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BOOKKEEPING MACHINES OR THE LIKE

Filed July 25, 1940

Serial No.
347,464

20 Sheets-Sheet 1

Fig. 1

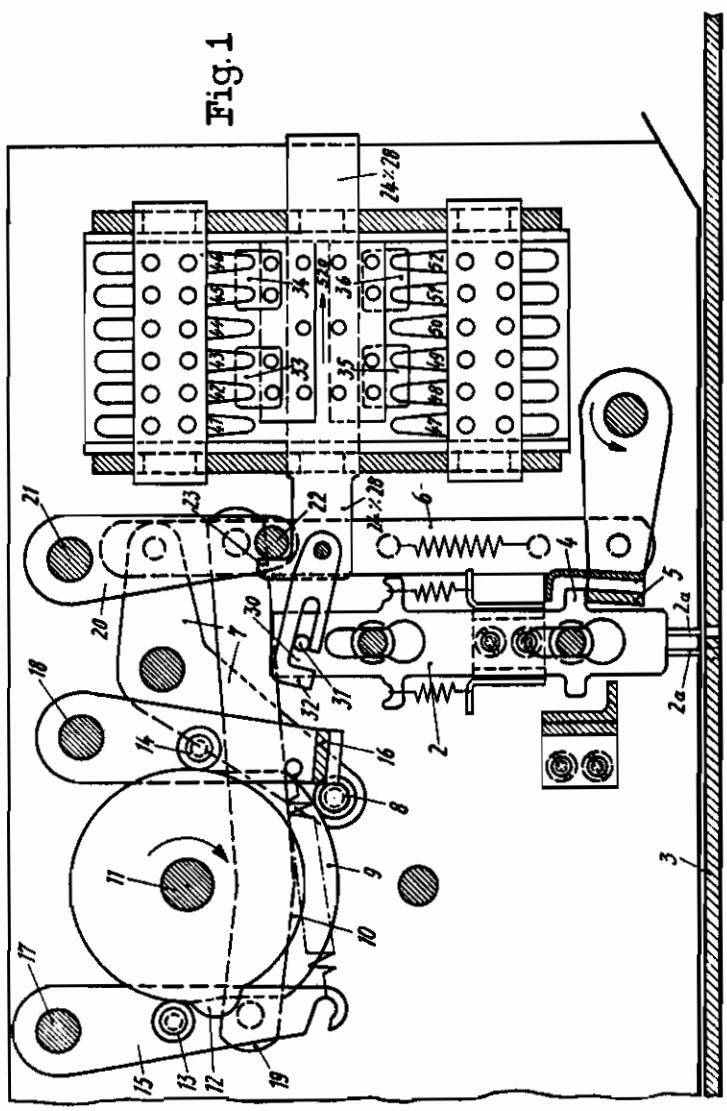

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Fig. 14

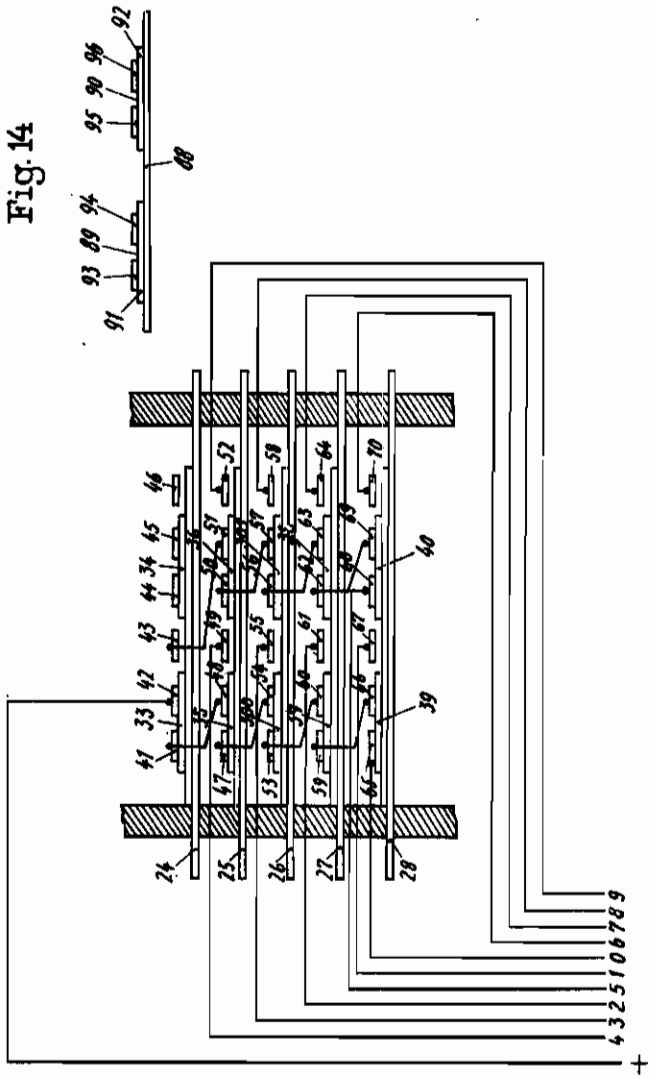

Fig. 2

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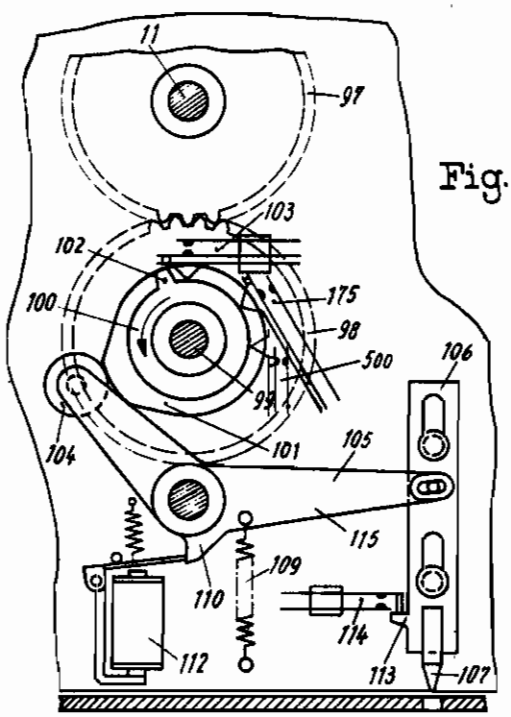

Fig. 4

Fig. 3.

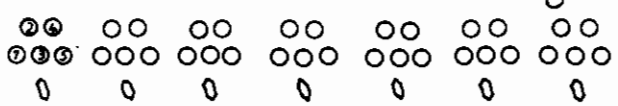

Fig. 3a.

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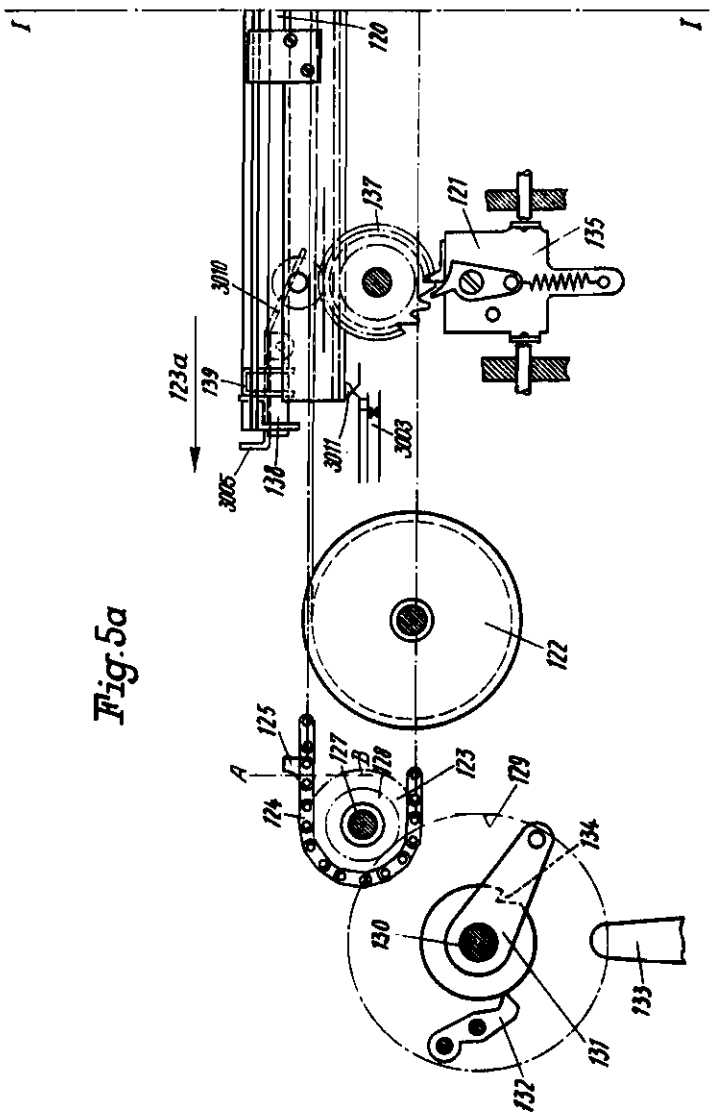

Fig. 5a

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Fig. 5b

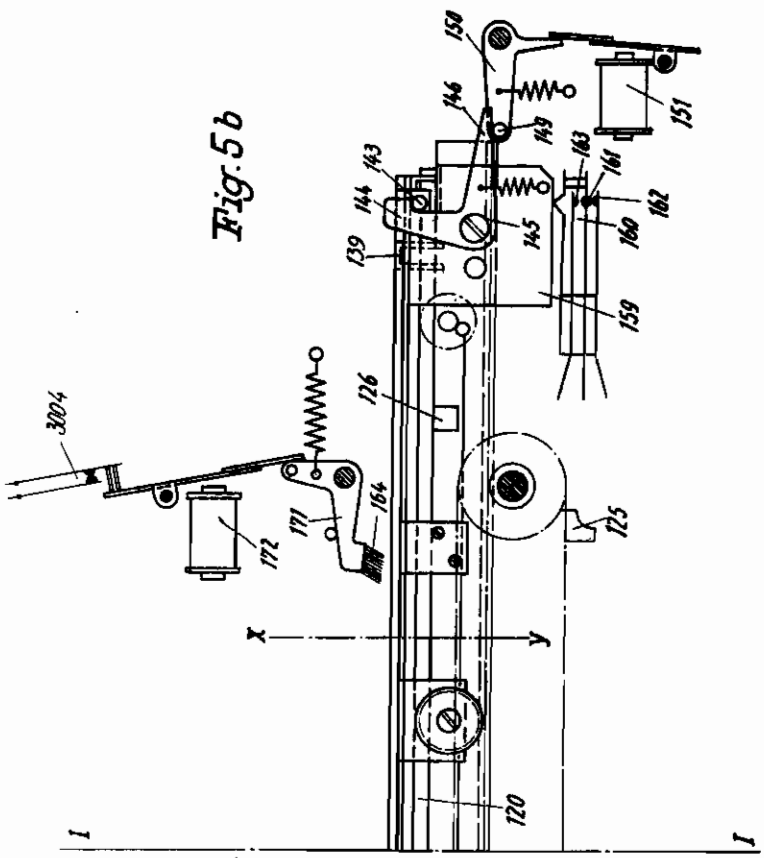

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Fig. 6.

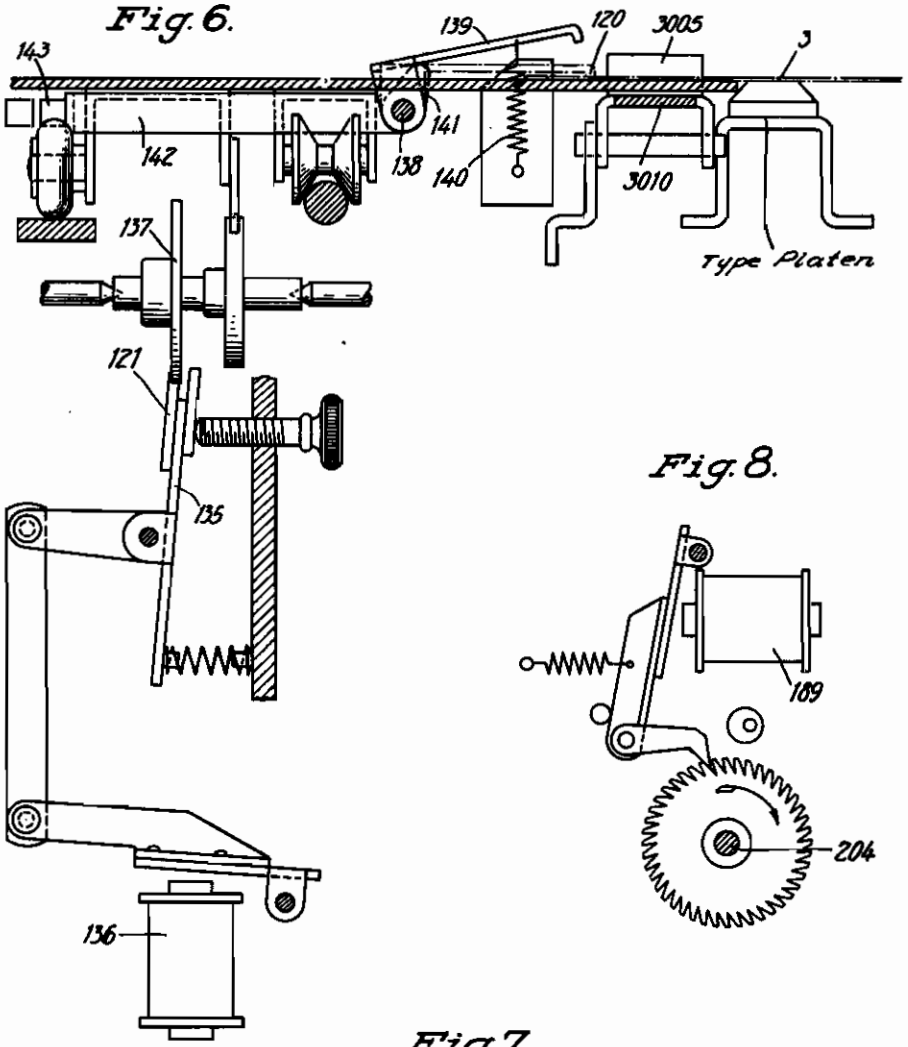
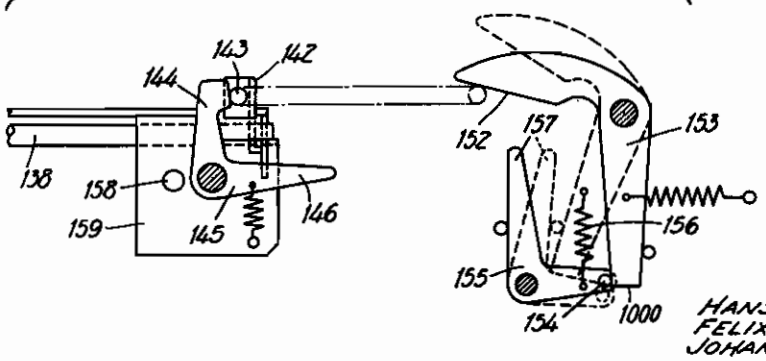


Fig. 8.

Fig. 7.



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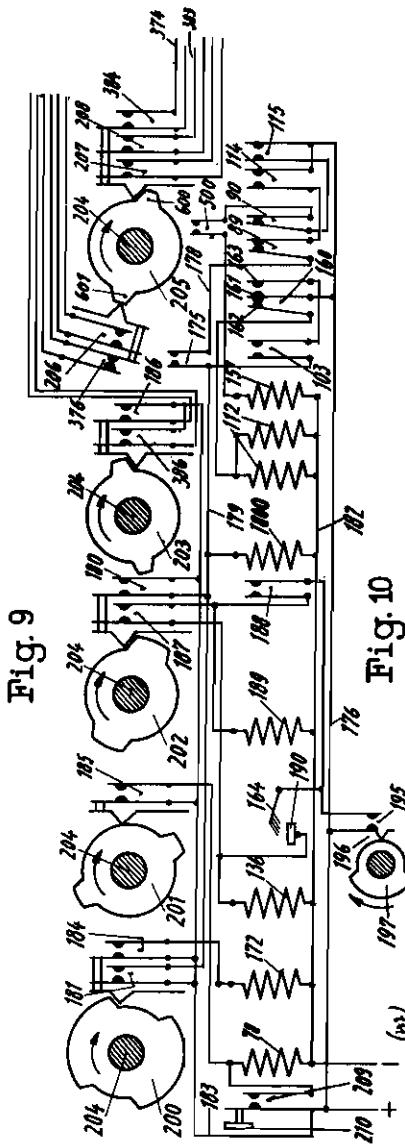

Fig. 9

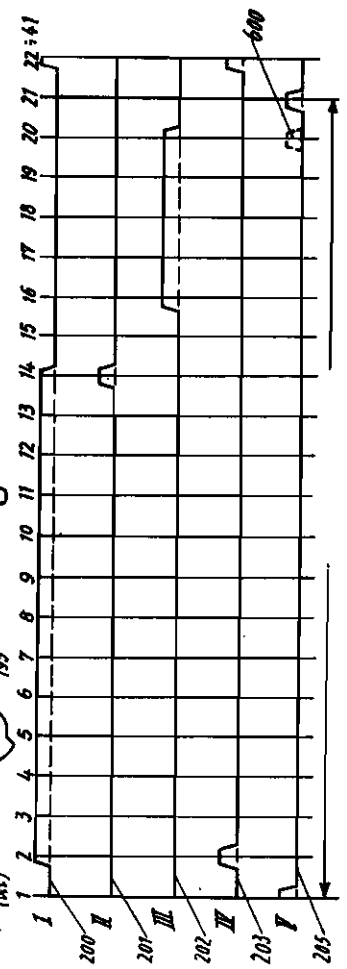

Fig. 10

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Fig. 11

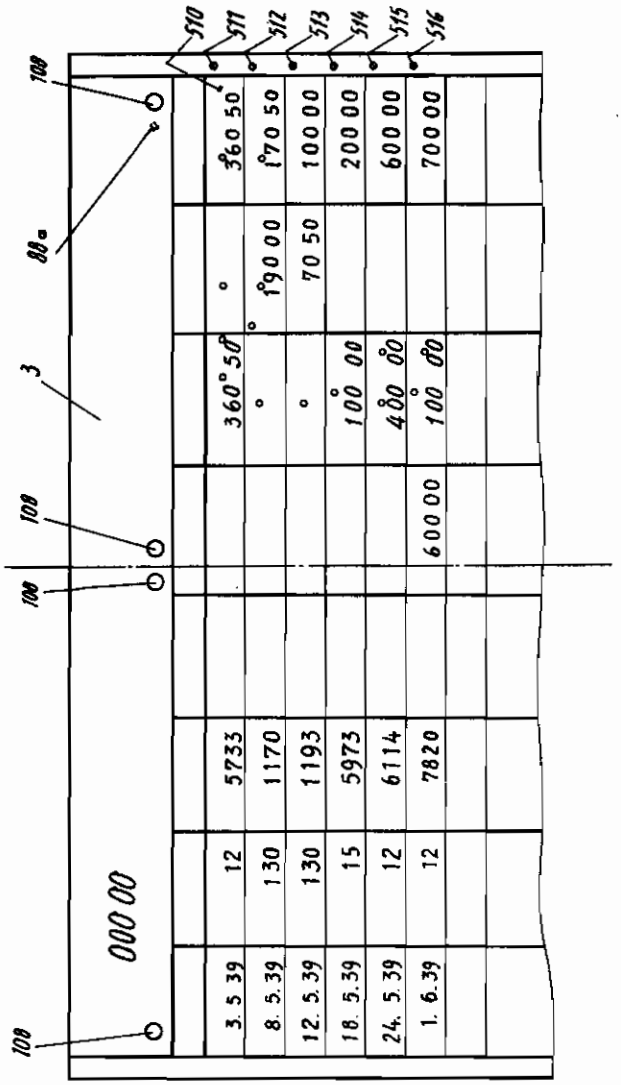

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Fig. 12a

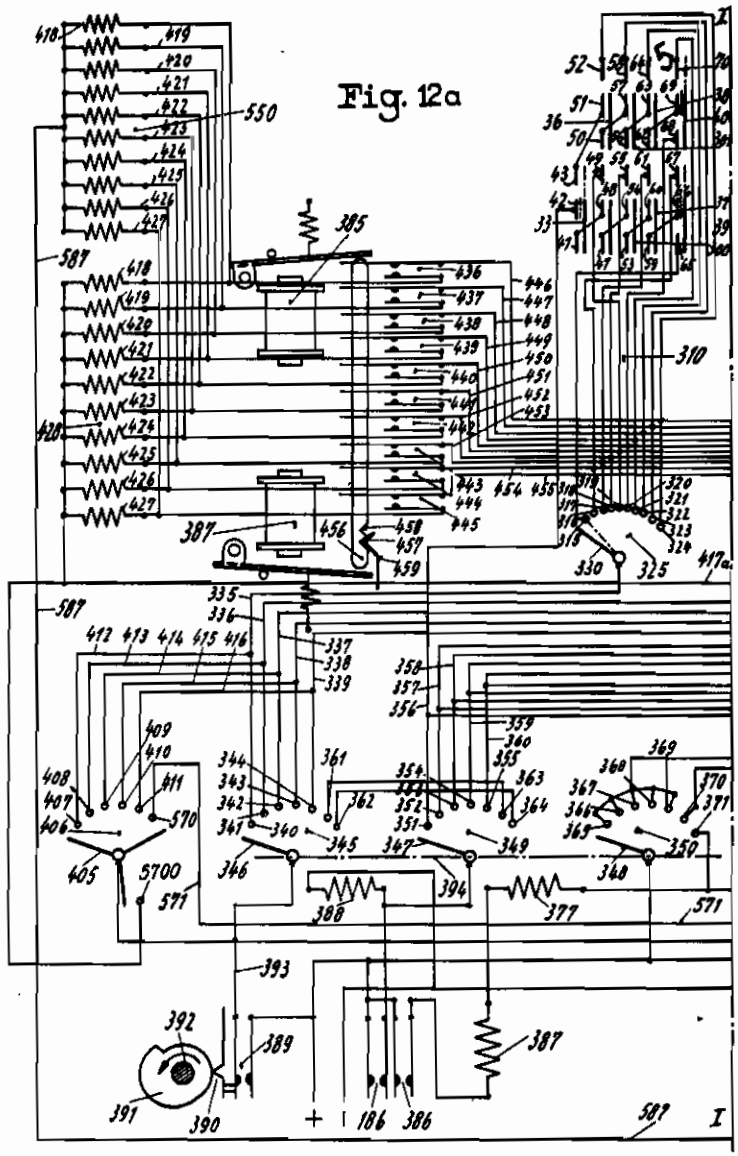

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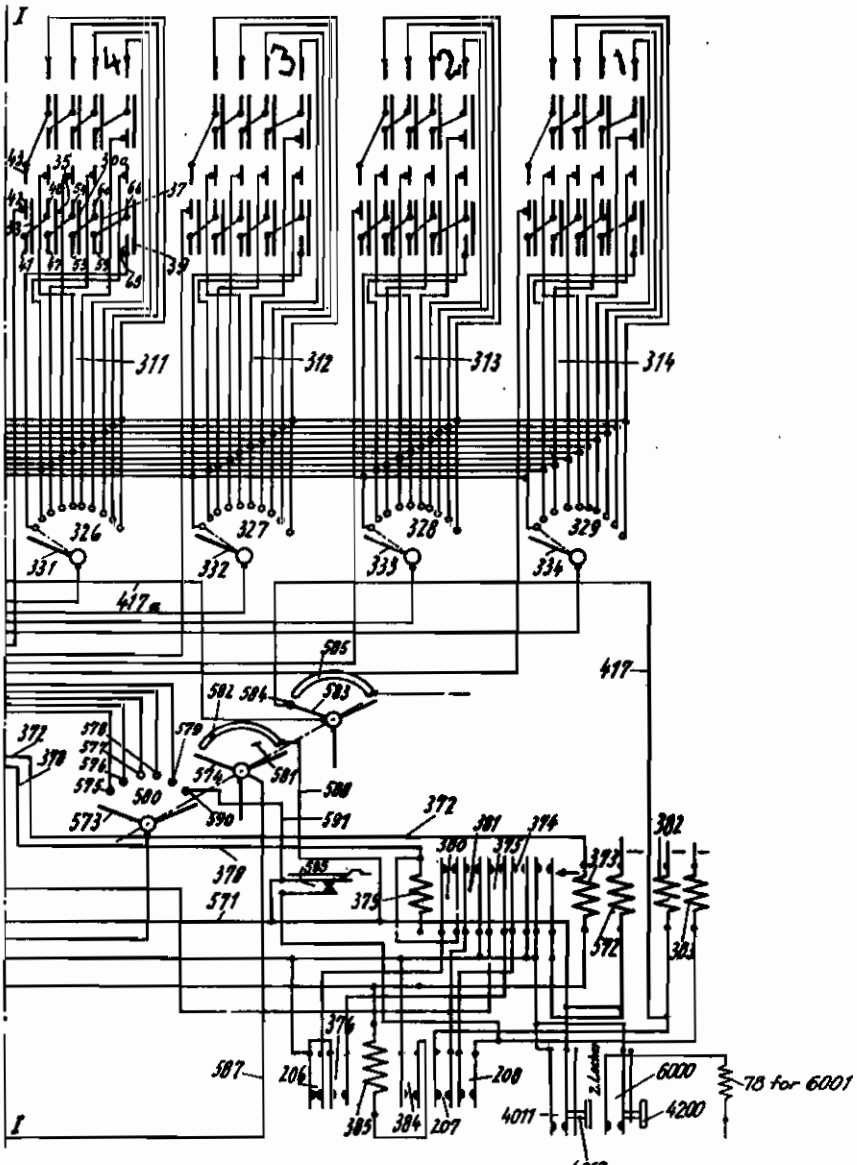
Fig. 12b



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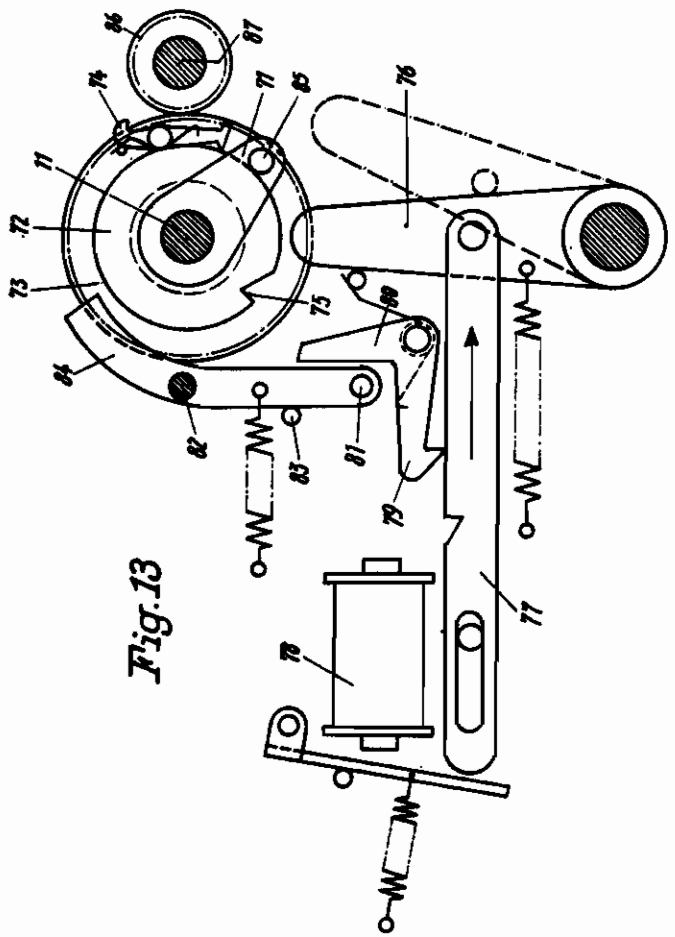

Fig. 13

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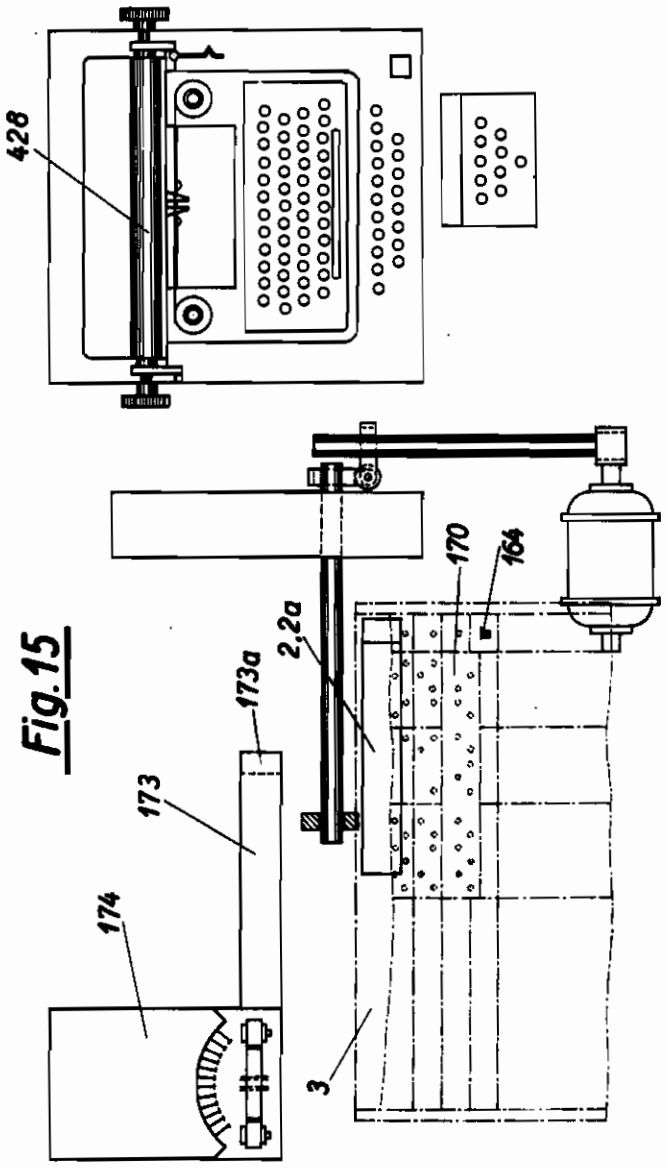

Fig.15

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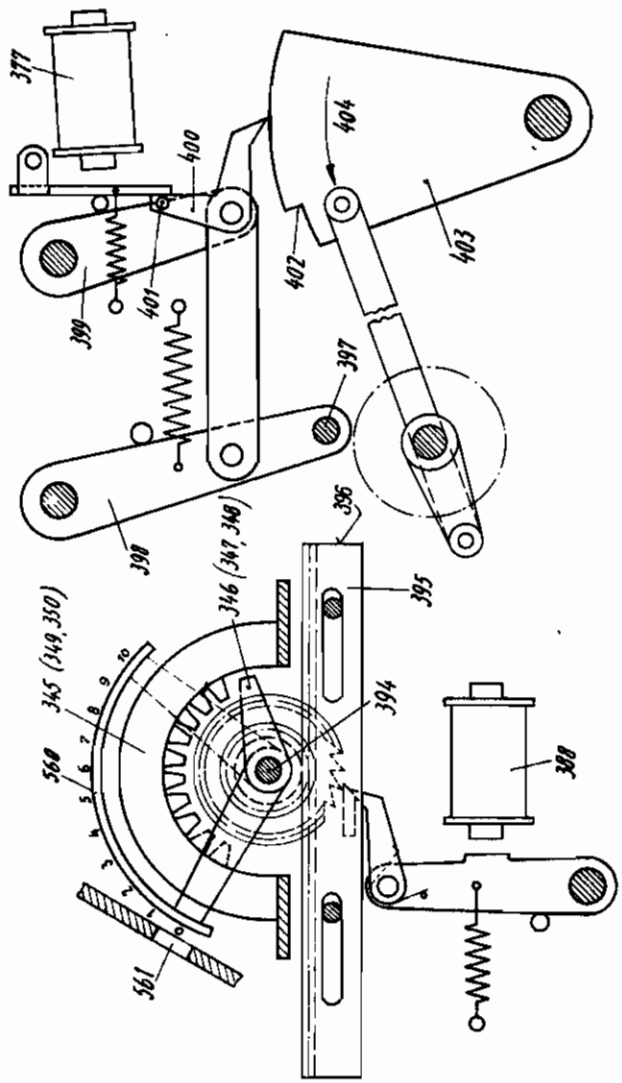

Fig. 16

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Fig. 17

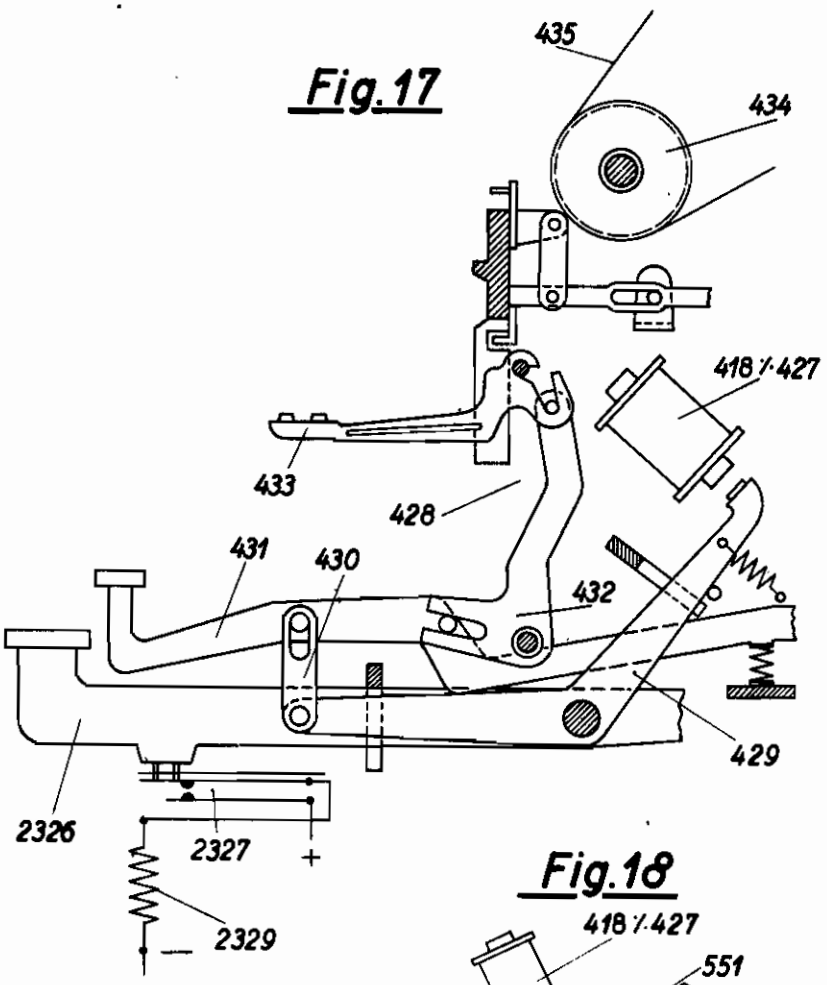

Fig. 18

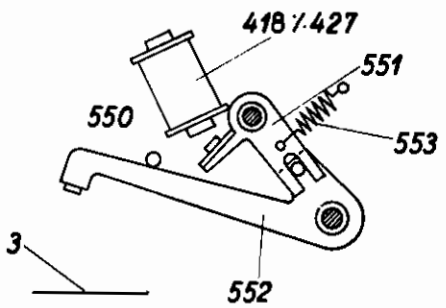

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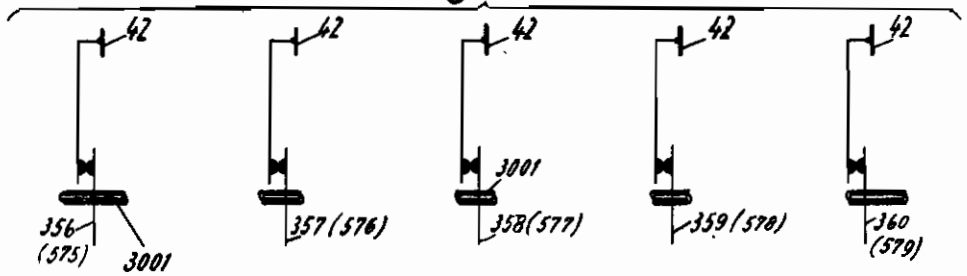
Fig. 19



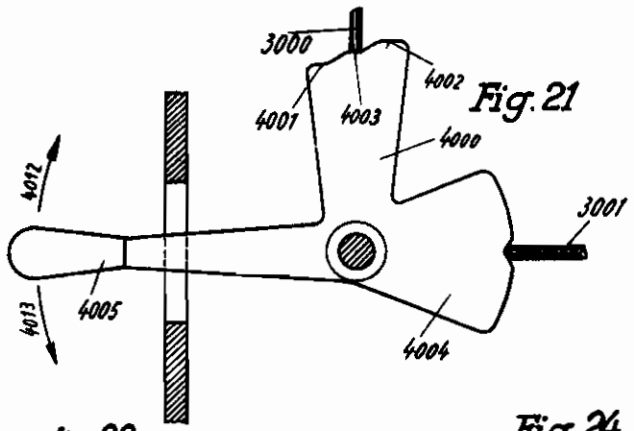


Fig. 21

Fig. 22

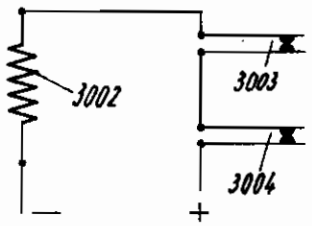
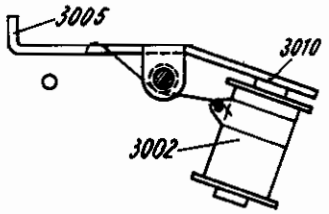


Fig. 24



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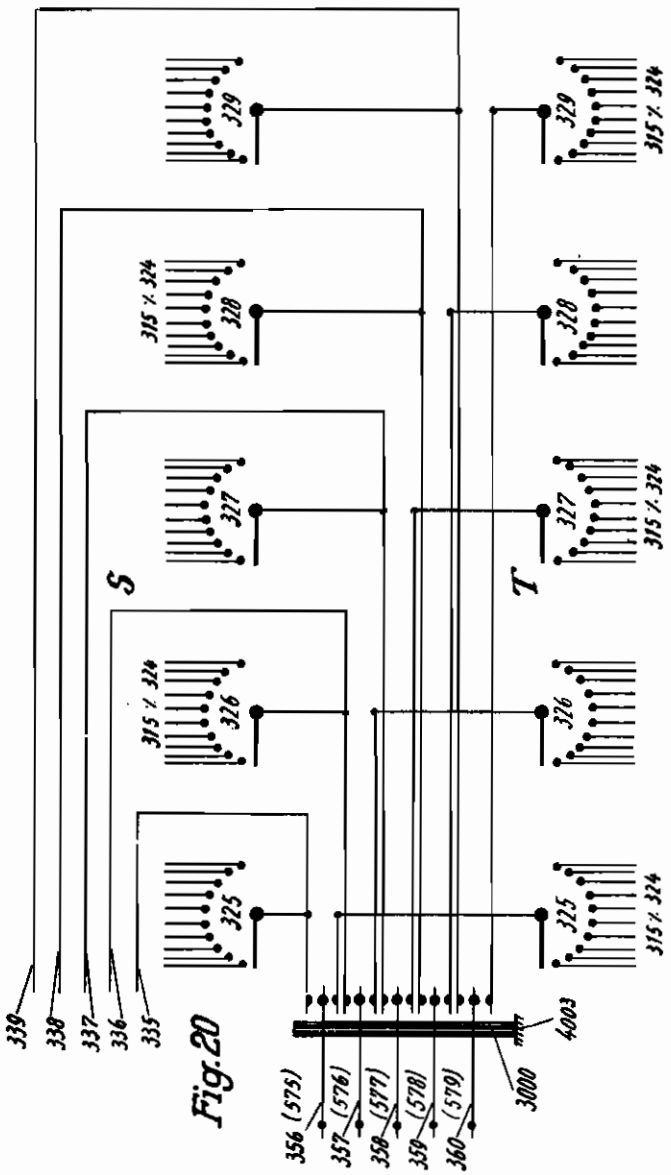

Fig. 20

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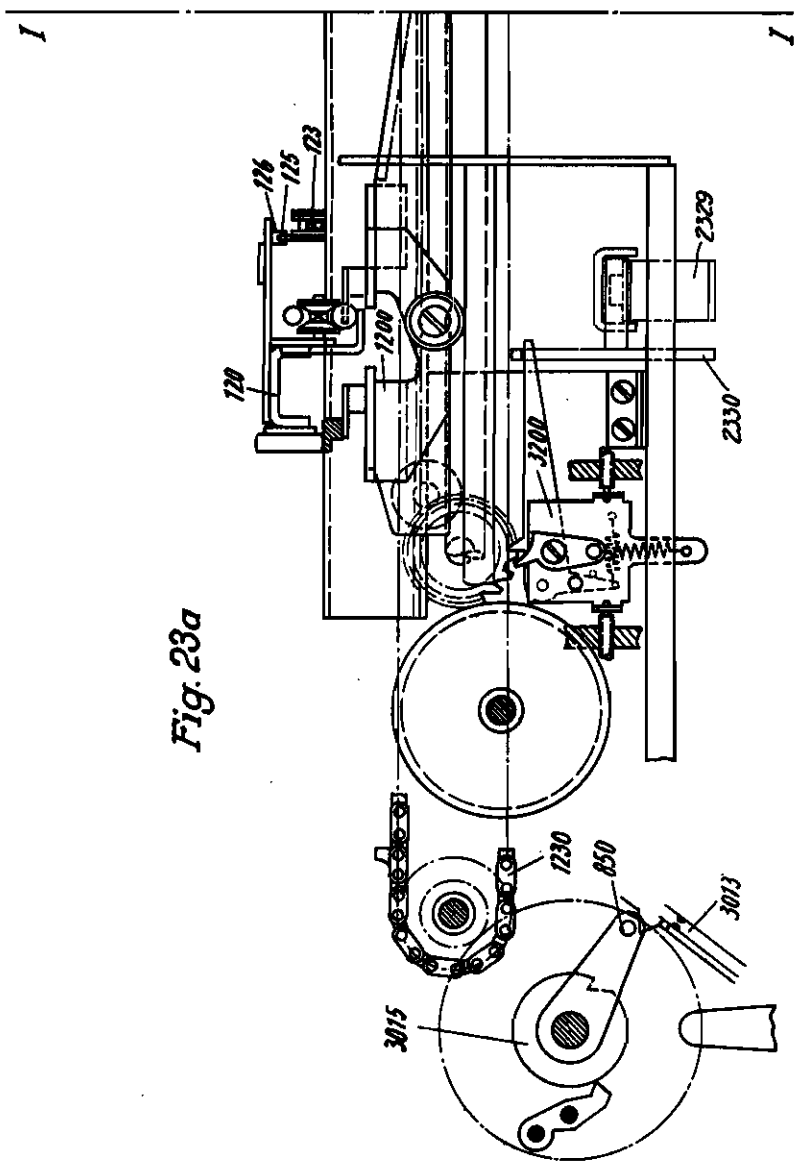

Fig. 23a

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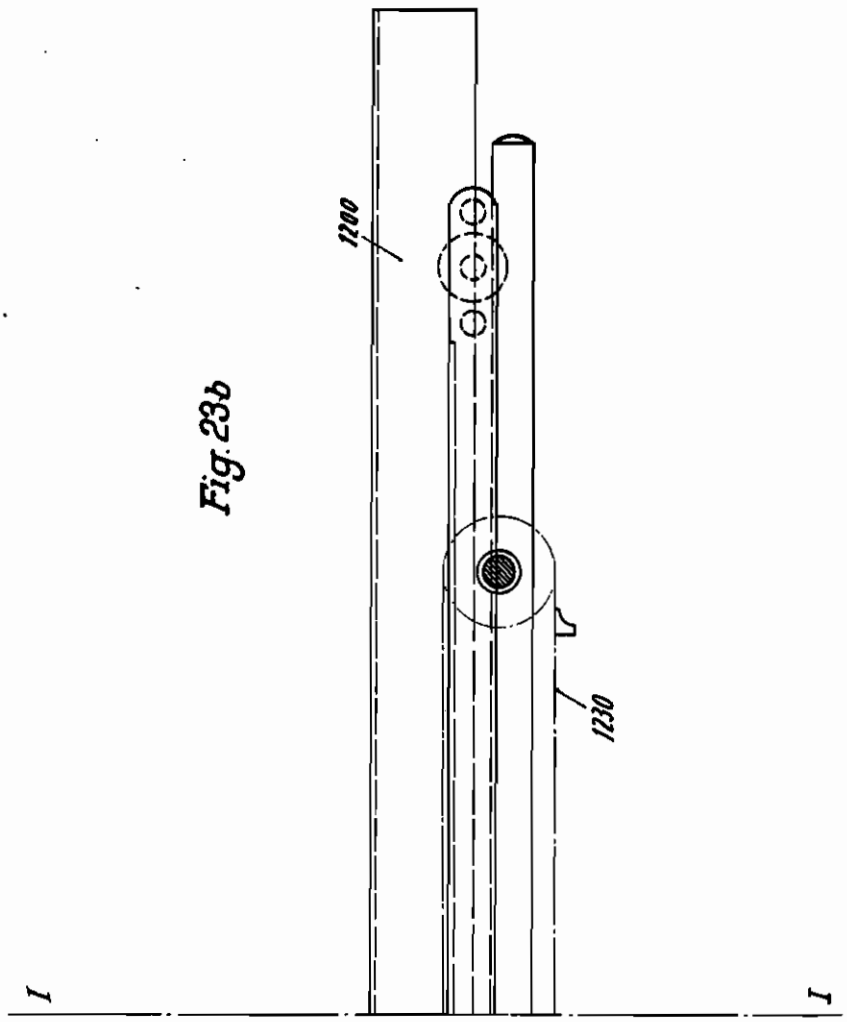

Fig. 23b

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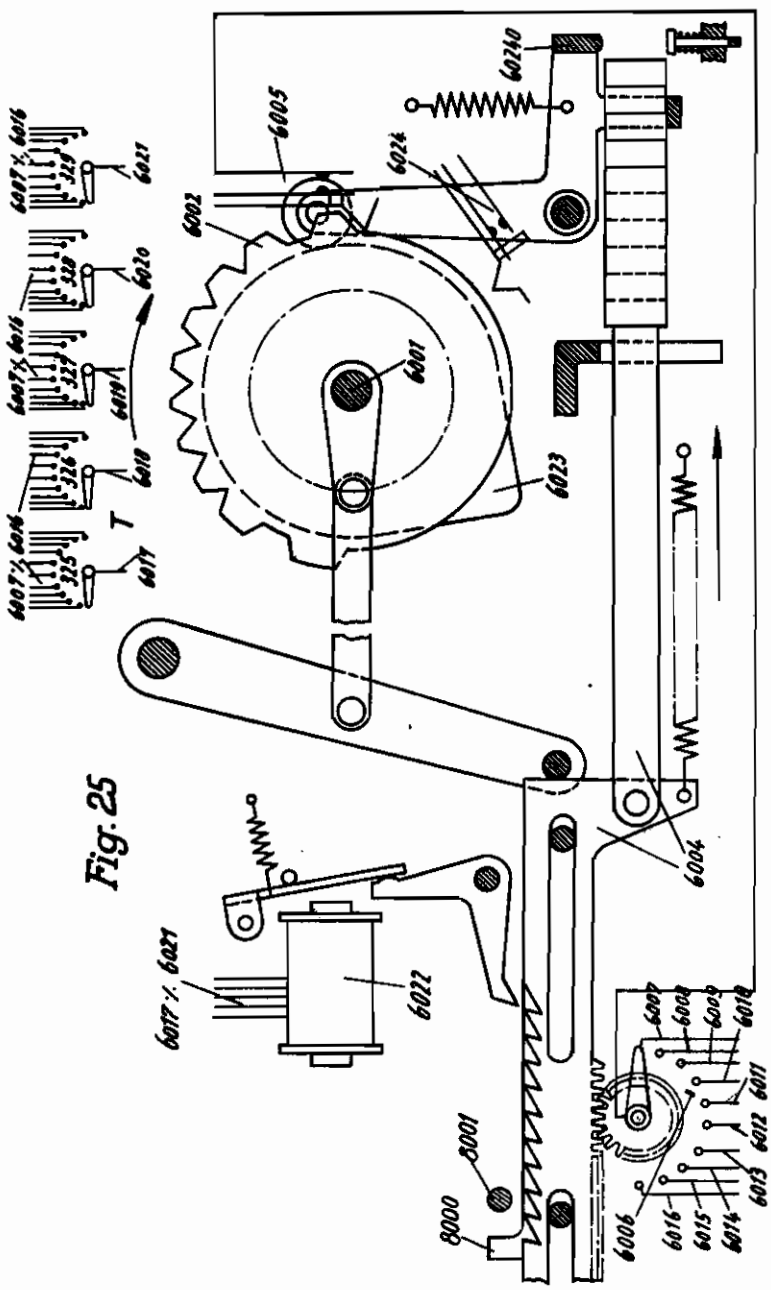

Fig. 25

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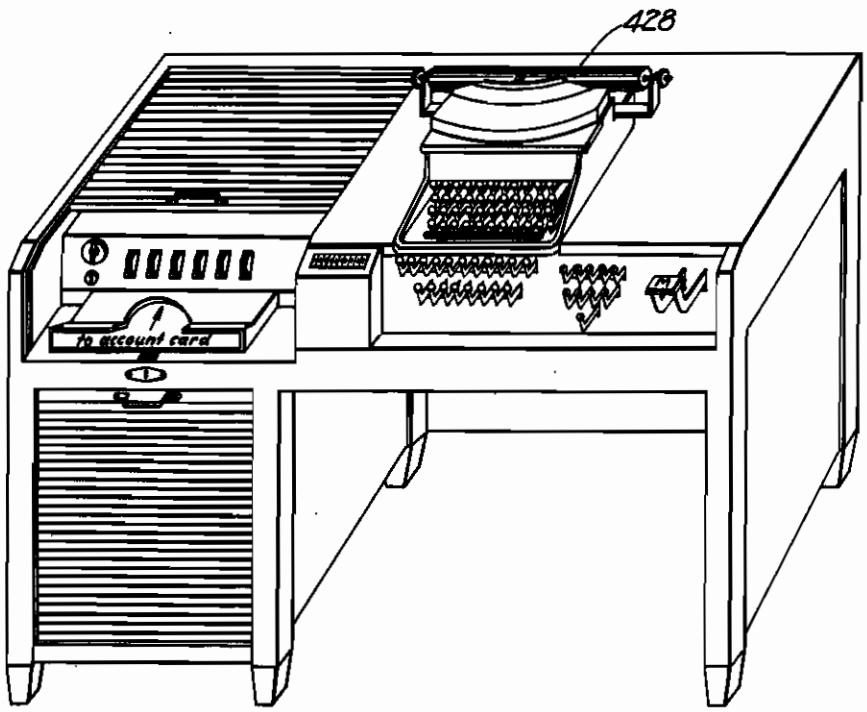
Fig. 26



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Published June 1, 1943

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ALIEN PROPERTY CUSTODIAN

BOOKKEEPING MACHINES OR THE LIKE

Hans Möller, Johannes Sobisch and Felix Loebe, Bielefeld, Germany; vested in the Alien Property Custodian

Application filed July 25, 1940

The invention relates to a bookkeeping machine, or the like, utilizing record sheets with sensible indicia, and particularly one having a comparing device. In such machines it is already known to carry out tabulating operations in dependence upon group-identifying marks and upon disagreement between the punched group-identifying marks with the setting of the machine, to stop the same, or to cause it to carry out in a certain way special machine operations.

Furthermore, it is customary to arrange for an account card inserted into the machine to have its last printed line fed into the sensing position simultaneously with the setting of the line to receive a new record at the recording position, whereby the sensing and recording operations are made to take place in the same position of the card. These machines, however, have no comparing means for testing the correctness of the card inserted.

Other tabulating machines are provided with a punched band, which is periodically divided into successive fields. In each field there is a special punching representing an identifying number. The fields are thus able to take up punched entries from punched cards of the same identifying sign, the correct section of the band for the entries being first selected by a comparing process, and then the line of the selected section which is to receive the record being moved to position. Then follows a transfer of the punched value from the punched card to the new line of the selected section.

Such a method of operation may be of advantage in cases where unsorted cards are fed to the machine, or a punched band with successive sections having a different sign is used. However, it is unsatisfactory if there are fed into the machine cards, or the like, already sorted, which serve both as the means from which the bookkeeping values are to be taken and upon which they are to be recorded.

In such cases the best system will be one using record bearing cards, or the like, which can be sensed in any suitable manner. In most kinds of bookkeeping operations there would therefore be a time-consuming interruption of the natural course of the bookkeeping operation, caused by the comparing procedure which must precede the sensing of the card.

These disadvantages are removed by the invention, in accordance with which the sensing of the identifying and accounting indicia of the cards, or the like, as well as the selective positioning of the parts of the card to be sensed and to receive impressions, takes place collaterally with the comparison of the identifying indicia of the card with the setting of the machine, but before the result of the comparing process has been worked out. In dependence upon the result of the comparing process the sensed values are then recorded in known manner, as well as automatically entered in a balance mechanism, and the new balance, or the like, formed by the entry of a value changing the old balance, is recorded, together with additional values of which it is composed and which classify it, in the selected section of the record space of the account card.

The drawing shows one illustrative form of the invention.

In the drawing,

Fig. 1 is a vertical section of a portion of the machine showing the sensing and transmitter mechanism and parts of their driving and adjusting means;

Fig. 2 is a diagrammatic plan view of one of the switch assemblies of the transmitter mechanism corresponding to one place of the plural digit numbers to be sensed;

Figs. 3 and 3*a* are punched diagrams;

Fig. 4 is a vertical sectional view showing the registering mechanism in side elevation, its driving means and appurtenant control devices;

Figs. 5*a* and 5*b* are two complementary parts of a vertical sectional view showing the record sheet table and its feeding and return mechanism in side elevation;

Fig 6 is a vertical section on the line 6—6 of Fig. 5*b*;

Fig. 7 is a vertical section of one end of the record sheet table showing a sheet clamp and its control means;

Fig. 8 is a vertical sectional view showing in side elevation a relay operated stepping mechanism for a cam shaft controlling the sensing, record sheet checking, and table feeding procedures;

Fig. 9 is a diagram of circuits and cams for control of the sensing, record sheet checking, and table feeding procedures;

Fig. 10 is a developed diagram of the control cams shown in Fig. 9.

Fig. 11 is a plan view of the upper portion of a record sheet, in this case an account card;

Figs. 12*a* and 12*b* are complementary parts of a circuit diagram of the machine;

Fig. 13 is a vertical sectional view showing in side elevation a rotary driver operating the driv-

ing means shown in Figs. 1 and 4, together with its controlling devices;

Fig. 14 is a diagram of a slide switch forming part of the transmitter mechanism;

Fig. 15 is a diagrammatic plan view indicating the relative positions of the record sheet table, sensing mechanism, punching mechanism, and printing mechanism;

Fig. 16 is a vertical sectional view showing in side elevation one of the selector switches of the comparing mechanism, its stepping means and returning means;

Fig. 17 is a vertical sectional view showing in side elevation mechanism for printing a second record sheet on a typewriter carriage;

Fig. 18 is a vertical section showing the printing mechanism for printing on the record sheet on the table shown in Figs. 5*a* and 5*b*;

Fig. 19 is an exploded view of a switch mechanism for cutting out the transmitter;

Fig. 20 is a wiring diagram showing a switch arrangement for transferring the control of the printing mechanism from a setting mechanism to a balance mechanism;

Fig. 21 is a vertical sectional view showing in side elevation a control lever for actuating the switching devices shown in Figs. 19 and 20;

Fig. 22 is a circuit diagram of a relay operating an abutment for guiding the record sheet to approximately correct position on the table;

Figs. 23*a* and 23*b* are complementary parts of a vertical sectional view showing a carriage providing for the lateral movement of the table, and its feed and return mechanism;

Fig. 24 is a detail side elevation of the record sheet abutment;

Fig. 25 is a vertical sectional view showing in side elevation the punching device.

The construction of the illustrative machine here disclosed is the following:—

The sensible indicia of the record sheets used in the illustrative machine are, as usual, in the form of perforations. The punch field may be divided into any desired number of decimal places, for instance ten, only seven being shown in Figs. 3 and 3*a*. In each place there are points for five punches, and these can be taken singly, to represent the digits up to 5, and in pairs, to make the values 6 to 9, zero being represented by the absence of any punch. In Figs. 3 and 3*a* the punch points are represented by open circles and those which have been punched by filled circles. Fig. 3 shows the field for the value 0000000 and Fig. 3*a* for the value 60000.

A set of five sensing bars **2** (Fig. 1) is provided for each place of the punch field, these bars being guided for movement perpendicular to the record sheet table **120** by their slots **2***b* sliding on cross rods **2***c*, and by combs **2***d*, and being urged downward by springs **2***e*. Each bar is provided with a sensing point **2***a* adapted to enter the punch of the record sheet **3** (Fig. 11) lying opposite it. In the position of rest of the bars downward movement is prevented by noses **4** projecting from the bars, which rest upon a rockably mounted bail **5** extending transversely to the bars. The bail **5** is articulated to a connecting bar **6**, the upper part of which is pivoted to a two-armed lever **7**. A spring **6***a* secured at its upper end to the connecting bar by a pin **6***b* and at its lower end to a stationary pin **6***c* acts constantly upon the bail **5** and the two-armed lever, urging the lever to turn in clockwise direction. A roller **8** mounted on the free arm of lever **7** coacts with a cam disk **9**. The lever **7** is mounted on a stationary shaft **7***a*. The cam disk **9** and another cam disk **10** are fastened to a shaft **11**, for example, by pins. The cam disk **10** is adapted by its nose **12** to operate rollers **13** and **14**, which are respectively mounted upon a lever **15** and a bail **16**. The lever **15** and the bail **16** are fixedly mounted, respectively, upon shafts **17** and **18** rockably supported in the machine frame. A connecting bar **19** joins the lever **15** in the manner of a connecting rod to a second lever **20**. The lever **20** and another lever not shown are fixed upon a shaft **21** and between them they carry a round crossbar **22**. The lever **15** and the bail **16** are so influenced by a spring **16***a* that their rollers lie constantly upon the cam disks **9**, **10**.

Beside the sensing mechanism is a transmitter mechanism comprising slides **24—28** (Figs. 1 and 2) bearing, respectively, insulated contact pieces **33/34**, **35/36**, **300/301**, **37/38**, **39/40**. These contact pieces coact, in the manner shown in the diagram, Fig. 2, with stationtary spring contacts **41**, **42**, **43/44**, **45**, **46**; **47**, **48**, **49/50**, **51**, **52**; **53**, **54**, **55/56**, **57**, **58**; **59**, **60**, **61/62**, **63**, **64**; **65**, **66**, **67/68**, **69**, **70** (Figs. 2, 12*a*, 12*b*). In this way two spring contacts are always in connection with each slide contact. The slides and contacts are arranged in assemblies, one assembly being allotted to each place of the sensing mechanism. Fig. 2 shows one assembly and Figs. 12*a* and 12*b* show the five assemblies allotted to the decimal places 5—4—3—2—1. The spring contacts of alternate slides are arranged alternately above and below, as shown in Fig. 1, on account of space requirements, and within each assembly are connected to each other by conductors in the manner shown in Fig. 2. The setting of the members in Fig. 2 represents the position of rest and zero position of the transmitter slides, while Fig. 1 shows them in adjusted position. Additional connections to the spring contacts of the transmitter assemblies for the purpose of transmitting the values held in them will be explained in detail later.

The slides **24—28** are set or adjusted by the bail **16**, under the control of the sensing bars **2**. Each slide has pivotally connected to it a link **29** coupled by a pin and slot connection **31**, **30** with the corresponding sensing bar **2**. From each link **29** extends a tongue **32** which is moved down into the path of the bail **16**, when the pin **2***a* of its bar **2** drops into a punch in the record sheet. The slides are returned to zero position by the crossbar **22**, which engages behind tongues **23** on all the slides and moves to the left any slides that have been adjusted.

Means are provided to drive the shaft **11** (Fig. 1) through one revolution to cause an operation of the sensing mechanism and adjustment of the transmitter. On shaft **11** (Fig. 13) are fixed a lever **71** and a coupling disk **72**. Beside these there is mounted on the shaft **11** in rotatable but not axially shiftable manner a gear **73**, upon which is pivoted a pawl **74**. The pawl, which is constantly urged by a spring **2000** in clockwise direction upon its pivot, is adapted to engage in a notch **75** of the coupling disk **72**, when the curved end of a rockable lever **76** is moved out of the path of the revolving pawl. A thrust bar **77** connected to lever **76** and guided by a pin and slot connection **77***a*, **77***b*, is adapted to be operated by the armature **78***a* of an electromagnet **78** (Figs. 13, 9). In this case a notch **79** of the thrust bar **77** moves into the range of a pawl **80** which is mounted above it and urged by a spring **80***a* so that its tooth engages in the notch **79**. Upon the free arm of the pawl **80** operates a pin **81** of

a two-armed lever 82 rockably mounted on the machine frame. The lever 82 is held in position of rest by a spring 82a constantly against a stationary pin 83. The free arm 84 of the lever lies in the path of a pin 85 extending out from the arm 71. The gear 73 meshes with a pinion 86 of the drive shaft 87, and is thereby constantly rotated when the machine is set in operation.

When the record space of the record sheet (Fig. 11), or one side of the sheet, has been completely filled, an "exhaust" perforation 88a is punched in it. There is an additional sensing bar for sensing this exhaust perforation and an additional transmitter slide 88 (Fig. 14) governed by it. This transmitter slide has non-conductively secured to it contact plates 91, 92, which stand, in the normal position of the transmitter slide 88, in electrical connection with spring contacts 93/94, 95/98, respectively, the contact plates and spring contacts together constituting two switches 89 and 90 (Fig. 9). The purpose of the mechanism controlled by the exhaust perforation, the operation of which will be described presently, is to interrupt the normal sequence of operations of the machine and to restore it quickly to position of rest, so that the record sheet can be turned over, if one side is exhausted, or replaced by a new sheet.

To shaft 11 (Figs. 4, 1) is rigidly secured an additional gear 97, which is in mesh with a gear 98 fixed upon a shaft 99. Also secured to the shaft 99 are cam disks 100, 101. The cam disk 100 is adapted, by its nose 102, to close successively contacts 103 and 175 (Figs. 4, 9). The cam disks 101 act upon rollers 104 carried by two-armed levers 105 pivotally supported in the machine frame, only one of the levers being shown. These levers engage, by pin and slot connections, 105a, 105b, slides 106 guided by pins 106a in slots 106b for movement perpendicular to the record sheet table 120. The slides bear similar tapered justifying pins 107. The justifying pins are so arranged that they can enter the justifying holes 108 of record sheet 3. Springs 109 urge the lever 105 constantly in clockwise direction. Armatures 111 of electromagnets 112 (Figs. 4, 9) normally lie in front of noses 110 projecting from levers 105, these armatures serving to prevent undesired oscillations of the levers 105 in clockwise direction. Upon a nose projecting from one of the slides 106 rest the movable arms of two spring contacts 114, 115 (Figs. 4, 9), which are held open in the position of rest of the slide 106 (only the contact 114 is visible in Fig. 4). The contacts 114 and 115 control the further operation of the machine, which is therefore dependent upon proper justification of the record sheet.

The record sheet 3 (Fig. 11) is so placed upon the record sheet table 120 (Figs. 5a, 5b), for bookkeeping operations and the like, that it is held by an abutment 3005 (see also Figs. 24, 6) with its justifying holes 108 in the range of the justifying pins 107 (Fig. 4). The abutment 3005 is formed as a part of the armature 3010 of an electromagnet 3002 (Figs. 22, 24). The electromagnet is connected through two switches 3003, 3004 (see also Figs. 5a, 5b), inserted in series, to the positive conductor of a source of current. As long as electromagnet 3002 is excited the abutment 3005 stands in operative position. When the table 120 is in starting position, a nose 3011 operates switch 3003 and holds it closed. On the other hand, switch 3004 is opened when the armature of an electromagnet 172 (Fig. 5b) is attracted. This electromagnet 172, which serves to condition a line-selector mechanism governing the record sheet-feeding mechanism, will be described in more detail later.

The record sheet table can be fed line by line by means of an escapement mechanism 121 (Figs. 5a, 6) and a spring motor 122. The belt 122a of the spring motor is connected to a pin 122b near the right end of the table (Fig. 5b) and draws the table toward the left. A rack bar 120a on table 120 meshes with a pinion 137a fixed on a shaft 137b rotatably mounted on center points 137c. The shaft 137b has also fixed to it a ratchet wheel 137 which coacts with the escapement dogs 135a, 135b of a rocking plate 135. The plate 135 is rockably mounted by a shaft 135c and is urged in clockwise direction (Fig. 6) by a spring 135d. An arm 135c of the plate 135 is connected by a link 136a to the armature 136b of a relay 136, which operates the escapement mechanism. The throw of the escapement dogs is limited by a set screw 135f. The return of the table is carried out directly by the machine drive. For this purpose there is provided adjacent the table a chain drive, the chain 124 of which circulates once for each two return movements of the table. The chain therefore has two similarly arranged lugs 125 (Figs. 5a, 5b, 23a), which are adapted to coact successively with a lug 126 on the table in successive return movements of the table. The rear shaft 127 of the chain drive carries, in addition to the sprocket 123, a smaller pinion 126, which meshes with a gear 129. The latter is rotatable upon the shaft 130 of a revolving arm 131, but held against axial movement on the shaft. The construction of the rotary driver 131 and its operation correspond with the rotary driver shown in Fig. 13. The spring-influenced pawl 132 on the gear 129 is adapted to be prevented from engaging in the notch 134 of a coupling disk 134a fixedly secured to the shaft 130, by a round ended lever 133 which may be rocked by a mechanism similar to that controlling the lever 78 (Fig. 13), operated by an electromagnet 383 (Fig. 12b).

Along the left side of the table 120 a shaft 138 (Fig. 6) is rotatably mounted on the table. This shaft has two clamp fingers 139 rotatably mounted upon it in the range of an account card placed upon the table, the clamps being not axially displaceable on the shaft. Each clamp finger is influenced by a strong spring 140. In the range of each of the clamp fingers there is non-yieldably fixed upon the shaft a cam finger 141. In the same way there is fastened upon the shaft 138 a lever 142, having a rectangularly positioned tongue upon which is mounted a roller 143. Above this roller engages, in the starting position and position of rest of the table 120, a tooth 144 of a pawl 145 (Figs. 5, 7) mounted upon the table and influenced by a spring 145a in clockwise direction. The free arm 146 of the pawl can be operated by the pin 149 of a lever 150 rockably mounted on the machine frame. The lever 150 is adapted to be rocked in clockwise direction, against the action of its spring, by an electromagnet 151 (see also Fig. 9). The roller 143 of lever 142 (Figs. 7, 6, 5b) can ride upon an inclined plane cam surface 152 of a lockable bell crank lever 153. A spring 153a operates in counterclockwise direction upon the bell crank lever. The free arm of the bell crank lever can be prevented by a pin 154 of a locking lever 155, which is likewise rockably mounted in the machine frame, acts upon the free arm of lever 153 to

prevent it from executing a clockwise rocking movement under the influence of the thrust to the right of roller 143 against cam surface 152. A spring 156 brings the arm 157 of the locking lever against a stationary pin 155a on the machine frame, when it is not positively actuated in another manner. In this position the pin 154 of the locking lever 155 stands in front of the free arm of the bell crank lever 153 (Fig. 7). A pin 158 which is mounted upon a cam plate 159 of the table, is adapted to coact with the arm 157 of the locking lever and to move its pin out of the path of movement of the bell crank lever 153. The cam plate 159 influences a double-acting switch 160 (Figs. 5b, 9), the contacts 161, 162 of which are closed in the position of rest of the table. As soon as the carriage leaves the position of rest the said contacts are opened and the contacts 161, 163 are closed.

Over the table 120 there is provided in the range of the filled-line perforations 165 of the account card 3 (Figs. 11, 15) a line-selecting contact brush 164 (see also Fig. 9), which is displaced by one line space from the sensing mechanism 170 and its feeler prongs 2a. The line-selecting brush therefore is positioned, in the starting position of the table, when the card is properly justified, over the filled-line punch point of the first line. The line selecting brush 164 is fastened non-conductively to a bell crank lever 171 rockably mounted on the machine frame, which is constantly influenced by a spring 171a to rest against the inner face of the armature 172a of an electromagnet 172 (Figs. 5b, 9).

The punching mechanism 172, 173a (Fig. 15) and the printing mechanism 174 in the illustrative example shown, are displaced by five line spaces from the sensing mechanism 170, on account of space requirements. Mechanisms of this kind are disclosed in Pierce Patents Nos. 1,761,741 and 1,260,704, and also in the Hollerith punched card machines.

The previously mentioned switches 114, 115 are directly connected to the positive wire 178 (Fig. 9). The moving contacts of these switches are constantly connected, respectively, with switches 89, 90. The moving contact of switch 90 is connected by a conductor 177 to the electromagnet 161 for releasing the card clamp fingers and through the latter to the negative conductor 182. A conductor 178 going out from the moving contact of switch 89 leads to a switch 175 (see also Fig. 4), the other contact of which is connected by a conductor 179 to the electromagnet of a relay 1800. Also connected to the relay 1800 are normally open switches 180, 181, which will be more fully explained presently. The moving contacts of these latter switches are connected to each other by a conductor 183 leading to the positive side of the source of current. To this conductor there are also connected contacts 184, 185, 186, and 386. Mounted on the drive shaft is a cam disk 197 which, at each rotation, closes a switch 195 of an impulse generator 196. The movable contact of switch 195 is connected to the positive conductor 176 and the other contact to one contact of a switch 198 operated by relay 1800. The other contact of switch 188 is connected to electromagnet 189 (see also Fig. 8) which operates a stepping mechanism for the progressive rotary feed of a cam shaft 204 bearing the cams 200—203, 205 (Fig. 9). Also connected to the switch 188 is a switch 197, mechanically connected with switch 180, the other contact of switch 197 being connected to electromagnet 136 (see also Fig. 6) which operates the escapement for the table feed movement. Also connected to the electromagnet 136 is a counter contact 190 for the line-selector brush 164, which is connected to the impulse generator switch 185. Switches 184 and 185 are connected, respectively, to electromagnets 172 and 78. To the contact 162 of the double-acting switch 160 are connected the electromagnet windings 112 (see also Fig. 4). The other ends of the windings of the electromagnets 78, 172, 136, 189, 1800, 112, 151, are all connected to the negative conductor 182. The electromagnet 78 which controls the rotary driver of the shaft 11 (Fig. 13) is also connected to a contact 209, which can be closed by means of a key 210 connected to the positive conductor. The contacts 181/184, 185, 187/180, 188/386, are controlled by the cam disks 200 to 203, which are rigidly mounted upon shaft 204. The cam disk 205, likewise fastened upon the shaft 204, is adapted, by its diametrically opposite raised portions 600, 601, to operate contacts 206, 207/208, 384, which are open in the position of rest of the machine and will be described in more detail presently, as well as a contact 376, which is closed in the position of rest of the machine. The operating diagram shown in Fig. 10 shows the development of the corresponding half-circumference of the cam disks and indicates the time of their operation. The second half-circumference is the same as the first and becomes operative in the following bookkeeping operation in the same way.

A setting mechanism is provided, composed of a number of selectors 325 to 329 (Figs. 12a, 12b) corresponding to the number of places of the transmitter mechanism. Each selector of the setting mechanism comprises a selector arm and a number of contacts 315—324 corresponding to the values "0" to "9." The selectors 325—329 are connected, respectively, to the transmitter assemblies, by cables 310—314, the individual contacts 315—324 of each selector being connected respectively to the spring contacts 65, 87, 61, 55, 49, 68, 70, 64, 58, 52, of the transmitter mechanism. The selectors of the setting mechanism may be of known type, shown for example in Patent No. 1,141,348. The setting member of each place carries along through the same distance through which it travels, the selector arms 330—334 of the selectors assigned to them. The selector arms 330—334 are connected by conductors 335 to 339 with contacts 340 to 344 of a comparing selector 345. With the control arm 348 of this comparing selector are constantly mechanically, but not electrically, coupled, control arms 347, 348 of additional selectors 340, 350. The contacts 351 to 355 of selector 349 are connected, respectively, by means of conductors 356 to 380 to spring contacts 42 of the places "5" to "1" of the transmitter mechanism. The supplementary contacts 361, 362 of selector 345 are individually short-circuited to the corresponding contacts 363, 364, of selector 349. The control arm 348 of selector 350 is adapted to cooperate with five contacts, that is, a number corresponding to the number of places of the setting mechanism, these contacts 365 to 369 being mutually short-circuited; also with two supplementary contacts 370, 371. The contacts 365 to 369 are connected by a conductor to a relay 373 adapted to close a pair of switches 374, 375. The switch 374 is connected in series with switch 208 (see also Fig. 9) between the positive conductor and an electromagnet 393, which is

adapted to control the lever 133 shown in Fig. 5a. The switch 375 is connected in series with switch 376, appurtenant to the cam disk 205 (Fig. 9), between the positive conductor and an electromagnet 377 (Figs. 12a, 16). In parallel to this latter circuit is a circuit through contact 371 of selector 350. In Fig. 12b the switches 205, 376, mechanically controlled in unison, are shown in the position they assume when a machine operation has started and are so arranged that, upon being shifted by cam 205, the switch 376 closes before the switch 206 opens. The contact 370 of selector 350 is connected by a conductor 378 to a relay 378, which also is adapted, upon excitation, to close two switches 380, 381. The switch 380 is connected in series with the switch 206 and ensures constant current supply to the relay 379. The other switch 381 is connected in series with switch 207 (Figs. 12b, 9) between the positive conductor and an electromagnet 382. An additional switch 384 (Figs. 12b, 9) mechanically controlled in unison with switches 207, 208, is connected in series with an electromagnet 385 between the positive and negative conductors of the supply main. An additional switch 386 mechanically connected to the contact 186 controlled by the cam disk 203 (Fig. 9) is connected in series with an electromagnet 387, to be described in detail with reference to its manner of operation, between the positive and negative conductors. Switch 188 and a rotary step electromagnet 388 (Fig. 12a) are arranged in the same way. The positive conductor also leads to the switch 389 of an impulse generator 390, the cam disk 391 of which is fixed to drive shaft 392, which rotates continuously when the motor is switched on. The movable contact of switch 389 is connected by a conductor 393 to the selector arm 348 of the selector 345. The selector arm 347 of selector 349 is connected to the conductor which joins the switch 186 to the rotary step electromagnet 388. The selector arm 348 of the selector 350 receives current directly from the positive side of the line. The selector arms 348, 347, 348 (Figs. 12a, 16), are advanced stepwise by the rotary step electromagnet 388. Upon that shaft 394 which carries the selector arms is fastened a pinion, which is constantly in mesh with a rack bar 395 guided by a pin and slot mounting. The rear end 396 of rack bar 395 lies in the path of movement of the pin 397 of a lever 398, which is pivotally supported on the machine frame and coupled by a parallel crank movement to a similarly mounted lever 399. A pawl 400 on lever 399 has a pin 401 projecting from its arm, which stands in front of the armature 377a of the previously mentioned electromagnet 377 (Figs. 16, 12a). The pawl 400 is constantly urged in clockwise direction by a coil spring (not shown). The tooth of pawl 400 is adapted to engage with a step 402 of a sector 403 mounted to swing back and forth, and to take part in the movement of this sector in the direction of the arrow 404. The sector 403 may form a part of an oscillating crank mechanism, as shown in Fig. 16, which need not be described in detail. The attracted position of the armature 377a, which is influenced by a relatively strong spring 377b, causes the pawl to move into operative position.

The electromagnet 382 (Fig. 12b) serves in known manner to carry out the stepwise advancement of the selector arm 405 of a printing selector 406, whose contacts 407 to 411 are connected by a cable 412 to 416 with the conductors 335 to 398. The selector arm 405 is connected to the conductor 383. All selector arms of the selectors 330—334, 345, 349, 350, 406 stand, in position of rest, one step before the first contact of their series of contacts. The stepping electromagnet 382 of selector 406 is connected by a disconnectable conductor 417 and parts 584, 583, 417a, to be described in detail later, in series with the electromagnets 418 to 427 of one or more printing mechanisms 428 (Figs. 17, 12a). In the foregoing illustrative example the second printing mechanism 550 (174, Fig. 15) is connected to another rotary step electromagnet 572. The printing mechanism 550 may, however, also be separated from electromagnet 572 by a simple switch and connected to the magnet 382. The electromagnets 418 to 427 are used in each printing mechanism, or the like, in a similar manner. These electromagnets are respectively assigned to the numbers "9" to "0" and each operates independently upon a lever chain 429 to 432, at the end of which the corresponding type lever 433 is located, which is adapted to print upon the journal 435, or the like, supported on the platen roller 434. The armatures 551 assigned to the printing mechanism 550 (Fig. 9) for printing the account cards on the table are formed as bell crank levers, the other arms of which are connected by pin and slot connections with the type levers 552 and are held in position of rest by springs 553.

The card table 120 rests upon a carriage 1200 (Figs. 23a, 23b), which can be moved transversely to the movement of the card table 120 in a direction parallel to the lines, by decimal places, by means of a conventional escapement mechanism 3200. The return of the carriage 1200 can be carried out by a mechanism similar to that used for the table 120 (Figs. 5a, 23a). A pin 850, corresponding to the pin 85 of the rotary driver shown in Fig. 13, forms a part of the rotary driver 3015 of the chain drive 1230 for the carriage 1200, and is arranged to close a contact 3013 (Fig. 23a) momentarily, shortly before the completion of one revolution. Then the coupling member 126 of the card table is again in the range of movement of the chain element 125 projecting from the chain drive 123. The closure of contact 3013 results in the engagement of the rotary driver 132, 134a for the chain drive 124 (Fig. 5a). The card table 120 is then returned to starting position.

The electromagnets 418 to 427 are connected to switches 438 to 445, the free parts of which are secured in electrically non-conductive manner to a switch bar 456. The moving contacts of switches 436 to 445 are connected by conductors 445 to 455 with the conductors of the cables 310 to 314 corresponding to the respective values "9" to "0" of all places of the indicating and setting mechanism. The switch bar 456 has two notches 457, 458, in which a retaining spring 459 may enter alternatively. In the position of rest of the machine the spring 459 lies in the notch 457 of switch bar 456. The contacts 438 to 445 are then opened. The armatures 387a and 385a of the electromagnets 387 and 385 coact alternately with the two end faces of the switch bar 456. To the printing machine 428 (Fig. 17) is operatively connected a tabulator mechanism. A mechanism of this kind for example is disclosed in Thieme Patent No. 1,027,225. In this construction the tabulator levers are operatively connected with a switch 2327. Said switch is combined with a electromagnet 2328 (Fig. 17,

23a) which over parts 2330, 3208 controls in a manner indicated before the lateral tabulating movement of the account card.

The operation of the machine is as follows:—

At the beginning of the bookkeeping operation the record sheet 3, in this case an account card (Fig. 11), is laid upon the card table 120 (Fig. 5) and pushed up to the abutment 3005 (Figs. 5a, 6, 24). Then the key 210 (Fig. 9) is pressed, so that the switch 209 is closed. Thereby the electromagnet 78 (Figs. 9, 13) receives a current impulse momentarily. It attracts its armature and throws the shift bar 77 in the direction of the arrow far enough to allow the tooth of pawl 80 to drop into the notch 79 and swings the lever 76 out of the path of movement of the revolving pawl 74 until a further change occurs. In this way the tooth of pawl 74 springs into the notch 75 of the coupling disk 72. The coupling disk, and with it the shaft 11 as well as the arm 71 and the cam disks 9, 10, 100, 101 (Figs. 1, 4), now take part in the revolution of the pawl 74. Immediately at the beginning of the rotary movement the nose 12 of cam disk 10 operates the roller 13 of lever 15 and displaces the latter in clockwise direction. By means of the coupling bar 19 the lever 21 and crossbar 22 are made to execute the same movement. Thereby the crossbar 22 engages the tongues 23 of those transmitter slides which were adjusted in the previously finished bookkeeping operation and moves the latter back into zero position. At the same time as the cam disk 10 becomes operative the cam disk 101 releases roller 104 of bell crank lever 105, which can then rock in clockwise direction, because the electromagnet 112 has been excited from the beginning through the circuit 178, 181, 182 (Fig. 9). Thereby the justifying pins 107 move down into the justifying holes 108 of the account card 3 and bring the latter into the correct position. At this time the nose 113 of one of the slides 106 allows the contacts 114, 115 (Figs. 4, 9) to close. As soon as this has occurred the raised portion of the cam disk 9 releases the roller 8 of lever 7, whereupon the latter, following the pull of the spring 6a of coupling bar 6, executes a clockwise swinging movement. The bail 5 (Fig. 1) is thereby displaced in the direction of the arrow and releases the noses 4 of the sensing bars 2. The latter then drop, aided by their springs, until they are arrested by the account card 3. If there are holes in the account card in the path of the feeler pins 2a, the feeler pins enter these holes and thereby swing the links 29 of the transmitter slides 24—28 connected to them, until their tongues 32 enter the path of movement of the bail 16. Then the nose 12 of cam disk 10 acts upon the roller 14 of bail 16 and swings the latter counterclockwise for such a distance that it engages the tongues 32 of links 29 in its path and shifts the transmitter slides so that their contacts plates come into contact with the spring contacts 43, 46, or the like, which up to that time were disconnected.

In the foregoing example these operations of the transmitter mechanism do not occur, because, in accordance with the account number "00000" at the head of the account card none of the punch points is punched, as indicated in the punch diagram (Fig. 3). Consequently no sensing pins 2a of the sensing bars 2 can enter corresponding holes of the account card, so that the transmitter slides 24 to 28 of all places remain in the zero position shown in Figs. 2, 12a, 12b.

Simultaneously with the sensing of the punch points of the account number of the account card (Fig. 11), an additional feeler pin 2a previously described, comes into engagement with the punch point 88a for the exhaust perforation of the card. If the card at this place is not marked "exhausted" by any perforation, the contacts 89, 90, remain in the position of rest shown in Fig. 14. However, if the feeler pin 2a is able to enter an exhaust perforation 88a, thereafter the switches 89, 90, are opened (see also Fig. 9). If there is no exhaust perforation 88a when the nose 102 of the revolving cam disk 100 comes into engagement with the auxiliary contact 500 (Figs. 4, 9) and closes it, current flows through the contact 115, closed at the beginning of the revolution, and through the parts 90, 500, to electromagnet 151 (Figs. 9, 5b). If there is an exhaust perforation 88a the switches 89, 90, are opened, so that the described circuit remains unoperative. But even when there is no account card, or the like, inserted, there is no excitation of electromagnet 151, because in such a case the contacts 114, 115 remain open. After the completion of the revolution under these conditions the card which has been punched "exhausted" to prevent the recording of additional entries can be removed from the card table and another card laid upon it.

The excited electromagnet 151, by its armature 151a, swings the lever 150, which so displaces the pawl 145 through the action of its pin 149 that the tooth 144 of the pawl releases the roller 143 of lever 142 (see also Fig. 6). The clamp finger 139 resting upon cam 141 is now able to follow the pull of its spring 140 and to come to rest on the account card 3. The roller 143 of lever 142 then assumes the position shown in Fig. 7.

The cam disk 100, which has been turning in the meanwhile and continues to turn further, now closes the contact 175 (Figs. 4, 9), by its nose 102, shortly before the cam disk 9 (Fig. 1) acts by its raised part upon roller 8 and thereby swings the lever 7 in counterclockwise direction, so that by the action of the bail 5 upon the noses 4 the sensing bars 2 lift the sensing pins 2a from engagement with the account card 3.

Meanwhile the pin 85 (Fig. 13) of the revolving arm 71 swings lever 82 counterclockwise. In this movement the pin 81 has carried with it the pawl 80 and raised the tooth of the pawl out of notch 79 of thrust bar 77, so that the latter and with it the lever 76, again assume the position of rest. The pawl 74, which in the course of its movement travels past lever 76 is deflected by the latter and its tooth is moved out of the notch 75 of the coupling disk. At this instant the rotary movement of cam disks 9, 10, 100, 101 (Figs. 1, 4) is interrupted. They have now again assumed their positions of rest. Thereby the justifying pins 107 have again been moved out of the justifying holes. The armatures 111 of electromagnets 112 again move in the blocking position in front of the noses of bell crank levers 105.

The closure of contact 103 by the nose 102 of cam disk 100 shortly before the latter comes to rest has no effect, because the contact 103 receives no current through the double-acting switch 160 (Figs. 9, 5) in the starting position of the card carriage. Since the nose 12 of cam disk 10 operatively influences the roller 13 only once in the course of its revolution—that is, only at the beginning of its revolution—the transmitter slides 14—28 are not displaced from their

set position, if any of them have been moved according to a number higher than "0."

The contact 175 (Figs. 9, 4) described above, which is closed by the nose 102 of cam disk 100, receives current during that period which lies between the return of the sensing pins 2a and the beginning of the withdrawal of justifying pins 107 from the justifying holes 108 of the account card 3 (Fig. 11). Accordingly a current impulse flows through the circuit 178, 114, 09, 178, 175, 179, to the relay 1800 and the negative conductor. By the succeeding closure of switch 195 of the impulse generator 196, a current impulse passes through switch 188 to the rotary step electromagnet 189 (Figs. 9, 8). The latter attracts its armature 189a momentarily and by the ratchet drive 189b, 189c, controlled by the latter, moves forward for one step the shaft 204 bearing the cam disks 200 to 203 and 205. Thereby the nose 601 of the cam disk 205 moves away from switch 206 (Figs. 9, 12), so that the latter closes, while the raised portions of cam disks 200, 203 (Figs. 9, 10) close the switches 181/184, 186/386, whereby the following operations take place:

From the positive conductor 183 (Fig. 9) the current flows through switch 386 to the electromagnet 387 (Fig. 12) and then to the negative conductor. The electromagnet 387 attracts its armature 387a, which operates the switch bar 456, so that the notch 458 thereof is displaced from detent spring 459 far enough to allow the latter to enter the notch 457. The switches 436 to 445 are thus opened, until further operation of the switch bar, so that the electromagnets 416 to 427 of the printing mechanism cannot be influenced.

Furthermore, a continuous current is supplied through the connection provided by the parts 183, 181, to the relay 1800. Simultaneously the electromagnets 172, 388 (Figs. 9, 12) are excited by current coming through the parts 183/184, 183/186.

By the armature 172a of electromagnet 172 the contact 3004 is opened and the bell crank lever 171 bearing the contact brush 164 (Figs. 5, 9) is swung in counterclockwise direction. Thereby the contact brush 164 engages the field provided for the filled-line punch point "one" (511), at the level of the first line 510 of the account card 3 (Fig. 11), and so, by passing through the line punch 511, comes into contact with the counter contact 190. By the opening of the contact 3004 the electromagnet 3002 is demagnetized and the abutment 3005 (Fig. 24) is withdrawn from the account card. By the following closure of the switch 195 of the impulse generator 196 a current impulse is generated which divides and passes through two circuits; first, from the positive conductor 176 through the parts 184, 190 to the electromagnet 136 (Figs. 9, 6); second, through the contact 188 of relay 1800 to the rotary step electromagnet 189 and thence to the negative conductor. The electromagnet 136 operates the line feed device 121 (Fig. 6). Hereby the card table 120 is released for a stepwise movement of one line space, under the influence of spring motor 122, whereupon the card table arrives in the next line position (512—Fig. 11). The simultaneously excited electromagnet 189 (Figs. 9, 8) moves the cam disks 200 to 203 and 205 by one step further in clockwise direction, into position 3, Fig. 10. Thereby the nose of cam disk 203 again releases switches 386, 186. They open again, while the raised part of cam disk 200 still holds the switches 181, 184 closed. It can be seen from this that the electromagnets 172 (Figs. 5, 9), 189 (Figs. 8, 9) are excited as long as the raised portion of cam disk 200 is able to act upon the switches 181, 184 in the course of its stepwise movement. This occurs during thirteen successive steps. These thirteen steps of the cam disk 200 correspond to the number of lines of one side of the account card 3 (Fig. 11). If more or less lines are provided on the account card the cam disk 200 must be formed accordingly in its raised parts. If there is a line punch 512 in the second line of the account card, another current impulse is given to the electromagnet 136, as well as electromagnet 189, whereby the card table 120 (Figs. 5a, 5b) and the cam disks 200, 203, 205 again move for one step in the direction indicated above. However, if there is no punch 512 at the level of the second line of the account card 3 (Fig. 11), the electromagnet 136 is no longer excited after the second line position has been reached and the card table remains in this position. This condition can evidently also occur upon sensing the first line punch point 511 of the account card 3. In that case the card table 120 will execute no feed movement during the succeeding machine operation, the object of which is to select the line for sensing the value. In the case here illustrated it is assumed that the first five lines, down to 515, of the account card have already received records. The card table 120 and the cam disks 200 to 203 and 205 therefore carry out four stepwise movements in the manner described, until the fifth line 515 passes under the contact brush 164, whereupon an additional step follows, by which the punches of the fifth line 515 (balance values, debit and credit partial balance, individual postings, or the like) move under the sensing pins 2a of the sensing mechanism (Fig. 1). In the illustrative example there have been punched a balance resulting from a new debit posting. After the next line "six," which has not been printed upon, moves with its unperforated filled-line punch point 516 under the contact brush, and the newest punched balance value 600.00 has taken its position under the sensing pins, the electromagnet 189 (Figs. 9, 8) receives several current impulses, namely, as many impulses as the step movements required to move the raised portion of the cam disk 200 out of operative relation to the switches 181, 184; (in the illustrative example "eight"). At the time when only one step movement is necessary to separate the raised portion of cam disk 200 from the switches 181, 184, the nose of cam disk 201 acts upon the switch 185 and closes it. Thereby current passes from the positive conductor 183 to the electromagnet 78 (Fig. 9), which is directly connected to the negative conductor. The next current impulse released through the switch 195 of impulse generator 198 then results in one step movement of the cam shaft 204, through the excitation of electromagnet 189, whereby the raised parts of cam disks 200, 201, again release the switches 181/184, 185. Thereby the relay 1800 drops, opening its switch 188. The electromagnet 172 is likewise demagnetized and thereby brings about the return of the contact brush 164 into the inoperative position shown in Figs. 5 and 9.

The electromagnet 78 (Figs. 13, 9) momentarily excited by the action of the nose of cam disk 201 upon the switch 185, brings about, in the manner described above, the engagement of pawl

74 in the notch 75 of coupling disk 11 and the movement of the latter through one operative revolution. Thereby the following procedures are carried out in dependence upon the cam disks 9 and 10:—

The crossbar 22 (Fig. 1) executes its normal movement serving to extinguish the setting of the transmitter slides. Then the sensing of the balance value punches of the line "five" of the account card 3 (Fig. 11) is carried out. The bell crank lever 105 remains in the position shown in Fig. 4, because it has been prevented from moving by the armatures of the unexcited electromagnets 112. Referring to Fig. 3a, it will be seen that in accordance with the balance value 600.00 only in place "five" from the right is the value "six" represented by a combination of punches. Now into these punches enter the sensing pins 2a of the sensing bars 2. Thereby the sensing bars carry down with them their appurtenant links 29. The slots 30 of the links 29 connected to the transmitter slides 24 and 28 of place "five" of the transmitter mechanism glide upon the pins 31 projecting from the sensing bars 2 as the latter move down. Thereby the tongues 32 of the two links come into the path of the ball 16, which is then displaced by the nose 12 of the cam disk 10 in counterclockwise direction. Thereby the selected links, together with their slides 24, 28, are moved from their "0" position in the direction of the arrow 520 (Fig. 1), into the position shown in Fig. 1. In this way the contact pieces 33/34, 39/40 of slides 24, 28, of place "five," move out of engagement with contacts 41/44, 65/68, and into electrical connection with the spring contacts 42—43/45—46, 86—87/69—70 (Fig. 2). In Figs. 12a, 12b, the setting corresponding to the number 60000 is drawn in dot and dash lines. In the hook-up as shown, the slide contact 35 and spring contacts 44, 45, 46, are dummies. After setting of the slides 24, 28, the cam disk 9 brings the sensing pins 2a back again into starting position (Fig. 1). Since in the range of the line which is being sensed there is no exhaust punch 88a (Fig. 11), the contacts 89, 90 remain in closed position. Shortly before the end of the revolution of the coupling disk and therewith also the cam disk 100 (Fig. 4) the nose 102 acts upon the switch 103 (see also Fig. 9) and closes the latter. Previously the card table 120 moved away from the double-acting switch 160, upon feeding to the last printed line of the account card 3, the contacts 161, 163 having been closed, while contacts 162, 161 were separated. In this way the current impulse passes through parts 178 (Fig. 9), 161, 163, 103, 179 to the relay 1800. The switch 188 of the same is thereby closed. Then from the following closure of the switch 195 pertaining to the impulse generator 196, an additional current impulse is given to the rotary step electromagnet 189 (Figs. 9, 8) through switch 188. This operates again upon the cam disks 200 to 203 and 205 and moves them in the direction of the arrow by one step. The cam disks now take the position "sixteen" (Fig. 10). In this position the cam disk 202, by its raised portion, acts upon switches 187, 180 and closes them. Hereby the relay 1800 receives current continuously. The switch 188 remains in closed position. The next current impulse of the impulse generator 196 coming through switch 195 goes through the members 186, 187 to escapement electromagnet 136 (Fig. 6), for causing a line spacing movement of the card table 120 (Figs. 5a, 5b), in the direction of the arrow 123 and through the contact 188 directly to the rotary step electromagnet 189. Thereby the card table 120 and the cam disks 200 to 203 and 205 are moved one step further. This procedure is repeated according to the extent of the distance of the printing mechanism and punch mechanism from the sensing mechanism. In the foregoing illustrative example the distance between these mechanisms equals five line spaces, or five line space movements. The raised parts of cam disk 202 acting upon the switches 187, 180 therefore cause five successive excitations of the electromagnets 136, 189. At the end of that time the new line 516 of the account card 3 (Fig. 11) to be printed upon, stands at the level of the printing and punching mechanism, while the raised part of cam disk 202 has again released the switches 187, 180. They are therefore again opened, whereby the relay 1800 again drops. The cam disks 200 to 203 and 205 are now in the position "twenty-one" (Fig. 10). At the instant when the cam disk 202 has only one step left to open the switches 187, 180 (position 20—Fig. 10), the nose 601 of cam disk 205 acts upon the switches 207, 208, 384 (Figs. 9, 12b) and closes them.

However, before explaining the operation resulting from this action, additional procedures (comparing procedures) going on collaterally to the card movements, are to be described. These were initiated at the beginning of the movement of cam disks 200 to 203 and 205 started by depression of key 210, by closure of switch 186 (Fig. 9). These procedures are always terminated not later than the thirteenth, or last line provided for bookkeeping has reached the sensing position, if all the higher lines have been printed upon (Fig. 11). The result of the comparison is only made effective, in the manner presently described, at the close of the entire line setting.

The impulse of current going over switch 188 excites the rotary step electromagnet 388 of the selector 345, 349, 350 Fig. 12). Thereby the selector arms 346, 347, 348, of the same run onto the first contacts next to them, 340, 351, 365. Before this, that is, before the depression of key 210 (Fig. 9) there was set up in the setting mechanism of the machine the identifying number of the desired account card 3 (Fig. 11) "00000." The selector arms 330 to 334 of selectors 325 to 329 thereby immediately took the dot and dash line position shown in Figs. 12a, 12b. As soon as the selector arms 348 to 348 of the selectors 345, 349, 350 have assumed their new positions, a current impulse comes through the switch 389 of the impulse generator 390, operated by the continuously rotating cam disk 391, which travels the following path: Switch 389, conductor 393, selector arm 348, parts 340, 335, 330, 315, 310, spring contact 85 of place "five" of the transmitter mechanism, members 39, 68, 59, 37, 60, 53, 300, 54, 47, 35, 48, 41, 33, 42, 356, 351, 347, rotary step electromagnet 388, negative conductor. At the same time the current flows through the following circuit: Positive conductor selector arm 348, contact 365, conductor 372, relay 373, negative conductor. The relay 373 now remains closed as long as the switch arm 348 remains in contact with one of the mutually short-circuited contacts 365 to 369. The electromagnet 388 now brings the selector arms 346, 347, 348 into connection with the contacts 341, 352, 366. The next impulse current thus runs through the following circuit: Switch 389, parts 393, 346, 341, 336, 331, spring contact 65 of place "four" of the transmitter mechanism members 39, 66, 59, 37, 69, 53, 300, 54, 47, 35, 48, 41, 33, 42,

357, 362, 347, electromagnet 388, negative conductor. In this way the agreement of the several places of the transmitter with the corresponding places of the setting and indicating mecchanism is tested place by place. The comparing procedure can, however, be carried out simultaneously in all places by connecting in series the contacts of the same value in the successive places, in known manner, shown for example in German Patent No. 195,310.

If, in the illustrative example, the setting of places of the same order is not in agreement—which is assumed for the third place—no suitably prepared circuit can be closed through the switch 389. The rotary step electromagnet 380 is not again excited. Consequently, according to the assumption, the selector arms 346, 347, 348 (see also Fig. 16) remain over contacts 342, 353, 367. The relay 373 remains excited. The excited relay keeps the contacts 374, 375 closed. Thereby after setting of the line 516 of the account card 3 (Fig. 11) to the level of the printing and punching mechanism and the closure of switches 207, 208, 384, current flows through parts 374, 208, to electromagnet 303, which swings lever 133 (Fig. 5a) out of the path of movement of the continuously revolving pawl 132. The manner of operation of the rotary driving member in Fig. 5 is the same as that of the rotary driving member shown in Fig. 13. The pawl 132 enters the notch 134 of the coupling disk of the rotary driving member 131 and carries the latter through 360°. Thereby the chain 124 is moved in clockwise direction, so that its lug 125 engages the cleat 126 of the card table 120 and moves the latter in the direction opposite to arrow 123a into its starting position. Thereby the roller 143 (Figs. 5 to 7) engages the control cam 152 of bell crank lever 153 and is displaced, together with its lever 142, in counterclockwise direction (Fig. 6), because the bell crank lever 153 is prevented from being deflected, by locking lever 155. Thereby the cam 141 raises the clamp fingers 139, which again release the account card 3. During its swinging movement the roller 143 moves under the tooth 144 of pawl 145 and thus is retained in the card releasing position. Directly thereafter the pin 158 of card table 120 actuates the arm 157 of locking lever 155 and brings the pin of the latter out of the path of movement of bell crank lever 153. The end surface 1000 of the bell crank lever thereby passes freely over the pin 154 of locking lever 155. The card table 120 has now reached its starting position. The active lug 125 now moves a bit further into the position shown in Fig. 5, while the second lug 125 moves into the preparatory position of the next return movement of the card table. The card which has been determined to be wrong can now be removed from the card carriage and replaced by another.

Since the bell crank lever 153 has been released, after the insertion of a new card and the rocking of pawl 145 caused by electromagnet 151, the card clamp fingers 139 (Fig. 6) can again become operative and retain the newly inserted card. Then as soon as the card table again leaves its starting position, the locking of the bell crank lever again becomes operative. Simultaneously with the attainment of the starting position (position of rest) the card table 120 also reverses the position of double acting switch 160 (Figs. 5b, 9). The electromagnets 112 are then excited in the manner described first. The switch 364 closed simultaneously with switch 208 causes the excitation of electromagnet 385 (Figs. 12a, 12b), which throws the switch bar 458 and thus closes the contacts 436 to 445. When this has occurred the retaining spring 459 springs into the notch 450 of the switch bar and holds the latter in the new position.

When the cam disk 205 (Fig. 9) again returns to starting position, its nose 600 operates the switches 376, 206, closes the former and opens the latter. Then current flows from the positive conductor through parts 376, 375, the electromagnet 377 (Figs. 12a, 16) to the negative conductor. The excited electromagnet attracts its armature, whereby pawl 400 moves so that its point comes into contact with sector 403, which then, by its swinging movement, moves its step 402 in front of the in-springing point of the pawl. The pawl 400 is thereby carried along in the direction of the arrow 404. The pin 307 is thereby caused to act upon the end face 386 of rack bar 385 and to move this, together with the selector arms 346, 347, 346, back into starting position. As soon as the selector arm 348 (Fig. 9) leaves the row of contacts 365 to 369, the relay 373 of the network is cut out and the contacts 375, 374 again open. The selector arms 346, 347, 348 (Fig. 16) and their shaft 394 can be fixed to a sector 560 bearing numbers, one number of which is always visible through a sight hole 561. Hereby upon a negative result of comparison it can be additionally determined in which place of the compared identifying number the stop precedure was released.

If the assumption that there was a disagreement in any part of the setting of the two parts to be compared, for instance, in the third place, is not true, the comparing procedure continues in the manner described for the first contact places 340—341, 351—352, up to the contacts 344 assigned to the last place, "one." If agreement is found in all places of the parts of the control devices to be compared (indicating and setting mechanism, and sensing transmitter), the switch arms 346, 347, 348 move onto contacts 361, 363, 370 of selectors 345, 349, 350. The relay 373 drops. From the positive conductor current flows through the parts 348, 370, 378, the relay 379 to the negative conductor. The relay 378 closes its switches 380, 381. Meanwhile the noses 600, 601 of cam disk 205 are out of the range of contacts 376/206, 207/208/384. The contact 206 is therefore closed. In this way current flows continuously through the parts 206, 380 to relay 379. The switches of the latter remain in closed position. The next switch step made possible by the contact connection 361/363 and the switch arms 346, 347 only brings the switch arm 346 onto its contact 371. The electromagnet 377 (see also Fig. 16) receives current and causes the return, in the manner described above, of the selector arms 346, 347, 348, and the indicating sector 560 to the starting position shown in the drawing. After the line 516 of account card 3 (Fig. 11) to be printed upon has been adjusted to the level of the printing and punching mechanism, as already described, the nose 601 of the cam disk 205 comes into engagement with contacts 207, 208, 384 and closes them. Hereby current flows through the contact 304 to electromagnet 365 (Figs. 12a, 12b), which causes the switch bar 456 to close the contacts 436 to 445. The switch bar is held in this position by the retaining spring 459 snapping into its notch 458. Also, current flows through the following circuit: Positive conductor 381, 207, rotary step electromagnet 362, negative conductor. The cam disk now again

releases contacts 207, 208, 384 and again assumes a position identical with the starting position, except that it is the nose 608 which opens switch 206 and closes switch 376. Thereby the relay 379 drops again.

The electromagnet 362 excited only for a short time moves the slector arm 405 of selector 406 one step forward in clockwise direction. Thereby selector arm 405 comes onto contact 407. The following closure of switch 389 of the impulse generator 390 now sends an impulse of current through the following circuit: Switch 389, parts 405, 407, 412, 335, 330, 315, 455, 445, electromagnet 427 of the printing mechanism 428 (printing mechanism 550 for account card 3 is switched out), 417a, 584, 417, electromagnet 382, negative conductor. The excited electromagnet 427 causes the printing of a zero upon the journal. The electromagnet 382 moves the selector arm 405 one step forward, so that it moves onto the contact 409. Thereby the identifying number "00000" is printed. When this has occurred, two of the combined selector arms come over its auxiliary contacts 570, 5700. Thereby two current impulses pass through parts 5700, 417a, 583, 584, 417 to electromagnet 382 and through conductor 571 to a rotary step electromagnet 572, which is directly connected to the negative conductor, and moves one step forward the selector arms 573, 574, of two selectors 580, 581, which are connected together mechanically but not electrically. In this way the selector arm 573 comes into connection with the first contact 575 next to it of a row of contacts 575 to 579, while the selector arm 574 coacts with the contact slide 582, which extends through the same angle as the abovementioned row of contacts. An additional selector arm 583, which is also non-conductively coupled to the selector arm 573, rests, in starting position, upon a single contact 584 and is adapted to coact with a contact slide 585 corresponding in size to the contact slide 582. To the selector arm 583 is connected the conductor 417a. The single contact 584 is connected to the conductor 417. The contact slide 585 is connected directly to the negative conductor of the network. The exciting of electromagnet 382 last mentioned brings the selector arms 405 into the position of rest shown in Fig. 12a. Upon the first step movement of the selector arms 573, 574, the selector arm 583 also moves onto its contact slide 585. The return conductor of electromagnets 418 to 427 of printing mechanism 428 is thereby disconnected from electromagnet 382 and connected directly to the negative side of the line, while the return conductor 587 of printing mechanism 550 is connected through selector 581 to rotary step electromagnet 572, which steps the selectors 590, 581, 583.

Over the selector arm 573 there now goes a current impulse from the switch 389 of the impulse generator 390 trough the following circuit: Parts 389, 393, 573, 575, 356, spring contact 42 of place "five" of the transmitter mechanism 43, 61, 38, 60, 57, 301, 58, 63, 38, 62, 69, 40, 70, conductor 310, 349, electromagnets 421, of the printing mechanisms 428, 550 (Figs. 17, 18), 417a/-583/585, negative conductor 587/574, 582, electromagnet 572, negative conductor. The number "six" of the old balance value "60000" is printed upon the account card 3 (Fig. 11, line 516) and journal 435 (Fig. 17). The electromagnet 572 brings the selector arms 573, 574, 583 into the next position. So it proceeds from place to place, until the old balance value has been printed down upon the account card and journal. At the same time, in accordance with the copending applications of Senkel, Dueball and Sobisch, Serial Nos. 279,322 and 290,207, the transfer to the balance mechanism also takes place. Balance or accounting mechanisms are disclosed for example by USA Patent No. 1,205,298, the British Patents Nos. 5674/1915, 5675/1915, and the German Patent No. 175,357. Then the selector arms 573, 574, 583, leave the series of contacts 575, 579, and the contact slides 582, 585. Thereby the selector arm 573 comes to an auxiliary contact 590, which is connected through a conductor 591 and a switch 595 to one or more electromagnets 363 for the return controls (lever 133) of the card table 120, of the carriage 1200 on which the card table is mounted (Figs. 23a, 23b), and of the typewriter machine carriage 434 (Fig. 17). Then the return of the card table 120 into starting position in the manner previously described is only begun when the return of carriage 1200 (Fig. 23a) has almost ended (contact 3013). The contact 3013 is not used when punching operations occur during the bookkeeping operations, as described further below. In this way the card table 120, or the like, is returned to its starting position, in the manner already described in detail, and the account card is released for removal. The selector arms 573, 574, 583 can again assume the positions of rest shown in Fig. 12b. In place of the contacts of the sensing transmitters the selectors of the balance mechanism T or the setting mechanism S (Fig. 20) can be coupled selectively to the selectors 588, etc., whereby the setting of the balance mechanism and the setting mechanism can be transferred directly to the printing mechanism, as well as to aggregates corresponding to the purpose and content of the mechanism switched in (setting mechanism or balance mechanism).

It can be seen from Figs. 19 and 20 how the series of conductors coming from the selector 580 (Fig. 12b), namely 358 (575) to 369 (579), can be disconnected from contacts 42 of the sensing selector mechanism and connected selectively either to the selectors 325 to 329 of the setting mechanism S or of the balance mechanism T. The switch 3000 required for this purpose is controlled by a cam 4000 (Fig. 21), the three steps 4001 to 4003 of which effect the individual connection of the said two mechanisms S and T, or their disconnection. The notch of a sector 4004 forming a unit with the cam 4000 provides for the coupling of the selector 580 with the contacts 42 of the sensing transmitter mechanism, through the action of a switch 3001 (Figs. 21, 19). The setting of the cam 4000 and sector 4004 can be accomplished by a lever 4005 projecting from them.

When the new values to be posted have been set in the setting mechanism S (Fig. 20), the printing of these values and the transmission of them to the balance mechanisms is initiated by the release of a current impulse by means of a key 4010 (Fig. 12b). Then immediately a current flows from the positive conductor through switch 4011 to rotary step electromagnet 572 for the selectors 580, 581, etc. Before this the lever 4005 had been shifted in the direction of the arrow 4013. A prerequisite for the multiple operation of selector 580 in a single bookkeeping sequence is prevention of closure of the switch 595 while selector arm 573 is on contact 590, until the bookkeeping sequence is finished. The control means for this purpose can be constructed in accordance with Fig. 21 of the previously mentioned patent

application, Serial No. 290,207 (the adjustable rider on the paper carriage. The conductor **591** is connected to the conductor **571**. In this way the switch arm **573** can be made to return to starting position after each individual value entry without delay. After the new posting has been entered in the machine and calculated, the lever **4005** is turned in the direction of the arrow **4012** (Fig. 21) to the opposite end position. The balance mechanism T is connected to the selectors **580**, **581**, etc. By depressing the key **4010** the printing of the newly formed balance **700 00** (line **516**) on the account card and journal occurs as in the preceding posting operation. After the printing of the new balance the new balance value is also entered by punches or the like on the line of the account card for the entry, as in the example above-described, by releasing a special contact key **4200** (Fig. 12*b*). In a corresponding manner also the punching of the filled-line punch point, at the line which has just received the entry, by means of a new line punch, takes place. Since at the close of printing of the new balance the corresponding rider of the paper carriage actuates the switches **595**, (Fig. 12*b*), the electromagnets **363** for the carriage **1200** and the typewriter carriage **434** receive current. Both return to starting position. Because the machine is supposed to carry out a punching operation, the contact **3013** is not connected to the rotary driver of carriage **1200**. The card table **120** therefore remains still at the same line. Then immediately the contact key **4200** (Fig. 12*b*) is actuated closing a switch **6000**. A special rotary driver (like Fig. 13) is released for control of the punching mechanism. In this way a shaft **6001** (Fig. 25) is set in rotation. The fingers **6002** of a cam disk **6003** close a switch **6005** repeatedly in synchronism with the setting movement of the individual punch selector member **6004** and a distributor **6006**. Through the distributor **6006** current impulses pass to the places "0" to "9" of the value selectors **325** to **329** of the balance mechanism T. To the return conductors **617** to **621** of the value selectors are connected an equal number of electromagnets **6022**, which are excited when the circuits including them are closed and then hold fast the punch selector member **6004**. The latter then embody the setting of the balance mechanism T. After a half revolution of cam disk **6003** the cam disk **6023** rigidly fixed to it becomes active and operates the bail **60240**. The new balance is punched, as well as printed, on the line of the account card on which an entry has just been made. Following this the cam **6023** closes contact **6024**, which corresponds in its operation to the above-described contacts **3013** (Fig. 23*a*) and sets in operation the rotary driver for the return of the card table **120** in the manner, previously described. During the punching operation of the machine the lever **4005** (Fig. 21) stands in its middle position. For punching a new line the adjustment of the punch selector member **6004**, **8000** (Fig. 25) is controlled irrespective of electromagnets **6022** by a stationary pin **8001**.

Like the posting of new values there can also be entered other values which are not to be calculated, such as contra-account numbers, record sheet numbers, dates, etc., simply by switching or operating the above-mentioned control members to journal and account card (Fig. 11).

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