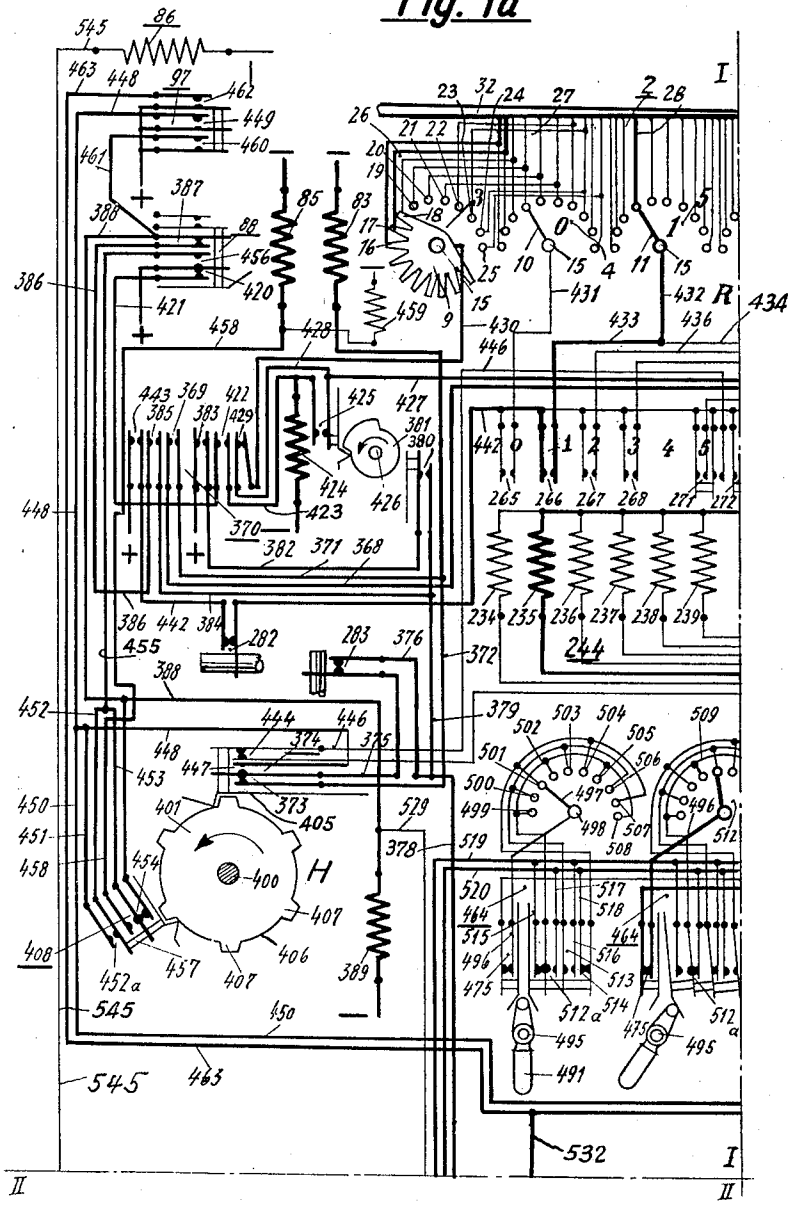
Dec. 22, 1942. J. SOBISCH 2,305,798

BOOKKEEPING MACHINE

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Fig. 1a



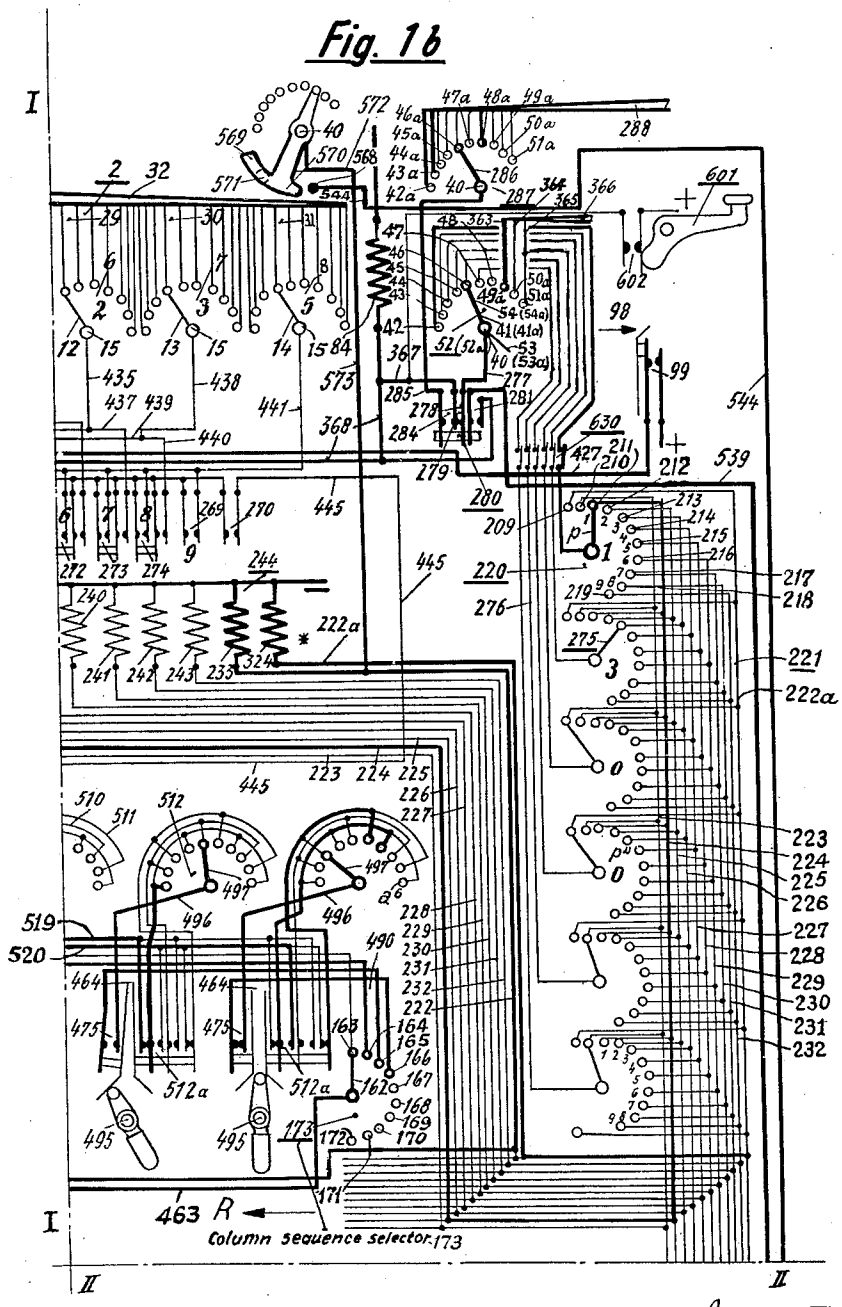
Inventor:
Johannes Sobisch
by Attorneys

Dec. 22, 1942. J. SOBISCH 2,305,798

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Fig. 16



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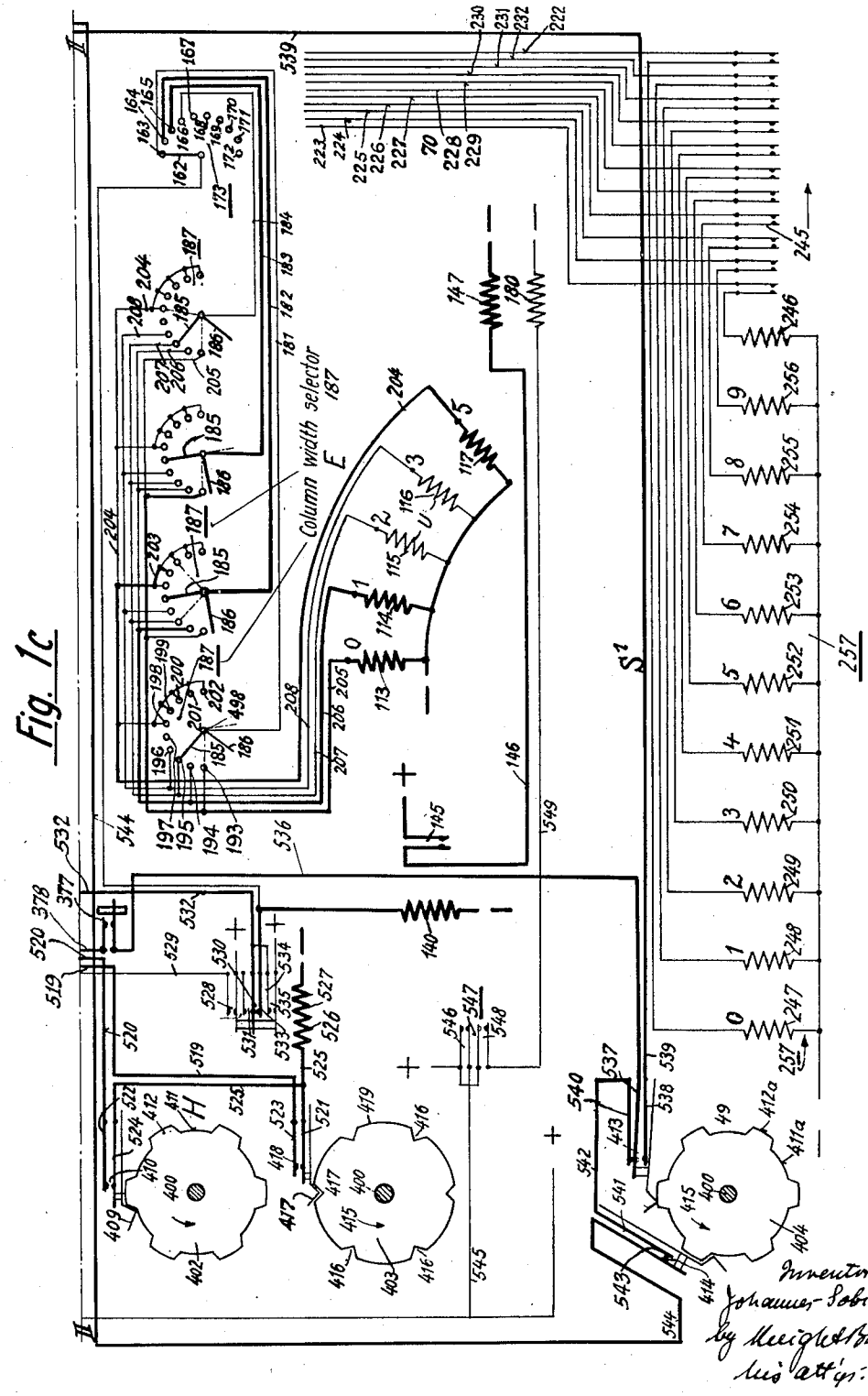


Fig. 1c

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BOOKKEEPING MACHINE

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Fig. 16

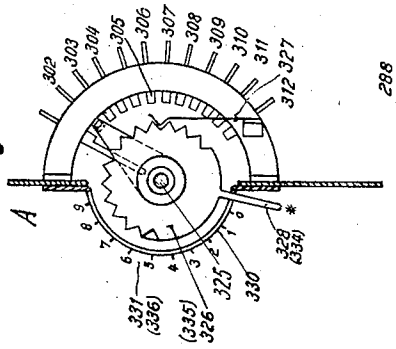


Fig. 15

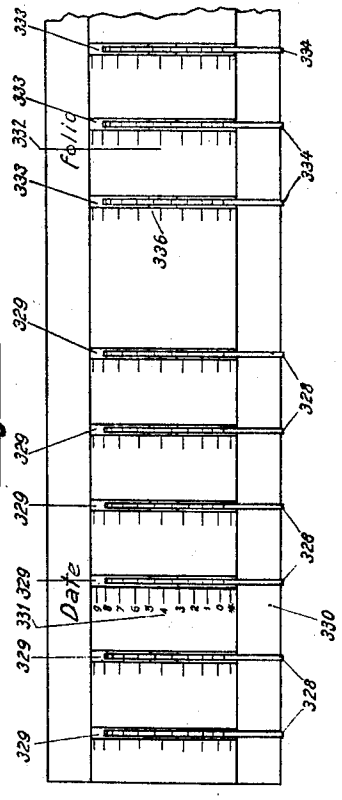
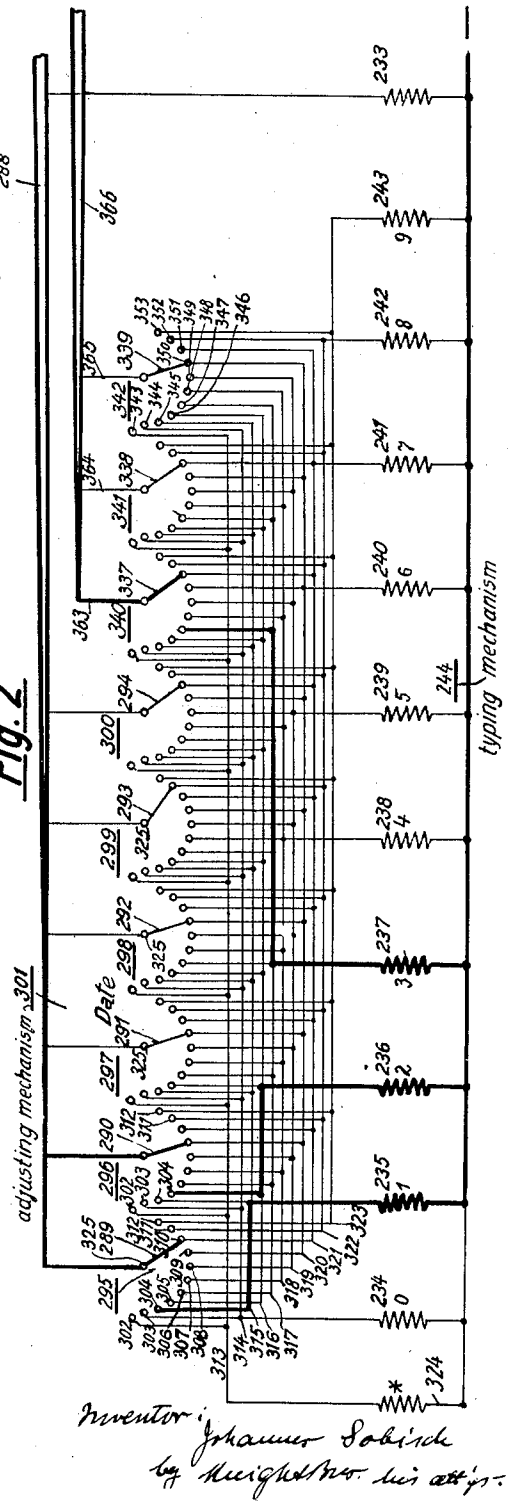


Fig. 2

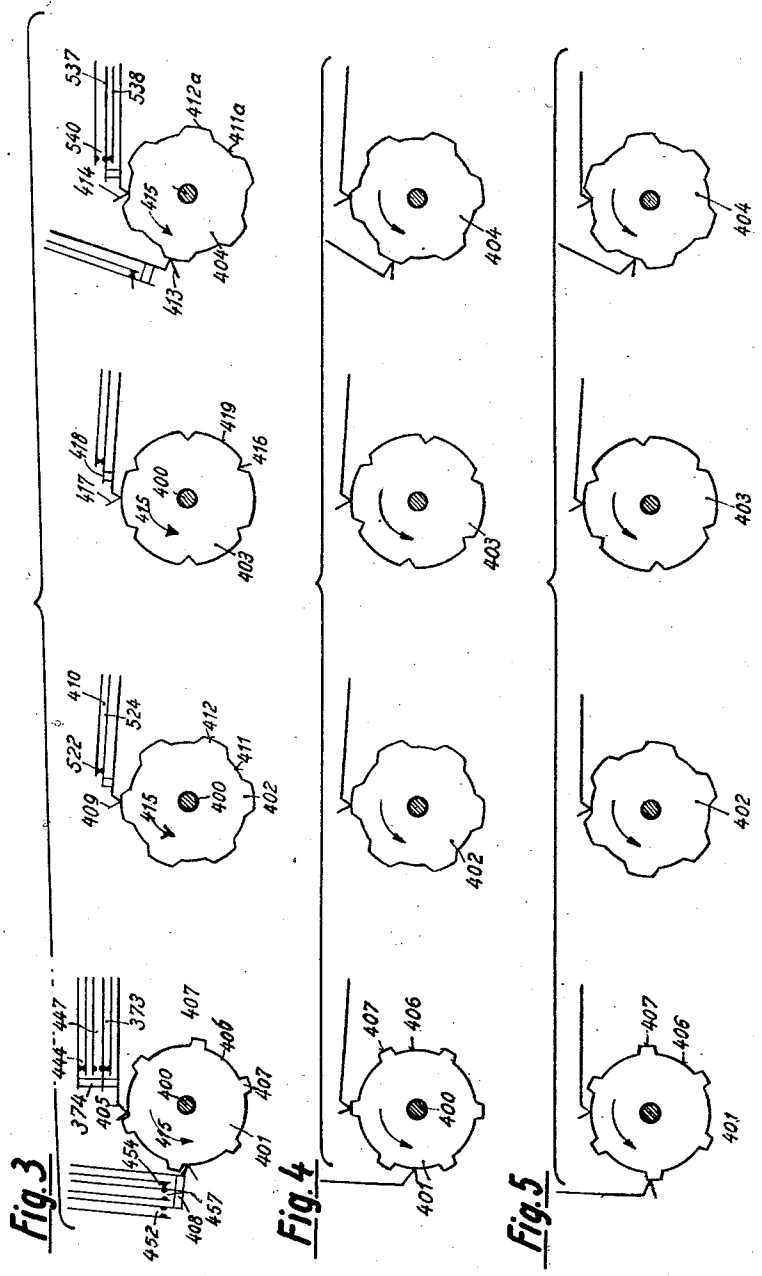


Inventor: Johannes Sobisch
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Dec. 22, 1942. J. SOBISCH 2,305,798

BOOKKEEPING MACHINE

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Inventor:
Johannes Sobisch
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Dec. 22, 1942. J. SOBISCH 2,305,798

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Fig. 8

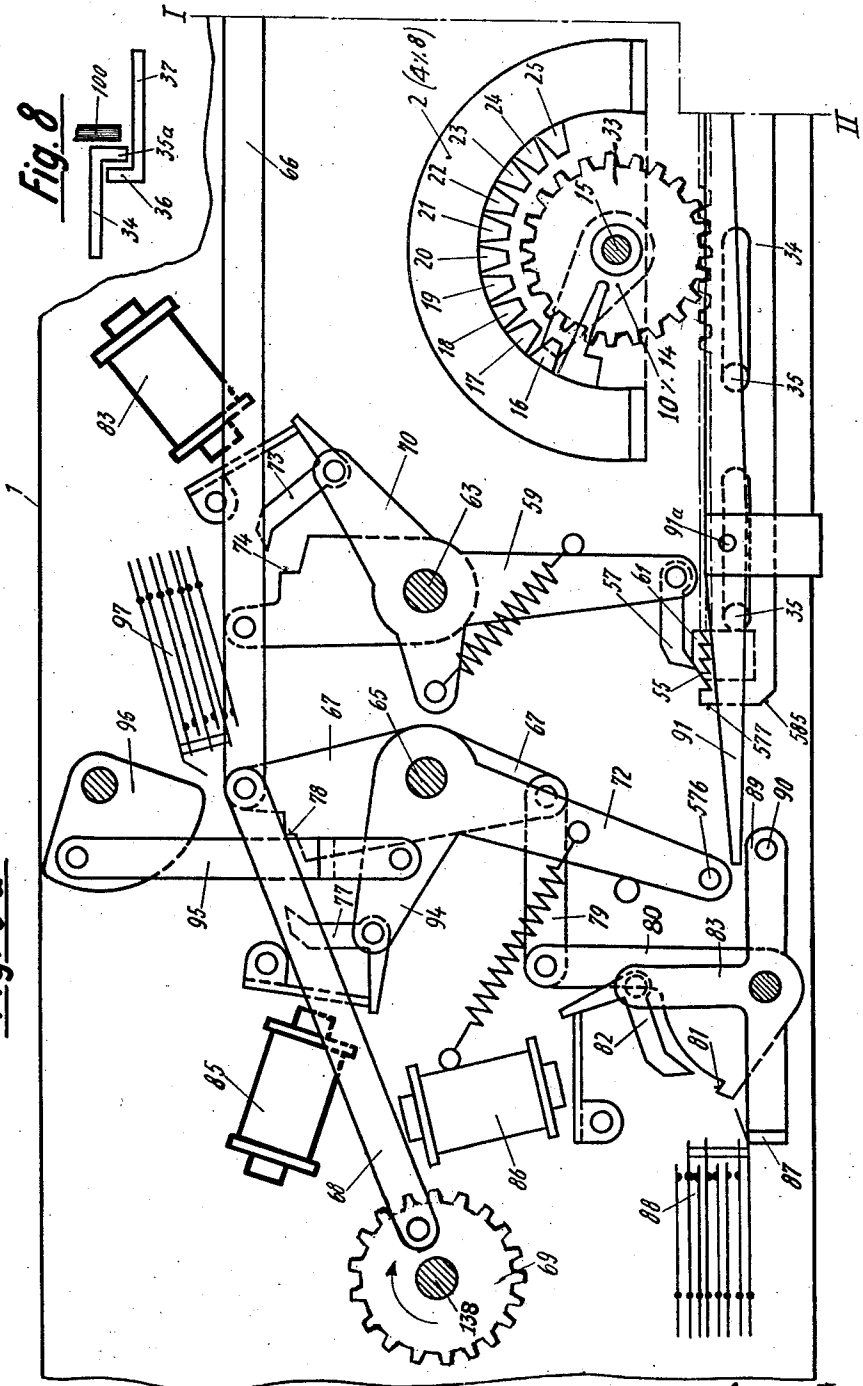


Fig. 6a

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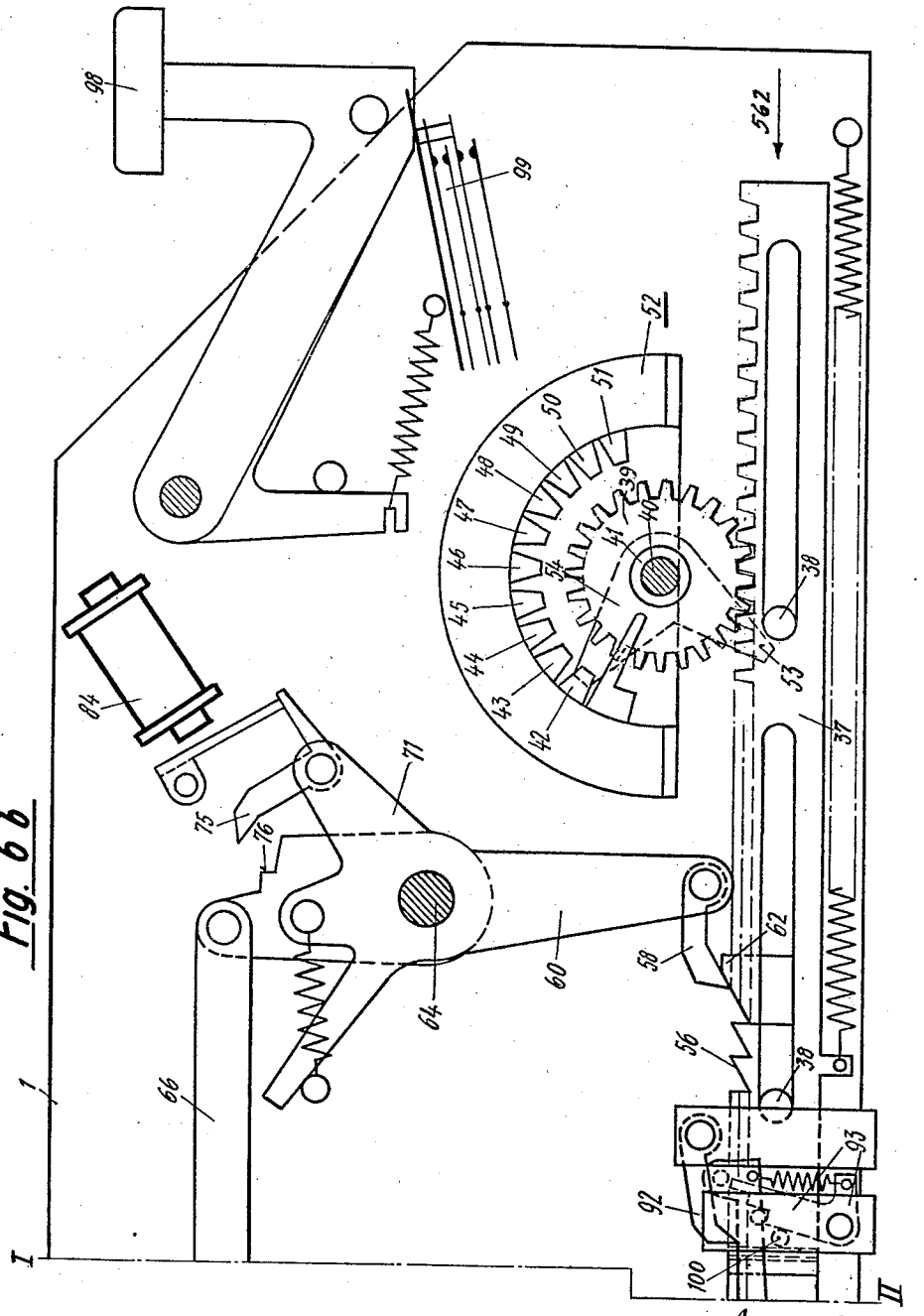


Fig. 6 b

Inventor:
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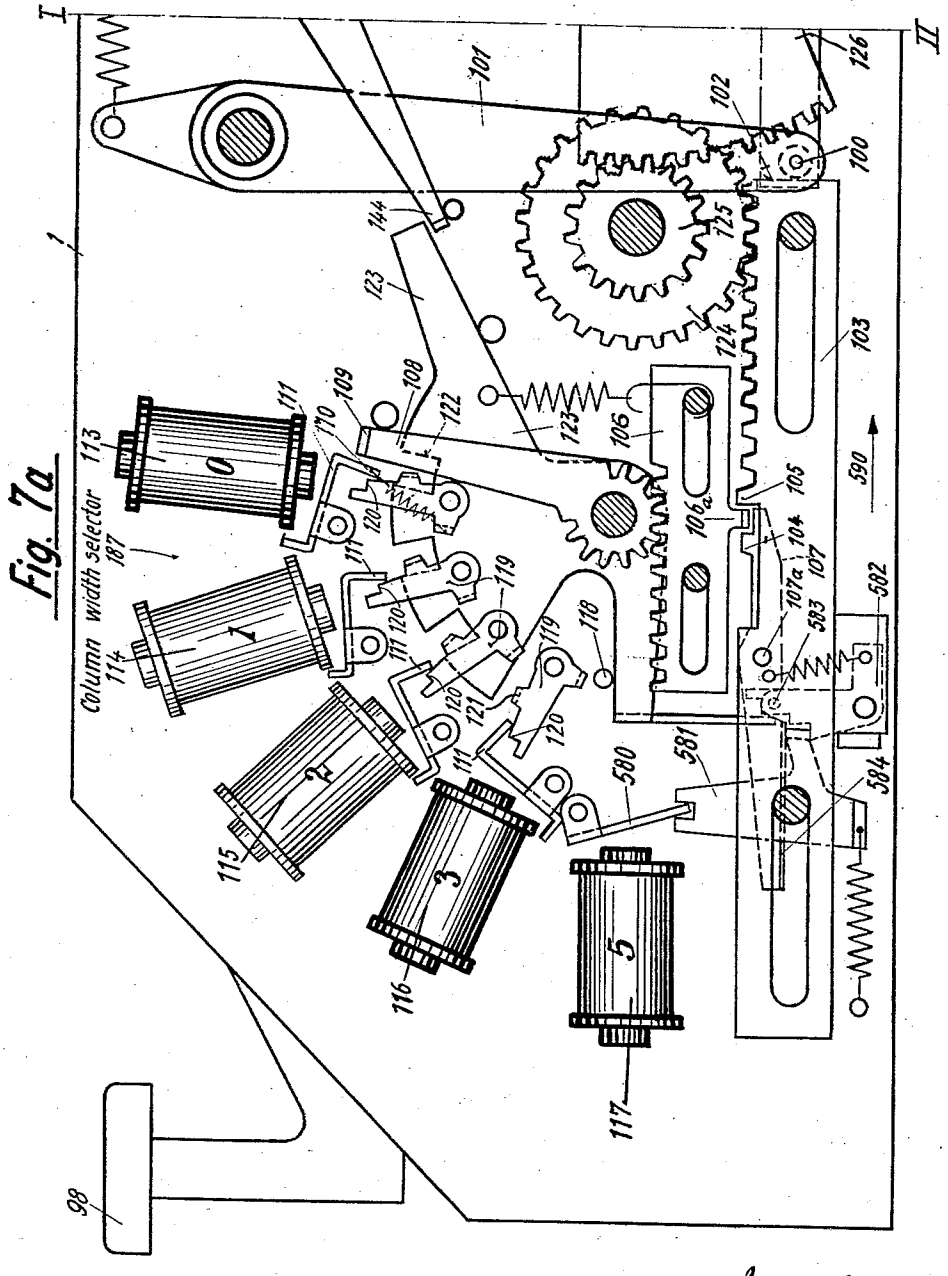


Fig. 7a

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Dec. 22, 1942. J. SOBISCH 2,305,798

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Fig. 9

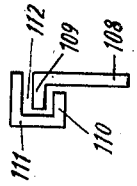


Fig. 7b

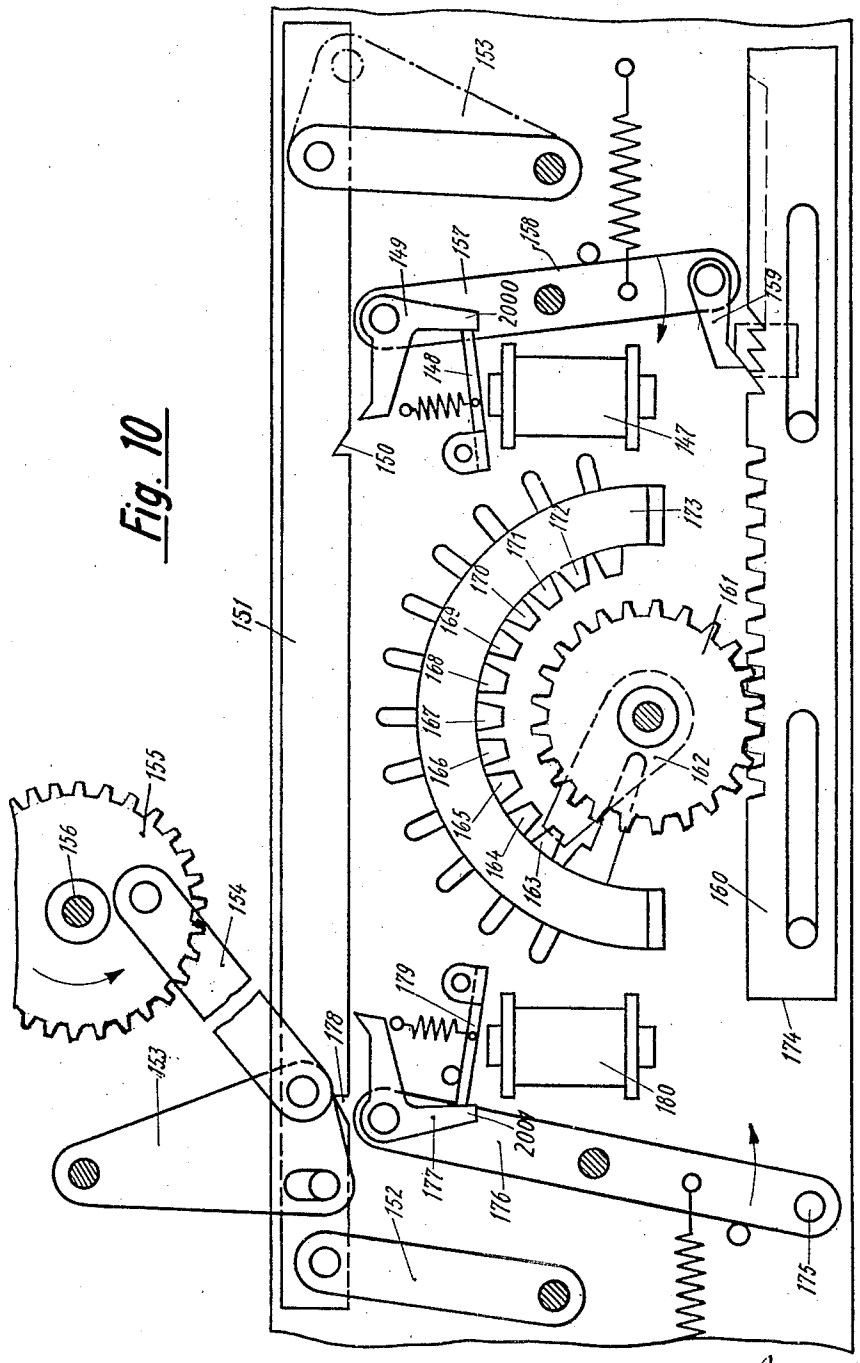
Inventor:
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Fig. 10



Inventor:
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Dec. 22, 1942. J. SOBISCH 2,305,798

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Fig. 11

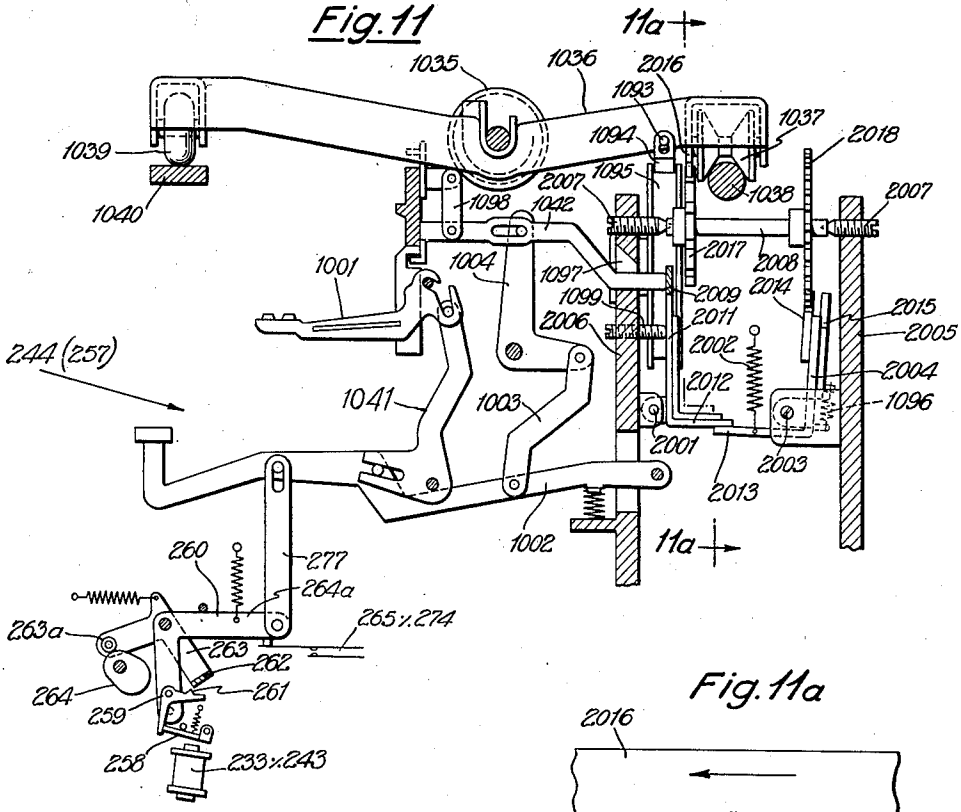


Fig. 11a

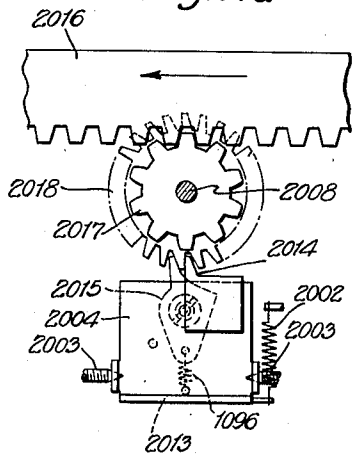
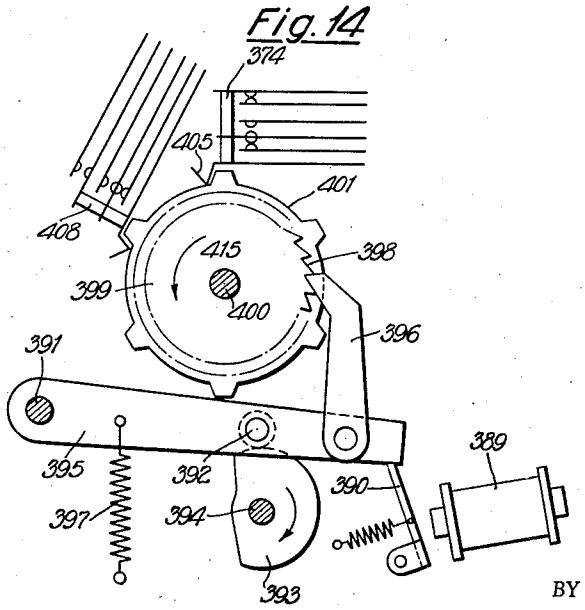


Fig. 14



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Knight Bros
ATTORNEYS.

BY

Dec. 22, 1942. J. SOBISCH 2,305,798

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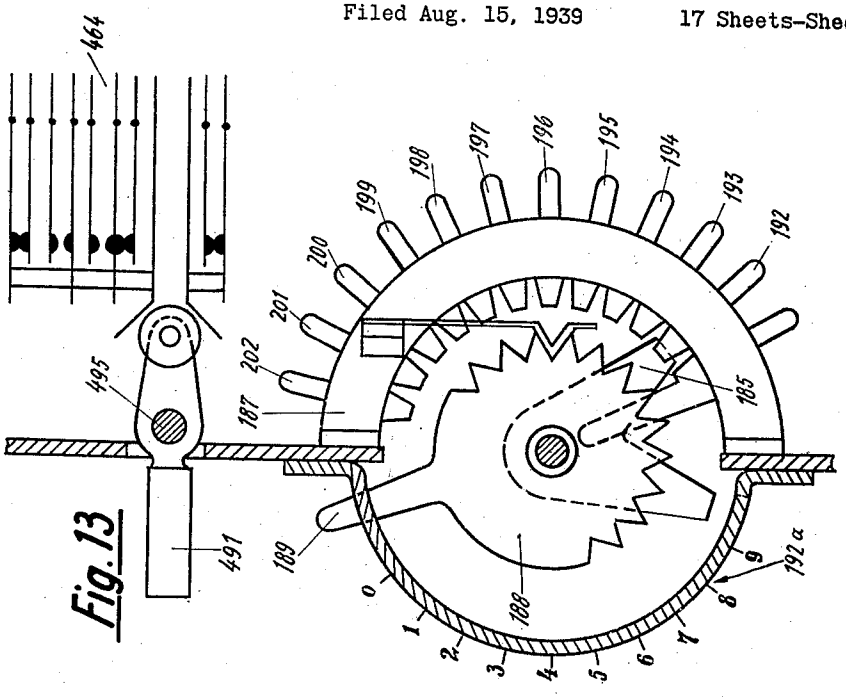


Fig. 13

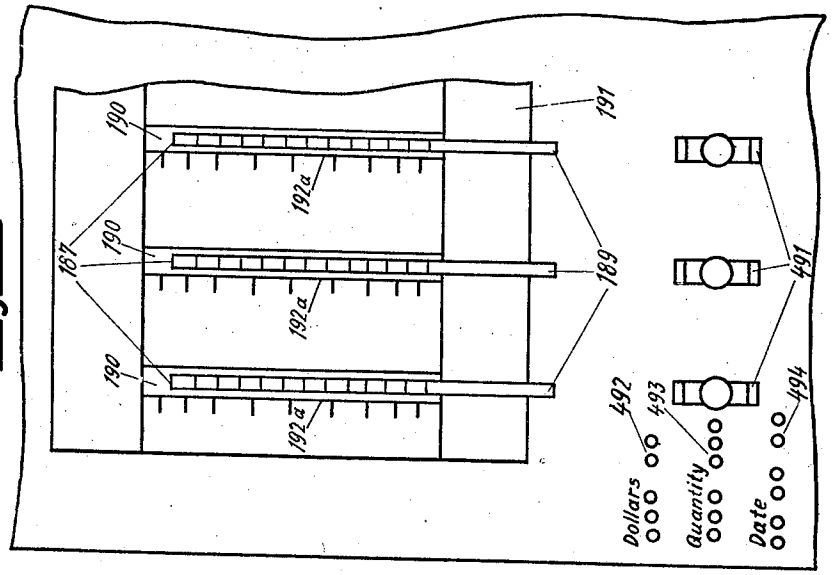


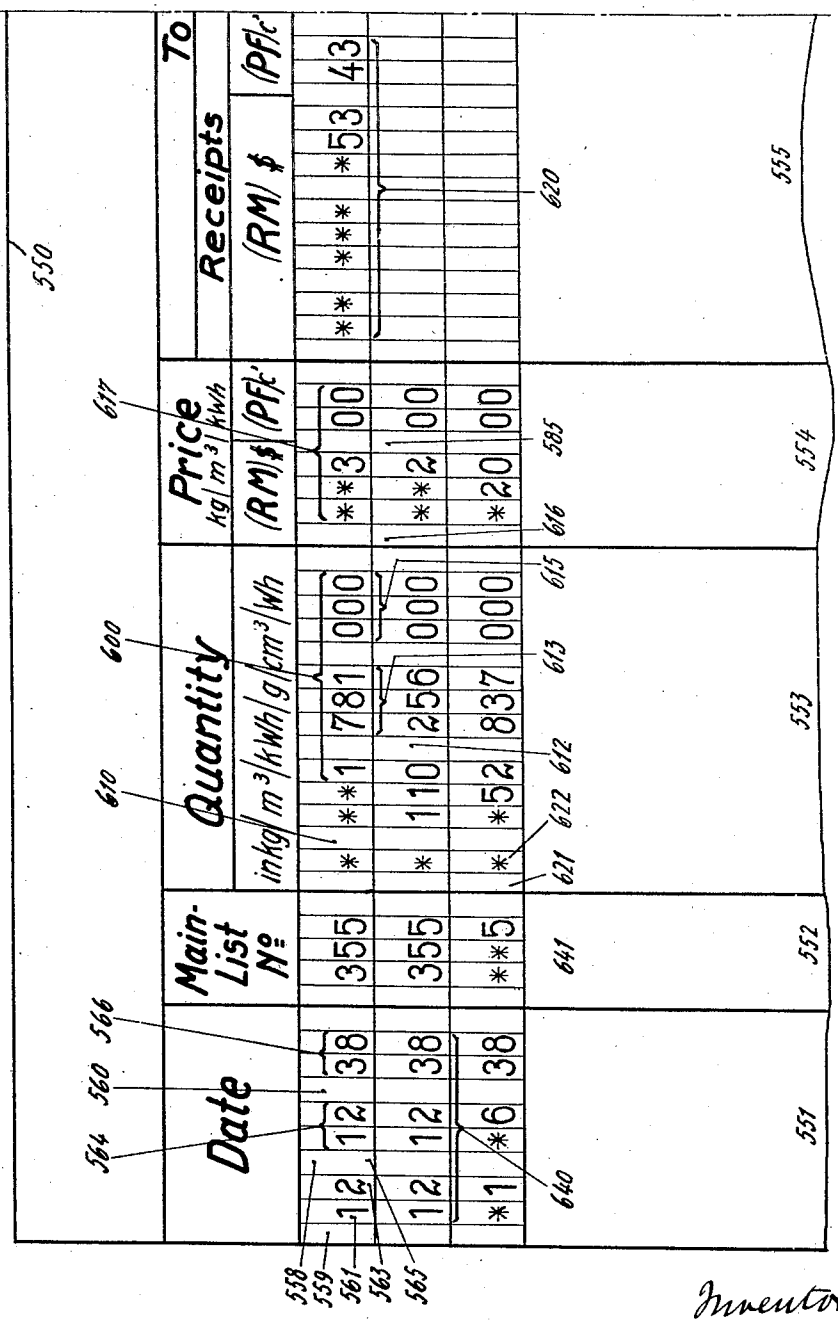
Fig. 12

Inventor:
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Fig. 17a

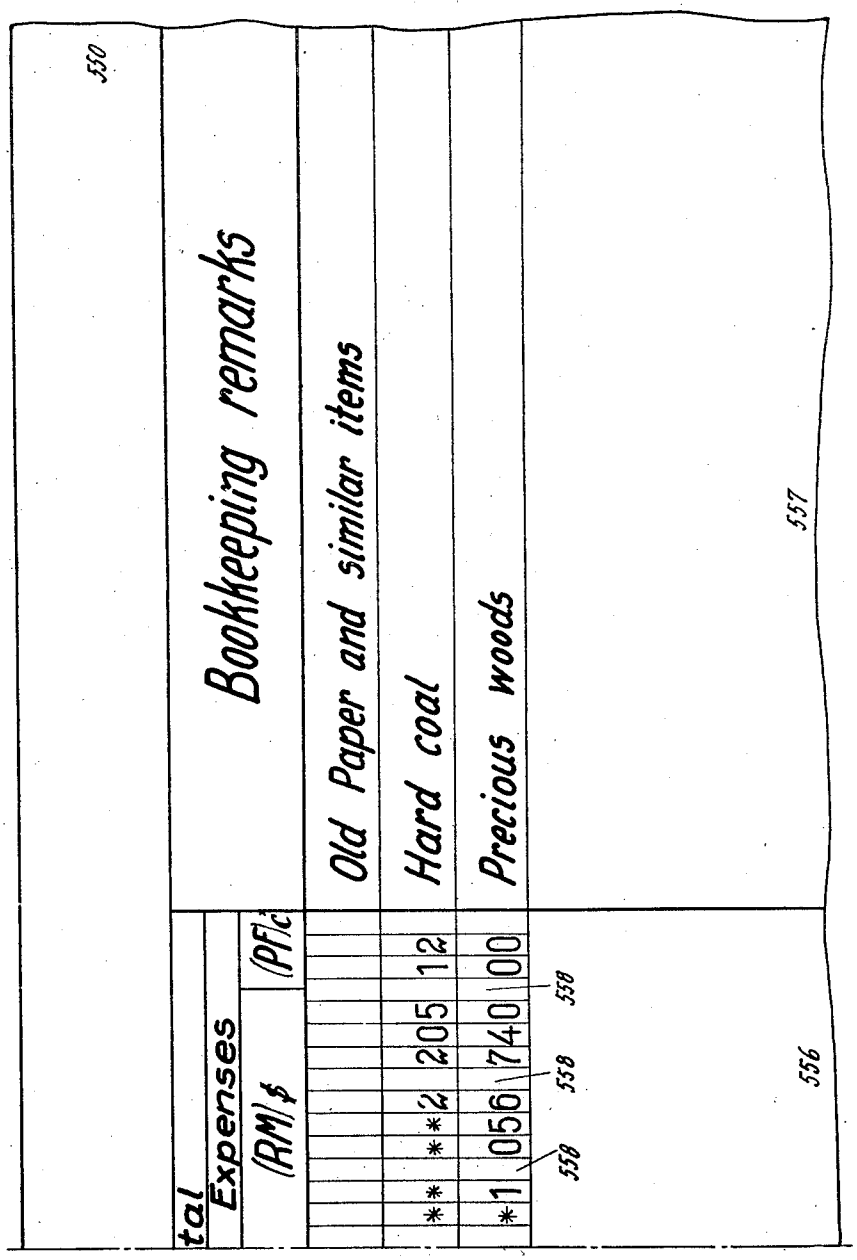


Inventor:
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BOOKKEEPING MACHINE

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Fig. 17b



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Dec. 22, 1942. J. SOBISCH 2,305,798

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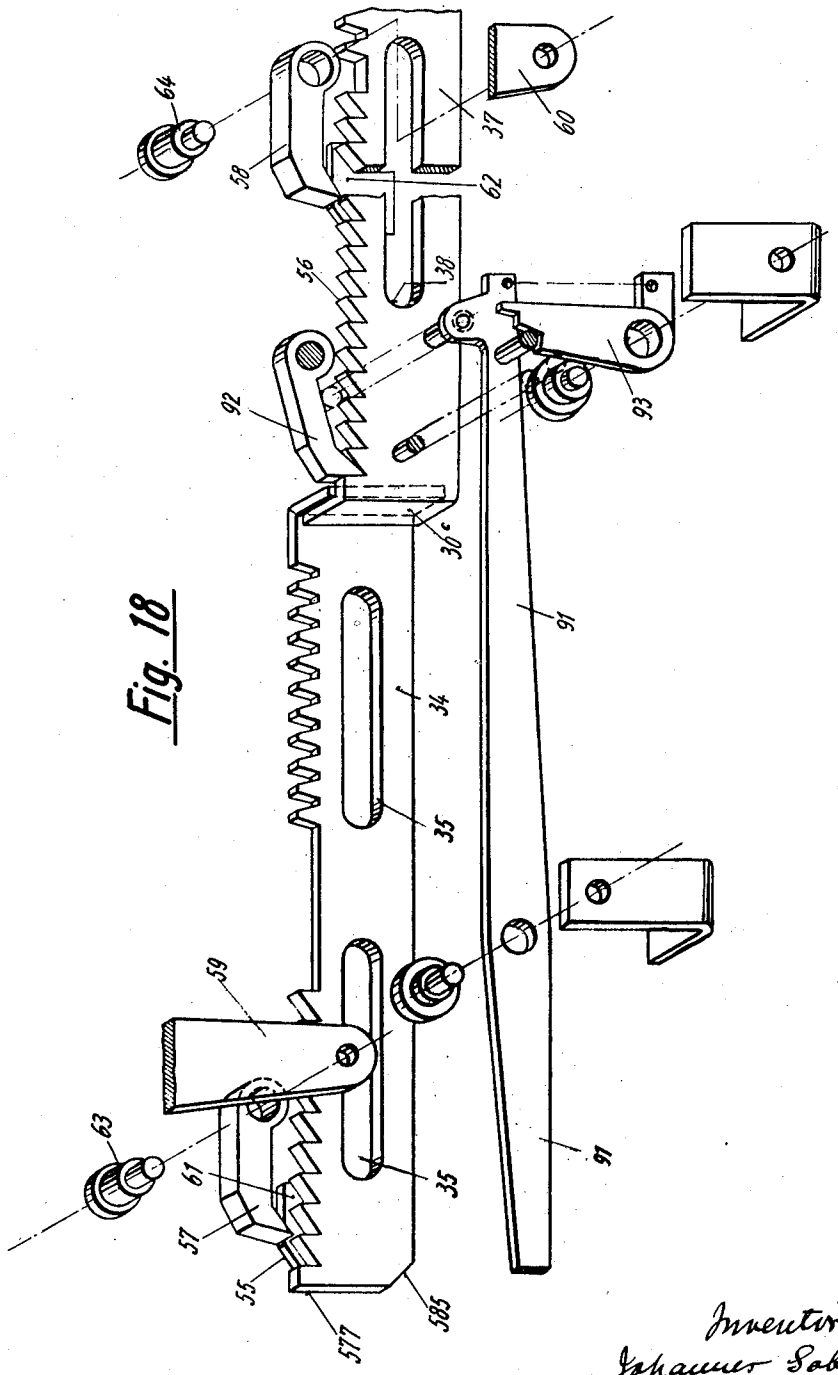


Fig. 18

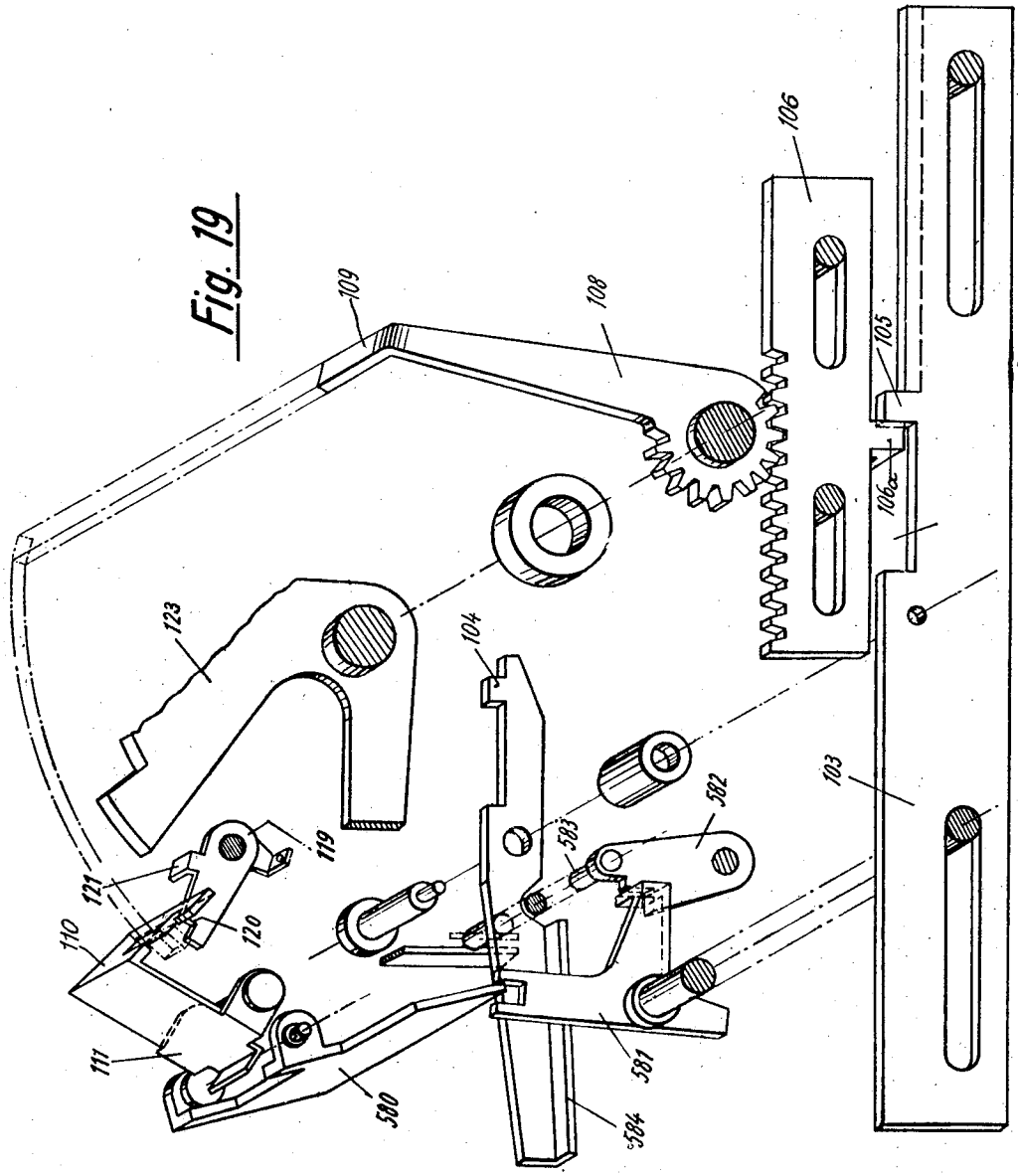
Inventor:
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Dec. 22, 1942. J. SOBISCH 2,305,798

BOOKKEEPING MACHINE

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Fig. 19



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Dec. 22, 1942. J. SOBISCH 2,305,798

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Fig. 20

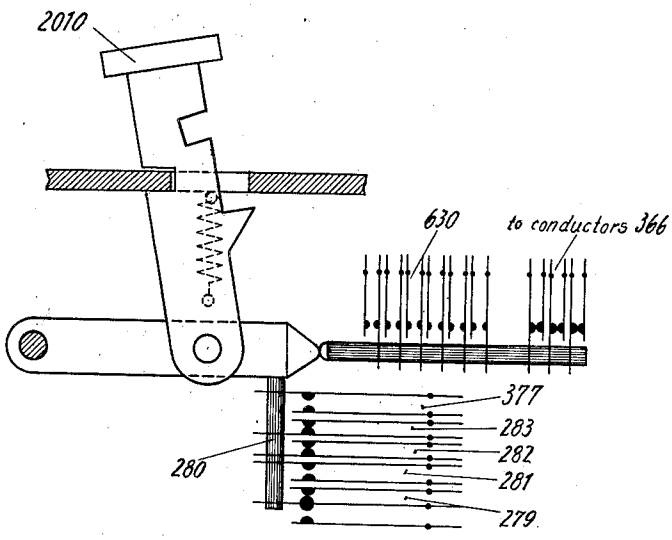
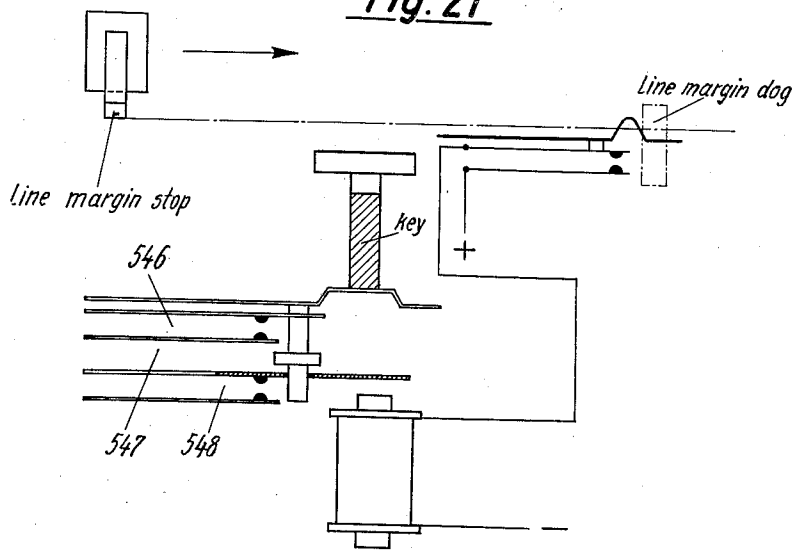


Fig. 21



Inventor:
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Patented Dec. 22, 1942

2,305,798

UNITED STATES PATENT OFFICE

2,305,798

BOOKKEEPING MACHINE

Johannes Sobisch, Bielefeld, Germany; vested in the Alien Property Custodian

Application August 15, 1939, Serial No. 290,207
In Germany August 16, 1938

8 Claims. (Cl. 197—1)

The invention refers to a machine for entering bookkeeping, statistical or similar records, and provided with a device for tabulating and writing numeric values.

In machines of this type it is customary to subdivide the numeric values by reading spaces into groups of numeric characters. Thus, for instance, in case of entering calendar dates, groups of two digits each are written, or in case of quantity and money values, groups of three characters each are written, slightly separated from one another; in case of entering money values, the cents values are written in groups of two digits and are separately entered.

This subdivision has heretofore, for instance in the case of calculating-typewriting machines, been carried out by forming the reading spaces by depressing spacing keys or by interposing point or comma characters. Machines capable of recording the totals have, with the exception of so-called comma spacings, no further subdivision of the written numeric values into reading groups.

Aside from this, these prior art constructions have the disadvantage that the subdivision of a numeric value in groups depends upon the attention of the operator. This occasionally produces disturbances due to the inattention of the operator by occasionally omitting the grouping spaces in tabulating a number of values, and thus produces an unattractive appearance of such tabulations. Especially the lack of group spaces in automatic totaling renders the reading very difficult.

In bookkeeping and calculating machines the printing devices are provided with a corresponding rigid group division by providing reading spaces or rigidly inserted point or comma characters. The division for numeric values indicating quantities, each containing three numbers, is partly accomplished by suspending for the time being the group of two numbers representing cent values whereby, however, two counting mechanism digits are lost.

According to the present invention these disadvantages are avoided by providing a control device cooperating with the digit controller, which device operates in accordance with a previously-made adjustment which automatically produces the insertion of reading spaces in all columns.

The invention is illustrated in the accompanying drawings, in which

Figs. 1*a*, 1*b*, 1*c* represent a wiring diagram of the entire arrangement.

Fig. 2 represents a supplement of the diagram, Fig. 1.

Figs. 3 through 5 represent a group of contact cams for controlling certain contacts, shown in Fig. 1, in different operating positions.

Figs. 6*a*, 6*b* represent the mechanism for transferring numeric values or the like to the typing, calculating or other devices.

Figs. 7*a*, 7*b* represent the column width setting mechanism.

Fig. 8 represents a detail of Fig. 6 in plan view.

Fig. 9 represents a detail of Fig. 7*a*.

Fig. 10 represents the digit sequence setting mechanism.

Fig. 11 is a vertical sectional view of the typing mechanism.

Fig. 11*a* is a detail view of part of the escapement mechanism of the typing mechanism.

Fig. 12 represents a front view of the indicator device for predetermining the column width and the reading spaces.

Fig. 13 represents the indicator device according to Fig. 12 in sectional elevation.

Fig. 14 represents a drive for the operating elements controlling the reading spaces.

Fig. 15 represents a front view of the indicator plate for adjusting the date and the book index values or the like.

Fig. 16 represents a sectional elevation of the indicating device behind the plate, Fig. 15, and

Figs. 17*a*, 17*b* represent a portion of the blank on which the entries are typed.

Fig. 18 is an isometric view of an important part of Figs. 6*a*, 6*b*, wherein the operating elements are shown moved apart for clearness sake.

Fig. 19 shows an isometric view of the main part of Fig. 7, wherein the operating elements are shown moved apart for clearness sake.

Fig. 20 represents the mechanisms of the "date"-key.

Fig. 21 shows particular controlling mechanisms in addition to Fig. 1*a*.

Referring first to Figs. 6*a*, 6*b*, a multi-selector 2 is mounted on an intermediate longitudinal wall 1 of the machine. The electrical connections of this selector are shown in Figs. 1*a*, 1*b*. The selector is composed of six individual selectors 3 through 8 in Figs. 1*a*, 1*b*. In Figs. 6*a*, 6*b*, the selectors 4 through 8 are assumed to lie one behind the other; the selector 3 does not appear in this view. Accordingly, also the switching arms 9 through 14 are mounted on a common axle 15 and prevented from laterally moving thereon and are electrically insulated therefrom. The contacts 16 through 25 of each individual

selector are connected respectively through conductors 26 through 31 to a cable 32 which leads to calculating or perforating or other mechanisms which may be required in the system but which are not illustrated here since they have no bearing on the present invention. In the electric connection, as shown in Figs. 1*a*, 1*b*, similarly located contacts 16 through 25 of the individual selectors 3, 4 are connected by conductors 26, 27. The switch arm 9 of the selector is divided into as many contact fingers as there are contacts in the particular selector (Fig. 1*a*), extending backward from the contact 16 in the direction opposite to the movement of the switch arm. The first finger of the switch arm 9 of the selector 3 lags behind the switch arm 10 of the next following selector 4 connected with it by one contact distance.

A gear wheel 33, shown in Fig. 6*a* keyed to shaft 15, meshes with a rack bar 34 which is guided on wall 1 by means of pins 35. The forward end of rack bar 34 is turned at right angles to form a hook 35ª, shown in Fig. 8, which engages behind a hook 36 provided at the rear end of another rack bar 37, also slidingly disposed on wall 1 by means of pins 38. The latter rack bar meshes with a gear wheel 39 which is keyed to shaft 40. On shaft 40 is also fixed a bell crank-shaped contact arm 41 which is disposed to cooperate with contacts 42 through 51 of a spacing switch 52, while the lagging arm 53 of bell crank 41 will contact with the first contact 42 when the leading arm 54 of the bell crank has passed the last contact 51 by one contact space.

Both rack bars 34, 37 have for a given distance uniformly-spaced ratchet teeth 55, 56, between which can engage respectively the spring-controlled pawls 57 and 58 of the double-armed levers 59, 60 pivotally mounted on wall 1. In their resting positions, pawls 57, 58 are held outside of the range of rack bars 34, 37 by means of supports 61, 62 respectively. The double levers 59, 60, which are journalled on axles 63, 64 respectively, are connected by means of a coupling bar 66 with a lever 67 pivotally mounted on an axle 65. Lever 67 is actuated by means of a connecting rod 68 from a drive disc 69 which is mounted on one of the drive shafts 137 of the machine. On the respective axles 63, 64, 65 are mounted bell cranks 70, 71, and 72, and each bell crank can be connected with its appertaining lever 59, 60, 67 by a step and pawl connection 73, 74; 75, 76; 77, 78. Lever 67 is coupled by way of a link 79 with a lever 80 which is provided with the step sector 81 by which it can actuate a three-armed lever 83. The pawl and step drives 73, 74; 75, 76; 77, 78; 82, 81 are disposed to be actuated, respectively, by electromagnets 83 through 86, as shown in Figs. 6*a*, 6*b*, and 1. All pawls are assumed to be spring-controlled, thereby tending to engage their respective steps, but are normally prevented from such engagement by the armatures of their respective electromagnets.

Three-armed lever 83 is provided at its left-hand end in Fig. 6*a* with a bent-over end 87 by which the contact group 88 can be actuated. The end 89 of this lever carries a pin 90 at its end by which a rocker 91 pivoted at 91ª is actuated. Rocker 91 controls a locking pawl 92, the tooth of which is disposed to normally engage the ratchet teeth 56 of rack bar 37. If pawl 92 is lifted off the ratchet bar by rocker 91, it is arrested by means of a spring-controlled latch 93 which also engages rocker 91 in the pawl-lifting position. This occurs during a certain period in the operation of the machine. The shank 94 of bell crank 72 has pivotally attached to it a rocking bar 95 which is connected at its other end to a cam 96 which controls a contact group 97. A key 98 is pivotally attached to wall 1 and spring-controlled as shown. By the depression of this key, a multi-contact 99 can be controlled.

Against the forward face of bent-over end 35ª of rack bar 34 bears a pin 100 (see Figs. 7*a* and 8) which is carried by a spring-controlled lever 101 pivotally attached to wall 1. This pin is controlled by the end 102 of a rack bar 103 slidingly mounted on wall 1. This rack bar carries a rocker 107 pivotally mounted thereon at 107ª, which rocker is disposed to engage, together with an extension 105 of rack bar 103, the detent 106ª of a further rack bar 106. With rack bar 106 meshes a toothed hub of an adjusting lever 108. The end 109 of this lever is bent at right angles and cooperates with the flat detents 110 of the armatures 111 of the several electromagnets 113 through 117. As will be explained more particularly later the arrangement, as shown in Fig. 9, is such that in one position of the armature the detent 109 of arm 108 can freely pass through the armature, and in another position of the latter it engages the armature. The electromagnets 113 through 117 serve for the limitation of the column width for "10", "10—1", "10—2", "10—3", etc. digits. The control arm 108 is limited in its motion by a fixed pin 118 which determines its resting position and sets the machine for an effective column width of 10—4 digits. Therefore an electromagnet for setting the column width 10—4 digits is unnecessary. The electromagnet 117 assigned to the column width 10—5 digits and, in connection with the pin 118 (as explained later), to the column width 10—9 digits, controls an armature 580 which engages the forked end of rocker 581. Each armature 111 coacts with its appertaining latch 119 provided with a step 120. The detent 121 of each latch is located within the range of a corresponding edge 122 of a resetting element 123.

With rack 103 meshes a gear wheel 124 which is coupled by way of a friction coupling with the pinion 125. The pinion in turn meshes with a toothed segment 126 which extends beyond its axle 127 in the opposite direction in the form of a sector 128. The latter carries two spring-controlled pawls 129, 130, which cooperate with steps 131, 132 respectively of a dog disc 133. This disc is connected by way of a link connection 134, 135 and crank 136 with a drive shaft 137 mounted in the machine. Drive shaft 137 and also shaft 138 (which drives gear 69 in Fig. 6*a*) are connected by a drive gear not shown here.

The previously-mentioned pawl 130 is controlled by the armature 139 of an electromagnet 140 (see Figs. 7*b*, 1*c*). The dog disc 133 acts with its pin 142 upon a drag element 143 to which is connected a lever 144 disposed to close a contact 145 and, at the same time actuate the resetting element 123 (Figs. 7*a*, 1*c*). Toothed segment 126, previously mentioned, carries further a pin 141 engaging the step 591 of drag 143. Contact 145, which is directly connected with a current source, is also connected by means of a wire 146 with an electromagnet 147 (Figs. 1*c*, 10), the armature 148 of which coacts with the detent arm 2000 of a pawl 149 to control the engagement of the pawl with a notch 150 of a coupling

bar 151. This coupling bar constitutes a portion of a parallel rocking system 152, 151, 153 which is connected by means of connecting rod 154 to a crank disc 155 mounted on drive shaft 156.

Pawl 149 is mounted spring-controlled on arm 157 of a lever 158 which is rockingly mounted in the machine and which carries on its lower arm a further spring-controlled pawl 159. Under given conditions, pawl 159 is capable of engaging the uniformly-spaced ratchet teeth of a ratchet bar 160 which is slidingly mounted in the machine and which is also provided with uniform gear teeth which mesh with a gear wheel 161. This gear wheel carries a switch arm 162 which is coordinated (Figs. 10, 1c), for instance, with the ten-digit contact group 163 through 172 of a column sequence selector.

The left-hand end 174 of rack bar 160 in Fig. 10 is disposed so that when the rack bar is shifted, it engages a pin 175 of double-armed lever 176. This lever carries at its upper end a spring-controlled pawl 177 disposed so that it can engage a notch 178 in coupling bar 151. The time at which this engagement occurs and its duration are controlled by the armature 179 of an electromagnet 180, which coacts with a detent arm 2001 of the pawl 177. Deenergization of electromagnets 147 and 180 causes the pawls 149 and 177 to be disengaged from the coupling bar 151.

Contact group 163—172 of the column sequence selector has its individual contacts respectively connected by means of conductors 181 to 184 etc. to the switch arms 185, 186 of the column width selectors 187 coordinated with the columns "one" to "ten". Contact arms 185, 186 (Fig. 13) are each non-conductively coupled with an adjusting and setting disc 188 which carries an arm 189 which protrudes through a slot 190 (Fig. 12) of a cover plate 191 provided in the machine. Adjacent to each slot is provided a scale 192ª carrying the numerals "0" to "9" by which the number of the idle digits of a column can be easily recognized. Corresponding with the combination system which is determined by the electromagnets 113 to 117 (Figs. 1c, 7a) and pin 118, and which forms the basis of the disconnecting or elimination of digits, the five highest digit individual contacts 198 through 202 of contact groups 193 through 202 of the column width selector 187 are short-circuited by bridges 203 and connected by way of a conductor 204 with electromagnets 117. The remaining individual contacts 193 through 196 are connected by means of cable strands 205 through 208 with electromagnets 113 through 116 respectively. The switch arm 186 engages the first contact 193 of its column width selector at a time when the leading contact arm 185 stands upon the contact 198 of the same contact group. The aforementioned groups of contacts with their connections to the conductors 203 are necessary because the electromagnets are also adjustable by perforations of cards. These perforations are punched by a combination code. Thereby for the digits "1" to "5" only one hole is provided, whereas for the higher digits provision is made for two holes ("5" and "1", "2" or "3").

From the contact groups 209 through 219 of the selectors 220 (Fig. 1b) of, for instance, a ten-digit adjusting mechanism 221, conductors 222 through 232 lead respectively to electromagnets 233 to 243 of a typing mechanism 244, and selectively by way of selector switches 245 (Fig. 1c) respectively to electromagnets 246 to 256 of one or several further typing mechanisms 257. With each of the electromagnets is associated an armature 258 (Fig. 11), which in each case controls an individual pawl 259. These pawls are individually supported by bell cranks 260 and are disposed so that they can move with their steps 261 into the path of a crossbar of a bail 262, which is carried by two parallel bell cranks 263. The other arm of each of these bell cranks carries a roller 263ª which cooperates with cam discs 264 of the driving mechanism. The arms 264ª of bell crank 260, assigned to the numerals "0" to "3," "9," and the idle stroke release, actuate individual contacts 265 to 270 (see also Figs. 1a, 1b). On the other hand, the bell cranks 260 which are assigned to the numerals "5" to "8" act upon the double contacts 271 to 274. All individual and double contacts serve for transmitting values to be written to calculating, perforating or other mechanisms which may be provided in the machine. In the present example no such contacts are associated with the typing mechanism 257. The arms 264ª of bell cranks 260 are linked to individual bars 277 which act upon the mechanism which actuates the typing levers or the like of the typing mechanism. The typing mechanism comprises a set of type bars 1001 adapted to print upon a record sheet supported upon a platen roller 1035 rotatably mounted in a carriage 1036. The carriage has grooved rollers 1037 at its rear end adapted to travel upon a rod 1038 and wheels 1039 at its front end adapted to travel upon a flat bar 1040. Each type bar 1001 is actuated by an appurtenant key bar 1002 through a bell crank lever 1041. The escapement mechanism for the carriage 1036 comprises a rack bar 2016 with which engages a pinion 2017 fixed to an arbor 2008 rotatably supported upon set screws 2007 mounted on frame walls 2006 and 2005. The shaft 2008 also has fixed to it a ratchet wheel 2018 with which coacts an escapement dog 2004. This escapement dog is in the form of a bell crank lever pivotally supported upon pivot screws 2003 and carrying upon its upwardly directed arm a fixed tooth 2014 and a pivoted tooth 2015. The latter is normally held by a spring 1096 one tooth pitch in advance of the fixed tooth 2014. A spring 2002, connected to the arm 2013 of the bell crank lever 2004, tends to turn the latter in clockwise direction. A universal bell crank member comprising arms 2012 and 2011 is pivotally mounted at 2001 on the frame wall 2006. The arm 2012 bears upon the arm 2013 of the escapement member, while the arm 2011 has fixed to its upper end a horizontally extending universal bar 2009. A stop 1099 limits the movement of the two bell crank members under the urge of spring 2002. Each key bar 1002 is connected by a link 1003 to a bell crank lever 1004. The upper end of the bell crank lever has a pin and slot connection with a bar 1042 supported by a link 1098 at its front end and slidably guided in a hole 1097 in frame wall 2006 at its rear end. All of the bars 1042 bear at their rear ends against the universal bar 2009, which consequently rocks the escapement member 2004 when each key is actuated. A conventional carriage feed mechanism is provided, comprising a tape 1095 connected at 1093 to the near frame member of carriage 1036 and wound upon a coil spring box 1095 rotatably mounted at the remote end (Fig. 11) of frame wall 2006.

Switching arms 275 of the selectors 220 of the adjusting mechanism 221 are connected by in-

dividual wire connections 276, commencing with the extreme left-hand digit, to contacts 42 to 51 of the idle stroke switching mechanism 52.

The foregoing briefly described arrangement is disclosed more fully in a copending application of Johannes Sobisch, Serial No. 279,322, and has only been briefly described hereinbefore in order to assist in the explanation of the following mechanism embodying the subject matter of the present invention.

Switch arm 41 of the idle digit switch 52 is connected by means of a conductor 277 (Fig. 1b) to the portion 278 of the individual contact 279 of a hand-operated multi-contact 280. This multi-contact, shown in rest position, comprises one normally open and two normally closed individual contacts. The normally open contact is shown next to contact 279 at 281. The two normally closed contacts are shown in Fig. 1a, for convenience of the wiring diagram, at 282 and 283. The contact 279 cooperates, after it has been switched over, with a contact element 284. From this element extends a conductor 285 to switch arm 286 of a selector 287. Switch arm 286, similar to arm 41, is fixed on shaft 40 (Fig. 6b) and parallel to arm 54 so that both stand on correspondingly situated contacts of their respective selectors. Accordingly, if shank 54 of switch arm 41 stands upon contact 42 of the idle digit switch 52, the circuit is closed between contact 42^a of selector 287 and the appertaining switch arm 286. Current, however, cannot flow simultaneously over both contacts because the switch arms are insulated from their shaft 40.

Contacts 42^a through 47^a of selector 287 are coupled by means of conductors 288 (Figs. 2, 1b) with switch arms 289 to 294 of selectors 295 to 300 of a further adjusting mechanism 301. This mechanism serves exclusively for the adjustment of the date. The contacts of contact groups 302 to 312 of selectors 295 to 300, which carry similar designations, are connected by means of conductors 313 to 323 which lead at the same time to the electromagnets 324, 234 through 243 of the typing mechanism 244 indicated in Fig. 2. Electromagnet 324 at the left of Fig. 2 serves for releasing fill-in characters, for instance an asterisk (*). Conductors 313 through 323 can also be connected, of course, to further typing mechanisms aforementioned. All switch arms 289 through 294 of the selectors in Fig. 2 are electrically insulated and mounted on a shaft 325 (Figs. 2, 16) and connected individually with a ratchet disc 326, the notches of each of which are engaged by a leaf spring 327. These ratchet discs each carry an arm 328 which protrudes through an individual slot 329 (Figs. 15, 16) in a face plate 330 which covers this adjusting mechanism and which is preferably mounted laterally, above or below the face plate for the column width adjustment. Laterally of each slot of face plate 330 a scale 331 is provided which carries the characters *, "0" to "9."

In additional slots 333 of the extension 332 of face plate 330, the arms 334 of further notched discs 335 are disposed. The scales 336 coordinated with these slots agree with those of the adjustment device for dates. In the present case three arms 334 are connected with a similar number of switching arms 337—339 of selectors 340—342 (Fig. 2), but electrically insulated therefrom. The latter selectors are provided for transferring adjusted booking entries, for instance main lists or numerals, to the typing mechanism or other recording mechanisms which may be provided in the machine. Of course, also more than three selectors may be used for additional, larger groups of characters. The contact groups 343—353 of selectors 340—342 (Fig. 2) are connected by means of leads with the conductors 313—323. From switch arms 337—339 a three-core (363—365) cable 366 (Figs. 2, 1b) leads to the last three contacts 19A—51A (Fig. 1b, right) of an idle digit switch 52^a (not shown per se) which is connected to the drive and the current supply 39, 277 of the idle digit switch 52 (see Figs. 1b and 6b).

From contact 279 of the multi-contact 280 extends also a lead 367, 368 (Fig. 1b, right) to electromagnet 84 (see also Fig. 6b) and to contact 369 of a multi-contact relay 370, also described in the aforementioned patent application. From this point a lead 371 extends to conductor 372 which connects electromagnet 83 with contact 373 of a multi-changeover contact 374. Another lead 375 extending from contact 373 leads to the already-mentioned individual contact 283 of the multi-contact 280. This latter contact is in turn connected by a lead 376 with a further individual contact 377 (Fig. 1c) of the multi-contact 280 shown at the right of Fig. 1b. The cable 376, split into two strands 378, 379, simultaneously leads (by way of 379) to a contact 380 which is controlled by a cam 381, contact 380 being connected by way of a lead 382 with a contact 383 connected in turn directly to the current source and forming part of the multi-contact relay. Another lead 384 extending from strand 379 leads to a contact 385 of the multi-contact relay 370 from which a conductor 386 extends to the portion 387 of contact group 88. This portion 387 is connected by means of a lead 388 to an electromagnet 389 (Figs. 1a, 14).

Armature 390 of electromagnet 389 cooperates with a control lever 395 which is pivoted on an axle 391. This control arm carries a cam roller 392 cooperating with a cam disc 393 fixed on a drive shaft 394. By means of a spring 397 the roller and cam disc 393 are held in contact. The control arm 395 further carries a spring-controlled pawl 396 tending to turn counter-clockwise. Thereby this pawl engages the teeth 398 of step wheel 399 which is fixed on a shaft 400. This shaft besides also carries cam discs 401 through 404 (Figs. 3, 4, 5), also fixed on the shaft.

By means of cam disc 401 (Figs. 1a, 14) the already-mentioned change-over contact 374 is controlled. The flat spring 405 of this contact is disposed so that it constantly contacts with the periphery of the cam disc 401. The latter is shaped so that the leaf spring 405 will rest during three switching steps brought about by pawl 396 within one of the valleys 406, and that it may rest only in the period between the two next succeeding switching steps on one of the elevated cam portions 407. With cam disc 401 cooperates a further contact group 408 to be described later and which is peripherally spaced with respect to change-over contact 374 a distance equal to the peripheral distance between two elevated cam portions 407.

As shown in Fig. 3, the cam disc 402 is differentiated in its contour from disc 401 by the feature that the contact leaf spring 409, which cooperates with the periphery of this cam disc, remains only during two switching steps in one of the valleys 411 of the disc and for the two next switching steps on the elevated cam por-

tions 412. This leaf spring controls contacts 410, 524. Cam disc 404 of Fig. 3 has a contour similar to cam disc 402, and has a leaf spring 413 with its contacts 540, 537, 538 arranged similar to leaf spring 409. On cam disc 404 also slides a contact spring 414 which is peripherally shifted with respect to spring 413 so that it lags in its operation with respect to spring 413 in the rotation direction 415 of the cam by one switching step of the operating pawl. In other words, while spring 414 is still on the elevated portion 412a of the cam, spring 413 has already descended from its elevated cam portion. The cam disc 403 of Fig. 3 is peripherally shaped so that the valleys are contracted to merely form notches 416, so that the leaf spring 417 of contact 418, which cooperates with the periphery of this cam disc, will enter the notch only at one feeding step, while during the remaining three subsequent feeding steps the spring remains on the elevated peripheral portion 419 of this cam.

The change-over contact 420 (Fig. 1a, left) of the contact group 88 is connected by way of lead 421 to contact 422 of the multi-contact relay 370, which contact is again connected by a lead 423 with electromagnet 424 of the multi-relay and with a contact 425. This contact is likewise actuated by the cam disc 381 fixed on drive shaft 426 and is positioned diametrically opposite to the previously-mentioned contact 380. From contact 425 extends a lead 427 to contact 99 of key 98. Another lead 428 emanates from contact 425 and extends to a normally closed contact 429 of multi-contact relay 370, contact 429 being connected by means of a lead 430 with the switch arm 9 of multi-selector 2. The remaining switching arms 10 to 14 of this multi-selector are connected by conductors 431/432, 433, 434/435, 436, 437/438, 439, 440/441 to the individual and double contacts 265/266, 272/267, 273/268, 274/269, 271—274. These contacts 265 to 269, 271 to 274 are connected together by a conductor 442 and connected with contact 443 of the multi-contact relay 370, contact 443 being directly connected with the current source. Conductor 442 can be interrupted by the separately shown contact 282 of the earlier-mentioned multi-contact 280.

The element 444 of the change-over contact 374 is connected by a lead 445 with contact 270 of the electromagnet 233 which is coordinated with the spacing bar of the typing mechanism 244. A lead 446 connects the same contact element with the double contact 271 of the typing mechanism 244. The contact point 447 of the change-over contact 374 is connected with a conductor 448 which leads to the element 449 of contact group 97 which is supplied directly from a source of current.

From conductor 448 branches off a lead 450 and connects with conductor 222 which comes from electromagnet 233 of the spacing bar. A further lead 451 is connected with the contact 452a of contact group 408. This contact 452a is in turn short-circuited by a wire 452, 453 and connected with the other portion 454 of the contact group, the short-circuit wire being connected by a lead 455 to the middle pole 456 of the change-over contact 420 of contact group 88.

The central contact 457 of this contact group 408 is connected by a lead 458 with the electromagnet 85 (Figs. 1a, 6a) and with a second electromagnet 459 (not shown structurally) which serves for returning the adjusting mechanism 221 to normal position.

The elements 387, 460 of contact groups 88 and 97 are directly connected by a lead 461. Lastly, a conductor 463 leads from element 462 of contact group 97 to switch arm 162 of the column sequence selector 173 and its contact group 163 to 172. The individual contacts of this selector are, commencing with 163, successively connected with the elements 475 of similarly constructed contact groups 464 by conductors 490. Contact groups 464 are allotted to the columns "1", "2", "3", "4", etc. The manner of connection is shown in Fig. 1 for only four columns. Each contact group 464 can be changed over by a lever 491 (Figs. 1, 12, 13) constructed similar to a toggle switch. These levers are preferably arranged below or above the column width switches 189 and are pivotally mounted below face plate 191. Each lever 491 can be set into three different positions. These positions are designated by numerals 492, 493, 494 in Fig. 12 and may represent, for instance, as shown in that figure, dollars, quantity, date. All levers 491 are pivotally attached on bosses provided for the pivots in the housing wall, for instance in the front plate of the machine, and they are pivotally journalled on their pivot pins 495 as shown in Fig. 13. The elements 475 of contact groups 464 are connected for each column by appertaining conductors 496 to respective switch arms 497 which, in a manner similar to switch arms 185, 186 of the column width selector 187, are journalled on a common axle 498. Between the switch arms 185 and 497, however, no conductive connection exists. They are fixed together and mechanically arranged in parallel, so that such a pair of switch arms always contacts simultaneously with the corresponding contact elements of its appertaining contact groups 193 to 202 and 499 to 508. For instance, contact is made simultaneously at 193 and 499. Contacts 499, 502, 505, 508, 500, 503, 506/501, 504, 507, of contact groups 499 through 508 of each selector 512, are short-circuited by bridges 509 through 511. Bridges 509/510/511 of each selector 512 are connected, respectively, to a double contact 512a and to single contacts 513 and 514 of the appertaining contact groups, the elements 515, 516/517, 518 of which are connected, respectively, to conductors 519, 520. These conductors lead to elements 523, 522 of contacts 416, 410 which are connected at their terminals 521, 524 through a conductor 525. This latter conductor besides leads to electromagnet 526 of a multi-contact relay 527. Contact element 528 of this relay receives current directly from a source and is connected by lead 529 with the conductor 380. A lead 532 connected to the central electrode 530 of change-over contact 531 of relay 527 leads to conductor 463 of the column sequence selector 173. The electrode 533 of the same change-over contact is permanently connected with electromagnet 140. The central electrode 530 of change-over contact 531 is further short-circuited to electrode 534 of the last contact 535 appertaining to the relay 527 and connected directly to the current source.

From the individual contact 377 (Fig. 1c), which also forms part of hand-operated multi-contact 280 of the right-hand side of Fig. 1b aforementioned, but is separately shown for convenience of the diagram, leads a conductor 536 to the central portion 537 of the spring contact 414 associated with cam disc 404. The pole 539 of this spring contact is connected by way of lead 539 with contact 281 of the multi-contact

280 in Fig. 1b. This latter contact, which also includes the electrodes 279, 281, 282, 283, 377 as aforementioned, may be changed over by means of a key not shown here for the purpose of writing the date. Figs. 1a, 1b, 1c show multi-contact 280 in a normal position not affected by the date key. The date key 2010 (Fig. 20), contrary to freely operating key 98 of Fig. 6, is constructed and mounted, as shown, so as to remain in the operated position until it is again released by hand.

Elements 540, 541 (Fig. 1c) of spring contacts 413, 414 are connected by a lead 542. Pole 543 of spring contact 414 is further connected by means of lead 544 with a contact pin 568 (Fig. 1b). This pin can make contact with a sliding contact arm 569 likewise mounted on shaft 40 but insulated from arms 286 and 41, arm 569 being constructed so that it can simultaneously make contact with pin 571 by means of its extension 570. This happens when switch arm 286 cooperates with contacts 42a to 47a. In all other positions of the switch arm, the sliding arm 569 only cooperates with contact pin 571. A conductor 572 leading from this pin is connected with a lead 573 which leads to conductor 222.

Electromagnet 86 (Figs. 1a, 6a) is connected by its lead 545 with element 546 of a double contact 547 (Fig. 1c). The second electrode 548 of this double contact is connected by way of lead 549 to electromagnet 180 (Figs. 1c, 10). Double contact 547 may be operated with respect to its individual elements 546, 548 separately, by omitting operation of element 548, or both elements may also be operated together by means of a key not shown. This key may, if desired, be substituted by the carriage spring control key of a typing mechanism, for instance the typing mechanism 244. Element 548 of double contact 547 may be closed only at the end of a ready-entered line, for instance by means of automatic interposition of an operating dog.

The mechanism according to the invention operates as follows.

It is assumed, for instance, that on the blank 550 (Figs. 17a, 17b) certain book entries are to be executed in the columns 551 to 557. It is desired in doing so, and especially in writing the day, month and year figures of the date, to interpose reading spaces 558, which permit easier reading. Besides, reading spaces are to be interposed in the items representing quantities and money values, for instance, according to the decimal system, but these reading spaces are to be arranged only in digit groups of thousands or in groups of thousands and hundreds.

Before starting the entry operation, the column widths are first adjusted on the switchboard 189, 192a (Figs. 12, 13). The first column width switch 187 assigned to blank column 551 (Figs. 1c, 12, 13, 17a) remains in its initial position since a date is to be entered there. Since in the second column 552 of the blank 550 probably only items of three-digit groups are to be entered, arm 189 of the second column width selector from the left is set on scale 192a to the numeral "7". Switch arm 185, 186 of the column width selector of the second highest column then stands on contacts 200, 195. In the next column the arm 189 of the third column width selector 187 remains in its initial position, because here likewise the highest obtainable column width range is required. The fourth column 554, however, should be limited to five digits, wherefore arm 189 of the fourth selector 187 is adjusted to its value "5" on the scale. The appertaining switch arms 185, 186, therefore, are set onto contacts 198, 193 of their appertaining contact group. Arms 189 of the two next column width selectors, not shown here, are left in their normal, initial position, being assigned to columns 555, 556 of blank 550.

Thereupon levers 491 are adjusted on the switchboard of the machine in accordance with the individual book entries to be made in columns 551 to 556. Lever 491 (Figs. 12, 13, 1a, 1b) is then thrown onto the designation "date". The second lever remains in the position shown in Fig. 12 because this lever is assigned to the quantity to be entered on the blank. Lastly, the third and fifth levers (only three levers being shown in Fig. 12) are set on the designation 492 which represents dollars. Of course, instead of the dollar sign, abbreviations designating any other currency may be substituted. By changing the position of the several levers 491, the appertaining contact groups 464 are set into the desired positions, such as is shown for instance at the bottom of Figs. 1a, 1b. The adjustment of levers 491 shown in Figs. 1a, 1b does not correspond to the above-described position.

Now the blank 550 (Figs. 17a, 17b) is inserted into the carriage of the typing mechanism 244 having, for instance, the construction of a conventional typewriting machine, and the first line 559 of its column 551 is brought into typing position. This may also be accomplished by depressing a key controlling the single contact 546 (Fig. 1c), and this key may also accomplish by means of 546, 86, 88, 85, 140, 145, 147 (Figs. 1c, 1a, 6a, 7b) the forward movement of switch arm 162 which belongs to the column sequence selector 173, onto contact 164, and it may also shift the carriage to the beginning of the line. Of course, similar blanks may also be inserted into other recording mechanisms 257 associated with typing mechanism 244. In the present explanation, however, only one typing mechanism, namely 244, will be discussed in connection with the entry operation. The typing of the date, with reading spaces between the day, month and year designations, occurs as follows.

First, arms 328 on switchboard 330 (Figs. 15, 16, 2), corresponding with the date 560 of the first book entry line, are correspondingly adjusted by hand on the scales 331. Thereupon the date key 2010 (Fig. 20) is depressed and contact group 280 (Figs. 1a, 1b, 1c) is changed over. After this has been accomplished, key 98 (Figs. 6b, 7a, 1b) is operated and contact 99 closed for a short time.

The current then flows from contact 99 through conductors 427, 428 to contact 429 of the multi-contact 370, which contact is closed in resting position. Thence the circuit flows through the conductor 430 to the switch arm 9, which rests with its first finger on contact 17 of its contact group. The two conductors 26, 27 connected to the contacts 16, 17, which are at that time covered by the multi-fingers of switch-arm 9, lead to the electromagnets assigned to the zero value of the adjusting devices for the calculating mechanism not shown which, in its construction and effect, corresponds to the digit release (113, 116, 117, 103, 106, etc. Figs 7a, 7b) device of the column width selectors 187.

The current flows also by way of contact 425 closed at regular intervals to electromagnet 424. Electromagnet 424 is energized and attracts its armature, whereby all contacts 443, 385, 369,

368, 422, 429 are changed. Contact 429 is thereby interrupted. At the same time, a current also flows from change-over contact 420 of contact group 88 through elements 421, 422, 423 to electromagnet 424 and thereby maintains the latter's excitation. If key 98 has not been again released up to that time, electromagnet 424 continuously receives current impulses, while the current supply is changed, by way of contact 425 which is alternately closed and opened constantly by the constantly rotating cam disc 381. This procedure ends as soon as the temporarily depressed key 98 returns into its normal position.

From the contact 388 of the multi-contact relay 370, which is now closed, the current flows by way of conductor 382 to contact 380. This contact is likewise periodically closed and opened by cam disc 381. As soon as contact 380 has been closed by cam disc 381, a current impulse passes by way of elements 379, 378, 377, 536 to the spring contact 413 of cam disc 404 (Figs. 1c, 3, 4, 5). Since the latter cam disc is at the beginning of the book entry in the position shown in Fig. 3, the current will flow by way of contact 536 and the elements 539, 284, 366, 367, 278, 284, 285 (Figs. 1a, 1b, 1c) to contact arm 286 of selector 287 and by way of the latter's contact 42a and a lead 288 (Figs. 1b, 2) to contact arm 289 (Fig. 2) of selector 295 of the switchboard 330 on which the date items are set. By way of contact arm 289, which stands on the contact 304 of its selector in accordance with the numeral "1" (561) of the date item 560 in Fig. 17a, the current flows by way of conductor 315 (Fig. 2) to electromagnet 235 of the typing mechanism 244.

Thereby the numeral "1" (561) is typed. Arm 264a (Fig. 11) of bell crank 260 now closes contact 266 (see also Fig. 1a). This, however, does not result in a transfer of numeral 561 to the multi-selector 2 or to any calculating or perforating mechanism which may be attached to the machine, because the current supply for such action was initially interrupted by opening of contact 282.

While the foregoing occurs, the current impulse aforementioned passes from contact 281 of the multi-contact device 280 through elements 368, 369, 370, 371, 372 to the electromagnets 84, 83 (Figs. 1a, 1b, 6a, 6b). Their armatures are now attracted and render the pawl-step combinations 75, 76, 73, 74 effective. The synchronously running disc 69 thereupon takes along the multi-arm levers 70, 71 by way of the elements 66, 65, 69, 68, so that their pawls 57, 58 engage the ratchet teeth 55, 56 of rack bars 34, 37 and feed the latter in the direction of the arrow 562 by one step. Now the gear wheel 39 driven thereby clockwise moves switch arm 286 fixed on the wheel shaft by one contact step so that it now stands on contact 43a of its selector. Besides, the switch arms 41, 9 to 14 of the idle digit switch 52 and of the multi-selector 2 are advanced by one contact. This, however, is of secondary importance for the present purpose since both of these last-mentioned elements are not any further connected with the present circuit under consideration. In the meantime, cam disc 381 has moved away its elevated portion from contact 380, so that the latter is interrupted. The dropping armatures of the electromagnets, therefore, remove pawls 73, 75 from their engaging position after producing one feeding step.

Electromagnet 389 (Figs. 1a, 14), which was energized up to that time by way of contact 380 of the cam disc 381 and by way of elements 379, 384 to 380, now releases its previously-attracted armature 390 after the cam disc 393, constantly and synchronously driven together with cam disc 381, has fed the step wheel 399 by means of pawl 396 by one tooth in the direction of arrow 415.

As soon as an elevated portion of cam disc 381 again closes contact 380, current again flows from contact 388 of multi-contact relay 370 by way of elements 382, 380, 379, 384 to 386 to electromagnet 389 and by way of elements 379 through 378, 377, 536 to spring contact 413 which now assumes the position with respect to cam disc 404 shown in Fig. 5. The contact between elements 537, 538 now permits passage of the current by way of elements 539, 284, 284, 285, 286, 43a and switch arm 290 (Figs. 2, 15, 16) of selector 296 on switchboard 330 for setting the date. Since arm 290 appertaining to numeral "2" (563, Fig. 17a) now rests on contact 304 of its selector the current can pass through electromagnet 236 of typing mechanism 244, so that there the typing of numeral "2" is accomplished. Following this, one carriage step occurs automatically in well-known manner as in any ordinary typewriting machine. Immediately following, the one-time forward feeding of switch arms 286, 41, 9 to 14 by one step is produced by means of the electromagnets 84, 83 Figs. 1a, 1b, 6a, 6b energized by way of leads 368, 369 to 371. Thus switch arm 286 of selector 287 cooperates with contact 44a.

The previously-mentioned excitation of electromagnet 389 (Figs. 1a, 14) had produced a forward feeding of step wheel 399 and the cam discs 401 to 404 mounted on its shaft 400 Figs. 1a, 1c, 3, 5 by one step in the direction of arrow 415. Thereby the spring contact 413 assumes, with respect to its appertaining cam disc 404, the position shown in Fig. 1c, whereby the elements 537, 538 of this contact are closed.

At the subsequent impulse produced by cam disc 381 the current flowing by way of contact 388 of multi-contact relay 370 can pass by way of elements 382, 380, 379 through 377, 536, 537, 413, 540, 542, 541, 414, 543, 544, 568, 569, 571 through 573, 222 to electromagnet 233 of the typing mechanism 244. In this manner an additional idle step of the carriage is produced. Immediately following occurs the feeding of shaft 400 by a further tooth division in the direction of arrow 415 by the excitation of electromagnet 389. Thus cam discs 401 through 404 are brought into the relation with their respective spring contacts shown in Fig. 4. Spring contact 414 now rests likewise on an elevated portion 412a of cam disc 404 whereby the contact elements 541, 543 are separated. A subsequent current impulse initiated through cam disc 381 (Fig. 1) therefore cannot pass at this point, so that it remains in this respect without effect and can only excite, by way of the previously frequently mentioned connection 384 through 386, the electromagnet 389 (see also Fig. 14). In this manner the cam discs 401 through 404 are advanced a further step. They now assume the position shown in Fig. 3.

Now, as has been described with respect to the entry items 561, 563, the individual values of the next numeral group 564 in Fig. 17a are picked up one by one in similar manner by selectors 287, 296 of switchboard 330 for the purpose of further recording the date and are typed on the first line column 551 of blank 50. Since, after typing the group containing the first numeric values 561, 563, two feeding steps of the carriage had occurred, a reading space 565 amounting to

the space of one digit occurs between the numeral groups **561**, **563** and **564**. After the numeral group **564** has been typed, one normal carriage feeding step is produced by the typewriting machine and after that a further reading space step is produced by the operation of cam discs **381**, **404**. Lastly, the numeral group **566** is picked up by the selectors **299**, **300** of switchboard **330** for further entering the date and transferred digit by digit into column **551** of the blank whereupon again two idle steps of the carriage occur.

Through the forward feeding of the switch arms **286**, **41**, **9** to **14** of selectors **287**, **52**, **2** respectively, which follows immediately after the typing of the numeral "8" of the number group **566** in Fig. 17*a*, and which operation is accomplished by the mechanism **69** in Fig. 6*a* through the same current impulse, among other occurrences during this operation also switch arm **286** is set onto contact **48**ª (Fig. 1*b*) of its selector.

Through the current impulse now produced by cam disc **381**, which follows the second feeding step of the carriage, the spring contacts **413**, **414** assume the position shown in Fig. 4. Thereby a flow of current to the typing mechanism **244** and to switchboard **330** (Figs. 15, 16, 1*a*, 1*b*) is interrupted. Thus the current can find its way only to electromagnet **389** by way of contacts **385**, **387**. In this manner cam discs **404** to **401** are fed forward by one tooth. The next current impulse flowing from contact **380** of cam disc **381** (Fig. 1*a*), by way of elements **379** to **377**, **536**, **537**, **413**, **538** (Fig. 3), **539**, **281**, **368**, **367**, **279**, **284** to **286**, cannot flow to contact **48**ª of selector **287**, since this contact, like the others ahead of it, has at that time no further connection. But from conductor **368** the current impulse can flow to electromagnet **84** (Figs. 1*b*, 6*b*) and by means of conductors **368** to **372** to electromagnet **83**. These electromagnets bring about the advance of the rack bars **35**, **37** in the direction of the arrow **562**, and also the further advance of switch arms **41**, **286**, **9** to **14**, each by one step. After two of such switching steps and a simultaneous corresponding forward step of cam discs **401** to **404** have occurred, the latter assume the position shown in Figs. 1*a*, 1*c*. If now cam disc **381** closes contact **380**, the current can only flow to electromagnet **389** but cannot flow by way of spring contacts **413**, **414** and the elements **545** to contact pin **568**, because the contact arm **569** has in the meantime moved away from this contact pin. At this time switch arm **286** lies on contact **50**ª of selector **287**. Thus when the date is typed, only two feeding steps of the carriage are possible between each of the character groups **561**, **563**, **564**, **566**, which would correspond with a reading space in each case of one digit. Since the constantly rotating cam disc **381** continues closing contact **380** at regular intervals, electromagnet **389** (Figs. 1*a*, 14) is energized at corresponding intervals, whereby each of cam discs **401** to **404** is advanced by one tooth in the direction of the arrow. Thus when cam disc **404** has assumed the position shown in Fig. 3, a current impulse reaches electromagnets **84**, **83** (Figs. 1*a*, 1*b*, 6*a*, 6*b*) which now initiates a further forward step of the rack bars **34**, **37** and of switch arm **286** in the direction of arrow **562** and a clockwise step of sliding arm **569**. Switch arm **286** then lies on contact **51**ª of selector **52**ª. The energizing of electromagnet **389** which has occurred during this time had produced the advance of cam discs **401** to **404** to the position shown in Fig. 5. The next following impulse would then bring about again a forward step of step wheel **399** by one tooth (Figs. 14, 1) after the electromagnets **84**, **83** have been energized shortly before. The rack bar **34** (Fig. 6*a*), which has now performed its tenth individual step, slides with its inclined surface **585** over pin **90** of three-armed lever **83** and shifts the latter clockwise. Thereby detent **87** of this lever changes over the contact group **88**. The electrode **420** of this contact thus interrupts its contact. The current flow by way of elements **421** to **423** to electromagnet **424** of the multi-contact relay **370** is interrupted. This electromagnet can no more hold its armature, and therefore permits the contacts **443**, **385**, **369**, **383**, **422**, **423**, controlled by this armature, to return into normal position shown in Fig. 1*a*.

The current now flows from change-over contact **420**, **456** of group **88** by way of elements **455**, **453**, **454**, **408**, **388** to electromagnet **389** (Figs. 1*a*, 14), which now again brings about the advance of cam discs **401** through **404** by one tooth of its step wheel **399** (Fig. 4). Now current can flow from lead **455** (Fig. 1*a*) by way of elements **452**, **452**ª, **408**, **451**, **450**, **222** to electromagnet **233** of the typing mechanism **244** and can energize this electromagnet. Since this electromagnet is coordinated with the carriage feed bar, an idle step of the carriage is brought about. Thereby a second reading space **622** (Fig. 17*a*) is added to the first reading space **621** occuring immediately after the typing of the date. In this manner it is brought about that between two character groups on the blank, which are separated by a column line, a reading space of at least two digits is automatically produced. After the advance of cam discs **401** to **404** aforedescribed has occurred and the contact group **408** has been actuated, the current flows from lead **455** by way of elements **453**, **454**, **457**, **458** to electromagnet **85** (Figs. 1*a*, 6*a*). This electromagnet attracts its armature so that pawl **77** is placed in operating position with respect to the step **78** of double-armed lever **72**. The constantly oscillating lever **67** actuated by the disc **69** now allows the double-armed lever **72** to partake in this oscillation for one swing in counterclockwise direction. This produces in turn a shifting of sector **96** in the same direction with the result that this last-named sector changes over the contact group **97**. At the same time pin **576** of double lever **72** has engaged rack bar **34** at its butt end **577**, has elevated rocker **91**, and has returned rack bars **34**, **37** into their initial normal position.

The current now flows by way of element **460** of contact group **97** and the elements **461**, **388** to electromagnet **389** with the result that step wheel **399** is advanced by one tooth in the direction of arrow **415**. The cam discs, therefore, now assume the original position which they had at the beginning of the above-described book entry and as shown in Fig. 3. Therefore, from contact group **97** electromagnet **233** can be energized by way of contact **449** and conductors **448**, **450**, **222**. In this manner a distance between character groups of adjacent columns amounting to three digits can be produced by adding a further spacing step of the carriage. Since, however, it is usually sufficient to have only a two-digit reading space between two adjacent columns, for instance between **551**, **552** in Fig. 17*a*, usually one of contacts **449**, **452**ª of contact groups **97**, **408** in known manner should be rendered ineffective.

At the same time a further current impulse flows from contact 462 of group 97 through conductor 463 to switch arm 162 of the column width selector 173. This switch arm had already been brought onto contact 164 of its contact group during the adjustment of blank 550 at the beginning of the entry in column 551, so that the current can now flow from this contact by way of conductor 182 to the section "2" of the column width selector (Figs. 1a, 1b, 1c) and to the switch arms 185, 186 of the latter section. Since these last-named arms, in accordance with their original adjustment, rest on contacts 199, 194, the current flows by way of elements 203, 204, 206 to electromagnets 117, 114 whereby the latter are energized. They attract their respective armatures 580, 111 (Fig. 7a). The latch 119 of armature 111 coordinated with electromagnet 114 now locks this armature against premature dropping off. Armature 580 brings about the rocking of rocker 107a clockwise by means of bell crank 581 (Figs. 7a and 19) and a latch 582, whereby pin 583 of the latch engages under the detent 584 of rocker 107a. Thus the cam 104 of the rocker releases the detent 106a of rack bar 106. In the meantime the current has passed from conductor 463 through elements 532, 530, 533 to electromagnet 140 (Figs. 1c, 7b). The latter attracts its armature 139, so that pawl 130 is brought into operative relation to the step 132 of dog disc 133. In this manner rack bars 103, 106 are sufficiently advanced in the direction of arrow 590 until the adjusting lever 108 operated by them rests against armature 111 of electromagnet 114. The pin 100 which follows rack bars 103 (Figs. 8, 7a) takes rack bars 34, 37 along, whereby switch arms 54, 286, 10 to 14 of the idle step switch 52 of selector 287, as well as the arms of multi-selector 2, are respectively moved onto contacts 48, 48a, 22. As soon as toothed segment 126 has attained its extreme right-hand position by means of the step-pawl arrangement 132, 113, and moved in clockwise direction, the drag 143 engages, with its step 591 (Fig. 7b), pin 141 of toothed segment 126. At the subsequently occurring reversal of the motion of the aforementioned elements, the drag 143 is taken along so that it closes contact 145 (Figs. 1c, 7a) by turning lever 144 to the right. Thereby electromagnet 147 (Figs. 10, 1c) receives a current impulse. This results in the coupling of double lever 158 with coupling bar 151. The rack bar now advanced by pawl 159 of double lever 158 sets switch arm 162 of the column sequence selector onto contact 165.

Before switch arm 162 is advanced by the aforementioned step, the current flows from contact 164 of the column sequence selector 173 by way of conductor 490 to handle 491 of the contact group 464, second from the left in Fig. 12, which was originally set to the designation "quantity" 493. From electrode 475 of contact group 464 the current flows through switch arm 497 of the appertaining selector 512. Since this switch arm lies on contact 506, current is prevented from flowing through the portion 510 to contact 512 because the contact 513 of group 464 is open at that time.

When dog disc 133 (Fig. 7b) returns from its extreme left-hand position into the next position towards the right, pin 142 engages the drag 143 and thereby disengages its step 591 from the pin of the toothed segment 126. Before this happened, the current supply to electromagnet 140 had already been interrupted and pawl 130 of the toothed segment had returned into the normal resting position.

The typing of a numeric value divided into numeral groups of thousands occurs in the following manner.

After the entry of the date on the blank, as aforedescribed, has been made, the main list number "355" should be entered into column 552 of blank 550 in Fig. 17 on the first line next to the date. For this purpose, arms 334 on switchboard 336 (Figs 15, 16, 2) are adjusted in accordance with the numeric value "355". Switch arms 337 to 339 of selectors 340 through 342 are thereby set onto their respectively corresponding contacts.

Before the transfer of the numeric value "355" onto blank 550 is initiated, first the date key, 2010 (Fig. 20) which controls contact 280 with its subsidiary contacts, is to be made ineffective. When this occurs, the elements 284, 279, 278, 281 to 283, 377 of the multi-contact 280 are returned into the position shown in Figs. 20, 1a, 1b, 1c. This date key 2010 is constructed so that it releases the multi-contact, in an intermediate position to which it is now adjusted by the operator and opens a multi-arm switch 630 (Figs. 1b, 20) whereby the adjusting mechanism 221 is separated from the idle step switch 52 for the duration of the entry of the main list numeric value, for instance the value "355." In said position the selectors 340—342 (conductors 366) are connected to the step switch 52a (Fig. 20). After the entry has been made in column 552 of the blank, the date key would be returned into its initial position in which neither the multi-contact 280 nor the multi-arm switch 630 is actuated. The control of elements 280 and 630, however, may be brought about in any other suitable manner.

Following the opening of the multi-arm switch 630, key 98 (Figs. 1b, 6b) is actuated and contact 99 closes. The current again flows through elements 427 and 425 to electromagnet 424 of multi-contact relay 370 which now switches over its contacts 443, 385, 369, 383, 422, 429. Contact 429 is thereby opened. By the closing of contact 422, electromagnet 424 constantly receives current from a contact group 88, constructed as a hold-over contact, by way of elements 420 through 423, while the contact 425, actuated by cam disc 381, periodically supports the current supply at the beginning of the change-over period.

From contact 383 of the multi-contact relay 370 the current flows through lead 382 to contact 380 which is likewise controlled by cam disc 381. This contact now sends in regular sequence current impulses into the conductor system connected to it (Figs. 1a, 1b, 1c). The first current impulse flows by way of elements 379, 376, 283, 375, 373, 372 and 379, 384 through 388, as well as by way of 372 to 368 to electromagnets 83, 389, 84 respectively. A branch 367, 279 to 277 conducts current to the shank 54a of switch arm 41a which stands on contact 49A of the idle step switching mechanism 52a.

From there the current passes over lead 363 of the three-core cable 366 to switch arm 337 of selector 340 appertaining to switchboard 334, 336 and through the contact 337 of its selector and lead 317 to electromagnet 237 of typing mechanism 244. In this manner the numeral "3" of the value "355" (Fig. 17a) is printed on the first line of column 552 of blank 550. A simultaneous transfer to the calculating mechanism, not shown here, may be prevented, for instance, by opening

contact 282 through date key 2010 (Fig. 20). In the meantime, electromagnet 389 (Figs. 14, 1a) has released lever 395, so that its pawl, controlled by cam disc 393, advances step wheel 399 and thus cam discs 401 through 404 by one tooth (Fig. 5) in the direction of arrow 415. During the same time, electromagnets 83, 84 attract their armatures which in turn bring about, in the manner aforedescribed, the further advance of switch arms 54, 54a, 9 to 14 by one contact. Arm 54a is now connected with contact 50A of the idle step mechanism 52a.

The second and third current impulses sent into the aforedescribed circuits by closing contact 380 subsequently bring about the typing of the two numerals "5" representing the last two digits of the numeric value "355" in column 552 of the blank. Electromagnet 389 now advances the cam discs 401 through 404 by two further teeth into the position shown in Fig. 4.

After writing the last digit "5" of the value "355," electromagnets 83, 84 attract their armatures the last time, so far as column 552 of the blank is concerned. The rack bar 34, which has thereby been shifted a further step in the direction of arrow 562 in Fig. 6, now actuates the three-armed lever 83, which in turn changes over the electrodes of contact group 88 in Fig. 1. Multi-contact relay 370 now ceases to receive current permanently so that it becomes deenergized. The current now flows through contacts 426, 456 of contact group 88 and the leads 455, 453, 457, 458 to electromagnet 85, which brings about the return of rack bars 33, 34 and the other elements into their normal positions as well as the closing of contact group 97. The cable lead 452, which is short-circuited by lead 453, now conducts the current through the elements 452a, 451, 450, 222 to electromagnet 233 of the typing mechanism 244. Thereby a reading space of one digit is produced by feeding the carriage one idle step. Immediately upon closing of contact group 97, the current flows through element 449 of this group and by way of leads 448, 450, 222 again through electromagnet 233 which now enlarges the already existing reading space between this column and the next column by a further digit by a repeated idle spacing step. At the same time, current flows by way of element 460 of contact group 97 and the leads 461, 387, 388 to electromagnet 389, which brings about the advance of cam discs 401 through 404 into the position shown in Fig. 3. During this time the current passes from contact group 97 through the conductors 462, 463 to switch arm 162 of the column sequence selector 173 and by way of contact 165 of the latter and by way of lead 490 to the third contact group 464 from the left, which is adjusted in accordance with the denomination which the column 553 on the blank carries, to the designation "quantity" (see also Fig. 12). Thus the appertaining hand switch 491 in Fig. 12 would stand in the middle position. Since the corresponding column width selector 187 likewise remains in its normal resting position, the current passes through contact 475 and elements 496, 498, 509, 519, 523, 418, 521 to electromagnet 526 of the multi-contact relay 527, all of whose contacts are thereby changed over. The current impulse flowing to contact 165 of column sequence selector 173 flows also at the same time through the portions 183, 185, 193 of the third column width selector from the left, and also flows through element 205 to electromagnet 113 (Fig. 1c). Electromagnet 140, which has been energized by way of a branch 532 from lead 463, has already received its current before multi-contact relay 527 was energized, and initiated the adjustment of the idle step mechanism and the advance of switch arm 162 of the column sequence selector 173 to a contact 166, with the aid of electromagnet 147.

Before switch arm 162 is advanced to contact 166 of the column sequence selector 175, current continues to flow to electromagnet 389 (Figs. 1a, 1c, 14) through contact 528 of the energized multi-contact relay 527 so long as contact 418 rests with its leaf spring 417 on the nose 419 of cam disc 403. In accordance with the initial position in Fig. 3, with which we are here concerned, the circuit is interrupted after two steps of step wheel 399. Thereupon the cam discs 401 to 404 assume the position shown in Figs. 1a, 1c.

Such items as the main list identification "355" in Fig. 17a, or other often-repeated items, may be typed also by keying them into the adjusting mechanism 221. This would, however, be an advantage only with individual items which are not repeated in the next line since in that case the new adjustment at the switch plate, necessary for each entry, and the changes necessary to entirely reset the switchboard, would be too cumbersome.

If a numeric value having its characters spaced in thousands groups is to be transferred to the calculating mechanism without similar adjusting of said mechanism, the following occurs.

The numeric item 600 in Fig. 17a (the item 1 781 000) is transferred by means of a keyboard shown in Fig. 1b only diagrammatically by a key 601 (Fig. 1, right-hand upper) to the setting device 221, commencing with the first left-hand digit. The adjustment of the selectors 220 of the setting mechanism 221 may, of course, also be accomplished in known manner by means of perforated cards or the like. At each transfer of one digit number, for instance from the keyboard 601, a contact 602 is closed. Thereby electromagnet 84 is supplied with current whereupon switch arm 41 is advanced with its shank 54 with each key depression from contact to contact. After the keying of the seventh digit of item 600, the contact arm has thus arrived on contact 49 of idle step switch 52.

If now key 98 (Figs. 1b, 6b) is depressed, the current flows through contact 99, then closed, to electromagnet 424 of the multi-contact relay 370, and operates the latter. Subsequently contact group 88 becomes effective as a hold-over contact and prevents the armature of relay 370 from falling off.

The first current impulse now produced by cam disc 381 flows by way of elements 379, 376, 283, 375, 373 (Fig. 1), 372, 371, 369 (370), 368, 367, 279 (280), 277 and 384, 385 (370), 388 to electromagnets 83, 84 to arm 54 of the switch arm 41 which belongs to the idle step switch mechanism 52 and to electromagnet 389. Since arm 54 then rests on contact 49 of the switch mechanism, the current impulse passes over the eighth element (not shown in Fig. 1b) of the selector group 220 of the setting mechanism 221, whose arm then stands on contact 209, and from this contact the current flows through conductor 222a to electromagnet 324, which effects the typing of a filler character, for instance an asterisk, as the first character in column 553. When the type lever which carries this character returns into its normal position, the paper carriage is advanced its normal step as in any typewriting machine. Thereupon electromagnets 83, 84 bring about the

forward feeding of the rack bars 34, 37 in the direction of the arrow 562, and thereby produce the shifting of switch arms 41/54, 9 to 14 (Figs. 1a, 1b, 6a). Arm 54 then rests on contact 50 of the idle step switch mechanism 52. In the meantime electromagnet 389 has caused a further advance of cam discs 401 to 404 so that they now assume the position shown in Fig. 4. Since thereby the leaf springs of contact groups 374, 408 rest on some of the elevated portions 407 of cam disc 401, the current supplies to electromagnets 83, 84 and to the idle digit switch 52 are interrupted. However, the current through contact 380 (Fig. 1a) and the elements 379, 376, 375, 447, 448, 450, 222 reaches electromagnet 233 of the typing mechanism 244 and brings about a further idle step of the carriage. Thereby the reading step 610 (Fig. 17a) is produced. At the same time the current flows by way of the contacts of the multi-contact relay 370 and contact group 88 to electromagnet 389. This produces a further advance of cam discs 401 to 404. The springs of contacts 374, 408 (Fig. 3) now rest again in one of the recessed portions 406 of cam disc 401.

Now the ninth and tenth digits of the setting device 221 are entered in the same manner as was described with respect to its eighth selector element. Thereby two further asterisks are printed on blank 550 (Figs. 17a, 17b) in the column 553. Now the shank 54 of switch arm 41 leaves contact 51 of switch device 52 so that the appertaining shank 53 can pass on the first contact 42.

The next current impulse now, aside from flowing to electromagnets 83, 84, 389, flows to the idle digit switch 53 and over its contact 42 to the first left-hand selector 220 of the setting device 221. Since this selector corresponds in its position with the highest digit "1" of the numeric item 600 in Fig. 17a, the current flows through conductor 224 to electromagnet 235 of typing mechanism 244, whereby the numeral "1" is typed in the proper place. When this occurs, contact 266 is closed by the bell crank 260 (Fig. 11). This causes the current, which flows over contact 443 of multi-contact relay 370, to flow by way of contact 266 to contact 19 of the selector 5 in the multi-selector group 2 and which is allotted to the numeral "1" and thus to the correct place in the calculating mechanism. Since, immediately following the typing of any character, the cam discs 401 to 404 are advanced by one step of their step wheel, the springs of contacts 374, 408 arrive at the successive typing of three characters anew on one of the elevated portions 407 of their contact disc 401. Consequently now again a reading step 612 (Fig. 17a) is produced by an additional idle step of the paper carriage.

Thereupon the automatic typing of the number group 613 of the item 600 is produced digit for digit. Then again a reading step 614 is interposed which, as all other reading steps produced before, only effects the paper carriage by causing it to make an idle step. The transfer of the reading steps to any device other than the typing mechanism, for instance to the calculating mechanism, cannot occur. Now the last group of characters 615 of item 600 (namely 000) is produced in the typing and calculating mechanism.

After all the steps involved in the writing of the last naught of this group has occurred in the machine, again the change-over of contact groups 88, 97, caused by the rack bar 34 (Fig. 6), is produced successively. In this manner also between the numeric item 600 in Fig. 17a and the item to be entered in the next following column 554 a reading step 616, amounting to two digits, is produced.

The preparing of the machine for automatically writing numeric values divided into thousands and hundreds groups occurs as follows.

The switch arms of the multi-selector 2 and of the idle step switch 52 (Figs. 1b, 6b) are now again adjusted anew by means of electromagnet 140 and of the fourth column width selector 187 from the left (Fig. 1c) which had originally been adjusted to "5" in Fig. 1c shown in dash and dot lines. The selector 512 which is assigned to this column width selector is adjusted at its contact group 464 to money values, that is to say to the dollar character 492 (Figs. 1a, 1b, 12) while its switch arm 497 stands parallel to the arm of the aforementioned selector and rests on contact 504. The current impulse arriving over line 463, and passing over the column sequence switch when the entries in column 553 and the return of the elements concerned with this procedure return to normal, again flows by way of elements 166, 475, 496, 497, 504, 511 to contact group 464, because the path is broken there by the interruption of the contacts through the adjustment of lever 491 to the dollar value 492 in Fig. 12. If, however, the column width selector 187 had been adjusted for a column width of four digits, the aforementioned impulse would flow from contact 505 of selector 512 by way of elements 509, 512, 517, 520 to contact 410 of cam disc 402, which up to that time and after typing of the numeric item 600 in Fig. 17 had been in the position shown in Fig. 3. From contact 410 the current flows directly to relay 527 which is then changed over and permits current to flow to electromagnet 389 (Figs. 1, 14). Thereby the cam discs 401 to 404 are advanced a further step, whereby contact 410 comes to rest with its spring 409 in the next following depression 411 (Figs. 5, 1c).

However, as mentioned before, only five digits had been provided in column 554 by setting the column width selector for that value, as aforementioned, so that the cam discs 401 to 404 remain in the position (Fig. 3) assumed when the typing of the last-entered item 600 in Fig. 17a was concluded. Finally, when all elements engaged at the conclusion of the entry in column 553 are returned to normal, contact 145 is closed and the advance of the switch arm 162 appertaining to the column sequence selector 173 onto contact 167 is brought about, which contact corresponds with the column 555. Now the next numeric item 617 (Fig. 17a) can be keyed into the keyboard 601 to be entered in column 554 of the blank, and is transferred to the setting mechanism 221 (Fig. 1b) which in the meantime, in a manner not shown here, had been returned to normal. The manner of operation of the setting mechanism is disclosed more fully in a copending application of Johannes Sobisch, Serial No. 279,322. The typing of the numeric item which had previously been given into the setting mechanism 221 occurs now in the same manner as had been described with respect to the previously-entered numeric values.

At the end of the transfer of item 617 in Fig. 17 to the typing mechanism 244, the cam discs 401 to 404 are in the position shown in Figs. 1a, 1c. The changing over of contact groups 88, 97, which occurs subsequently, produces the further advance of cam discs 401 to 404 by two steps (Fig. 3) of its step wheel 399. The current impulse

(by way of conductor 463), which now runs by way of the contact group 464 which is set for dollars (492 in Fig. 12) and which represents the fifth position from the left, now flows through conductor 520 to contact 410 of cam disc 402 and thus to multi-contact relay 527 which now sends a current impulse to electromagnet 389. This causes a further advance of cam discs 401 to 404 by one step (Fig. 5). The multi-contact relay 527 thus immediately interrupts its contacts as soon as leaf spring 409 of contact 410 drops again into a depression 411 of cam disc 402 and thereby the contact elements 522 and 524 of contact group 410 are separated. Cam discs 401 thus assumes the correct initial position which corresponds with the typing of the numeric item 620 into column 555 of Fig. 17*a*.

When in this manner column 555 or 556 has finally been entered, the explanatory book entry remarks are entered in the conventional manner. Thereupon the return of the carriage and of the column sequence selector 173 into their initial positions may be brought about automatically by the machine or by hand in a manner not shown and described here.

I claim:

1. In a bookkeeping machine or the like, a carriage adapted to support a record sheet, means for feeding said carriage, means for recording on the record sheet one character at a time, means for operating said carriage-feeding means concomitantly with the operation of said recording means or independently thereof, adjustable governing means controlling said recording means and said carriage-feed operating means to cause a plurality of operations of said recording means in groups of various selected numbers of operations, separated by one or more independent operations of said carriage-feeding means, and setting means for varying differently the width of said groups for a plurality of columns.

2. In a bookkeeping machine or the like, a carriage adapted to support a record sheet, means for feeding said carriage, means for recording on the record sheet one character at a time, means for operating said carriage-feeding means concomitantly with the operation of said recording means or independently thereof, adjustable governing means controlling said recording means and said carriage-feed operating means to cause a plurality of operations of said recording means in groups of various selected numbers of operations, separated by one or more independent operations of said carriage-feeding means, said adjustable governing means comprising setting devices for a plurality of columns operable from the outside of the machine, and means for rendering said setting devices operative in succession to control the grouping in different columns of the record sheet.

3. In a bookkeeping machine or the like, a carriage adapted to support a record sheet, means for feeding said carriage, means for recording on the record sheet one character at a time, means for operating said carriage-feeding means concomitantly with the operation of said recording means or independently thereof, adjustable governing means controlling said recording means and said carriage-feed operating means to cause a plurality of operations of said recording means in groups of various selected numbers of operations, separated by one or more independent operations of said carriage-feeding means, said adjustable governing means comprising a plurality of manipulative devices, means for rendering said devices operative in succession to control the grouping in different columns of the record sheet, and means for modifying the total number of operations of said recording means in each column of the record sheet.

4. In a bookkeeping machine or the like, a carriage adapted to support a record sheet, means for feeding said carriage, means for recording on the record sheet one character at a time, means for operating said carriage-feeding means concomitantly with the operation of said recording means or independently thereof, means to control said recording means comprising a plurality of settable devices operable from the outside of the machine, said devices being adapted to vary differently the width of groups of the numbers to be recorded for a plurality of columns, means for initiating an operation of the machine, means operating in response to said last means for causing successive operations of said recording means controlled in sequence by said settable devices, and adjustable governing means controlling the operation of said recording means jointly with said settable devices to subdivide the operations thereof into groups separated by independent operations of said carriage-feeding means.

5. In a bookkeeping machine or the like, a carriage adapted to support a record sheet, means for feeding said carriage, means for recording on the record sheet one character at a time, means for operating said carriage-feeding means concomitantly with the operation of said recording means or independently thereof, adjustable governing means controlling said recording means and said carriage-feed operating means to cause a plurality of operations of said recording means in groups of various selected numbers of operations, separated by one or more independent operations of said carriage-feeding means, manipulative devices to control said governing means, comprising multi-contact electrical switches each having a plurality of contact positions, one for each kind of grouping.

6. In a bookkeeping machine or the like, a carriage adapted to support a record sheet, means for feeding said carriage, means for recording on the record sheet one character at a time, means for operating said carriage-feeding means concomitantly with the operation of said recording means or independently thereof, and adjustable governing means controlling said recording means and said carriage-feed operating means to cause a plurality of operations of said recording means in sub-groups of various selected numbers of operations separated by single independent operations of said carriage-feeding means to provide reading spaces, and in main groups separated by plural independent operations of said carriage-feeding means to provide column spacing.

7. In a bookkeeping machine or the like, a carriage adapted to support a record sheet, means for feeding said carriage, means for recording on the record sheet one character at a time, means for operating said carriage-feeding means concomitantly with the operation of said recording means or independently thereof, switch control mechanism governing said recording means and said carriage-feed operating means including a plurality of cams, means for stepping said cams forward with each operation of said carriage feed means, and circuit means including switches operated by said cams to cause operations of said recording means in groups of certain numbers of operations different for each cam and inde-

pendent operations of said carriage feed means between the groups, and means for setting the machine for control by a selected one of said cams.

8. A machine as described in claim 1, wherein selector means for a plurality of orders are provided for setting up, irrespective of decimal value, numbers to be recorded by said recording means, and means to cause said recording means to record automatically first a number of "blank" signs corresponding to the number by which the number of digits set up in said selector means falls short of a given number of digits, and then, in succession, the digits of the number set up in said selector means.

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