No. 2 totalizers is conventional, having been used in previous Ellis machines and will be but briefly treated herein. However, reference may be had to the Ellis patents referred to at the beginning of this specification for a complete description of this mechanism. A description will now be given of the mechanism involved in releasing the starting bar 42.

A lock shaft 441 (Fig. 24) extends through the width of the machine and is journaled in the two main frames 40 and 41 (Fig. 3). Secured on one end of the shaft 441 is an arm 442 bifurcated to embrace a stud carried by a starting bar latch plate 443 pivotally mounted on the right machine frame 40, and having cut therein a recess with a stop 444 arranged to be normally held by a spring 445 in the path of a square stud 446 fast in a starting bar lever 447 pivoted on the right side frame 40 to normally block the movement of the starting bar 42. Secured to the other end of the lock shaft 441 is a multi-armed lever 450 having an arm 451 which cooperates with a stud 452 in a controlling latch 453 pivoted on the left machine frame. An add hanging bar 454 connects the latch 453 to an add hanging bar lever 455 for the No. 2 totalizer, which is actuated by stops suitably arranged on the front of the traveling carriage. Lifting of the hanging bar 454 by the hanging bar lever 455 rocks the latch 453 counter-clockwise to position the No. 2 totalizer for an add operation and to rock the lock shaft 441 clockwise to rock the latch plate 443 counter-clockwise to remove the stop 444 from the stud 446 in the starting bar lever 447, thus permitting depression of the starting bar 42.

Again referring to Fig. 24, another arm 461 of the lever 450 is adapted to be engaged by a stud 462 carried by a latch 463 pivoted on the left machine frame 41. Pivoted on the stud 462 is an

add hanging bar 464 connected to an add hanging bar lever 465 for the No. 1 totalizer. Rocking of the hanging bar lever 465 by carriage stops lifts the hanging bar 464, causing the stud 462 to rock the lever 450 and shaft 441 clockwise to unlock the starting bar when carriage stops are used to select the No. 1 accumulator for addition. Pins 456 and 458 carried respectively by the No. 2 hanging bar 454 and the No. 1 hanging bar 464 are arranged to be engaged respectively by projections on subtracting hanging bars 460 and 457 (Fig. 22) to unlock the starting bar when the No. 1 and No. 2 totalizers are conditioned for subtract operations by the traveling carriage.

A third arm 466 (Fig. 24) of the lever 450 carries a stud 467 adapted to be engaged by projections on a pair of release bars 470 and 471 (Figs. 24 and 26B) for the row of control keys 98 (Fig. 1). Depression of a key in this row causes one of the release bars 470 or 471 to move forwardly to rock the lever 450 and shaft 441 clockwise to unlock the starting bar 42, as previously described. A rod 472 (Fig. 24) connects the lever 450 to an arm 473 fast on an auxiliary lock shaft 474 journaled in alignment with the shaft 441 in the order plates 204, 205 and 348 (Figs. 15B, 15C and 25B). Fast in the arm 473 is a stud 475 adapted to cooperate with projections on the release bars 382 and 412 (Fig. 25B). Upon depression of a total or sub-total key for either the No. 3 or No. 4 totalizer one of the release bars 382 or 412 moves forwardly, in a manner previously explained, and rocks the arm 473, the lever 450, and the shaft 441 clockwise to unlock the starting bar 42.

Fast on the shaft 474 (Fig. 24) is an arm 476 carrying a stud 477 arranged to be engaged by a projection on the release bar 433 to unlock the starting bar 42 when one of the selecting keys 106 is depressed. The release bar 436 also has a projection adapted to contact a stud 480 in the arm 481 secured to the shaft 474 to unlock the starting bar 42 when one of the selecting keys 107 is depressed.

Means for releasing the starting bar when selecting a totalizer on the No. 3 and No. 4 lines, by means of stops on the rear of the traveling carriage have also been provided and will now be described.

Pivoted to the lever 281 (Figs. 15A, 15B, 16 and 17) is a link 482 bifurcated at its front end to embrace a stud 483 (Figs. 15B and 24) carried by the release bar 433. When one of the sets of totalizers on the No. 3 line has been selected by means of the traveling carriage the lever 281 is rocked clockwise in a manner previously set out, to move the release bar 433 forwardly to unlock the starting bar as heretofore explained. Likewise the selection by the carriage, of one of the sets of totalizers on the No. 4 line rocks a lever 484 (Figs. 15A, 15B and 16) clockwise which, through a link 485 pivoted between the lever 484 and a lever 486 pivoted on the order plate 205, rocks the said lever 486 clockwise causing its upper end to engage a stud 487 (Figs. 15B and 24) in the release bar 436 to move the latter forwardly, thereby unlocking the starting bar 42.

Interlocks between starting bar and release keys

The usual interlocking mechanism has been supplied to prevent depressing the starting bar 42 and error key simultaneously, and also to prevent depressing the error key after the starting bar has been depressed, and vice versa. Mechanism has been added to act in a like manner on the release

key 105 and as this mechanism is old in its application to the Ellis machine it will be briefly treated herein.

Referring to Figs. 23 and 25B, extending through the width of the machine and journaled in the main frames 40 and 41 and the order plate 348 is an interlock shaft 490 having secured on its right end an arm (not shown) bifurcated to cooperate with a stud (not shown) in the starting bar lever 447 (Fig. 24). Fast on the shaft 490 is a lock lever 491 having an arm 492 adapted to cooperate with a formed extension 493 of a plate 494 secured to the error key. Also secured to the shaft 490 is an arm 495 (Fig. 25B) arranged to cooperate with a square stud 496 carried by the release key 105.

Depressing the starting bar 42 rocks the starting bar lever 447 (Fig. 24) clockwise to rock the shaft 490 counter-clockwise thereby moving the lever 491 to a position where its arm 492 is in the path of the extension 493 to block the depression of the error key after the motor starting bar 42 is depressed. Also the depression of the error key causes the extension 493 to pass in front of the arm 492 on the lever 491 thereby blocking the counter-clockwise movement of the shaft 490 thus preventing depression of the starting bar. This interlock is so constructed that it is impossible to depress the error key and starting bar simultaneously.

The arm 495 (Fig. 25B) operates in relation to the stud 496 in the release key 105 in the same manner as the arm 492 and likewise depression of the starting bar 42 rocks the arm 495 into the path of the square stud 496 to block the depression of the release key after the machine has been released for operation. Also holding the release key in a depressed condition causes a flat surface 497 cut on the stud 496 to block the counter-clockwise movement of the arm 495 thereby preventing depression of the starting bar. As in the case of the error key, the interlock mechanism for the release key is constructed to prevent depression of both the release key and the starting bar simultaneously.

Key interlock mechanism for control keys

The control keys of the machine described in this application are provided with various interlocks to lock out certain keys when others are depressed and to prevent simultaneous depression of two controlling keys whose functions interfere. Some of this mechanism is conventional and has been used on previous Ellis machines. However much of the said mechanism is new in its adaptation to the present machine. Therefore a detailed explanation of the interlock mechanism will not be amiss.

Referring to Fig. 23, a plurality of key cams 500 and a starting bar lock arm 501 all of which are pivoted on the left frame 40 cooperate together and with studs 502 in the total keys for the No. 1 and No. 2 accumulators, the same as in previous Ellis machines to prevent depression of both total keys in unison and to prevent depressing the starting bar 42 when one of the total keys is partially depressed. Likewise a plurality of the key cams 500 (Fig. 25B) are pivoted on the order plate 348. These cams cooperate with each other and with the studs 502 in the total and sub-total keys for the No. 3 and No. 4 totalizers to prevent depression of more than one of said keys at a time. Pivoted on the order plate 348 is an arm 503 arranged to cooperate with the key cams 500 for a purpose to be later

described. Said arm 503 is pivotally connected by a link 504 to an arm 505 fast on a sleeve 506 free on the shaft 490. Also secured to the sleeve 506 is a hook-shaped arm 510 (Figs. 23 and 25B) adapted to cooperate with a stud 511 in the lock arm 501.

A spring 512 is tensioned to hold the arm 501 in contact with the stud 502 in the total key No. 1. Partial depression of either of the total keys No. 1 or No. 2 moves the lock arm 501 counter-clockwise to a position where a bent ear 513 thereon will be in the path of a projection 514 on the lock lever 491. This prevents counter-clockwise movement of the shaft 490 thereby locking the starting bar 42 against depression when the total key No. 1 or No. 2 is partially depressed. Full depression of either of these total keys rocks the arm 501 to a position where the projection 514 will pass over the ear 513 thereby permitting depression of the starting bar.

When the starting bar is unlocked by depression of other control keys than the No. 1 and No. 2 total keys subsequent depression of said starting bar rocks the lever 491 counter-clockwise to move the projection 514 under the ear 513 to lock the total keys Nos. 1 and 2 against depression after releasing of the starting bar. The counter-clockwise rocking of the lock arm 501 by partially or wholly depressing one of the total keys No. 1 or No. 2 causes the stud 511 to contact and rock the hooked arm 510 clockwise thereby through the arm 505 and link 514 rocking the arm 503 counter-clockwise to lock the total and sub-total keys Nos. 3 and 4 against depression. In a like manner partially or wholly depressing any one of the last mentioned keys will cause the hooked arm 510 to block the movement of the lock arm 501, thus locking the total keys Nos. 1 and 2 against depression when one of the total or sub-total keys No. 3 or No. 4 has been depressed.

Interlock for the subtract and total keys

As previously explained, it is possible to carry on subtracting operations in both the No. 1 and No. 2 accumulators. Therefore it is necessary to provide means for preventing the simultaneous depression of the subtract and total keys for the same accumulator. Also a flexible latch has been devised which permits selection of subtract operations by means of the traveling carriage without depressing the subtract key. This mechanism will now be explained.

Pivoted on a screw stud 515 (Figs. 22 and 26B) in the left side frame 41 is a lever 516 having in the lower end thereof a stud 517 adapted to cooperate with the subtracting cam for the No. 1 accumulator in the usual manner, to cause the accumulator wheels to be engaged with and disengaged from the actuator racks at the proper time. A link 520 pivotally connects the lever 516 to the mechanism that shifts the transfer mechanism so that subtraction may be carried on in the No. 1 accumulator. This transfer shifting and transfer mechanism is the same as that used in previous Ellis machines; therefore, it is thought unnecessary to explain this mechanism at any length in this specification. Loose on the stud 515 is a latch 521 having a bent ear 522 normally held by a spring 523 against the rear edge of the No. 1 subtract key. A flat surface on the lower end of the latch 521 is arranged to cooperate with a stud 524 in the lever 516. Depression of the subtract key No. 1 causes the bent ear 522 of the latch 521 under tension of the spring 523 to en-

ter a notch 525 in the No. 1 subtract key to pivot the lever 516 clockwise thereby conditioning the No. 1 accumulator for subtract operations.

Clockwise rocking of the lever 516 (Fig. 22) causes the stud 524 to contact the upper end of a bell crank 526 loosely mounted on a stud 527 in the left frame 41 to rock said bell crank counter-clockwise, causing its lower arm to move into the path of a stud 530 carried by the total key for the No. 1 totalizer. Subsequent depression of the total key will through the bell crank 526 rock the lever 516 counter-clockwise to force the latch 521 out of the notch 525 thereby releasing the subtract key No. 1 so that its spring 401 will return said key to its normal position. Thus, it can be seen that as long as the total key No. 1 is in a depressed position the movement of the lever 516 and latch 521 is blocked and depression of the subtract key No. 1 will be ineffective.

A link 531 pivotally connects the lever 516 to a bell crank 532 pivoted on a stud 533 in the left frame. Pivoted to an arm of the bell crank 532 is the subtract hanging bar 457 slotted on its upper end to receive a hanging bar lever 534 flexibly connected to said hanging bar by a spring 535. Rocking of the hanging bar lever by the proper setting of a stop on the traveling carriage, through the spring 535 which is strong enough to overcome the tension of the spring 523, lifts the hanging bar thereby rocking the lever 516 clockwise to condition the No. 1 accumulator for a subtract operation by means of the traveling carriage. Clockwise movement of the lever 516 rocks the bell crank 526 counter-clockwise, moving its lower arm into the path of the stud 530 in the No. 1 total key. If the No. 1 total key is depressed after a subtract operation has been set up by means of the traveling carriage, the stud 530 acting on the bell crank 526 restores the subtract mechanism to its normal position with the exception of the No. 1 subtract hanging bar 457 (Fig. 22) which due to its spring connection to the subtract hanging bar lever 534 remains depressed until the traveling carriage is tabulated to another position. The spring coupling referred to above also permits the traveling carriage to be moved at will without interfering with a total-taking operation.

Summarizing the foregoing description of the subtract mechanism it will be seen that the depression of the No. 1 total key will always restore the subtracting mechanism for the No. 1 totalizer to its ineffective position, whether selected by key or carriage and the depression of the No. 1 total key makes it impossible to condition the No. 1 totalizer for a subtract operation either by key or carriage until said total key is released. The mechanism composing the interlock between the subtract and total keys for the No. 2 accumulator is substantially a duplicate of and operates exactly like the above described mechanism for the No. 1 totalizer. Therefore it is thought that an explanation of the No. 2 mechanism is unnecessary.

Operation

As the machine of the present invention is very flexible and adaptable to many different uses, it is felt that a sequence of any single operation would not do it justice. However, a summarizing of its possibilities is deemed helpful, and will now be given.

The two front totalizer lines Nos. 1 and 2 are adding and subtracting totalizers, while the interspersed totalizer on the lines No. 3 and No. 4 are arranged for addition only in the present

machine. The two rear totalizer lines each have nine totalizers, making a total of twenty totalizers in the complete machine.

Selection of the No. 1 and No. 2 totalizers for subtracting operations may be accomplished by key or traveling carriage. The No. 1 totalizer may be conditioned for addition either by key or carriage, while the No. 2 totalizer is conditioned for add operations by means of the traveling carriage only. Selection of the No. 3 and No. 4 totalizers for addition, sub-total or total-taking operations may be accomplished either by key or carriage while sub-total and total operations are controlled in the No. 1 and No. 2 totalizers by means of keys only. The non-add feature may be controlled in all four totalizer lines either by key or carriage.

In the present machine add transactions may be carried on in one or more of the four totalizer lines simultaneously, or subtraction operations may be carried on in one or both of the lines No. 1 and No. 2, and addition in the remaining totalizers at the same time. It is also possible to take a total or sub-total of any one totalizer and add such total or sub-total into one or more of the remaining totalizers in one operation of the machine. Likewise a total or sub-total of any one totalizer may be taken and subtracted from either or both of the totalizers No. 1 and No. 2 and added into the remaining totalizers in one operation of the machine.

From the foregoing summary it can be readily seen that the machine of the present invention, due to its flexibility, is susceptible to most any condition to be encountered in the present-day business world.

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

What is claimed:—

1. In an adding machine, the combination of a plurality of totalizers slidably mounted on a single line each totalizer comprising several elements arranged in denominational groups, key-controlled actuating means for each denominational group; a traveling carriage; a selecting key for each totalizer; selecting means controlled either by key or traveling carriage for shifting the entire group of totalizers to place the selected totalizer in position to be engaged with the actuators; means controlled by the selecting means for conditioning the totalizers for add operations; means for engaging the totalizer with the actuators; and printing means controlled by the actuating means for recording the result of an operation.

2. In an adding machine, the combination of a plurality of totalizers slidably mounted on a single line each totalizer comprising several elements arranged by denominations; key-controlled actuating means for each denomination; a traveling carriage; a selecting key for each totalizer; selecting means including an invariable reciprocating member; an auxiliary slidable member mounted on the reciprocating member and arranged to be arrested in its travel in a given direction to place the selector totalizer in position to be actuated; and means controlled by the selecting means for engaging the selected totalizer with the actuators in add operations.

3. In an adding machine, the combination of a shiftable sleeve; a plurality of totalizers arranged in denominational groups on said shiftable sleeve; a single actuating means for each denominational group; means including an invariable reciprocating slide for shifting the totalizers laterally in relation to the actuators; an auxiliary slide mounted on the reciprocating slide; a selecting key for each totalizer; a traveling carriage; means controlled by the selecting key or traveling carriage for obstructing the movement of the auxiliary slide at various intervals of its travel to stop a selected totalizer in position to be engaged with the actuator; and means controlled by the selecting means for engaging the selected totalizer with the actuators in add operations.
4. In a calculating machine of the class described, the combination of a shiftable sleeve, a plurality of totalizers arranged in denominational groups on said shiftable sleeve; a single actuator for each denominational group; a single differential device including an invariable reciprocating slide and an auxiliary slide mounted on the reciprocating slide arranged to normally travel as a unit therewith; means under control of the auxiliary slide for shifting the totalizers laterally; a plurality of selecting keys; a traveling carriage; and means controlled by the selecting keys or traveling carriage for arresting the movement of the auxiliary slide at different stages of its travel in a given direction to place a certain totalizer in position to be engaged with the actuators.
5. In an adding machine of the class described, the combination of a plurality of totalizers mounted on a single shaft each totalizer comprising several elements arranged in denominational groups; actuating means for each denominational group; means for shifting the totalizers as a unit in relation to the actuators; a plurality of selecting keys; a traveling carriage; and a single differential means controlled by the selecting keys or traveling carriage for arresting the shifting means in any stage of its movement to stop a particular totalizer in position to be engaged with the actuators.
6. In an adding machine, the combination of a plurality of shafts each having slidably mounted thereon a plurality of totalizers arranged in denominational groups; a common means to slide the plurality of shafts; a member on the common means for each shaft; a traveling carriage; and means controlled by the traveling carriage to control the members for selecting a totalizer on either shaft or a totalizer on both shafts simultaneously.
7. In an adding machine, the combination of a plurality of shafts each having slidably mounted thereon a plurality of totalizers arranged in denominational groups; an actuator common to all elements in each denominational group; common means for moving the totalizers into operative alignment with the actuators; a member on the common means for each shaft; a plurality of selecting keys; a traveling carriage; means controlled either by selecting key or traveling carriage to control the members for stopping a selected totalizer on either or both shafts in position to be engaged with the actuators and for simultaneously conditioning said totalizers for an add operation.
8. In a calculating machine of the class described, the combination of a plurality of shafts each having mounted thereon a plurality of totalizers arranged in denominational groups; a common actuator for each group arranged to operate the totalizers in add operations and to turn said totalizers to zero in total taking operations; an invariable reciprocating member; an auxiliary reciprocating member for each totalizer shaft carried by the invariable member; a plurality of selecting keys; a traveling carriage; means controlled either by the selecting key or the traveling carriage for obstructing the movement of the auxiliary members at various intervals of their movements in a given direction to locate the selected totalizer or totalizers in proper relation to the actuators; another reciprocating member having an invariable movement for engaging the selected totalizer or totalizers with the actuators in add operations; a variable reciprocating member for engaging the selected totalizers with the actuators in total operations; key means for controlling total operations; and means operated by the total keys for disconnecting the engaging mechanism from the add reciprocating member and connecting it to the total reciprocating member to condition the selected totalizer for a total operation.
9. In an adding machine, the combination of a shiftable sleeve; a plurality of sets of totalizers mounted in denominational groups upon said shiftable sleeve; a single set of reciprocable actuators; a main selecting slide with an invariable movement; an auxiliary selecting slide mounted on the main slide and arranged to normally travel as a unit with said main slide; means connecting the auxiliary slide to the shiftable sleeve to cause the sets of totalizers to reciprocate laterally in relation to the actuators; an add slide with an invariable movement for properly engaging the totalizers with the actuators; a selecting key for each totalizer; and means whereby the depression of a selecting key places an obstruction in the path of the auxiliary slide and simultaneously connects the engaging mechanism to the add slide to select a particular totalizer and simultaneously condition the machine for an add operation.
10. In an adding machine, the combination of a shiftable sleeve; several sets of totalizers mounted in denominational groups upon the shiftable sleeve; a single set of reciprocable actuators; a main selecting slide having an invariable movement upon machine operation; an auxiliary slide mounted on the main slide arranged to normally travel as a unit with said main slide but capable of being restrained at different stages of its initial movement; means connecting the auxiliary slide to the shiftable sleeve to reciprocate the totalizers laterally in relation to the actuators; an add slide having an invariable reciprocating movement for properly engaging the selected totalizer with the actuators; a traveling carriage; and means operated by the traveling carriage in predetermined positions of its travel for restraining the auxiliary slide to select a particular totalizer and for simultaneously connecting the engaging mechanism to the add slide to condition the selected totalizer for add operations.
11. In a calculating machine of the class described, the combination of a plurality of totalizer shafts; a shiftable sleeve mounted upon each shaft; a plurality of sets of totalizers mounted in denominational groups upon each sleeve; a single set of reciprocating actuators for the totalizers; a main selecting slide having an invariable reciprocating movement upon operation of the main

chine; an auxiliary slide for each totalizer shaft mounted upon the main slide and arranged to travel as a unit therewith but capable of being restrained at different stages of its initial movement; means including levers, arms and horizontal slides for operatively connecting the auxiliary slide to the shiftable sleeve to shift the totalizers laterally in relation to the actuators; an add slide having an invariable reciprocating movement for properly engaging the totalizers with the actuators; a traveling carriage; a plurality of selecting keys; and means controlled either by the traveling carriage or the selecting keys for restraining the auxiliary slides in their initial movement to align a particular totalizer on either shaft or a particular totalizer on each shaft with the actuators and for simultaneously connecting the engaging mechanism to the add slide.

12. In a calculating machine of the class described, the combination of a plurality of totalizer lines, a plurality of totalizers on each line shiftable as a unit each totalizer comprising a plurality of denominational elements arranged in groups; an actuator for each denominational group of elements; a main slide; an auxiliary slide for each totalizer line mounted on the main slide and arranged to normally travel as a unit therewith but capable of being restrained at different stages of its initial movement; means operated by the auxiliary slides for shifting the totalizers across the path of the actuators; a series of levers for each totalizer line; a plurality of pawls for each totalizer line operatively connected to the levers; a traveling carriage; and adjustable stops on said traveling carriage arranged to cooperate with the levers to move the pawls into the path of the auxiliary slides to stop a particular totalizer on either line or both lines in operative alignment with the actuators.

13. In an adding machine of the class described, the combination of a driving means; a main operating means normally disengaged from the driving means; a device for engaging the driving means with the main operating means; a plurality of totalizers mounted in denominational groups on a single shaft; an actuator for each denomination operated by said operating means; a reciprocating member having an invariable movement; means on the reciprocating member mounted to move varying distances for shifting the totalizers laterally in relation to the actuators; and means operatively connecting the driving means to the reciprocating member, whereby the initial movement of the driving means causes said reciprocating member to complete its initial movement prior to the engagement of the driving means with the operating means so that said actuators are operated subsequently to the shifting of the totalizers.

14. In an adding machine, the combination of a plurality of totalizers mounted in denominational groups on a single shaft; an actuator for each denomination; a carrying element for each denomination; aligning means for holding the totalizers stationary while out of actuating position; means for shifting the totalizers laterally in relation to the actuators and operatively connecting said totalizer to the carrying element; means for stopping a selected totalizer in operative alignment with the actuators; means for engaging the selected totalizer with the actuators; and means for causing the carrying elements to remain connected to the totalizer until said totalizer is properly meshed with the actuators.

15. In an adding machine, the combination of a plurality of totalizer elements shiftable as a unit; a single set of actuators; a traveling carriage; a selecting key for each totalizer; means controlled by the selecting keys or traveling carriage for shifting each totalizer into operative alignment with the actuators; aligning means for maintaining alignment of the unselected totalizers; a single set of carrying elements normally engaged with the selected totalizer to hold said totalizer in alignment; and means which moves the selected totalizer in engagement with the actuators and causes the carrying elements to travel as a unit therewith until said totalizer is operatively connected to the actuators.

16. In a calculating machine of the class described, the combination of a plurality of totalizers; a single set of actuators for said totalizers; a frame supporting the totalizers; a single set of carrying elements for the totalizers; a frame supporting said carrying elements; selecting means for the totalizers; means for shifting the totalizers laterally to align the selected totalizers with the actuators and to operatively connect said totalizers to the carrying elements; means for reciprocating the totalizer frame vertically to engage and disengage the selected totalizer with the actuators; and means whereby the reciprocating means causes the carrying frame also to reciprocate vertically, first, to retain the carrying elements in connection with the selected totalizer until such totalizer is properly meshed with the actuator, second, to withdraw the carrying elements during actuation, and third, to re-engage said carrying elements with the totalizer after actuation and prior to disengagement of said totalizer from the actuator to retain the alignment of the selected totalizer.

17. In an adding machine, the combination of a plurality of totalizers shiftable as a unit mounted on a single line; a single set of actuators; a selecting key for each totalizer; a traveling carriage; means for engaging the totalizers with the actuators in add operations; means controlled by the selecting keys or traveling carriage for shifting a particular totalizer into position to be engaged with the actuators and simultaneously connecting said totalizer to the add-engaging mechanism; a non-add key; and means operated by the non-add key or traveling carriage for disconnecting the add-engaging mechanism when said totalizer has been previously conditioned for an add operation.

18. In a machine of the character described, the combination of a plurality of movable totalizers; a plurality of selecting keys; a traveling carriage; a single differentially movable device to select the totalizers; and means settable to control the differential adjustment of said device, said means adapted to be set either by the selecting keys or by the traveling carriage.

19. In a machine of the character described having operating means, the combination of a plurality of movable totalizers; a single differentially movable device operated by the operating means to select the totalizers; a plurality of selecting keys; a traveling carriage; and means whereby either the selecting keys or the traveling carriage controls the movement of said device by the operating means.

MARGARET PERKINS,
Administratrix of the Estate of Nathan W.
Perkins, Deceased.