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MAY 25, 1943.
BY A. P. C.

H. K. F. EWALD ET AL

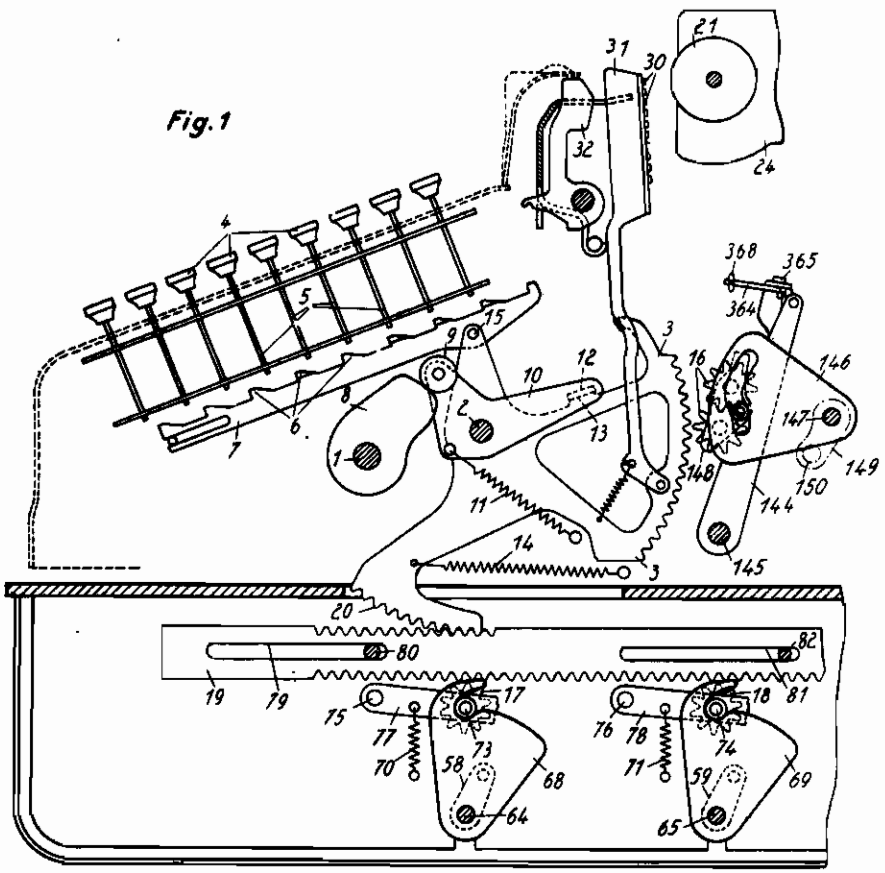
ACCOUNTING MACHINES

Filed Aug. 27, 1938

Serial No.
227,220

7 Sheets-Sheet 1

Fig. 1



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7 Sheets-Sheet 2

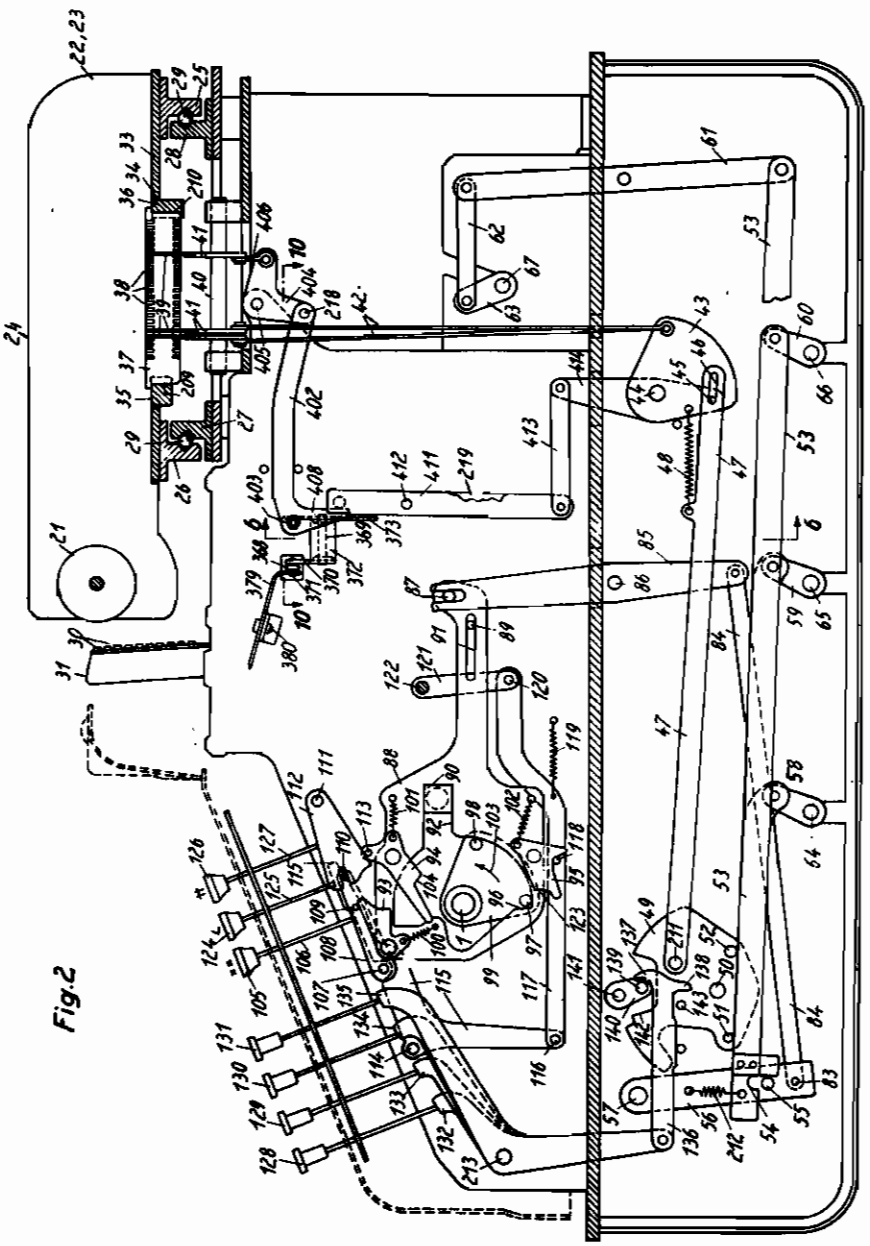

Fig. 2

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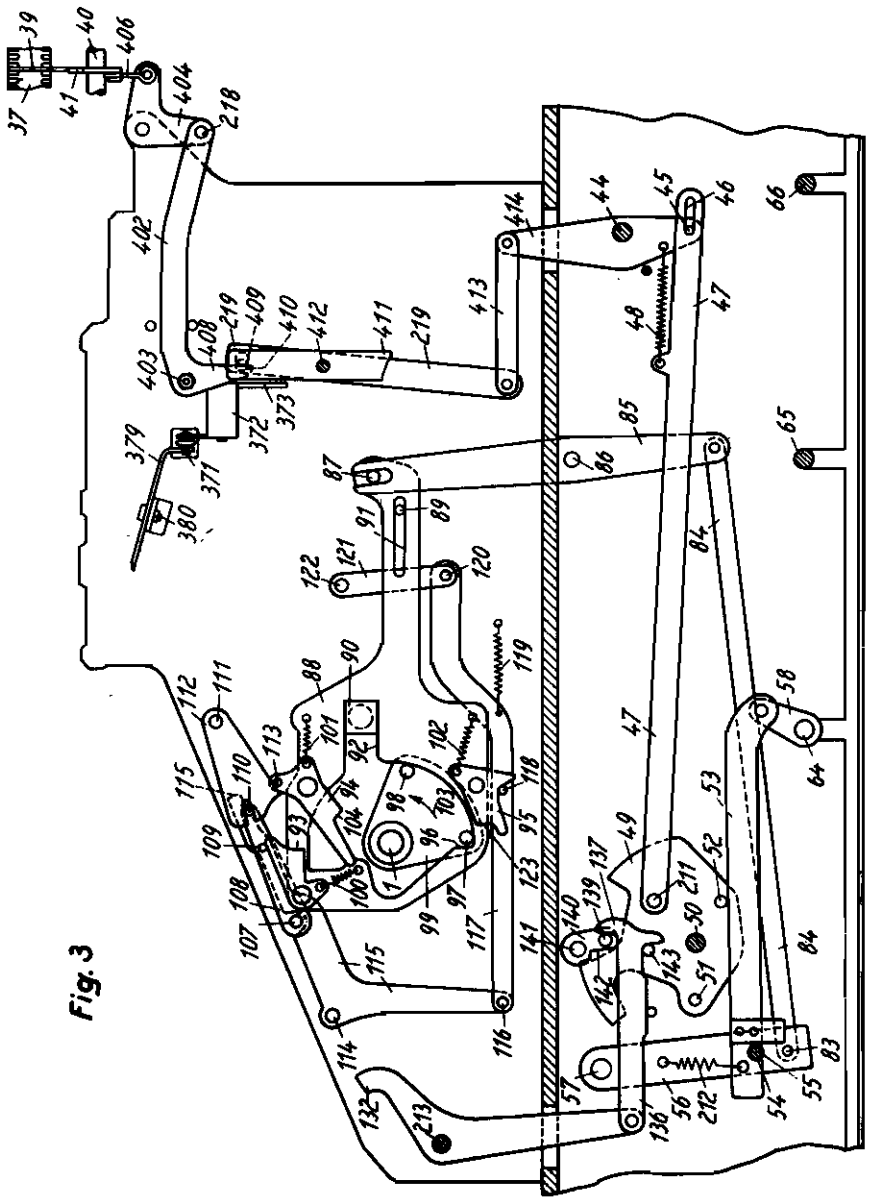

Fig. 3

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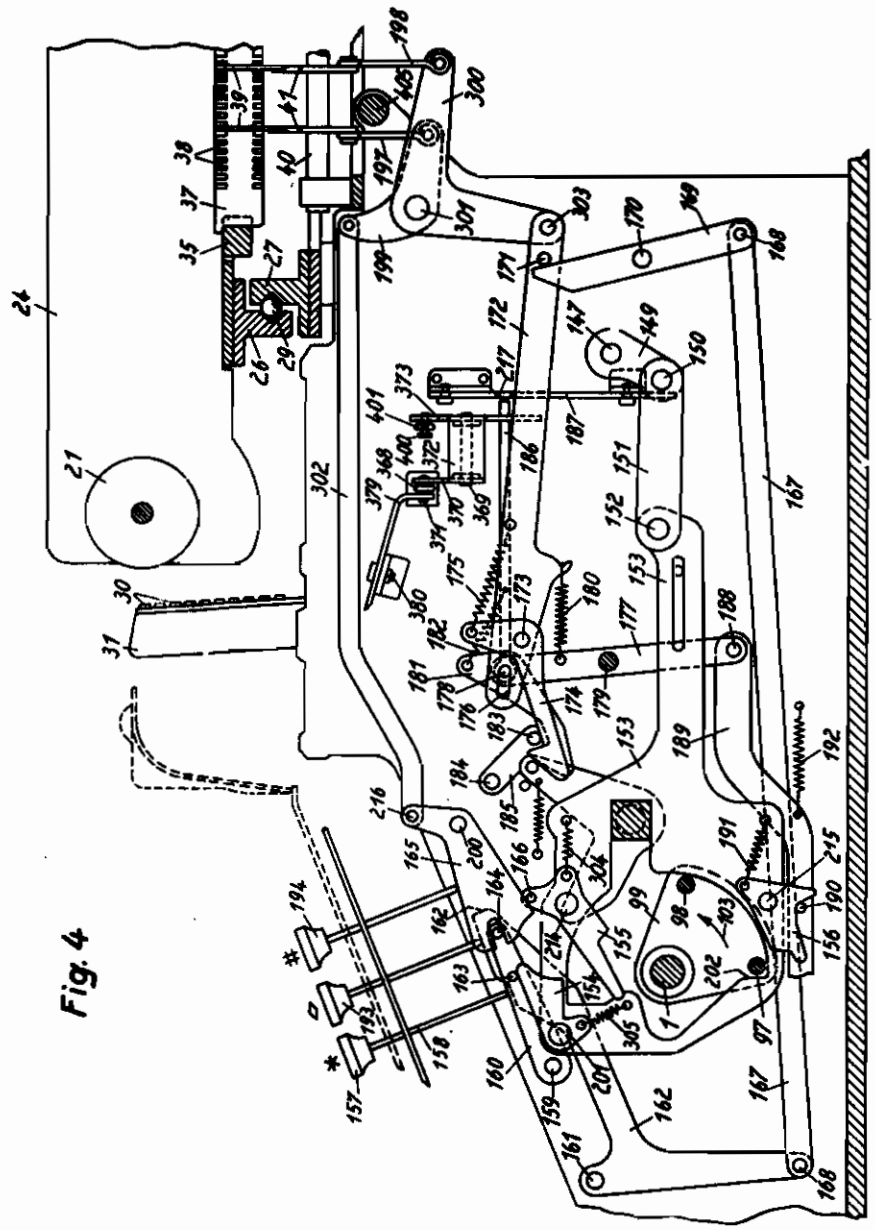

Fig. 4

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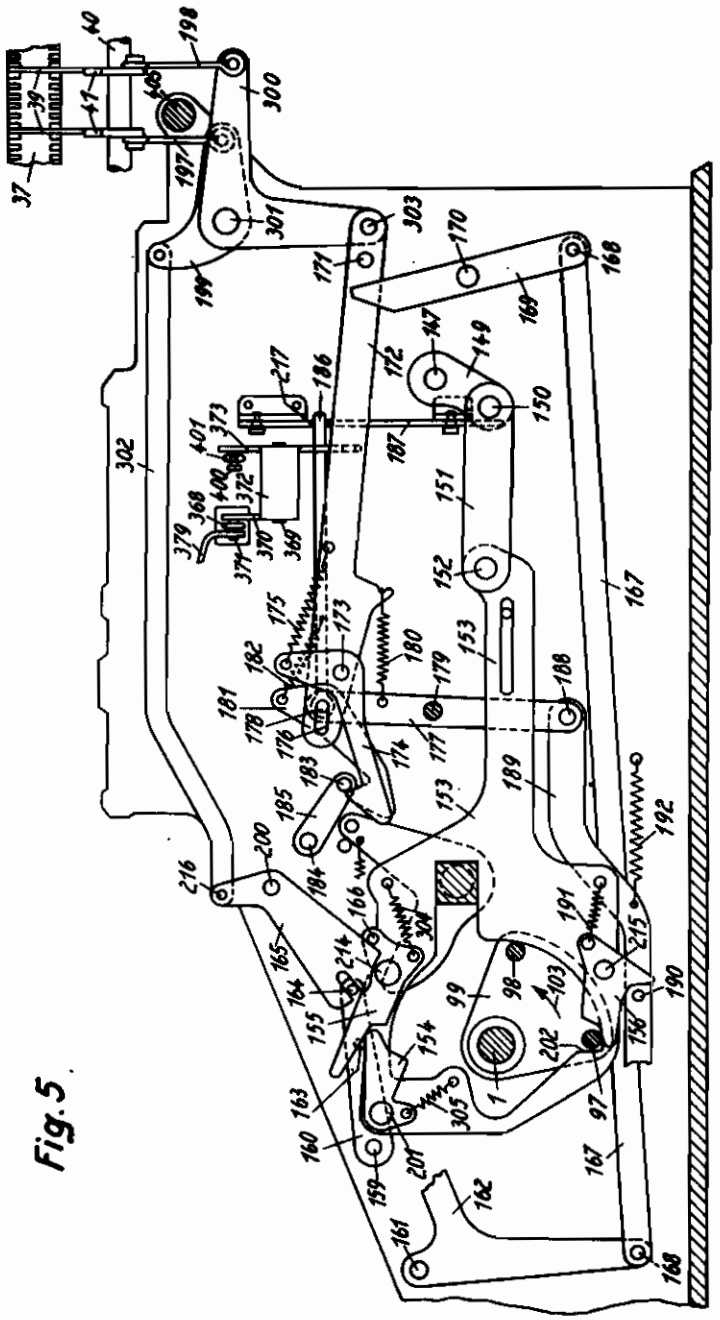

Fig. 5.

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Fig. 6

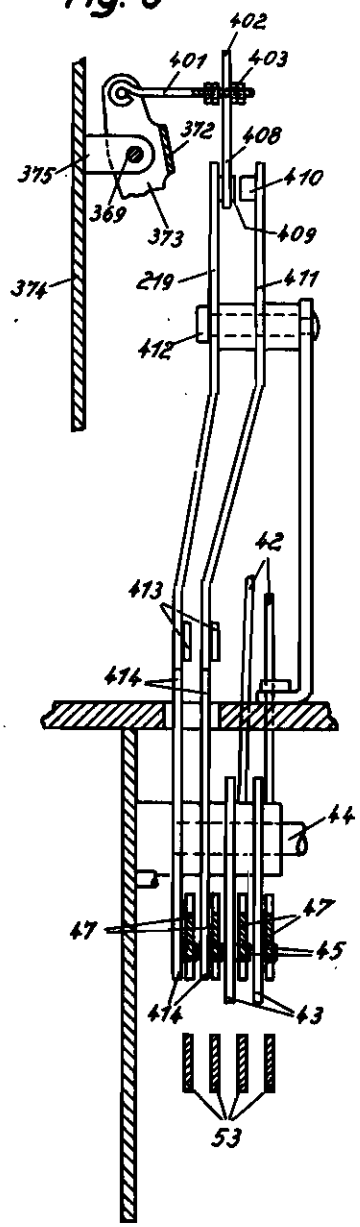
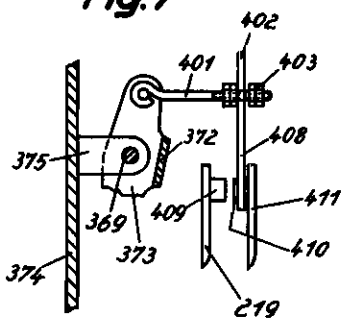


Fig. 7



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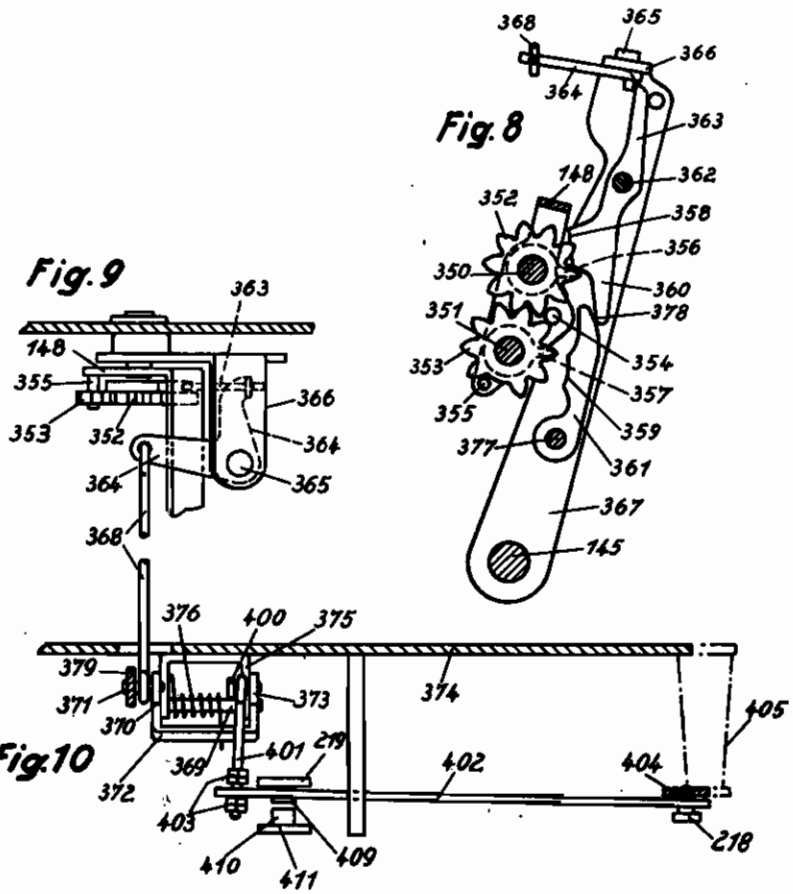
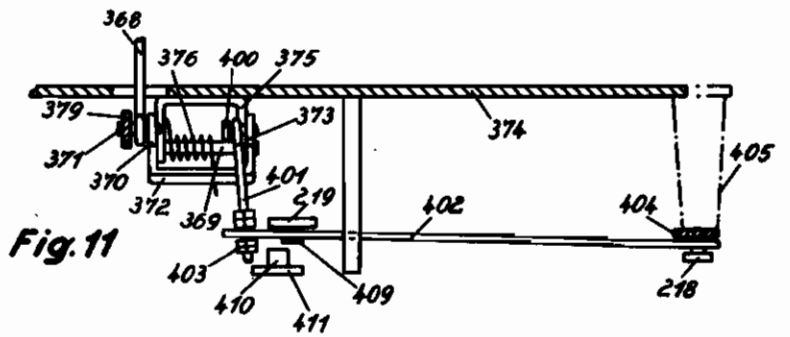
7 Sheets-Sheet 7





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ALIEN PROPERTY CUSTODIAN

ACCOUNTING MACHINES

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Application filed August 27, 1938

The present invention relates to an accounting machine comprising a movable paper carriage, a balancing mechanism from which positive and negative sums can be automatically posted, a series of computing devices into a predetermined number of which are entered the sums calculated by the balancing mechanism, and a device to automatically select the computing mechanism in dependence of the respective columnar position of the paper carriage.

Accounting machines of this type are known in which computation the balancing mechanism is accomplished by manual operation in accordance with the prefix of the respective contents of the balancing mechanism, and wherein different computing devices are selected in each case to enter the sums formed by the balancing mechanism. Machines of this type necessitate particular attention of the operator and are not safe from errors which may occur due to faulty manipulation, and their operation involves intricate manual operating mechanism.

The present invention consists in that a control device is provided which is automatically controlled in accordance with the prefix of the contents of the balancing mechanism, which, on computing from the balancing mechanism while the paper carriage is in a predetermined position, controls the device to automatically select the computing mechanism in such a way that in case of a negative sum, a different computing mechanism will be selected as in case of a positive sum.

The accompanying drawings illustrate a preferred embodiment of the invention, and in which:

Fig. 1 is a sectional view of an accounting machine, according to the invention;

Fig. 2 is a lateral view of the control device and the selecting device of the computing mechanism;

Fig. 3 is a side view of the selecting device for the computing mechanism in accordance with Fig. 2, having its parts in a different position;

Fig. 4 is a lateral view of the control device for the balancing mechanism;

Fig. 5 is a side view of the control device for the balancing mechanism in accordance with Fig. 4 with its parts occupying a different position;

Fig. 6 is a sectional view of the selecting device for the computing mechanism, taken on line 6—6 of Fig. 2;

Fig. 7 is a detail view of the selecting device of the computing mechanism according to Fig. 6, with the parts in a different position;

Fig. 8 is a side view of an indicating device for the prefix of the contents of the balancing mechanism;

Fig. 9 is a top view of the device shown in Fig. 8;

Fig. 10 is a top view of a control device partly in section and taken on line 10—10 of Fig. 2; and

Fig. 11 is a view similar to Fig. 10, showing the parts in a different position.

The embodiment of the accounting machine, illustrated by way of example in the drawings is essentially similar to the machine disclosed in U. S. Applications Serial Nos. 39,065 and 181,440, filed September 3, 1935 and December 23, 1937 respectively and therefore only the parts of the machine are herein described and illustrated which are necessary for a full disclosure of the present invention.

The accounting machine according to the invention is provided with a main shaft 1 (Fig. 1) carrying a cam 8 rigidly connected thereto. Toothed segments 3 are mounted for free rotating movement on a shaft 2, which latter furthermore carries, likewise mounted thereon for rotating movement, a forked lever 10, the left arm of which carries a roller 9.

A spring 11, acting upon the forked or cranked lever 10, urges the roller 9 against saddle or cam 8. The right arm of the forked lever is provided with a saddle or seat portion 12. The toothed segments 3 are held against the seat 12, by means of springs 14 and lugs 13.

To begin the operation, the main shaft 1 describes a swinging movement in clockwise direction, whereby the lug 8 release the roller 9 so that the cranked lever 10 may swing in counter-clockwise direction due to the action of the spring 14. The tooth segments 3 are hereby released from the seat 12 and, due to the effort of the springs 14, swing about shaft 2 in counter-clockwise direction. Pivotally connected at 15 to the tooth segments 3 are regulating slides 7, which are shifted towards the left, (Fig. 1) on upward movement of the tooth segment 3. The regulating slides 7 are provided with lugs 6 adapted to co-operate with key shafts or rods 5 of the summing up or totaliz-keys 4. In accordance with the lowered summing up key the regulating slides 7 come, sooner or later, to a stop during their movement to the left, due to the engagement of one of the stops 6 on the corresponding lowered key shaft.

The toothed segment 3 which is connected to the corresponding regulating slide 7 is hereby set

upon the numeral corresponding to the lowered summing-up key 4.

In the embodiment shown a balancing mechanism 16 is provided having an upper and a lower set of wheels, and which is adapted to directly engage the toothed segments 3. Furthermore a series of computing mechanisms are provided, two of which, 17, 18 are shown. The computing mechanisms 17 and 18 are driven by means of a particular tooth formation 20 on the toothed segment 3, in cooperation with double-toothed racks 19.

A writing roller or platen 21 is supported in the lateral walls 22, 23 of a paper carriage 24. Fastened on the paper carriage 24 are two slide rails 25, 26 (Fig. 2), by means of which the carriage is guided on rollers 29 on two slide bars 27, 28 fastened on the machine frame.

Types 30 of the type carriers 31 can be impressed upon the writing roller 21. The type carriers 31 are pivoted on the toothed segments 3, and, on regulation of these, are set on the struck number. Pressure hammers 32 are provided for producing an imprint by projecting the type carriers 31 against the writing roller.

In the bottom plate 33 (Fig. 2) of the paper carriage is formed an opening 34, into which a frame may be inserted. This frame comprises a front rail 35, a rear rail 36, and two lateral connection webs which are not shown. The frame 35, 36 rests, together with the lateral connecting webs, upon the bottom plate 33 of the paper carriage 24.

Both the front rail 35 and the rear rail 36 are provided with inter-corresponding slots 209, 210. These slots are adapted to receive the control lug holders 37. These holders carry in any desired number of slots or recesses 38 and any desired number of control elements 39, which have for their object the setting of the accounting machine for the various operations at any columnar position of the paper carriage. They may all be uniformly shaped or may be more particularly adapted to each individual operating method.

According to their position, on the control element holder 37, the functions of control elements 39 will vary, as is well known. Thus, e. g., the control elements 39 are capable of determining any desired operation of the counting devices, such as subtraction, non-addition, sum and, or, intermediate sum.

Furthermore certain counting devices may also be selected by the control elements 39. To this effect several forked levers 41 are mounted on a shaft 40, to co-operate with the control elements 39 in such a manner that they may be swung out by these. The forked levers 41 are connected to pulling wires 42 to which an upward movement is imparted by the control elements 39 on swinging out of the cranked levers. The lower ends of the pulling wires 42 are connected to discs 43 which are adapted to swing about a common axis 44. A connecting rod 47 is fastened to each of the discs 43 by means of a pin and slot connection 45, 46, the connecting rods 47 being drawn towards the right, (Fig. 2), by means of a spring 48, disposed between connecting rod 47 and disc 43. The left ends of the connecting rods 47 are fastened by means of journals 211 to the discs 49. The discs 49 are arranged for swinging movement upon a common shaft 50, and carry pins 51, 52 which latter may selectively co-operate with rods 53, (Figs. 2, 3).

On imparting a swinging out motion to a lever 41 by means of a control element 39 and thereby cause the corresponding pull wire 42 to describe an upward movement, the corresponding disc 43 will be rotated in counter-clockwise direction. The disc 49 is hereby caused to rotate in clockwise direction by the rail 47, whereby the pin and slot connection 45, 46 is held in the position shown in Fig. 2 by means of the spring 48. Due to the rotation of the disc 49 stop pin 52 causes one of the rods 53 to move downwardly against the effort of a spring 212 (Fig. 3). The rods 53 are provided on their lower part with a slot 54, by which they are enabled to contact on downward movement with a pin 56 of a saddle or seat 56.

The saddle 56 comprising two arms is mounted for turning movement about a journal 57 and is adapted, while rotating, to shift the rods 53 back and forth which, in each case, are in contact with the pin 55.

The rods 53 may be linked to levers 58, 59, 60 or also by means of a forked lever 61 and a link 62, to a lever 63. The levers 58, 59, 60, 63 are mounted on shafts 64, 65, 68, 67 carrying revolving plates, two of which, 68, 69 are shown in Fig. 1. On swinging the revolving plates 68, 69 in counter-clockwise direction, the shafts 73, 74 of the counting mechanism, which are carried by levers 77, 78, oscillating about shafts 75, 76, are moved upwardly against the action of the springs 70, 71. As a result of such upward movement the counting gears of the computing mechanism 17, 18, mounted on the shafts 73, 74 of the counting mechanism will mesh with the racks 19 which, on each movement of the toothed sectors 3, are moved back and forth by means of the toothed formation or sector 20 in the pin slot guides 79, 80 and 81, 82 respectively.

As stated herebefore, the counting mechanism is connected or disconnected by means of the saddle 56 and the pin 55. The saddle 56 is connected to an arm of a forked lever 95 by means of a rod 84, which is fastened to a swing bolt 83 (Fig. 2). The forked lever 95 is mounted for rotating movement about journal 86. With its upper fork-shaped arm, the two-armed lever 95 grips a pin 97 of an anchor 99. The latter is guided in slots 91 and 92 on the machine frame by means of a pin 89 and a slide block 90. The larger front end of the lever is provided with several pawls 93, 94, 95 and a contacting surface 98, allowing its selective co-operation with pins 97, 98 of a control disc 99 fastened to the main shaft 1. The pawls 93, 94, 95, according to the embodiment shown, can be selectively engaged by or disengaged from pins 97, 98, by means of springs 100, 101, 102. The connecting and disconnecting movement of these pawls can be effected either by hand or automatically as will be more fully described hereinafter.

As the pawl 94 is connected at the anchor 88 (Fig. 2), the pin 98, during its turning movement in the direction of the arrow 103 at the end of the advancing movement of the machine, travels past pawl 94, swinging same only slightly out against the effort of spring 101.

According to the particular stage or period of time of the operation at which the computing mechanism 17, 18 is engaged with, or disengaged from the racks 19, varied counting operations will be carried out by the computing mechanism 17, 18. The further computing mechanism, and which are not illustrated, correspond to computing mechanism 17, 19 and are adapted to be coupled with the toothed racks 19 by rotating shafts 66, 67 (Fig. 2).

As the machine starts its rearward movement during which the control disc 99 moves back to its original position in clockwise direction, the pin 98 contacts the head 104 of pawl 94 and thereby moves anchor 88 in its slots 92, 91 towards the right in Fig. 2. This movement towards the right of the anchor 88 determines the movement over the parts 85, 84, 56, 55, 53 towards engagement of the already selected computing mechanism. The anchor 88 remains in this position and the corresponding counting device remains connected until, at the end of the rearward movement of the main driving shaft 1, the pin 87 strikes the stop surface 98 and thereby returns the anchor 88 toward the left in Fig. 2, into its inoperative position. The corresponding computing mechanism is thereby simultaneously disconnected.

Each computing mechanism 17, 18, similarly as the computing mechanism not shown, is provided with its proper connecting device for tens, which may be of any appropriate design.

For adding and subtracting computing mechanism any known type of connecting device for tens may thus be used. Since a separate connecting device for tens is provided for each computing mechanism, it is to be seen that several computing mechanisms, according to the embodiment shown, may be simultaneously engaged by the toothed racks 19.

In posting a sum, the pawls 93, 85 are swung either by hand or automatically, while the pawl 94, however, is disengaged from the pin 98. This is attained in the manner described hereinafter.

On pushing down the summing-up or totalizer key 105 for the computing mechanism, the key shaft or rod 106 abuts a lever 108 pivoting about the journal 107 and carrying two pins 109, 110. The pin 110 of the lever 108 is engaged by a lever 112 pivoting in 111. The lever 112 rests upon a pin 113 of the pawl 94, while the pin 109 of the lever 108 rests upon the pawl 93. To the rear of the lever 108 is provided a two-armed lever 115 which is mounted for oscillating movement about a journal 114, and which, likewise, is situated within reach of the shaft 106 of the summing-up key 105. A link 117 is fastened to a swing bolt 116 at the lower branch of the two armed lever 115, and carrying a pin 118 which is adapted to cooperate with the pawl 95 in such manner that the pawl 95 is normally held, against the traction effort of its spring 102, outside of the reach of the control pin 97. The link 117 is constantly drawn towards the right in Fig. 2 by means of a spring 119 the tension force of which is greater than that of the spring 102. The right end of the link 117 is pivotally connected to a lever 121 by means of a journal 120. The lever 121, together with the journal 122 is mounted for rotating movement on the machine frame.

On pushing down the summing-up key 105, the levers 108, 115 are swung out in clockwise direction by the key shaft 106. The link 117 is thereby moved over lever 115 towards the left in Fig. 2, whereby the pin 118 releases the pawl 94 which, due to the effort of spring 102, comes within the operating field of the control pin 97. Simultaneously the pawl 93 is brought within reach of the control pin 98, by means of the pin 109, while the pawl 94 is swung out in clockwise direction by the pin 110 of the lever 108 in co-operation with the lever 112. The control pin 97 of the control disc 99, while moving in the direction of the arrow 103, at the start of the operation, contacts a lug 123 of the pawl 95 and thereby shifts the anchor 88 towards the right, bringing the previously selected computing mechanism in engagement with the toothed racks 19 by means of one of the revolving discs 68, 69. The anchor 88 remains in its position towards the right until the end of the advancing movement when it is again moved toward the left by the pin 88 striking the pawl 93. Hereby the corresponding computing mechanism is likewise disengaged anew from the toothed racks 18.

To post an intermediate sum, the intermediate sum key 124 for the computing mechanism is pushed down. The key shaft or rod 125 of the intermediate sum key 124 is formed in such a manner that it will only influence the two-armed lever 115, but not the lever 108. On pushing down the intermediate sum key 124, as described herebefore, the pawl 95 is swung but not the pawl 93. As opposed to the summing-up or totalizing operation the pawl 94, on entering the intermediate sum, remains in operative position as shown in Fig. 2. At the start of the advancing movement of the machine, the anchor 88 is moved towards the right in Fig. 2 by the pin 97 in co-operation with the pawl 95 and the corresponding, previously selected computing mechanism, is thereby connected. At the end of the advancing movement of the machine drive the control anchor 88 will not be moved to the left, because the pawl 93 is not swung in. The position of the pawl 94 remains without effect upon the control of the anchor 88, since, due to the position towards the right of the anchor, the pawl 94 is positioned outside of the operating field of the pin 98. At the summing-up of an intermediate sum, the rearward movement of the anchor 88 occurs only at the end of the rearward movement of the machine drive while pin 97 contacts the stop surface 96 of the anchor 88. During the forward movement as well as during the rearward movement of the machine drive the previously selected computing mechanism is thus in engagement with the toothed racks 19.

Non-addition operations are carried out by holding the pawls 94, 85 in their swung out position during the forward movement as well as during the rearward movement of the machine drive. This is attained by pushing down the non-addition key 126 of the computing mechanism. The key shaft or rod 127 of the non-addition key 126 acts upon the lever 112 and thereby swings the pawls 94 in clockwise direction over the pin 113 against the action of the spring 191. Even as the pawl 93 is likewise swung by means of the pin 110 of the lever 108 and the pin 109, on swinging motion of the lever 112, pawl 93 will coact with the pin 98 since the anchor 88 has not left its inoperative position as pawl 95 is disengaged. It is obvious that setting of the machine to non-addition position may also be effected automatically and in a similar manner by the paper carriage, as will be described hereinafter in connection with the control of the balancing mechanism, as shown in Fig. 4.

In the present embodiment of the invention connection and disconnection of the computing mechanism 17, 18 can be automatically effected in accordance with the pre-setting of the control elements 39 in relation to the position of the columns of the paper carriage 24. However, in the

present example it is possible to select other computing mechanism than those which are precisely automatically selected in a certain position of the columns of the paper carriage during any desired function of the machine and in any columnar position of the paper carriage 24. To this effect a connecting mechanism is provided which, while one computing mechanism is connected by means of a corresponding key, automatically renders ineffective any connecting operation effected by the paper carriage with a view of determining the connection of the computing mechanism.

In the present embodiment selecting keys 128, 129, 130, 131 are provided co-operating with angular levers 132, 133, 134, 135 for the four computing mechanisms which are engaged by the toothed racks 19 on shafts 64, 65, 66, 67.

The angular levers 132, 133, 134, 135 are mounted on a common axis 213. Slides 138 are pivotally connected to the lower arms of the angular levers 132, 133, 134, 135 each of which is provided with an upper boss 137 and a lower boss 136. The upper boss 137 rests against a rod 139 of a saddle 140 which is mounted for rotating movement about the shaft 141.

When the key 131 is, e. g., pushed down, the saddle 140 describes a swinging movement in clockwise direction over the cranked lever 135 and the slide 136. The rod 139, due to contacting of the disc 49 at the left borders of recesses 142 formed therein, sets back all of those discs 49 to which a clock-wise movement had been imparted by the paper carriage in co-operation with a control element 39 on displacement of the pulling wires 42 and the rail 47. The rails 47, sliding on pins 45, in the slots 48 against the effect of springs 46 are hereby again moved toward the left in Fig. 2.

The discs 43 and the pulling wires 42 may thereby remain in their respective positions, in which they were placed at the corresponding columnar position of the paper carriage on setting of the control elements 39. Thus all control elements actuated by the paper carriage in view of establishing the connection of computing mechanism are rendered inoperative due to the movement instituted by any one of the slides 136.

During the movement towards the left of one of the slides 136, a pin 143 of a disc 49, co-operating with said disc 136, is likewise and simultaneously carried along by means of the lower boss 136. A rotary movement of the corresponding disc 49 in counter-clockwise direction is induced hereby, causing the pin 51 to contact the corresponding rod 53 pushing same downwardly. The slot 54, engaging hereby the pin 55, which, in the succeeding operation of the computing mechanism, determines the operation of the computing mechanism, corresponding to the respective selective key.

The control of the balancing mechanism 16 is carried out in a similar manner as already described. The balancing mechanism 16 is supported on a frame 144, Fig. 1, which is mounted for oscillating movement about a shaft 145. The counting mechanism 18 can be connected to, or disconnected from the toothed segments 8 by means of a revolving disc 146. For this effect the revolving disc 146, which is fastened to a shaft 147, is swung in a counter-clockwise direction. Depending upon whether the struck figure shall appear in the balancing mechanism 16 additionally or subtractively, the upper or the lower set of wheels respectively of the counting mechanism 16 engages the tooth segments. The position of engagement of both sets of wheels of the counting mechanism 18 is determined by the position of a second frame 148, arranged within the oscillating frame 144, the second frame carrying the shafts 350, 351 of the counting wheel, Fig. 8 The control of the frame 148 is not a part of the present invention and therefore is not further described. This control is clearly disclosed and shown in application Serial No. 181,440.

As shown in Fig. 4 a lever 149 is fastened to the shaft 147 which carries the revolving disc 146, said lever being pivoted at 150 to a link 151.

The left end of the link 151 is connected to a control anchor 153 by means of a journal 152, the arrangement, disposition and operation of said anchor being the same as those of the control anchor 66 already described. The machine, according to the present embodiment, is thus provided with two anchors, one anchor 153 for the balancing mechanism 16 exclusively and an anchor 66 for the control of the computing mechanism, which is situated underneath the toothed rack 18. The anchor 153 carries pawls 154, 155, 156, which are held in the position shown in Fig. 4 by means of springs 385, 304, 161. The operation of the pawls 154, 156 is however different from that of the pawls 93, 95 of the anchor 66.

The balancing mechanism 16 or the anchor 153 respectively is provided with distinct keys 157, 193, 164 for the operating method and which are independent from the operating method keys 105, 124, 129 of the computing mechanism. The summing-up key or totalizing 157 of the balancing mechanism is connected by means of its key shaft or rod 158 to a lever 160 oscillating about the journal 159 as also to a cranked lever 162 oscillating about the journal 161. On pushing down the summing-up key 157 of the balancing mechanism the levers 160 and 192 are swung about in clockwise direction. The lever 160 carries two pins 163, 164 of which pin 163 acts upon the pawl 154 while pin 164 is gripped by a lever 165.

It is thus to be seen, that swinging motion of the lever 160 determines, in co-operation with the pin 193, a rotary movement of the pawl 154 in clockwise direction and furthermore, in co-operation with the pin 164, a swinging movement of the lever 165 in counter-clockwise direction, thereby causing pawl 155 to swing in clockwise direction over a pin 166 about the pivot 214.

On pushing down the summing up key 157 of the balancing mechanism, the pawl 154 will thus be brought within reach of the pin 98 while pawl 155 is removed out of the path of this pin. The pins 98 and 97 are so formed that they can co-operate with the pawls 93, 94, 95 of the control anchor 98 as well as with the pawls 154, 155, 156 of the control anchor 153. The swinging motion of the lever 162 results in a movement towards the left of a rail 167 which is pivotally connected at 168 to the lever 162. The right end of the rail 167 is pivotally connected in 169 to a two-armed lever 169. The two-armed lever 169 is mounted for oscillation movement about the pivot 178 on the machine frame. The upper end of the double-lever 169 rests against a pin 171 which is fastened to a link 172. A pawl 174, having a tendency of being swung by a spring 175 in clockwise direction, is mounted for swinging movement about a pivot 173 on the link 172.

The link 172 is formed with a slot 176 into which extends a pin 178 fastened upon a double-

armed lever 177, which latter is mounted for swinging movement about a pivot 179. A spring 180 between lever 177 and link 172 has a tendency of swinging the lever 177 in clockwise direction until the pin 178 contacts the right hand end of the slot 178. A pawl 181, mounted for swinging movement on a pin 178, is moved in clockwise direction by a spring 182. Both pawls 174, 181 co-operate with a pivot 183 of a lever 185 fastened to a shaft 184. The shaft 184 is used in connecting the driving motor which is not shown. Loosely connected to the pin 178 is a rod 188 which cooperates with a slide 187 for controlling the co-operative operation of the machine while posting positive or negative sums such as described and shown in application Serial No. 181,440.

A link 189, carrying a pin 190 is pivotally connected at 188 to the lower arm of the two-armed lever 177. The pin 190 maintains the pawl 166 out of engagement with the pin 97 against the action of its spring 191.

On pushing down the summing-up key 157 of the balancing mechanism, the parts 162, 167, 169, 171, 172, 180, 177 of the links 189 are shifted towards the left against the effort of a spring 182 (Fig. 4), whereby the pin 190 releases the pawl 166 thus allowing the latter to be swung about its pivot 216 by the spring 191 into the operating path of the pin 97. After releasing the summing-up key 157 the said parts are returned by the spring 192 into non-operative position shown in Fig. 4. It is thus to be seen that during the forward movement of the machine drive, the pin 97, in co-operation with the pawl 156 shifts the anchor 153 towards the right, (Fig. 4), whereby the balancing mechanism 16 is brought in engagement with the toothed arcs 3, over link 151 and lever 149 by means of the revolving disc 146. At the end of the forward movement of the machine drive the pin 98 contacts pawl 154 and thereby returns the anchor 153 in its non-operative position, disconnecting anew the counting mechanism 16.

In carrying out postings of intermediate sums and non-adding operations of the balancing mechanism 16, the intermediate summing-up key 193 and the non-addition of the balancing mechanism are used to correspondingly control the control anchor 153 in an appropriate manner such as described heretofore in connection with the intermediate summing-up key 124 of the computing mechainsm and the non-adding key 126 respectively, in connection with the control anchor 86.

Setting of the balancing mechanism for summing-up, posting of intermediate sums and non-addition operations can also be effected automatically by means of an appropriate carriage control. To this effect control elements 39 are placed in certain slots 38 of the control element holders 37. These control elements co-operate with cranked levers 41 to which are fastened pulling wires 197, 198' The pulling wire 197 is fastened to a cranked lever 199 and the pulling wire 198 to a cranked lever 300. Both levers 199, 300 are mounted on a common shaft 301. Mounted on the cranked lever 199 is a link 302, the left end of which is connected to the lever 165 by means of a pivot 216. The lower arm of the lever 300 is connected to the link 172 by means of a pivot 303.

When a control element is placed in the slot 38 of the control member holders 37 corresponding to the non-addition operation in a certain columnar position of the paper carriage 24, the pulling wire 197 is moved upwardly over lever 41 (Fig. 4), whereby the lever 165 is swung about pivot 200, in counterclockwise direction over the parts 199, 302. The lever 165 thereby moves the pawl 166 against the action of the spring 304 out of reach of the pin 98. The pawl 154 is swung against the effort of the spring 305 in clockwise direction about the pivot 201, by means of the pin 163 of the lever 160 and the pin 164 into its operative position, yet this swinging motion of the pawl 154 remains without effect upon the control of the anchor 153 because the latter has not been moved towards the right and the pin 98, consequently, cannot come within reach of the pawl 154.

In thus setting a control element 39 in a corresponding position, the balancing mechanism 16 is automatically adjustable to a certain columnar position of the paper carriage.

If a sum is to be posted or set up automatically from the balancing mechanism 16 in a certain columnar position, two control elements 39 for the corresponding columnar position of the paper carriage must be set in the slot 38 of the control element holders 37 corresponding to the non-addition and the sum.

By means of one of the control elements 39, similarly as decribed heretofore in connection with the non-addition operation, the pawl 155 is automatically swung out of the path of the pin 98 while pawl 164 is moved into the path of the pin 98. The other control elcment 39 determines in the corresponding columnar position of the paper carriage 24 an upward movement of the pulling wire 198, (Fig. 4), whereby the link 172 is moved over the lever 300 into the position shown in Fig. 5. The movement toward the right of the lever 172 over the parts 160, 177, 189, similarly as described hereabove, has for result the release of the pawl 156 which, due to the effort of spring 191, moves into the path of the pin 97, (Fig. 5).

At the beginning of the operation, the pin 97, on shifting of the anchor 153 toward the right, moves the balancing mechanism 18 in operating position, while at the end of the advancing operation of the machine drive, the pin 98 moves on its movement toward the left of the anchor 153 the balancing mechanism out of operative position by means of pawl 154. The balancing mechanism 16 is thus automatically set on total.

If in a certain columnar position, only one control element 39 is placed in the slot 38 of the control element holder 37 corresponding to the posting of a sum, the pawl 156 is swung into active position. The pawls 165, 164, remain in the position shown in Fig. 4.

The pin 97 thus sets the balancing mechanism 16 to begin of the advancing movement of the machine drive by means of the pawl 156 on movement towards the right of the anchor 153, and the balancing mechanism is disconnected only at the end of the rearward movement of the machine drive on contacting of the anchor 163 with the surface 202 and shifting towards the left of the anchor 153. The balancing mechanism is consequently automatically set to intermediate sum.

The machine according to the present embodiment is provided with an arrangement to ascertain the prefix of the contents of the balancing mechanism. A pair of wheels 353, 352 (Fig. 8) is mounted upon the shafts 351, 350, of the balancing mechanism 16 laterally of the counting

wheels corresponding to the position of the highest value. The pair of wheels 352, 353 is set from the position of the highest value by means of a control device for tens, which is not shown, always then when all of the counting wheels of the balancing mechanism 16 pass through zero. On the right lateral wall of the frame 148 oscillating about the shaft 354, is a pin 355 which engages the lower wheel 353 at a point in which one of the teeth is cut out. The pin 355 therefore allows only a forward or rearward movement of the pair of wheels 352, 353, corresponding to the value of one tooth.

The wheels 352, 353 are provided with lateral teeth 356, 357 for the control device of tens, said teeth being positioned opposite protruding parts 358, 359 on pawls 366, 361. The upper pawl 360 is mounted for rotary movement upon a shaft 662 and contacts with its upwardly projecting arm 363 a cranked lever 364 (Fig. 9). The cranked lever 364 is mounted about a pin 365 situated in a bent-off portion 366 of the oscillating frame 367 of the counting mechanism. A connecting rod 369 is mounted for oscillating movement on a cranked lever 364 and has its free end connected to an arm 370, which is adapted to oscillate about a shaft 369 by means of a pin 371 (Figs. 10, 11).

The arm 370 is connected to a two-armed lever 373 by means of a bridge 372. The shaft 369 is mounted on a U-shaped plate 375 which is fastened to the machine frame 374. A spiral spring 378 is disposed on shaft 369. The spring 376 has a tendency to swing the arm 370 in counter-clockwise direction whereby a pressure is exerted in clockwise direction upon the cranked lever 364.

The setting of the balancing mechanism 16 according to Fig. 1, 0 corresponds to the position of addition. The position of the teeth 356 of the control mechanism for tens of the upper wheels 352 beneath the raised portion 358 of the control pawl 360 corresponds furthermore to a positive content of the counting mechanism.

When the balancing mechanism 16 is reversed, in a manner not illustrated, either by means of a key or automatically, into subtracting position, this operation is effected by swinging the frame 148 about its shaft 354, this without that rotation of the wheels 352, 353, takes place in respect of the shafts 350, 351. On shifting the balancing mechanism 16 by means of the revolving disc 148 (Fig. 1), the upper set of wheels of the balancing mechanism 16 engages the toothed segments 3.

If now an amount is subtracted which is greater than the contents obtaining in the balancing mechanism 16, a setting to the position of the highest numeral is effected by means of a device for setting tens, as in this case the counting device has been "over-drawn." The wheel 351 is hereby carried along about one setting step in a normal manner by means of the setting device for the tens which is not shown, from the value of the highest position situated next to the counting device. The setting tooth 367, which, in the position of subtraction of the balancing mechanism 16 having a positive content, is situated slightly above a raised portion 359 of the setting pawl 361, swings the setting pawl 361 about its shaft 377 toward the right, as soon as the contents of the balancing mechanism become negative, (Fig. 8). During its swinging motion toward the right the setting pawl 361 carries the pawl 366 along on its contacting surface 376, the pawl 360 itself swinging the cranked lever 364 against the effort of the spring 376, in a counter-clockwise direction. The connecting rod 366 hereby swings the arm 370 and the two-armed lever 373 in a clockwise direction.

The lower arm of the double-armed lever 373 carries the right hand end of the rod 166 (Fig. 4), which is usually guided in the lever 373, so that it may freely shift to the right and to the left when the lever 177 is adjusted.

On swinging the lever 373 in the above-mentioned manner perpendicularly to the plane of the drawing (Fig. 4), the rod 166, which is guided by the lever 373, is likewise swung in a perpendicular direction to the plane of the drawing. The movements of the rod 166 to the right and left are thus controlled in such manner that the rod 186 will co-operate in a certain manner with the recesses 217 formed in the slide 186. This co-operation of the rod 186 and the slide 187 serves for controlling the machine to automatically carry out zero-settings before summing-up operations. This control is not an object of the present invention and is therefore not more precisely described and illustrated, but is fully disclosed in the application Serial No. 181,440.

A lever 379 can be fastened to the pin 371, (Figs. 2, 3, 9) this lever being capable of being swung by means of a screw-bolt 380 which is fastened to the machine frame.

The lever 379 is formed at its front end with a bent-over portion, not shown, which is marked with a plus and a minus sign. The respective prefix of the contents of the balancing mechanism can be indicated by means of the swinging motion of the lever 379 which is controlled by the connecting rod 388, similarly as described in application Serial No. 181,440.

The double-armed lever 373 carries at its upper arm a pin 400, to which a connecting rod 401 is pivotally connected, (Figs. 6, 10, 11). A link 402 is movably connected to the connecting rod 461 by means of screws 403. The link 402 is fastened to a cranked lever 404 by means of a pivot 219 (Fig. 2). The cranked lever 404 is mounted for oscillating movement upon a shaft 405 and is connected to a connecting rod 406. The other end of the connecting rod 406 is fastened to a lever 41 which is adapted to be swung by means of a control element 39 disposed on the paper carriage 24.

The link 402 is provided with a boss 408 which is adapted to selectively co-operate with one of two journals 409, 410, (Fig. 6).

The journals are fastened to two armed levers 411, 219 which are mounted for rotating movement on a shaft 412. Each of the lower ends of both levers 411, 219 is connected over a link 413 to a two-armed lever 414. The two-armed levers 414 are mounted for oscillating movement on shaft 44 and joined at their lower end to one of the connecting rods 47 in view of effecting setting of the counting mechanism.

The connection between the two-armed levers 414 and the connecting rods 47 is carried out in exactly the same manner as the connection between the discs 43 and the connecting rods 47, the latter being actuated directly by means of the pulling wires 42 and the control element 39 disposed on the paper carriage 24.

As has been described hereabove the position of the two-armed lever 373 is dependent on the prefix of the content of the balancing mechanism. When this content is positive the two-armed lever 373 is in the position shown in Fig. 6, and, if negative, in the position shown in Fig. 7. The exten-

sion 408 of the link 402 is consequently coupled to the journal 409 by means of the connecting rod 401 if this content is positive, and to the journal 410 is the content is negative. If in a predetermined columnar position of the paper carriage 24 a control element 39 is placed in a corresponding slot 38 of the holders 37 of the control elements, the control element 39 of the levers 41 will swing out and thereby move the pulling wire 406 in Fig. 2 upwardly. The link 402 is thereby moved over the angular lever 404 toward the right in Fig. 2. Corresponding to its setting depending on its respective prefix of the contents of the balancing mechanism, the extension 409 of the link 402 engages either the journal 409 or the journal 410, and the computing mechanism 17 or the computing mechanism 18 will be automatically brought into engagement with the toothed racks 19 by the paper carriage over the parts 413, 414, 47, 49, 53.

If in a same columnar position of the paper carriage two control elements 39 are also set to automatically adjust the machine to summing-up, the computing mechanism 17, 18 which are automatically selected by means of the links 402, take up separately from the balancing mechanism 16 the sums automatically set according to prefixes.

It is obvious that any computing mechanism of the machine may be selected by means of the link in accordance with the prefixes of the balancing mechanism, such selection being not limited to the computing mechanism 17, 18. The computing mechanism which are adapted to be set in operative position might as well be selected by the link 402 on rotating the shafts 66, 67.

If on actuating in the usual manner a horizontal motor key or a skip-key, not shown, the paper carriage 24 is set in the columnar position which is predestined for summing-up, the sum is automatically thrown out from the balancing mechanism, and posted, and at one and the same columnar position of the paper carriage, the positive sums are entered in one, and the negative sums in another computing mechanism without any co-operation of the bookkeeper. As the positive and negative sums are also posted in one and the same column, they must necessarily be differently characterized which may be done in the usual manner by imprinting in different colors or in simultaneously imprinting certain signs. It is obvious, without departing from the scope of the invention, that instead of one, several balancing mechanism may be present. In such case each of these balancing mechanism controls a selecting device for the computing mechanism corresponding to the prefix of its contents.

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