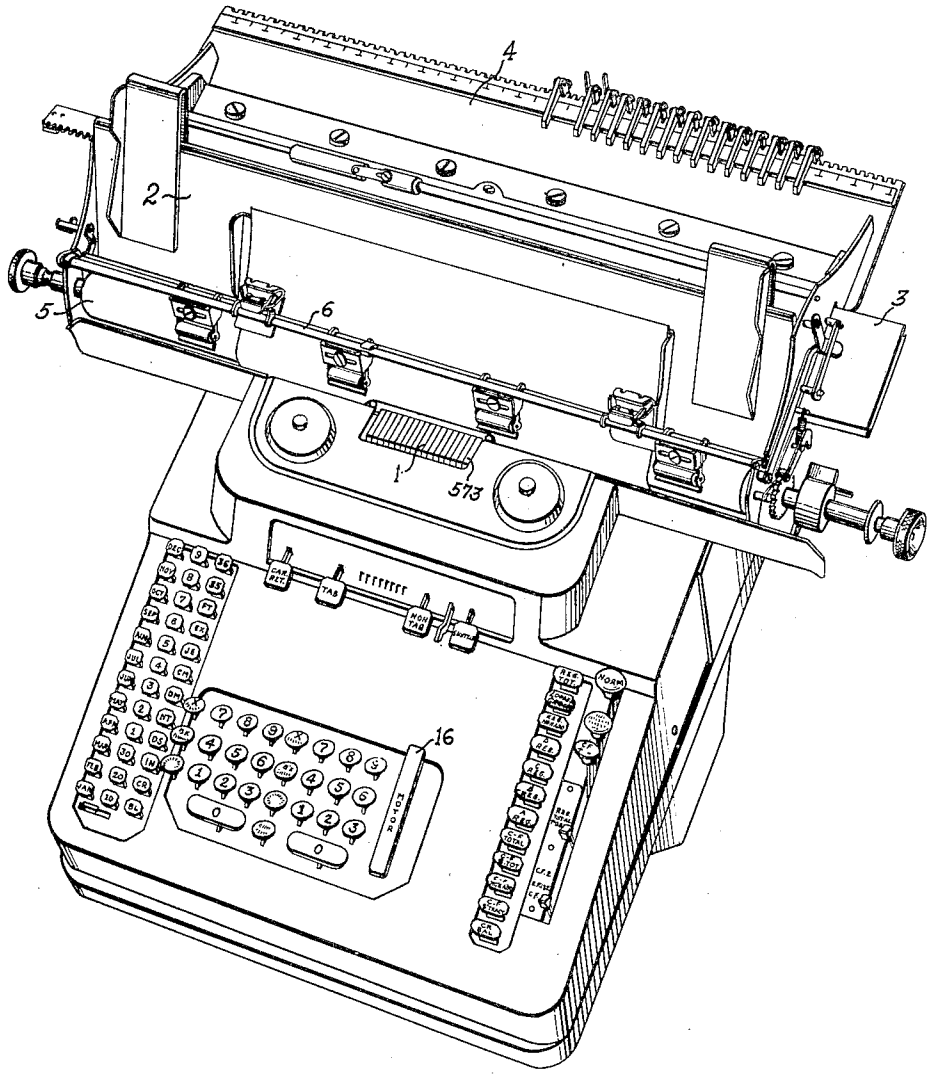
July 23, 1940. O. J. SUNDSTRAND 2,209,240

ACCOUNTING MACHINE

Filed June 30, 1936 4 Sheets-Sheet 1

Fig. 1.



INVENTOR.
OSCAR J. SUNDSTRAND.

BY

L. G. Julihn
ATTORNEY.

July 23, 1940. O. J. SUNDSTRAND 2,209,240

ACCOUNTING MACHINE

Filed June 30, 1936 4 Sheets-Sheet 2

Fig. 2.

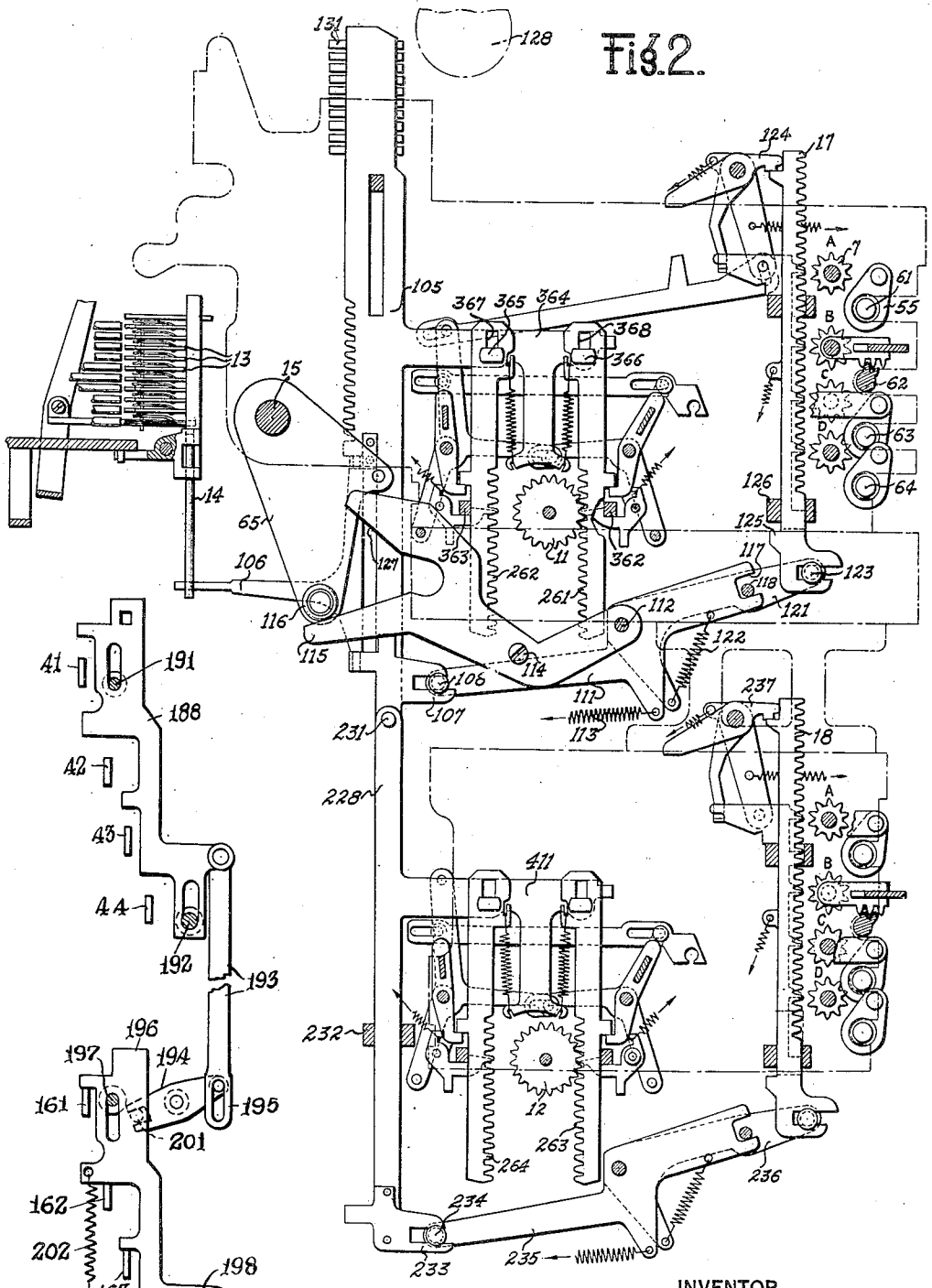


Fig. 7.

INVENTOR
OSCAR J. SUNDSTRAND.
BY L. G. Sullivan
ATTORNEY

July 23, 1940. O. J. SUNDSTRAND 2,209,240

ACCOUNTING MACHINE

Filed June 30, 1936 4 Sheets-Sheet 3

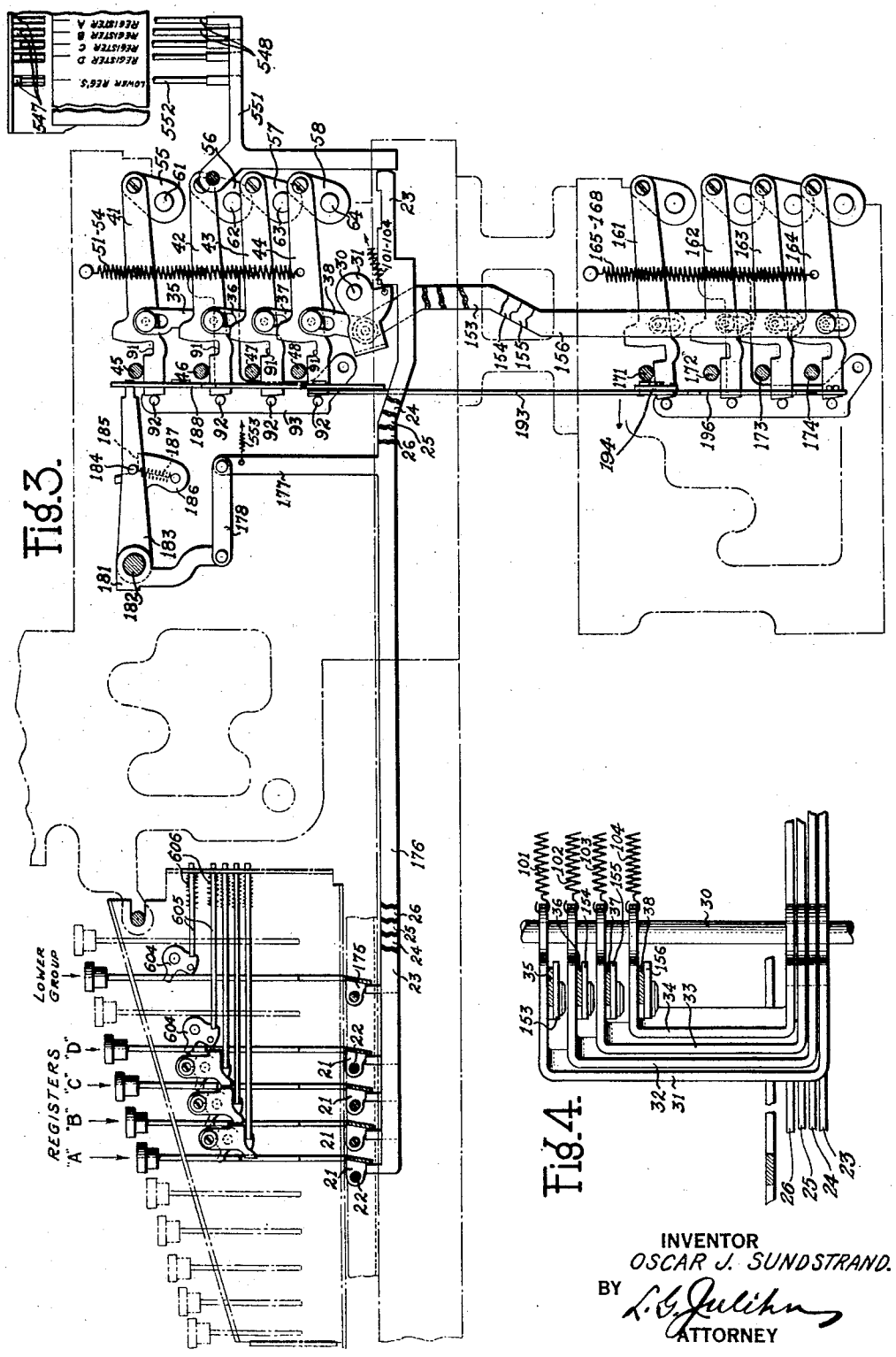


Fig. 3.

Fig. 4.

INVENTOR
OSCAR J. SUNDSTRAND.
BY L. G. Julihn
ATTORNEY

July 23, 1940. O. J. SUNDSTRAND 2,209,240

ACCOUNTING MACHINE

Filed June 30, 1936 4 Sheets-Sheet 4

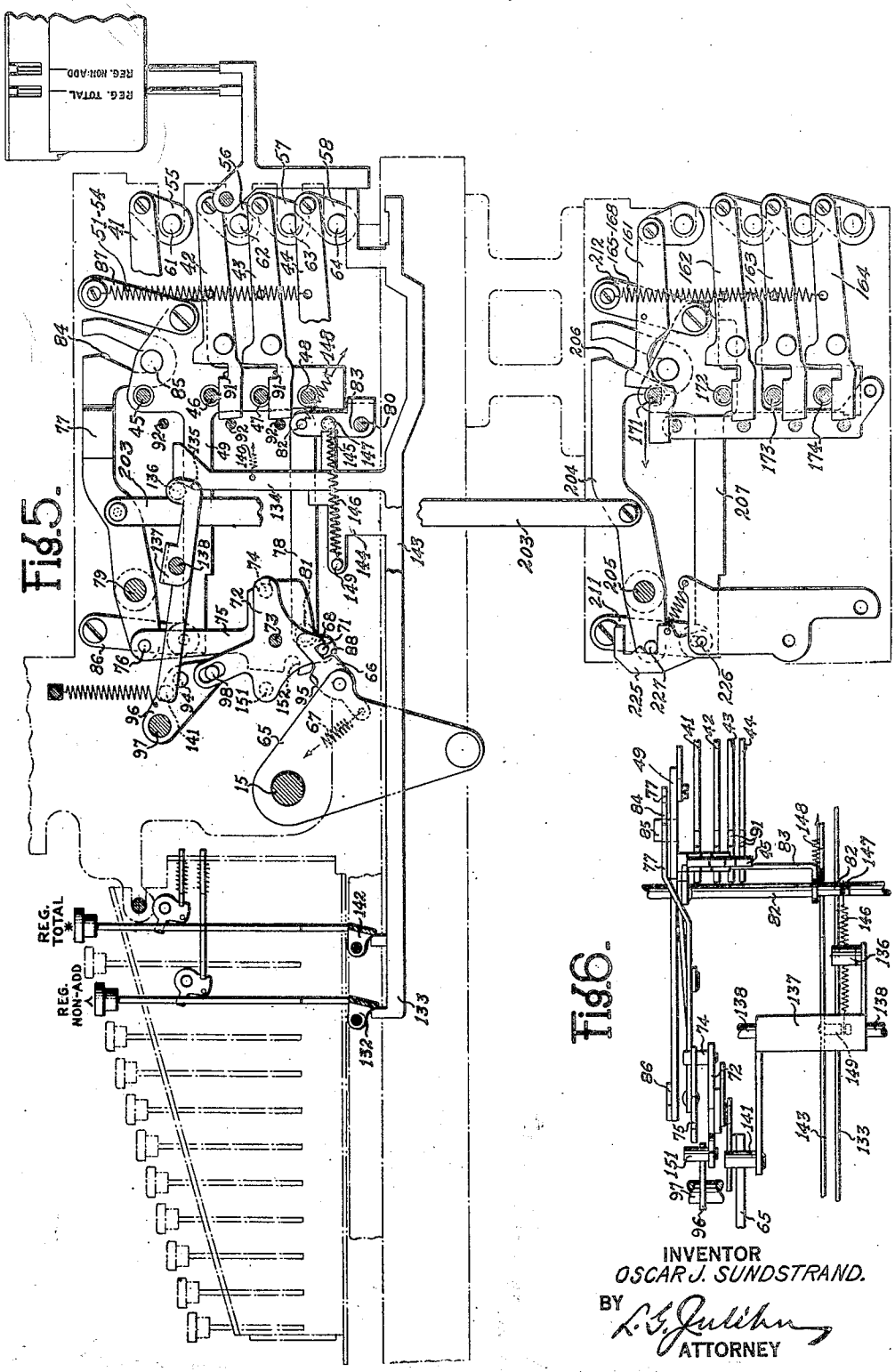


Fig. 5.

Fig. 6.

INVENTOR
OSCAR J. SUNDSTRAND.
BY L. G. Julihn
ATTORNEY

Patented July 23, 1940 2,209,240

UNITED STATES PATENT OFFICE

2,209,240

ACCOUNTING MACHINE

Oscar J. Sundstrand, Bridgeport, Conn., assignor to Underwood Elliott Fisher Company, New York, N. Y., a corporation of Delaware

Application June 30, 1936, Serial No. 88,092

4 Claims. (Cl. 235—60)

This invention relates to accounting machines and more particularly to the key set motor operated type having a plurality of registers.

The primary object of the present invention is to provide a machine with a sufficient number of adding registers and controls therefor to enable the machine to handle complex accounting problems.

Another object of the invention is to provide a set of register controls so simple and compact as to require but little additional keyboard and carriage construction than ordinarily employed in a machine having half the number of registers.

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

In said drawings:

Figure 1 is a perspective of the entire machine,

Figure 2 is a right side elevation showing the adding registers, the crossfooters, the type bars and actuating mechanism for each,

Figure 3 is a right side elevation showing the selecting mechanism for the registers of both the upper and lower groups,

Figure 4 is a plan view from the right side of the machine showing details of certain of the parts shown in Figure 3.

Figure 5 is a right side elevation showing the engaging mechanism for the registers in both the upper and lower groups,

Figure 6 is a plan view from the right side of the machine showing certain of the parts shown in Figure 5, and

Figure 7 is a front elevation of certain of the parts shown in Figure 3 for selecting the registers.

General Description

This machine is an improvement on my copending application, Serial No. 581,800, filed December 18, 1931, and includes the customary keyboard with amount keys, date setting keys and totalizer and printer controlling keys. It has a traveling paper carriage automatically adjustable to a series of columnar positions, together with return mechanism operable automatically at a predetermined point in the carriage travel. The carriage includes a control plate carrying a series of magazines with control lugs for automatically controlling the numerous operations that are controlled manually by the keyboard. The carriage illustrated in the drawings is of the combined front and rear feed type. The machine includes eight adding registers and two crossfooters, four registers and one crossfooter being located in what will be termed the upper group and the other four registers and crossfooter being located in what will be termed the lower group. All the registers and crossfooters are actuated by a common set of actuators adjustable under control of pins set by the amount keys. The actuators also control the adjustment of type for printing amounts and totals. Each group of four adding registers has separate transfer elements and the crossfooters likewise have separate sets of transfer elements. Selection of the adding registers is performed by depression of one of four keys to select a particular register in the upper or lower group and the group in which the desired register is located is selected by the depression of a fifth key. Totals are taken from the adding registers by depressing the proper selecting keys, operating the machine through a blank cycle, then depressing the register total key and again operating the machine. Sub-totals are taken from the adding registers in the same manner as totals except that the register non-add key is depressed jointly with the register total key.

Detailed Description

The description is divided into the following topics:

1. The machine sections and general actuating mechanism
2. Adding registers—In general
3. Selecting of adding registers in upper group
4. Engagement of adding registers in upper group
5. Actuation of adding registers in upper group
6. Amount printing
7. Non-adding in registers in upper group
8. Taking a total from the adding registers in the upper group
9. Taking a sub-total from the registers in the upper group
10. Selection of the registers in the lower group
11. Engaging of the registers in the lower group
12. Actuation of the registers in the lower group
13. Operation of the registers in the lower group
14. Control of various operations by the paper carriage

1. *The machine sections and general actuating mechanism*

Referring to Figure 1, the machine includes a keyboard, type bars **1** for printing on the inserted paper, a laterally movable paper carriage indicated generally at **2**, mounted on a track **3**, and a control plate **4** mounted on the traveling paper carriage and having a plurality of control magazines secured to its under side for controlling the various operations of the machine in predetermined columnar positions. The carriage is provided with the customary roller platen **5** for the insertion of the paper at the rear thereof, and a bail structure **6** for use in feeding other paper sheets at the front thereof. The machine also

includes (Figure 2) eight adding registers arranged in two groups situated one above the other, there being four registers in each group. They are designated generally A, B, C and D in each group, and each includes a plurality of 10 tooth wheels 1. These registers are operable for adding only. Situated in front of these registers are two crossfooters each having a plurality of 20 tooth wheels 11 and 12. The crossfooters are arranged for both addition and subtraction. The actuation of the registers and crossfooters is controlled by stop pins 13 that are projected into the path of a rod 14 by depression of the amount keys on the keyboard. The rod 14 is connected with the actuators in a manner to be later described. The conditioning of the machine for adding, subtracting, non-adding, total taking, sub-total taking, computing selectively in the various registers, etc., is controlled manually by the keys and levers situated at the right hand side of the keyboard (Figure 1). These various operations will be described in detail under appropriate headings.

The machine is actuated by an electric motor (not shown). The motor is started by the closing of suitable switch mechanism and is coupled with an actuating shaft 15 (Figure 2) by a suitable clutch mechanism upon depression of a motor bar 16 (Figure 1). The actuating shaft is connected with the motor drive in such a manner that it is rocked, first, counterclockwise (Figure 2), and then clockwise about ninety degrees during each operation of the machine.

2. *Adding registers—In general*

The eight adding registers are each composed of a number of 10 tooth wheels, engageable with actuating racks 17 and 18 for their operation. The four registers in the upper group are provided with one set of transfer elements and the four in the lower group with another set. The transfer elements for each set are identical. These registers per se, and their transfer elements, are identical with those shown in my application, Serial No. 581,800, and therefore will not be described in detail.

3. *Selection of adding registers in upper group*

Referring to Figures 1 and 3, the row of wide top keys at the right hand side of the keyboard includes four keys designated A register, B register, C register and D register. Depression of one of these keys results in the selection of the adding register corresponding to the key depressed. Referring particularly to Figure 3, four bails 21 are pivoted on rods 2 and lie directly beneath the stems of the keys for selecting the A, B, C and D registers. These bails have their lower portions lying directly behind upstanding portions of slides 23 to 26 extending to the rear of the machine. At their rear ends the slides 23 to 26 have upwardly extending portions lying directly behind downwardly extending shoulders on bails 31 to 34 (Figure 4) pivoted on the rod 30. At their opposite sides the bails 31 to 34 have pivoted thereto four links 35 to 38 which in turn are pivoted to four engaging links 41 to 44. As shown in Figure 3, there is a pin and slot connection between the links 35 to 38 and engaging links 41 to 44 to provide for a movement of any of the links 35 to 38 without a corresponding movement of the engaging links. By the train of connections just described, depression of one of the register selecting keys A to D oscillates one of the bails 21 clockwise and one of the links 23 to 26 forward. This rotates the corresponding bail 31 to 34 clockwise and raises the corresponding link 35 to 38. Four studs 45 to 48 are secured to a member 49 (Figures 5 and 6) held against vertical movement in a manner to be later explained. Four springs 51 to 54 are connected to the engaging links and to the machine frame to hold the forward ends of the links up against the studs 45 to 48. The rear ends of the engaging links are pivoted to levers 55 to 58, which in turn are secured to shafts 61 to 64. From this construction it is seen that when one of the links 35 to 38 is raised by depression of its register selecting key the corresponding engaging link will be free to move up a short distance under the tension of its corresponding spring 51 to 54 when the studs 45 to 48 are moved into alinement with notches 91.

4. *Engagement of adding registers in upper group*

Referring to Figure 5, an arm 65 is secured to the actuating shaft 15 and has pivoted thereto a pawl 66 tensioned clockwise from its position in Figure 5 by a spring 67. A hook 68 is provided on the rear end of the pawl and embraces a stud 71 when the machine is at rest. The stud 71 is carried by a plate 72 pivoted on a stationary stud 73. Another stud 74 is secured to the plate 72 and lies within a notch in the rear edge of a pendant 75 during accumulating operations. Pendant 75 is pivoted at 76 to a cam lever 77 pivoted on a stationary rod 79, and has its lower end held normally against movement forward or rearward of the machine by a link 78 pivoted at 81 to the lower end of the pendant and at 82 to one arm of a bail 83 pivoted on a rod 80 and normally held stationary. The rear end of lever 77 is provided with a cam slot 84 embracing a stud 85 on member 49. This member is mounted for horizontal movement forwardly and rearwardly of the machine by being suspended from the machine frame on two links 86 and 87 pivoted to the front and rear ends of member 49 and to the machine frame. As heretofore mentioned, studs 45 to 48 are secured in member 49 to move forwardly and rearwardly of the machine with the member.

When the machine begins an operation, counter-clockwise movement of arm 65 causes a shoulder 88 on pawl 66 to push stud 71 a short distance to the rear. This movement, and the accompanying movement of plate 72 and stud 74, raises pendant 75 and lowers the rear end of lever 77. The lowering of the rear end of lever 77 causes cam slot 84 to shift member 49 to the rear so that any engaging link 41 to 44 that is free to rise under the tension of its spring 51 to 54 may do so as soon as the corresponding stud 45 to 48 reaches its rearmost position in line with its notch 91. Such raising of one of the engaging links causes its forward end to lie above its corresponding stud 92, the latter being secured in a stationary bracket 93 (Figure 3). As soon as actuating arm 65 (Figure 5) rises to the point where spring 67 no longer rotates the pawl 66 in relation to arm 65, pawl 66 moves away from stud 71, the parts 72, 75, 77, 49, etc., remaining in their moved positions during the remainder of the counter-clockwise movement of arm 65. Just before arm 65 completes its counter-clockwise movement the forward edge of pawl 66 strikes a stud 94, so that continued movement of arm 65 tensions spring 67 and rotates pawl 66 clockwise with respect to arm 65. When arm 65 has reached its extreme counter-clockwise position, pawl 66 lies with the shoulder 95 on

pawl 66 lying in front of stud 94. At the beginning of the return or clockwise oscillation of arm 65, pawl 66 moves stud 94 upwardly and to the rear, causing arm 96, on which stud 94 is mounted, to move counter-clockwise about its pivot 97. This moves stud 98, also secured to arm 96, in a corresponding direction, and since stud 98 lies within a slot in an arm on plate 72, moves plate 72 clockwise about its pivot 73. It must be remembered that this movement of plate 73 takes place at the very begining of the return oscillation of arm 65.

Such movement of plate 72 lowers stud 74 and thereby raises the rear end of lever 77 to move member 49 to the left. Since the selected one of the engaging links is now in its upper position the forward movement of member 49 pulls this link forward, the front end of the engaging link now lying over its corresponding stud 92. This forward position of the engaging link is illustrated by the engaging link for the A register in the lower group (Figure 5). This forward movement of the engaging link oscillates its corresponding arm 55 to 58 and shaft 61 to 64 counter-clockwise. Referring to Figure 2, it is seen that oscillation of one of the shafts 61 to 64 causes its corresponding register A to D to be engaged with the actuating racks 17.

During the remainder of return movement of arm 65 (Figure 5) the parts 72, 75, the engaging links, etc., are not moved so that at the end of the operation the register selected and engaged for that operation remains engaged. If at the beginning of the next operation the register engaged for the last operation is not selected, the initial counter-clockwise movement of plate 72 disengages such register by movement of its engaging link 41 to 44 to the rear. As soon as the engaging link reaches its rearmost position, one of four strong springs 101 to 104, attached to the bails 31 to 34 (Figures 3 and 4) and to the machine frame, pulls its corresponding bail counter-clockwise about its pivot 30. At this time the bail is free to be rocked in this direction since its corresponding slide 23 to 26 is not pulled forward during this operation by depression of its corresponding register key.

5. *Actuation of adding registers in upper group*

Referring to Figure 2, a plurality of identical actuator bars 105 are mounted for vertical movement. Each of these bars is provided with a forwardly extending arm 106 attached to the lower end of the vertically movable rods 14. The extent of vertical movement to be imparted to actuators 105 is controlled by the rows of stop pins 13 that are moved into the paths of rods 14 selectively under control of the keyboard. The lower ends of the actuators 105 are each provided with a slotted arm 107 embracing a stud 108 on the forward end of levers 111 pivoted on a rod 112. Strong springs 113 are attached to levers 111 and to the machine frame and tend to rotate levers 111 clockwise. The levers are normally restrained against such movement by their forward arms pressing against a rod 114 extending between a cam lever 115 pivoted on rod 112 and a corresponding cam lever (not shown) located at the opposite side of the machine. These cam levers in turn are restrained by resting against a roller 116 on arm 65 and a corresponding roller (not shown) on a corresponding arm at the opposite side of the machine. Arm 65 and its corresponding arm are secured to actuating shaft 15, the actuating shaft being normally restrained against the movement as explained in my application, Serial No. 581,800, making the above described train of connections normally held in the position shown in Figure 2.

The rear end of each lever 111 is provided with a wide slot 117 in which lies a stud 118, there being an increment of lost motion between the stud and the slot. Stud 118 is secured to lever 121 pivoted on rod 112. Springs 122 extend between the lower arms of levers 121 and the rear arms of levers 111. This spring tension causes the studs 118 to be urged toward the upper end of slots 117. Studs 123 are secured to the rear end of levers 121 and lie within slots in the lower end of vertically movable racks 17. The racks 17 are normally held against upward movement from their position in Figure 2 by levers 126 of the transfer mechanism. As explained in my application, Serial No. 581,800, when a transfer occurs between two denominational orders, the rack 17 affected is released for an additional step of movement, which causes the rack to be raised to a position where a shoulder 125 thereon contacts a guide bar 126, and the stud 118 lies in the upper end of slot 117. However, since the transfer mechanism for these registers is identical with that in my application, Serial No. 581,800, we need not be concerned with this additional step of movement or with the relative movement between levers 111 and 121.

When the machine is operated the roller 116 moves counter-clockwise about actuating shaft 15 allowing strong springs 113 to raise the actuators 105 and rods 14, and to lower racks 17. These elements continue their movement until rods 14 strike the extended pins 13. Continued movement of the roller 116 raises cam levers 115 without an accompanying movement of levers 111 and the other parts.

During the first portion of the return movement of roller 116 it rides along a dwell portion 127 of cam levers 115 to give the selected register an opportunity to become engaged with the racks 17 before they are returned to their raised positions. The ensuing return movement of the racks during the remainder of the return movement of roller 116 rotates the register wheels of the engaged register to add thereon the number set up.

6. *Amount printing*

Amount printing is effected after the rollers 116 have reached their extreme counter-clockwise position, at which time all of the actuators 105 have had an opportunity to rise to the positions corresponding to the numbers in their respective denominational orders. The printing is effected on a platen 128 by type 131 under the action of hammer mechanism disclosed in my application, Serial No. 581,800.

7. *Non-adding in registers in upper group*

Referring to Figure 5, a register non-add key has the lower end of its stem resting on bail 132 similar to bails 21 in Figure 3. A slide 133 contacts the bail 132 and is mounted similarly to slides 23 to 26, in Figure 3, for forward and rearward movement in the machine. An arm 134 extends upwardly from slide 133 and has a cam surface 135 contacting a stud 136 on the rear arm of a bail lever 137 pivoted on a rod 138. A stud 141 is secured to the forward end of lever 137 and lies in the vertical plane of the stud 94.

Depression of the register non-add key rotates bail 132 clockwise and pulls slide 133 forward.

This forward movement causes cam surface 135 to raise stud 136 and lower stud 141.

During the ensuing operation, after the pawl 66 has disengaged whatever registers were engaged during the preceding operation and has reached its upper position where the shoulder 95 thereof would normally rise in front of the stud 94, it is now held depressed by the presence of stud 141 lying in front of the stud 94. Therefore, instead of pawl 66 swinging stud 94 upwardly to engage the selected register before the actuating racks 17 return, it will ride idly under the stud, leaving the selected register disengaged until after the actuating racks have returned. This makes it possible to obtain a printed record of the number set up on the keyboard without having that number added in the register. At the end of the return stroke, hook 68 reengages stud 71 and rotates plate 72 clockwise to its normal position shown in Figure 5. Although this last movement engages the selected register with the racks, it is not actuated. A spring 140 returns the slide 133 as soon as the register non-add key is released.

8. *Taking a total from the adding register in the upper group*

Referring to Figure 5, the register total key has the lower end of its stem resting on a bail 142 similar to the bail 132. A slide 143 is mounted for forward and rearward movement similarly to slide 133 and has an upwardly extending portion 144 with a rearwardly extending arm 145. A spring 146 is secured to a stud 149 on the portion 144 and to a stud 147 on the bail 83, tending to hold the stud normally in contact with the arm 145. The slide 143 and bail 83 are held in their normal rear position by a spring 148 secured to bail 83 and to the machine frame. This spring is weaker than spring 146.

When it is desired to take a total from one of the registers, it is first necessary to operate the machine through a blank cycle and to engage the register from which the total is to be taken. The desired register may be engaged during this cycle by pressing the proper register selecting key and operating the machine in the customary manner. As explained above, this will leave the register engaged at the end of the operation. To initiate the total taking cycle, it is then necessary only to depress the register total key (Figure 5) and the motor bar. Depression of the register total key moves the slide 143 forward, stretching spring 146. Movement of slide 143, together with arm 145, allows also bail 83, link 78, and pendant 75 to move forward under the tension of spring 146 until the forward edge of the pendant rests against a stud 151 on plate 72. This movement is sufficient to disengage stud 74 from its notch in pendant 75. However, slide 143 is moved forward a sufficient distance to allow pendant 75 to move still farther forward as soon as stud 151 is lowered to a position opposite a notch 152 in pendant 75.

Now upon operation of the machine, counter-clockwise movement of plate 72 at the very beginning of the operation lower stud 151 as just mentioned to a position opposite notch 152, at which time spring 146 moves pendant 75 forward, engaging the stud in the notch. It will be noted that this counter-clockwise movement of plate 72 did not raise pendant 75 since stud 74 was disengaged from its notch by the initial forward movement of the pendant. Actuator arm 65 then completes its counter-clockwise movement with the register that was engaged during the preceding cycle remaining in its engaged position.

As explained in my application, Serial No. 581,800, when a register is in engagement with the actuating racks during the initial stroke of the actuator arm 65, the total is taken from the register wheels and printed, the transfer teeth (not shown) on the register wheels arresting movement of the actuating racks 17 as soon as the respective register wheels reach zero. At the beginning of the return stroke of the actuator, shoulder 95 on pawl 66 raises stud 94 as in accumulating operations, rotating plate 72 clockwise and raising pendant 75 through the engagement of stud 151 with notch 152. This lowers cam slot 84 and moves member 49 to the rear, disengaging the register. This all takes place while roller 116 (Figure 2) travels on the dwell portion 127 of cam lever 115, and has the effect of disengaging the register before actuating racks 17 start their return movement. During the remainder of the return stroke of actuator arm 65, racks 17 return to their normal positions. At the very end of the operation when the total key is released, in the manner explained in my application, Serial No. 581,800, spring 148 (Figure 5) pulls pendant 75 to the rear, disengaging it from stud 151 and bringing the rear edge of the pendant against stud 74.

It will be noted that this is not the normal position of pendant 75 as shown in Figure 5. The pendant, however, returns to its normal position at the end of the next cycle. During this next cycle the initial counter-clockwise movement of plate 72 raises stud 74 until it is opposite its notch, at which time spring 148 engages it therewith. The pendant is then in position to be returned to its normal position when shoulder 95 raises stud 94 at the beginning of the return movement of the actuating arm 65.

9. *Taking a sub-total from the registers in the upper group*

To take a sub-total from any of the registers it is necessary to depress both the register total key and the non-add key. The depression of the register total key causes the machine to function exactly as it did during the total taking operation until nearly the end of the counter-clockwise movement of the actuating arm 65 (Figure 5). At this time stud 141 prevents engagement of shoulder 95 with stud 94 just as in ordinary non-add operations, so that plate 72 is not rotated clockwise to disengage the register during the return movement of the actuator racks. Since the register remains engaged during the entire operation, the number taken therefrom during the first half of the operation is restored thereon during the latter half and is printed when the printing mechanism operates at the middle of the operation.

10. *Selection of the registers in the lower group*

Referring to Figures 3 and 4, four links 153 to 156 are pivotally connected to the bails 31 to 34 respectively on the same pivot studs as the links 35 to 38. Links 153 to 156 are connected at their lower ends to four engaging links 161 to 164 for the registers in the lower group by pin and slot connections.

When one of the register keys A to D is depressed, rocking its bail 31 to 34 clockwise, as explained above, the corresponding link 153 to 156 is raised, freeing the corresponding engaging link 161 to 164 to the tension of its corresponding

spring 165 to 168. The spring then holds the forward end of the engaging link against its corresponding stud 171 to 174 until such stud is moved rearwardly by the register engaging mechanism to be explained.

In order to make it possible to select a register in the lower group to the exclusion of the corresponding register A to D of the upper group a key designated "Lower group" and the following connections are provided.

A bail 175 is situated under the stem of the lower group key and is pivoted similarly to bails 21. A slide 176 is situated similarly to slides 23 to 26 and adapted for similar movement. An arm 177 extends upwardly from slide 176 and is connected by a link 178 to a bail 181 pivoted on a rod 182. An arm 183 also is pivoted on rod 182 and has a stud 184 projecting laterally therefrom and lying over a shoulder 185 on the rear end of an arm 186 of the bail 181. A spring 187 is connected to stud 184 and to a stud on arm 186. A slide 188 (see also Figure 7) is mounted for vertical reciprocation on stationary studs 191 and 192 and has a small opening in its upper end to receive the rear end of arm 183. A link 193 is pivoted to slide 188 and is connected at its lower end to a lever 194 by a pin and slot connection, the slot being numbered 195. A slide 196 similar to slide 188 is likewise mounted for vertical movement on stationary studs 197 and 198. A stud 201 on slide 196 is embraced by a bifurcated end of lever 194. A spring 202 is connected to slide 196 and to the machine frame. Slides 188 and 196 each have four laterally extending shoulders lying above the forward ends of the engaging links 41 to 44 and 161 to 164.

When the parts are in their normal position, as shown in Figure 7, and assuming that no register in either group was selected during the last operation, the shoulders on the upper slide 188 will lie a sufficient distance above the forward ends of their respective engaging links 41 to 44 to allow a selected one of these engaging links in the upper group to rise during the operation for the purpose of engaging its register, as previously described. The four shoulders on the lower slide 196, however, lie in contact with the upper surfaces of the forward ends of their corresponding links 161 to 164 and are held in this position by the tension of spring 202. With the parts in this position, a depression of one of the register selecting keys and the accompanying raising of its corresponding link 153 to 156 (Figure 3) will free its corresponding engaging link 161 to 164 to the lifting action of its corresponding spring 165 to 168, which lifting, however, will be prevented when studs 171 to 174 are moved rearwardly because of the superior strength of spring 202 (Figure 7). In this manner a register in the upper group may be selected and engaged without an engagement of the corresponding register in the lower group.

In the event that one of the registers in the lower group, for instance, the A register, was selected during the last operation, its engaging link 161 is left in the position shown in Figure 5. Therefore, when the lower group key, the slide 176, bail 181, slide 188 and link 193 returned to their normal positions at the end of the operation, the slide 196 remained in its upper position and the lever 194 in its corresponding position, where its stud lay in the bottom of slot 195. If, during the next operation, the lower group key is not depressed, spring 202 will pull slide 196 downward to its lower or normal position as soon as the register engaging mechanism disengages the A register. Should the A register key be depressed for this operation to select the A register in the upper group, slide 196 would notwithstanding return to its lower position and pull the engaging link 161 for the A register in the lower group down with it because of the superiority of spring 202 over spring 165. Such movement is also made possible through the provision of the lost motion connection between the link 153 and the engaging link 161.

Assuming now that the operation just described, where the upper A register was engaged, is completed, the engaging link 41 is left in its upper forward position similar to that shown for the lower A register in Figure 5 and the remaining seven engaging links are in their normal positions. Now if it is desired to engage one of the lower registers for the next operation, depression of the lower group key rocks bail 181 clockwise about its pivot 182, and since slide 188 and arm 183 are held in their upper positions by engaging link 41, spring 187 is tensioned. After the appropriate register selecting key is depressed and the machine cycle started, the tension of spring 187 lowers its arm 183 and slide 188 as soon as the engaging link 41 is moved rearward to disengage its register. This lowering of slide 188 lowers link 193 and raises slide 196 so that the engaging link 161 to 164 for the selected register in the lower group may rise under the tension of its spring 165 to 168. This raising of the slide 196 and the tensioning of spring 202 is made possible by the superiority of spring 187. The raising of slide 196 allows the engaging link 161 to 164 of the selected register to rise so that its register will be engaged at the appropriate time in the cycle.

11. *Engaging of the registers in the lower group*

Referring to Figure 5, a link 203 is pivoted to cam lever 77 and to a similar cam lever 204 for the lower group of registers. Lever 204 is pivoted on rod 205 and has a cam 206 similar to cam 84. A member 207 similar to member 49 is mounted for reciprocating movement forward and rearward of the machine by being pivoted to two links 211 and 212 which are in turn pivoted to the machine frame. The motion of member 207 is similar to that of member 49. The four studs 171 to 174 are mounted on the member 207 and co-operate with the four engaging links 161 to 164 for the lower registers.

The lower registers are engaged and disengaged in a manner similar in every respect to the engagement of the registers in the upper group. When the pendant 75 is raised and lowered to reciprocate member 49 for the upper registers, the link 203 reciprocates cam lever 204 and member 207 to disengage and engage the lower registers. Springs 165 to 168 similar to springs 51 to 54, are connected to engaging links 161 to 164 and to the machine frame. A spring pressed detent 225 pivoted at 226 to a stationary part of the machine co-operates with a stud 227 on the forward end of cam lever 204 to hold the parts in their moved positions.

12. *Actuation of the registers in the lower group*

Referring to Figure 2, a plurality of auxiliary actuators 228, one for each denominational order, are connected to actuators 105 at 231. The actuators 228 are guided in a slotted guide 232 so as to be vertically reciprocable in a manner identical with their corresponding actuators 105. The lower ends of actuators 228 are each pro-

vided with a forked arm 233 embracing studs 234 on levers 235 similar to levers 111. A plurality of levers 236 similar to levers 121 are connected to levers 235 and to racks 18. The operation of levers 235, 236 and racks 18 is identical with that of the corresponding parts for the upper registers. A separate set of transfer elements designated generally at 237 and operating similarly to those for the upper registers is provided for the lower registers.

13. *Operation of the registers of the lower group*

The operations of adding, non-adding, totaling and sub-totaling in the registers in the lower group are identical with the corresponding operations in the registers in the upper group except that for the lower group the lower group key must be depressed in addition to the other keys, for initiating the operations. This depression of the lower group key, as explained above, causes the selection of a register in the lower group instead of in the upper group, and since the engagement and actuation of the two groups is identical, the register selected in the lower group is controlled the same as the corresponding one in the upper group would have been, if the lower group key had not been depressed.

14. *Control of various operations by the paper carriage*

The paper carriage, indicated generally at 2 in Figure 1, may control the various registers and crossfooters by suitable mechanism cooperating with the control plate 4 that travels with the carriage. As explained in my application Serial No. 581,800, this control mechanism includes magazines removably connected to the control plate in the various tabular positions of the carriage, and carrying one or more depending lugs co-operating with depressible levers. Selective depression of these levers, the ends of which are numbered 547 (Figure 3) depresses rods 548 resting on bell cranks 551. The lower ends of these bell cranks rest against the rear ends of the slides such as 23 to 26 connected to the various control keys. By this train of connections, movement of the paper carriage into a columnar position selectively depresses rods 548 and shifts their corresponding slides forward the same as though their corresponding keys had been depressed manually. Since these connections are the same as illustrated in my application Serial No. 581,800, a further explanation of them will be given only insofar as the new mechanism is concerned.

In Figure 3 a rod 552 similar to rods 548 is arranged to be depressed by its lever 547 for selecting the registers in the lower group for actuation. This rod presses on its corresponding bell crank 551 and moves slide 176 forward the same as though the lower group key was depressed manually. At the end of the operation rod 552 and the other parts are returned to normal position by the tension of a suitable spring 553.

Although reference to my application Serial No. 581,800 is given a number of times in the preceding description, it was not given in every instance where a more complete reference to many of the parts may be found. It is, therefore, to be understood that wherever the disclosure is inadequate for a complete understanding of the invention, such reference should be resorted to.

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

What is claimed is:

1. In a machine of the class described, two groups of totalizers, a traveling paper carriage, an element controlled by the carriage, means controlled by the element for conditioning the totalizers of one or the other group for selection, a plurality of other elements controlled by the carriage and equal in number to the totalizers in one group, and means controlled by said other elements for selecting the totalizers in the selected group.

2. In a machine of the class described, two groups of totalizers, actuating racks therefor, means for engaging the totalizers with the racks, keys for selecting the totalizers, the number of keys corresponding to the number of totalizers in one group, means whereby operation of any one of these keys selects a totalizer in each group, another key, and means, including a pair of plates co-operating with the engaging mechanism of the totalizers and controlled by the last mentioned key, for selecting the group in which the desired totalizer is located.

3. In a machine of the class described, two groups of totalizers, actuating racks therefor, means to engage the totalizers with the racks, a group selecting means including a key and a pair of plates, one of the plates co-operating with the engaging mechanisms for the totalizers of one group and the other with the engaging mechanisms for the totalizers of the other group, and connections between the key and the plates whereby movement of the key in one direction raises one plate to free the engaging mechanism for operation, and lowers the other plate to hold the engaging mechanism against operation, and movement of the key in the opposite direction reverses the movements of the plates.

4. In a machine of the class described having two groups of totalizers, there being an equal number of totalizers in each group, actuators therefor, a separate engaging means associated with each totalizer and with a common engaging mechanism to engage the associated totalizer with the actuators, the said engaging means being normally ineffective, and means to render the engaging means effective, the combination of a plurality of means for preventing each engaging means from being rendered effective, actuable elements equal in number to the totalizers in one group, means whereby actuation of any one of these elements renders ineffective one of the preventing means associated with the engaging means for one totalizer in each group and another actuable element, and means whereby actuation of this element renders ineffective one of the preventing means associated with the engaging means of each totalizer in one group.

OSCAR J. SUNDSTRAND.