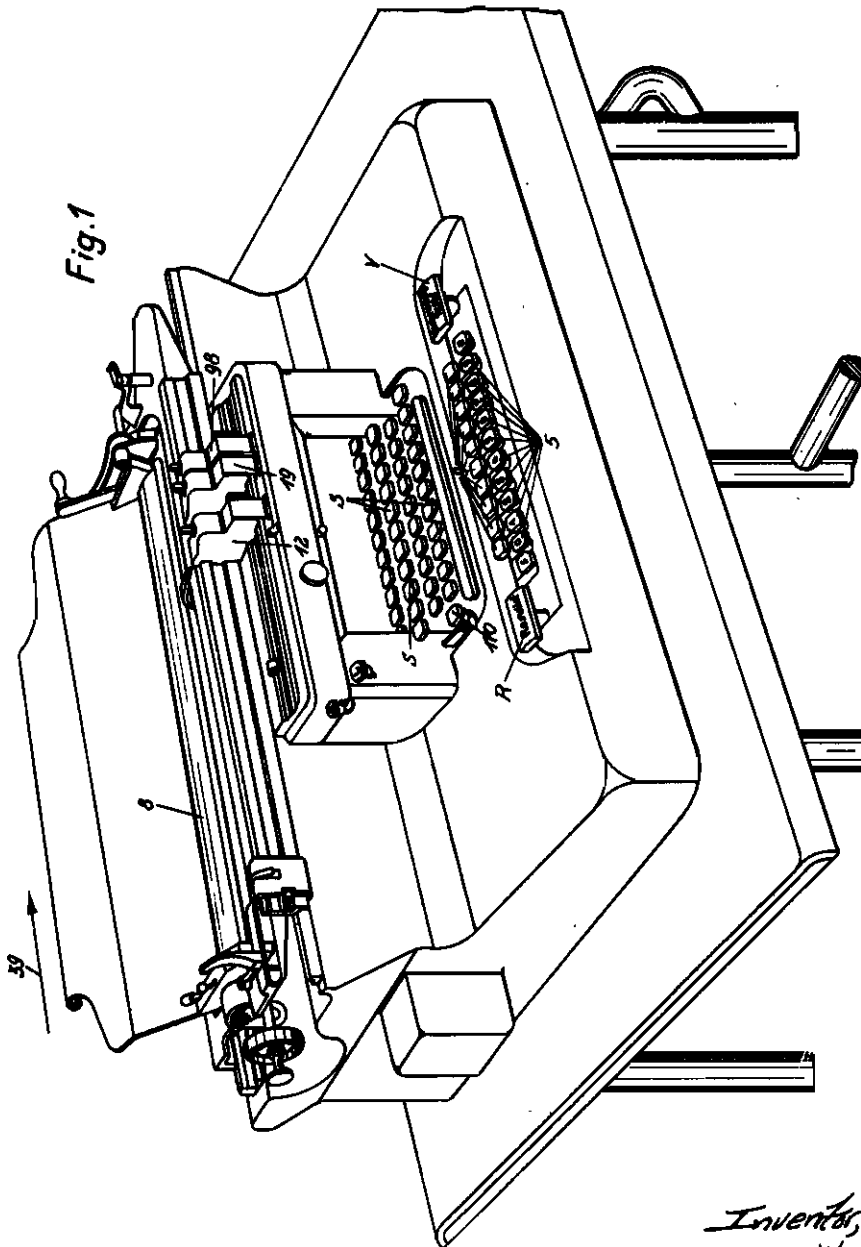


PUBLISHED  
MAY 25, 1943.  
BY A. P. C.

R. ANSCHÜTZ  
BOOKING MACHINES, ESPECIALLY  
TYPEWRITING-CALCULATING  
MACHINES EQUIPPED WITH  
TOTAL-TAKING MECHANISM  
Filed April 30, 1941

Serial No.  
391,202  
10 Sheets-Sheet 1



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

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Serial No.  
391,202  
10 Sheets-Sheet 2

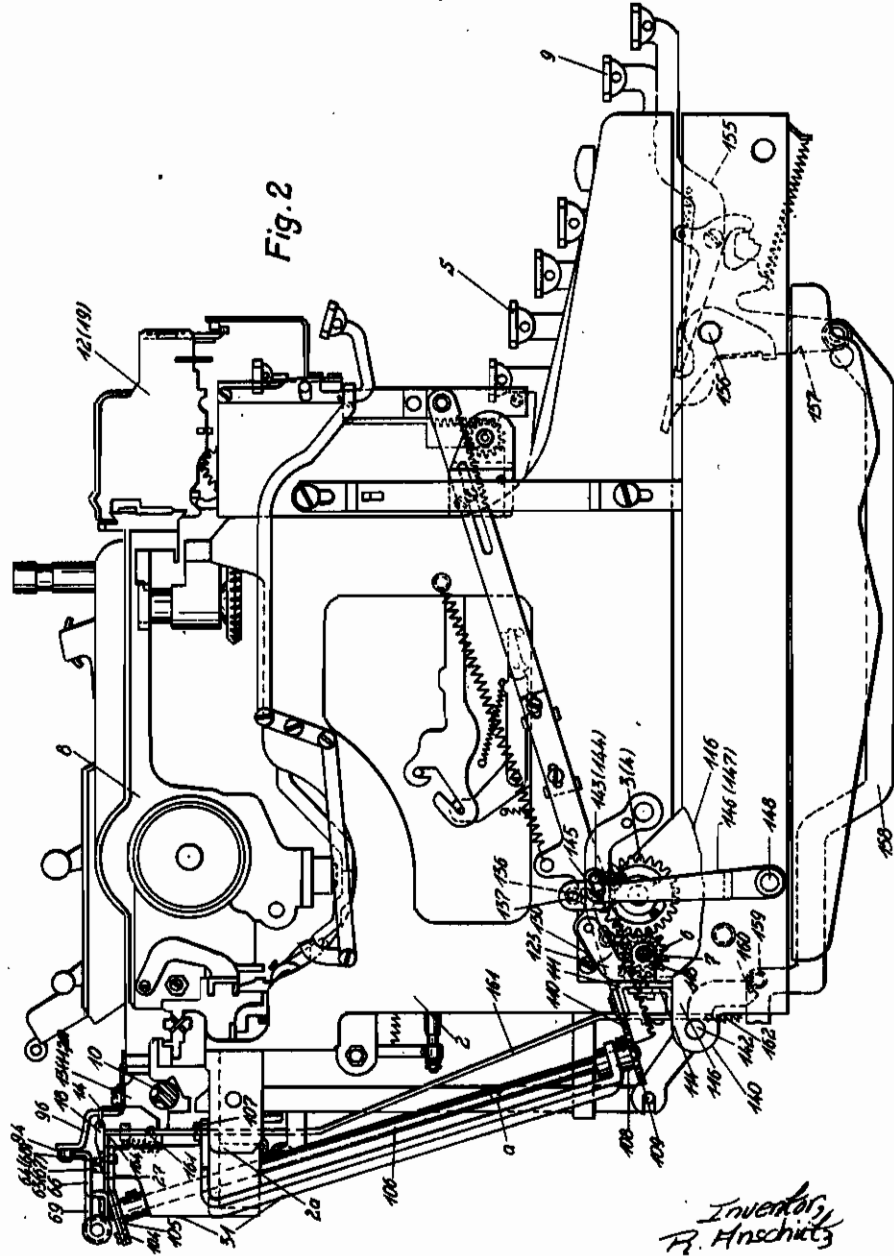


Fig. 2

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PUBLISHED  
MAY 25, 1943.  
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Serial No.  
391,202  
10 Sheets—Sheet 3

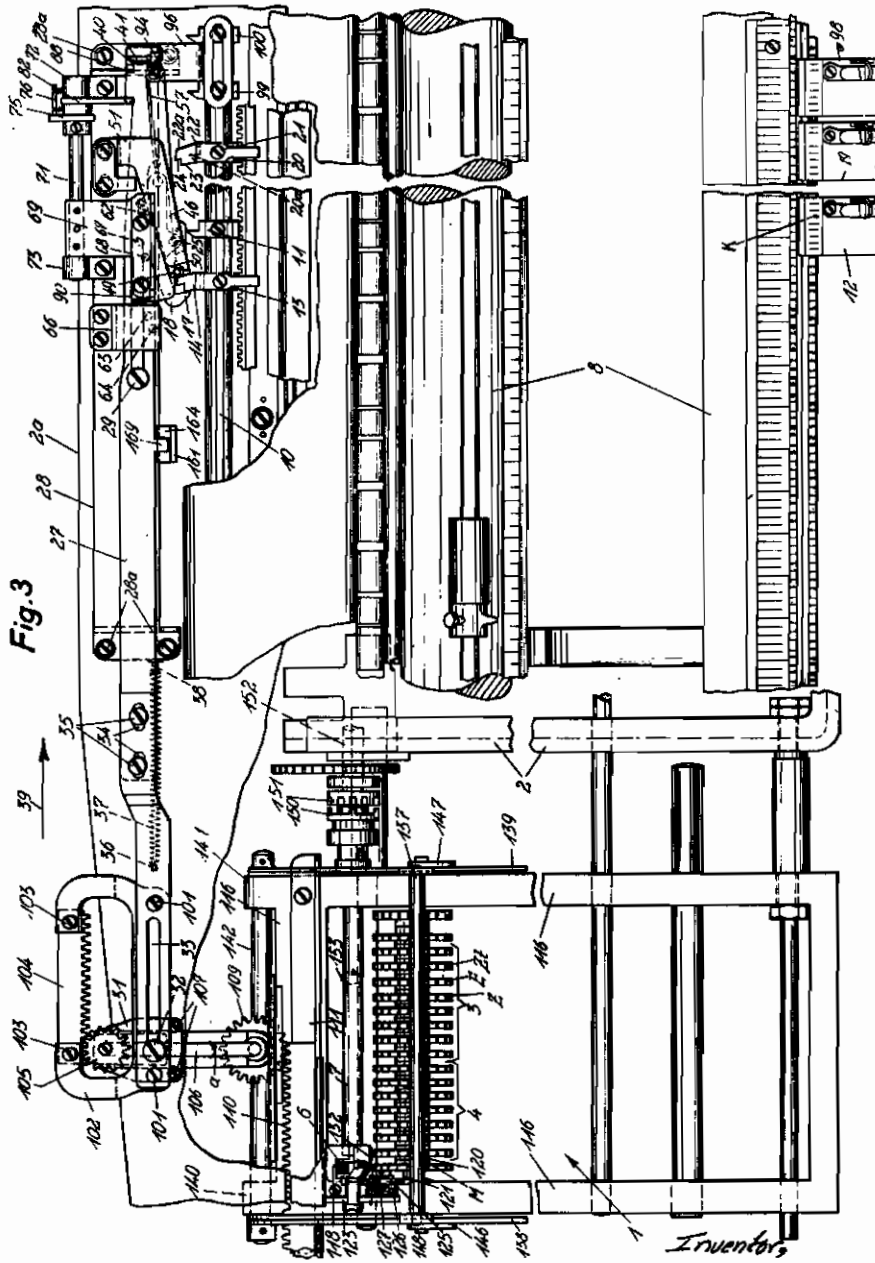


Fig. 3

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PUBLISHED  
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Serial No.  
391,202  
10 Sheets-Sheet 4

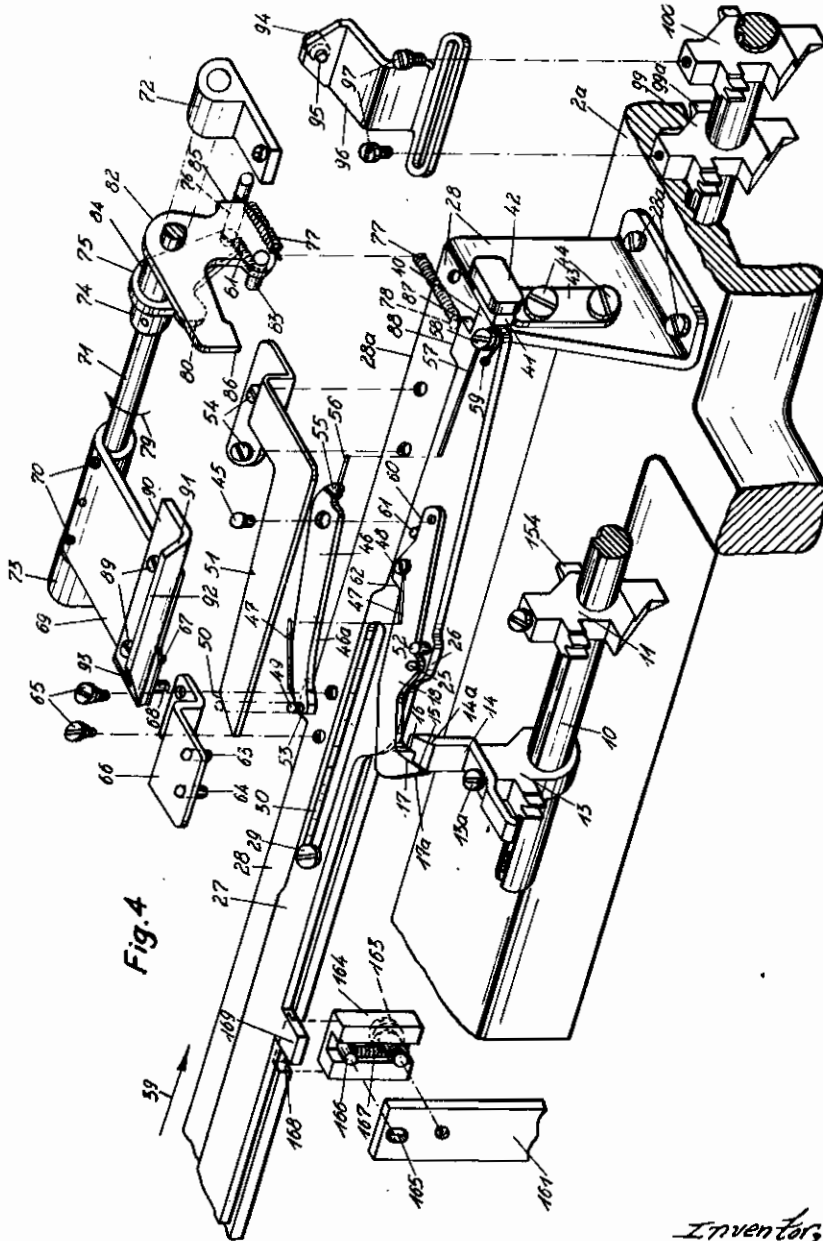


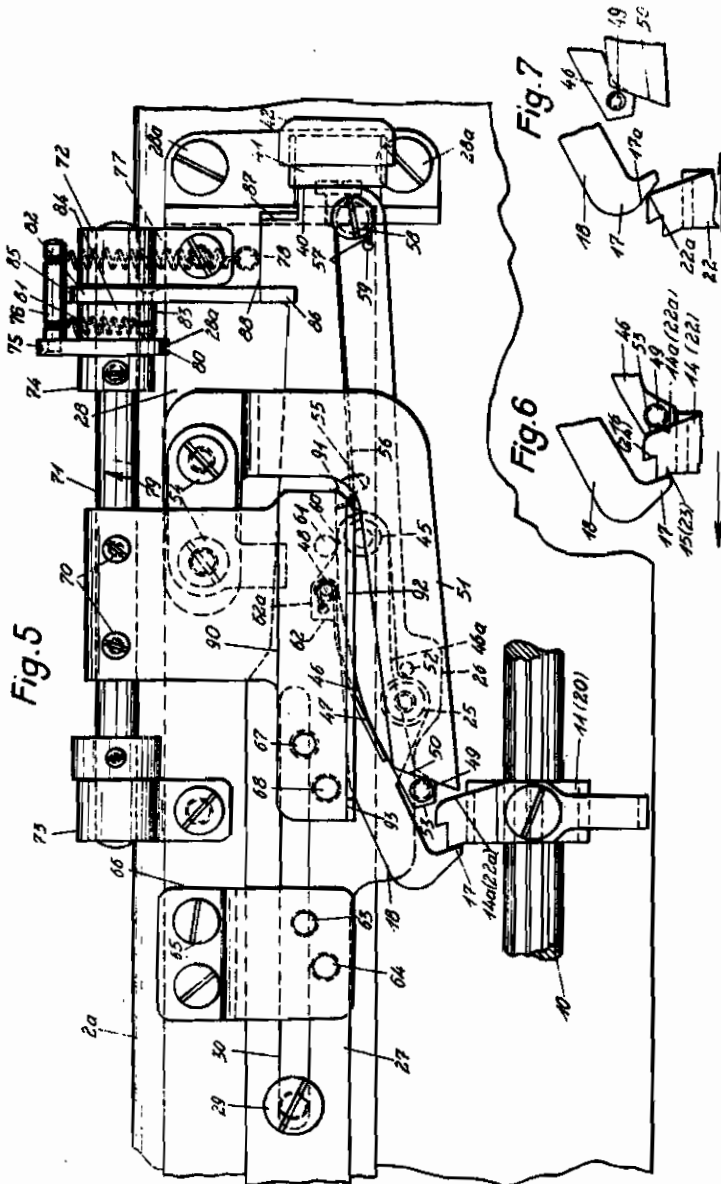
Fig. 4

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PUBLISHED  
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Filed April 30, 1941

Serial No.  
391,202  
10 Sheets-Sheet 5



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PUBLISHED  
MAY 25, 1943.  
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TYPEWRITING-CALCULATING  
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Filed April 30, 1941

Serial No.  
391,202  
10 Sheets-Sheet 6

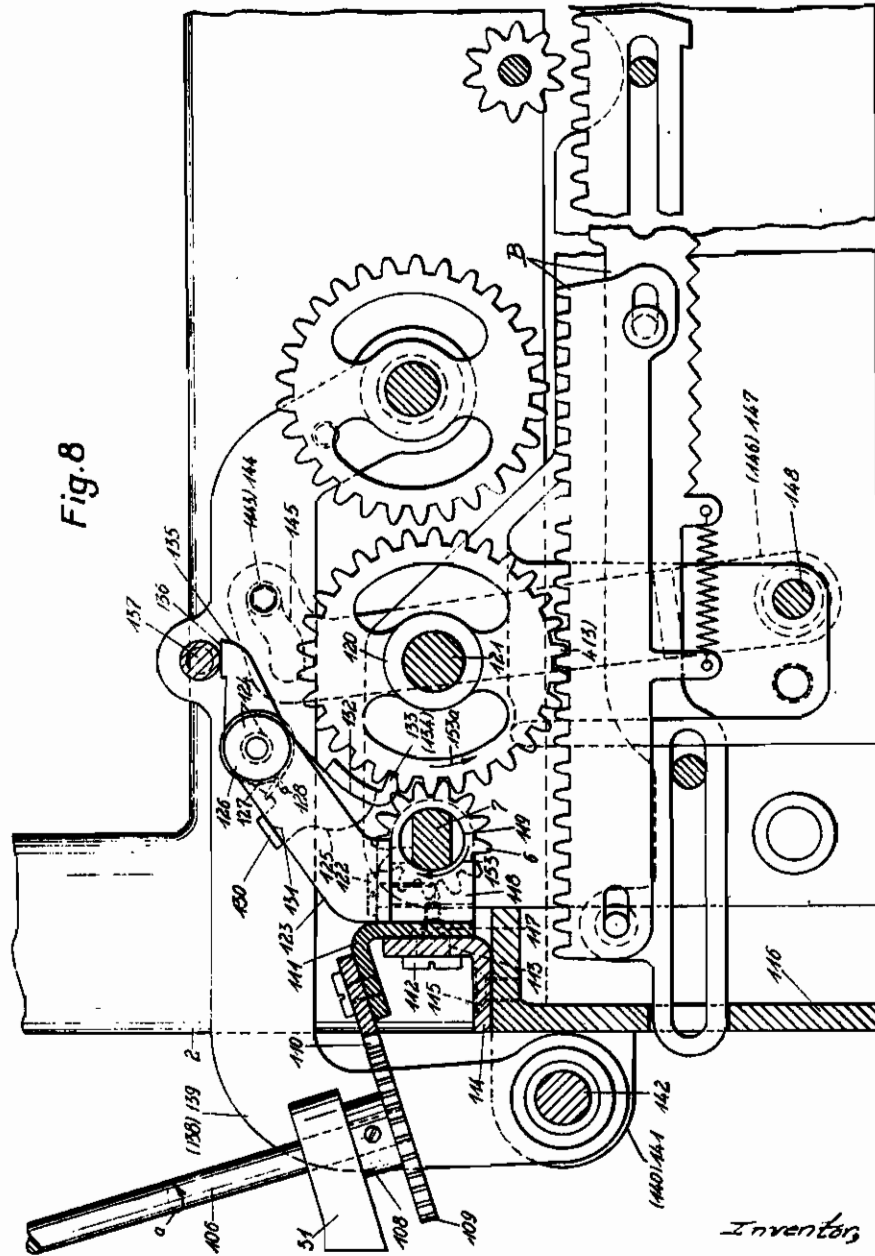


Fig. 8

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PUBLISHED  
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TOTAL-TAKING MECHANISM  
Filed April 30, 1941

Serial No.  
391,202  
10 Sheets-Sheet 7

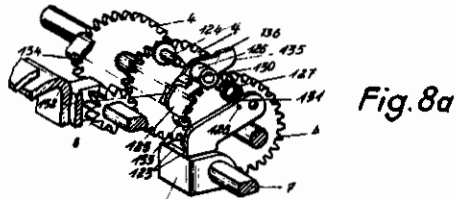


Fig. 8a

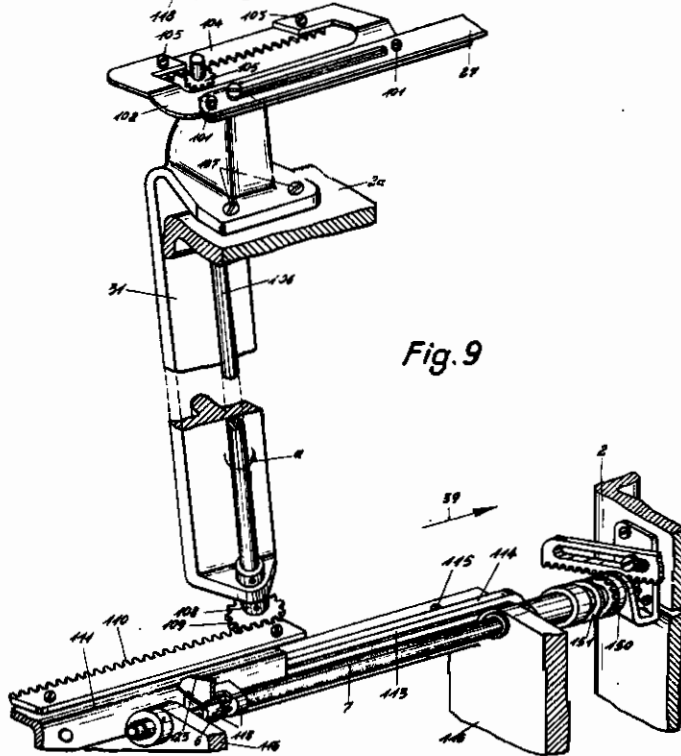


Fig. 9

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PUBLISHED  
MAY 25, 1943.  
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Filed April 30, 1941

Serial No.  
391,202  
10 Sheets-Sheet B

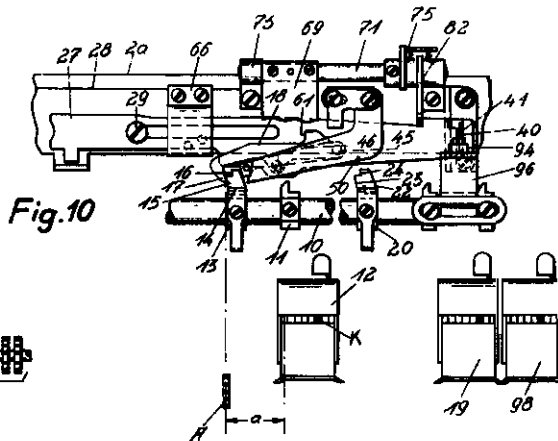
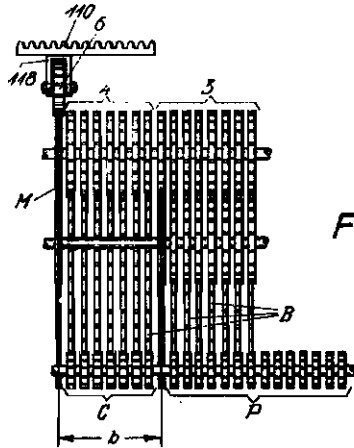


Fig. 10

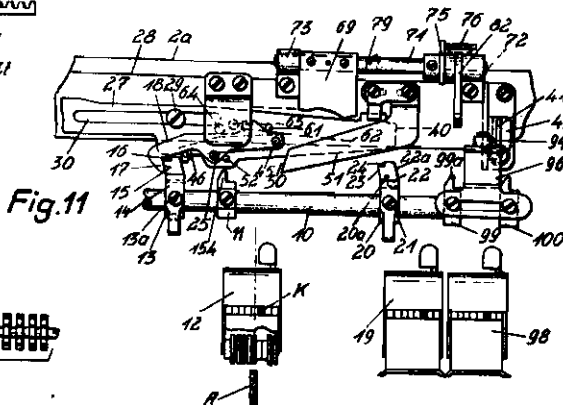
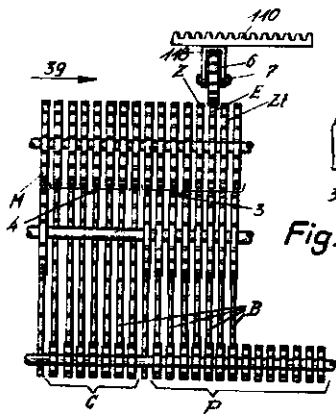


Fig. 11

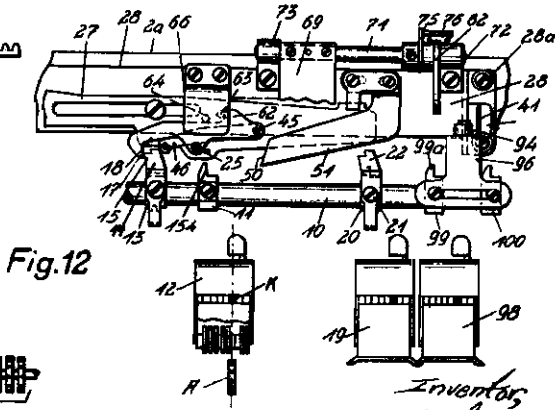
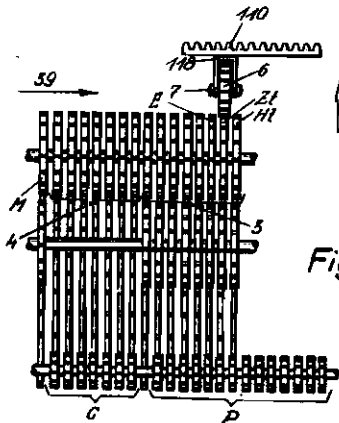


Fig. 12

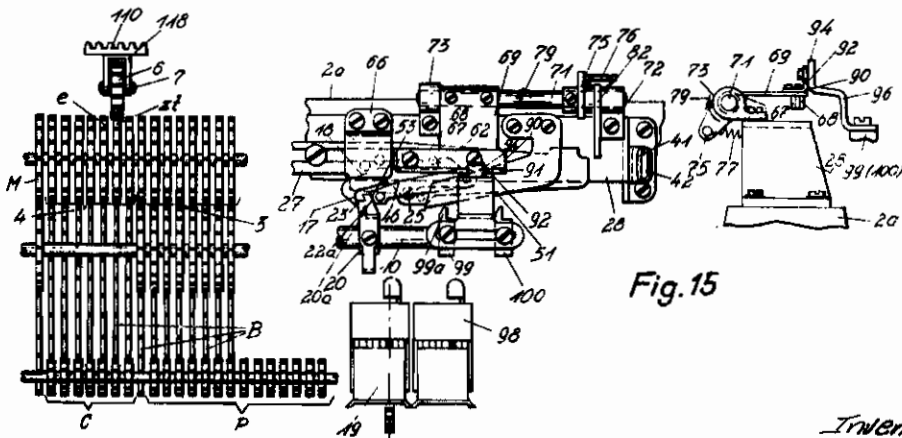
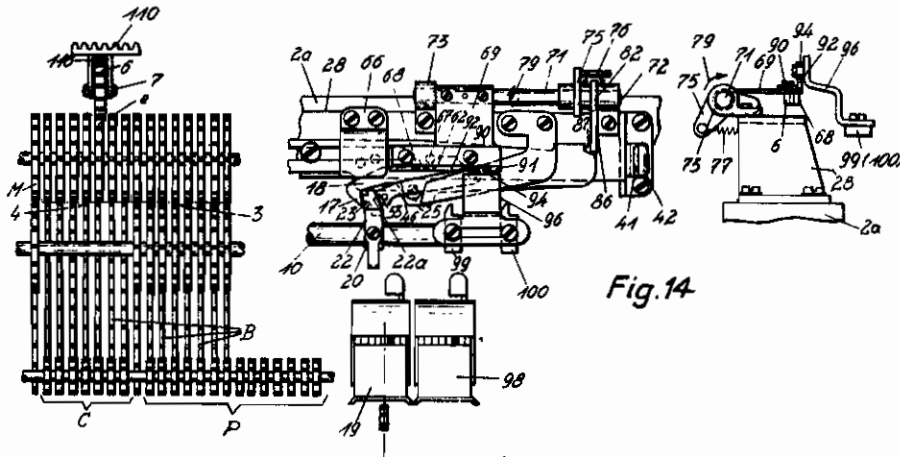
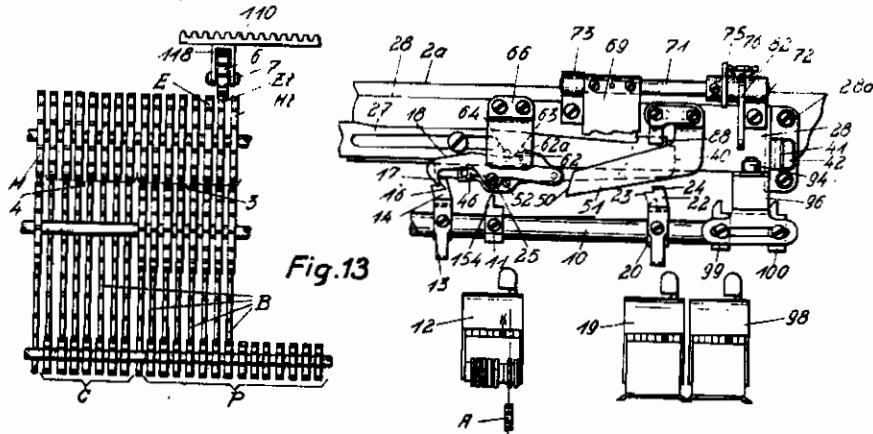
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Filed April 30, 1941

Serial No.  
391,202  
10 Sheets-Sheet 9



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PUBLISHED  
MAY 25, 1943.  
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Serial No.  
391,202  
10 Sheets-Sheet 10

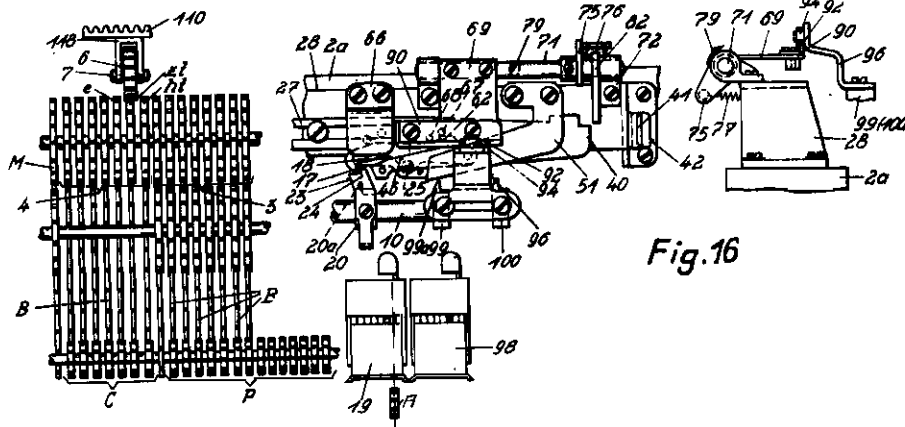


Fig. 16

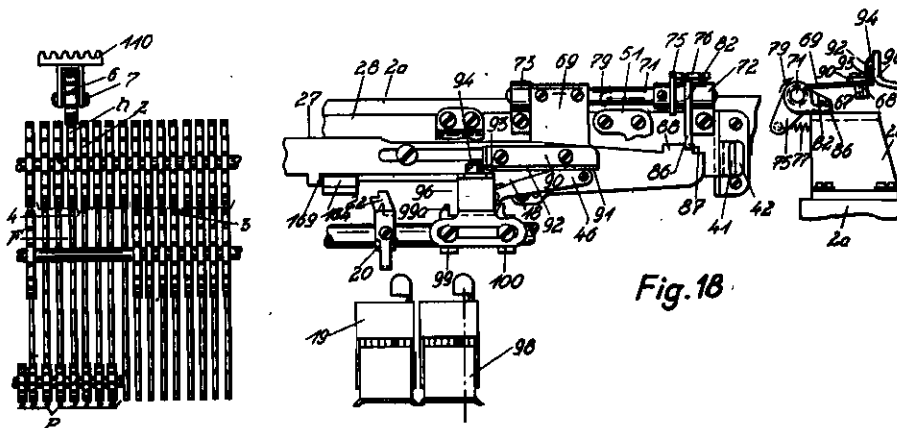


Fig. 18

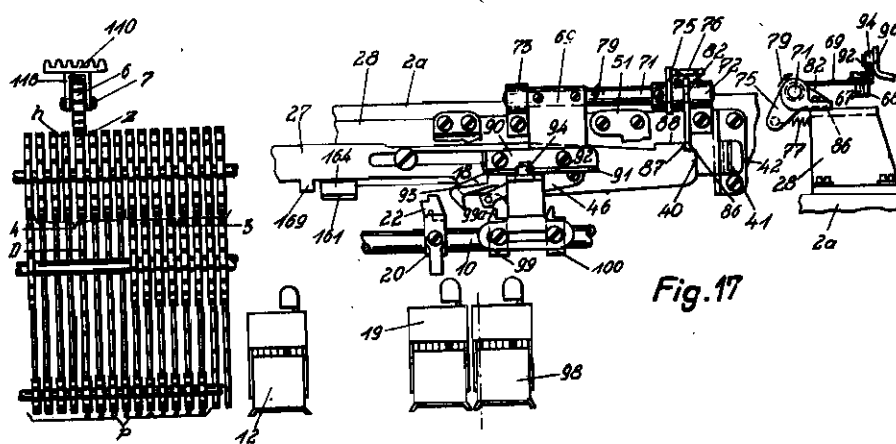


Fig. 17

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# ALIEN PROPERTY CUSTODIAN

## BOOKING MACHINES, ESPECIALLY TYPEWRITING - CALCULATING MA- CHINES EQUIPPED WITH TOTAL-TAK- ING MECHANISM

Robert Anschütz, Zella-Mehlis, Germany; vested  
in the Alien Property Custodian

Application filed April 30, 1941

This invention relates to booking machines, especially typewriting-calculating machines equipped with total-taking mechanism.

In known machines of this kind, selection of the multiplicand- and multiplier places of a multiplying mechanism was done electrically, but owing to the sensitiveness of electrical transfers, trouble has been experienced quite often with machines of this kind.

According to the invention these disadvantages are eliminated by means of a coupling device controlled in dependence of the paper carriage for decimal switching of a transfer member driven by the total-taking mechanism for entering the factors in the factor place and for taking the product from the product mechanism.

In the accompanying drawings one form of carrying out the invention is shown by way of example, viz:

Fig. 1 shows a perspective view of a typewriting-calculating machine including the device according to the invention.

Fig. 2 shows a left-hand side view of the typewriting-calculating machine, the housing and some parts being shown broken off or broken out.

Fig. 3 shows a plan view of a part of the paper carriage and the multiplying mechanism of the typewriting-calculating machine, in which for better display some parts are broken off or out and the parts are shown in rest position.

Fig. 4 shows a perspective view, as viewed from the right front of the machine, of the coupling device of the paper carriage, and part of the coupling rods according to Fig. 3, some parts being drawn apart telescopic-fashion for better illustration.

Fig. 5 shows a plan view of a section of Fig. 3, upon an enlarged scale.

Fig. 6 shows the coupling connection between the paper carriage and the coupling rod system in the direction of carriage movement.

Fig. 7 shows the parts according to Fig. 6 during the return of the carriage.

Fig. 8 shows a section of Fig. 2 upon an enlarged scale.

Fig. 8a shows a perspective view of individual parts according to Fig. 8, viewed from the right rear of the machine, these parts being drawn apart telescope-fashion for better display.

Fig. 9 shows a perspective view, as viewed from the left front, of the gears between the coupling rods and the small wheel registering the values in the multiplying mechanism.

The Figs. 10 to 18 show in schematic view var-

ious positions of the device in accordance with the invention, as follows:

Fig. 10 shows that position in which on tabulating the driving connection is established between the paper carriage and the device according to the invention, for the purpose of entering the multiplicand.

Figs. 11 to 13 show the positions before, during and after the skipping of the comma position when entering the multiplicand.

Figs. 14 to 16 show the positions before, during and after the skipping of the comma position when entering the multiplier, and

Figs. 17 and 18 show the positions before and after the comma position during the product total-taking.

### General-description

The present device according to the invention is for use on a typewriting-calculating machine with automatic total-taking device, which besides the conventional species (addition, subtraction) is also equipped for multiplication. A multiplying mechanism 1 (Fig. 3) suitable for forming the product from two factor values is preferably mounted on the left beside the machine frame 2. The factor values are suitably entered by decimal places in gear systems provided for this purpose within said multiplying mechanism 1 (multiplicand gear 3 and multiplier gear 4) by way of the conventional calculating keys 5 (Fig. 1) depressed during normal calculations (addition and subtraction) and by means of the customary total-taking device (not shown). These processes have been described in detail in the Patent — (Patent application Ser. Nr. 338,272, filed May 31, 1940) and therefore need not be further explained here.

The entry by decimal places of the factor values into the multiplying mechanism 1 (Fig. 3) and after their product has been computed the removal of the product value from the multiplying mechanism 1 is effected by way of a registering wheel 6 (Figs. 2, 3, 8). The latter is mounted to slide but not to revolve on a shaft 7 driven by the total-taking mechanism of the typewriting-calculating machine and is set by the mechanism according to the invention in dependence of the paper carriage movement with respect to the gear wheel of one of the chain of gears 3 or 4 (Figs. 8 and 3) corresponding to the decimal place selected during the tabulating of the paper carriage 8. The gear system 3 consists of eight wheels arranged in parallel by decimals by means of which any desired multiplier

is entered by decimals into the multiplying mechanism.

The device according to the invention is arranged as follows:

*Arrangement of the coupling device—*

As is known, in order to limit a left-hand movement of the paper carriage 8 which has been started by depressing the respective tabulator key of a decimal tabulator keyboard 9 (Fig. 1), corresponding tabulator riders are set on a tabulator rider bar 10 (Figs. 2 to 4) arranged on the rear section of the paper carriage 8. A similar tabulator rider is also set on the rider bar 10, opposite the column totalizer 12 intended for storing the multiplicand value, in such a way that as soon as the column totalizer 12 with its comma position K (Fig. 10) moves into operating position, the rider 11 by its lug 154 (Fig. 4) will positively release the paper carriage 8 to move one step towards left so that automatic skipping of the comma is effected. A similar rider 13 is mounted on the left, as viewed from the front of the machine, beside this tabulator rider 11 at a distance marked *a* in Fig. 10. The distance marked *a* which is limited on one side by the driving gear A of the calculating mechanism of the machine and on the other side by the highest calculating place of the column totalizer 12 storing the multiplicand, corresponds to the distance *b* reaching from the place M of the multiplying device controlling the multiplication as far as the highest place of the multiplicand gear system 3. It should be noted, however, that latter rider 13 does not cooperate with the decimal tabulator device of the typewriting-calculating machine.

A coupling hook 14 is screwed to said rider 13 by means of a screw 13a (Fig. 4). This hook 14 at its upwardly and rearwardly bent portion has a coupling edge 15 as well as a second coupling edge 16 which is recessed towards right by one shifting step of the paper carriage. The edge 15 during the tabulating into the operating position of one of the calculating places of the column totalizer 12 to the left of the comma position K engages a lug 17 of a pawl 18 whereas this lug 17 of the pawl 18 is engaged by the lug 16 of the coupling hook 14 during the comma skip, and as the calculating places of the column totalizer 12 to the right of the comma position K are moved into operating position.

Opposite the column totalizer 19 for storing the multiplier value, another tabulator rider 20 (Fig. 3) corresponding to the rider 11 is set on the tabulator rider bar 10 in such a way that as soon as the totalizer 19 with its comma position moves into operating position, the rider 20 with its lug 20a will positively start a shifting step of the paper carriage 8 towards left for the purpose of automatically skipping the comma position. A coupling hook 22 is fixedly screwed to this tabulator rider 20 by means of a screw 21 in such a way that its coupling edges 23 and 24 can also cooperate with the lug 17 of pawl 18. The pawl 18 (Figs. 3 to 5) is mounted to swing on a projection 28 of a slide 27 by means of a screw 25. The slide 27 is mounted to slide horizontally on a U-shaped supporting bridge 28. For this purpose a headed screw 29 screwed into the supporting bridge 28 projects through a longitudinal slot 30 of the slide 27 and another headed screw 32 screwed into a supporting member 31 (Fig. 3) extends through a longitudinal slot 33 of the slide 27. The slide 27 suitably comprises two parts which can be adjusted by means of screw-slot con-

nections 34, 35 to form an integral unit. One end of a tension spring 37 is fastened to a pin 36 which is riveted in the slide 27. The opposite end of said spring is hooked in a suspension bar 38 which is fastened to the supporting bridge 28. This spring 37 constantly tends to move the slide 27 towards right (arrow 38) which movement is limited by the right end 40 (Figs. 3 and 4) of slide 27 striking against a rubber stop 41. The rubber stop 41 is fastened in a metal box 42 which by means of screws 44 protruding through its downward extended arm 43 is screwed to the supporting bridge 28. This bridge is itself mounted on the rear supporting bar 2a of the machine frame 2 by means of screws 28a. A locking pawl 46 is mounted to swing on the right arm of the above-mentioned pawl 18 (Figs. 3 and 5) by means of a riveted pin 45. The locking pawl 46 supports one arm of a torsion spring 47 which is coiled around a screw 48 threaded into the pawl 18 and constantly tends to move the pawl 48 anticlockwise around the riveted pin 45. When the slide 27 is in rest position, however, (Figs. 4 and 5), a pin 49 which is riveted into the locking pawl 46 is supported by a bevel 50 of a control member 51 thus preventing any further movement of the locking pawl 46. If, however, this locking 48, 58 is released, as will be described later, the torsion spring 47 moves the locking pawl 46 anticlockwise around the riveted pin 45 so that the front edge 46a of the pawl 46 will strike against a stop pin 52 riveted into the slide 27. In this position the locking pawl 46 by means of its slanted edge 53 can cooperate with one of the chamfered edges 14a or 22a of the coupling hooks 14 or 22. The control member 51 is screwed to the supporting bridge 28 by means of screws 54.

The right end 55 of the locking pawl 46 is shaped like a hook from which the longer arm 56 of a torsion spring 57 is suspended. The torsion spring 57, which is coiled around a screw 58 threaded into the slide 27 and by means of its short arm protrudes into a bore-hole of the slide 27, tends to move the locking pawl 46 anticlockwise around the riveted pin 45. Owing to the lock 48, 50, pawl 46 cannot participate in this movement, so that the tendency of the torsion spring 57 will be transferred to the pawl 18 by way of the rivet connection 45, 18, causing the latter to swing anticlockwise around the screw 25 until in its rest position the pawl 18 by its rear edge 60 strikes against a pin 61 fastened in the slide 27.

The pawl 18 also has a slanting edge 62 which when entering the multiplicand, at the moment of skipping the comma position K (Figs. 11 and 13) provided in the column totalizer 12 storing the multiplicand, cooperates with a pin 63 (Figs. 4 and 5) and, after the entry of the multiplicand has been completed, with a pin 64. Both pins 63 and 64 are fastened in a supporting member 66 screwed to the supporting bridge 28 by means of screws 65 and are spaced from each other by the distance of two shifting steps. When entering the multiplier, the slanting edge 62 of the pawl 18, at the moment of skipping the comma position provided in the column totalizer 19 storing the multiplier, engages a pin 67, and after the entry of the multiplier has been completed, a pin 68. These pins 67 and 68 are arranged in the same manner as the pins 63 and 64 but are fastened in a flap 69 mounted to swing, whereas its pins 67 and 68 whilst the flap is in rest position are outside of the pathway of the edge 62 of the pawl 18, as will be hereinafter explained. The

flap 69 is screwed on a shaft 71 by means of screws 70 and said shaft 71 is mounted to revolve in two supports 72 and 73 fastened on the supporting bridge 28. A lever 75 is also rigidly mounted on the shaft 71 by means of a hub 74. A spring suspension pin 76 is riveted to said lever 75, and engaged by one end of a spring 77 whose opposite end is suspended from a pin 78 fastened in the supporting bridge 28 and influences the members 75, 71 and 89 in the direction of arrow 79 until in its rest position a lug 80 of lever 75 strikes against the rear edge 28b of the supporting bridge 28. Suspended from the pin 76 of the lever 75 is another spring 81 which with the other end is fastened to a pin 83 riveted to a locking lever 82. The locking lever 82 is mounted to swing on the shaft 71 by means of a hub 84 and is constantly influenced around the shaft 71 in the opposite direction of arrow 79 by the above-mentioned tension spring 81 until in the rest position its catch 85 strikes against the pin 76. The locking lever 82 is also provided with a back-catch 86 which at the right moment is capable of cooperating with the right front edge 67 of a lug 88 mounted on the slide 27.

A bar 90 is screwed on the flap 69 by means of screws 89 (Fig. 4). This bar 90 is bent upwards at its front part and there provides an oblique surface 91, a horizontal surface 92 and another oblique surface 93. These control surfaces 91, 92, 93 of the rail 90 can cooperate with a roller 94 (Figs. 2 to 4). The roller 94 is mounted to revolve on a supporting member 96 by means of a rivet 98 (Fig. 4). The said member 98 at one end is mounted for adjustment by means of screws 97 on the tabulator rider 99 set on the tabulator bar 10 opposite the column totalizer 93 storing the product and at its opposite end is mounted for adjustment on another tabulator rider 100.

#### *Arrangement of the setting mechanism for the registration wheel 6*

A U-shaped member 102 is fastened at the left end section of the slide 27 by means of screws 101 (Figs. 3 and 9) and a ratchet 104 is screwed to said U-shaped member 102 by means of screws 103. The teeth of this ratchet are in mesh with a cog wheel 105, having, e. g. 12 teeth, which is fastened to the upper end of a shaft 106 (Figs. 2, 3 and 9), mounted to revolve in the supporting member 31 previously mentioned which is screwed to the rear supporting bar 2a of the machine frame 2 by means of screws 107. At the lower end of shaft 108 (Figs. 2, 3, 8 and 9) a cog wheel 109 with e. g. 20 teeth is rigidly mounted by means of a sleeve 108. Said toothed wheel 109 is in mesh with a ratchet 110 which is screwed on the slanted part of a slide 111 referred to henceforth as "sliding carriage 111." By means of the headed screws 112 (Fig. 8), the heads of which move in guide slots 113 of a rectangular bar 114, the sliding carriage 111 is mounted to slide on the bar 114, in horizontal direction. The bar 114 is fastened to the rear section of the frame 116 containing the multiplying mechanism, by means of screws 115.

A U-shaped setting member 118 (Fig. 9) is also fastened to the sliding carriage 111 by means of a screw 117 (Fig. 8), which by means of bore holes 119 (Fig. 8) drilled in its leg encircles with little play the shaft 7 of the multiplying mechanism 1 (Fig. 3). The registering wheel 6 is mounted to slide but not to revolve on the shaft 7 between the two legs of the setting member 118. Conse-

quently, wheel 6 is forced to participate in the horizontal movement of the sliding carriage 111 meshing consecutively with each of the toothed wheels of the gear systems 3 and 4 (Figs. 2, 3 and 8).

In the rest position of the coupling rod system 18, 27, 106, 111, the registering wheel 6, as may be seen on Fig. 3, is in mesh with the toothed wheel M controlling the multiplication proper, and mounted to the left of the multiplier train of wheels 4.

The individual toothed wheels of the gear systems 3 and 4 are loosely mounted to turn side by side on a shaft 121 fixed in the frame 116 of the multiplying mechanism 1 by means of their hubs 120 (Fig. 3). Consequently, the front surfaces of said hubs 120 of the adjoining gears will rub against each other so that it might be possible for the adjoining wheels to the left and to the right of one particular wheel in the train of wheels 3 and 4 to be taken along so that certain values are registered unintentionally. In order to avoid such faulty registrations, the following device has been provided.

#### *Device for preventing the frictional turning of wheels adjoining the wheel to be revolved within the train of wheels 3 and 4*

A bent supporting member 123 is mounted on the setting member 118 (Figs. 3, 8 and 8a) by means of a screw 122 (Fig. 8). A catch pawl 125 by means of its hubs 126 is mounted to swing on a headed screw 124 which is screwed in the forwardly bent part of the supporting member 123. A coil spring 127 is wound around the hub 126 of the catch pawl 125. One arm of said spring 127 is fastened in a bore hole 128 of the supporting member 123, whilst its other arm rests on the catch pawl 125. The coil spring 127 tends to move the catch pawl 125 constantly anticlockwise around the screw 124 (Fig. 8) until in the rest position a bent lug 130 of the pawl 125 comes to lie upon the upper edge 131 of the supporting member 123. The catch pawl 125 (Figs. 8 and 8a) is also provided with a bent catch 132 having two catch teeth 133 and 134 which enter into the opposite recesses of those wheels of the wheel system 3 and 4 which adjoin the particular gear in mesh with the registering wheel 6.

The catch pawl 125 is also provided with a forward pointing arm 135, the upper edge 136 of which is in slight contact with a bar 137 (Figs. 3 and 8). Said bar 137 is mounted at the left in a lever 138 (Figs. 3 and 8) and at the right in a lever 139. Both levers 138 and 139 are fastened rigidly on a shaft 142 which is mounted to revolve in the supporting catches 140 and 141 of the frame 116. The lever 138 (Figs. 2, 3 and 8) has a pin 143 and the lever 139 has a pin 144 riveted in. These pins protrude through curved longitudinal slots 145 of the levers 146 and 147 which are mounted on a shaft 148 supported in the frame 116. The shaft 148 and the levers 146 and 147 can be moved clockwise (Fig. 8) by means of suitable means not shown when depressing an operating key R (Fig. 1), whereby the multiplying process, that is calculating of the product, is started. If this is the case, the pinslot connections 145, 143 and 145, 144 as well as the members 137, 138, 139 and 142 are likewise moved clockwise (Figs. 2 and 8) around the pivots 140, 141. Simultaneously the bar 137 acts upon the edge 136 (Fig. 8a) of the arm 135 of the catch pawl 125, moving the latter against the coil spring 127 clockwise around the screw 124. Accord-

ingly, the catch teeth 133 and 134 of the catch pawl 125 move out of the opposite recesses of the toothed wheels of the gear systems 3 or 4, just locked by them, so that these toothed wheels are released for revolving. This is necessary since when calculating the product, the individual wheels of the gear systems 3 and 4 are revolved simultaneously more or less by means of a ratchet system B (Figs. 8 and 10) not explained in detail.

When the operating key R, which starts the multiplication, is not depressed, the above-mentioned members are kept in rest position (Fig. 8), so that those toothed wheels of the gear systems 3 or 4 respectively, which are located to the right or left of the toothed wheel just in mesh with the registering wheel 6, are prevented from turning.

#### OPERATING METHOD OF THE COUPLING DEVICE

##### *Entering of the multiplicand*

The operating method of the device according to the invention will be explained for better understanding by way of a simple multiplication chosen at random, as follows:

$$3,25 \times 1,40$$

It should be noted that in the following the place to the left of the comma will be referred to as "units place" and the places to the right of the comma as "tenths"—or "hundredths place."

First the conventional preparations are made for booking on the typewriting-calculating machine and the paper carriage 8 is brought into its extreme right position. Then a preparatory key V (Fig. 1) is depressed, whereby the typewriting-calculating machine is set for multiplication, as described in the Patent — (Patent application Ser. Nr. 338,272, filed May 31, 1940).

By depressing the key corresponding to the units-place of the decimal tabulator keyboard 9, the paper carriage 8 is moved towards left in the conventional manner until the units-place of that respective column totalizer 12 is put into operating position, that is, opposite the driving gear A (Fig. 11), in which the multiplicand value "3,25" shall be stored.

During this movement towards left of the paper carriage, the coupling hook 14 in the position of the paper carriage shown in Fig. 10 with its catch 15 engages the hook 17 of the pawl 18 so that the coupling rods 18, 27, 46, (Figs. 4, 5) thereby participate in the further movement of the paper carriage towards left. In this beginning of the movement the pin 49 of the locking pawl 46 slides from the oblique edge 50 of the control member 51. Consequently the locking pawl 46 is turned anticlockwise around its pivot 45 by the spring 47 and then lies with its front edge 46a against the pin 52. Simultaneously the locking pawl 46 in this position comes to lie with its edge 53 against the edge 14a (Fig. 6) of the coupling hook 14. In this way a safe coupling connection between the rider 13 and the coupling rods 18, 27, 46 is established in both directions of movement.

During the leftward movement of the coupling rods 18, 27, 46, the spring 37 (Fig. 3) is contracted. Simultaneously by means of the ratchet 104 (Figs. 3 and 9) of the slide 27 the toothed wheel 105 in mesh with the said ratchet as well as the shaft 106 and the toothed wheel 109 mounted on same are revolved anticlockwise (arrow a). The latter moves the ratchet 110 with which it is in mesh and thereby also the sliding

carriage 111 (Fig. 9) towards right (direction of arrow 39) in the opposite direction of the tabulating movement of the paper carriage 8, whilst the headed screws 112 (Fig. 8) screwed into the same slide in the guide slots 113 (Fig. 9) of the angular rill 114.

It will be noted that owing to the different numbers of teeth of the toothed wheels 105 and 109, the distance of movement of the sliding carriage 111 is larger than that of the paper carriage 8.

The setting member 118 with the registering wheel 6 is forced to participate in the movement towards right of the sliding carriage 111. That particular tooth of the registering wheel 6 which happens to face a recess of the single wheels of the gear systems 4 and 3 consequently slides past the recesses of the toothed wheels of the multiplier gear system 4 and then past the places of a higher denomination located to the left of the units-place of the multiplicand gear 3 and finally at the end of the rightward movement meshes with the units-gear E of the multiplicand gear 3 (Fig. 11). At this moment the tabulating movement towards left of the paper carriage 8 as well as the movement towards left of the coupling rods 18, 27, 46, 104, the movement of the members 105, 106, 108 in the direction of the arrow a and the movement towards right of the members 110, 111, 118 and 6 are finished. Consequently the units-place of the column totalizer 12 and the registering wheel 6 are now in operating position, the latter being opposite the units-place E of the multiplicand gear 3.

The supporting member 123 (Fig. 8a), and therewith the catch pawl 125 also participated in the movement towards right of the setting member 118. At the end of the tabulating-and setting movement of the members 111, 116 and 8, as shown in Fig. 11, the left tooth 133 (Fig. 8a right) of the catch pawl 125 now meshes with the wheel (tens wheel Z) located on the left of the units-place E (Fig. 11) of the gear system 3 and the right tooth 134 of the catch pawl 125 meshes with the gear (tenths wheel ZT) located on the right of the units wheel E of the multiplicand gear 3. Consequently, the adjoining wheels to the right as well as to the left of the units wheel E of the gear system 3 are barred from any revolving movement and therefore cannot participate in any turning of the units wheel E.

The tabulating- and setting movement of the paper carriage 8 and the registering wheel 6 finished, the calculating key marked "3" of the calculating keyboard 5, (fig. 1) is depressed in order to register the "3" of the multiplicand "3,25". Consequently the conventional column totalizer mechanism of the machine is started, as described in detail in the Patent — (Patent application Ser. Nr. 338,272, filed May 31, 1940) and the coupling 150, 151 (fig. 3) is locked. Then the known column totalizer shaft 152 is turned automatically by three units in the direction of the arrow 153. The shaft 7 (fig. 8) and the registering wheel 6 also participate in this movement by means of the locked coupling 150, 151. Since the latter is in mesh with the units wheel E of the gear system 3, as mentioned above, the units wheel E is likewise positively turned by three units in the direction of arrow 153a. This driving movement is now transferred by the units wheel E of the gear system 3 upon the opposite ratchet of the ratchet gear system B of the multiplying mechanism.

Simultaneously with the registration of the

"3" of the multiplicand value "3,25" into the multiplying mechanism, a "3" is also registered additively in the units place of the column totalizer 12 and the type-lever of the figure "3" is positively made to write upon the booking sheet directed around the platen of the paper carriage 8. The falling-back of the type-lever then releases the carriage switching device so that the paper carriage 8 further supported by a carriage feeding mechanism, moves one shifting step to the left.

Owing to the coupling connection 14, 15, 17 (fig. 11), 18, 46, the coupling rods 27, 104 (fig. 3) are also positively moved towards left by a further shifting step against the spring 37. Thereby the shaft 106 by means of the gears 104, 105 is moved further in the direction of arrow *a* and consequently the sliding carriage 111 by means of the gears 109, 110, and also the setting member 118, the registering wheel 8 as well as the catch pawl 123 by means of the member 123 (fig. 8a) arc moved towards right by one step (direction of arrow 39). The registering wheel 8 thereby comes into mesh with the tenths wheel Zt of the train of wheels 3 (fig. 12).

Shortly before completion of this movement of the catch rods 18, 27, 46 by one step towards left, the edge 62 (fig. 4) of the pawl 18, contacts with the pin 63 of the supporting member 66. Consequently, during the subsequent slight leftward movement of the members 18, 27, 46 until the completion of this movement by one step, the pawl 18 and the pawl 46 are slightly moved clockwise around the pivot screw 25 against the spring 54, the coupling rods 18, 27, 46 assuming the position with respect to the member 14 as shown in fig. 12. The distance covered by the pawl 18 in this case will only be a short one, so that the coupling connection 15, 17 for the time being remains intact.

The shifting step of the paper carriage towards left just described caused the comma position of the column totalizer 12 to be moved into operative position. As mentioned previously, the tabulator-and comma rider 11 (figs. 4 and 12) is located opposite this calculating place on the tabulator rail 10 and its catch 154 at this moment operates a distance skipping device, the shifting step to the left of the paper carriage 8 thus being succeeded by a further shifting step towards left by automatic and positive action. The coupling connection 15, 17, will, of course, impart to the coupling rods a still further movement towards left. At the beginning of the latter, the oblique edge 62 of the pawl 18 slides further along the pin 63 of the supporting member 66. Consequently also pawl 18 and pawl 46 are moved further around the pivot screw 25 against the spring 57. In doing so, the catch 17 of the pawl 18 slides off the edge 15 of the coupling hook 14, so that the coupling connection 15, 17 for the coupling rods is interrupted. At this moment the spring 37, which has previously been contracted, takes effect and by its tension causes the coupling rods 27, 18, 46 to be moved towards right in the direction of the arrow 39.

Meanwhile the shifting step towards left (comma skipping) of the paper carriage 8 which, as previously mentioned, had been released by the catch 154 of the rider 11 takes place, so that now the paper carriage and the coupling rods move in the opposite direction. The movement of the coupling rods 18, 27, 46 is stopped, however, by the edge 16 of the coupling hook 14, which has been released by the width of a shifting step,

the hook 17 clinging to the edge 16 (fig. 13). It follows that the coupling rods 18, 27, 46 and the driven members 104, 106, 110, 111, 6 (fig. 3) annul for themselves the comma skipping of the paper carriage 8, so that the registering wheel 6 is moved by only one switching step, whilst the paper carriage 8 and its column totalizers jump by two switching steps from the units-place of the column totalizer 12 beyond the comma place into the tenths place. This is done for the reason that, as known, no comma- or vacant places have been provided in the multiplying mechanism in order to save space.

These operations completed, the tenths place of the column totalizer 12 as well as the tenths place ZT of the multiplicand gear system 3 are in their operating positions (fig. 13).

Now the calculating key "2" of the calculating keyboard 5 (fig. 1) is depressed in order to enter the "2" of the value "3,25", whereupon the gear of the tenths place ZT (fig. 13) of the gear system 3 and the opposite ratchet of the ratchet system B as well as the tenths place of the column totalizer 12 are set by two units and the type lever carrying the "2" is made to print on the sheet before the platen. The subsequent falling-back movement of the type lever releases another shifting step of the carriage towards left. Owing to the coupling connection 16, 17 (fig. 13), the coupling rods 18, 27, 46 participate in this leftward movement. Simultaneously the horizontal rear edge 62a (fig. 13) of the pawl 18 slides along the pin 63, but this movement is not imparted to the pawl 18 itself.

Owing to the continued leftward movement of the coupling rods 18, 27, 46, the sliding carriage 111, by means of the ratchet gear 104 (Figs. 3 and 9), 108, 106, 109, 110, and the registering wheel 6 as well as the catch members 123, 125, by means of the member 118, are moved towards right (direction of arrow 39) by one further shifting step. Consequently on completion of this shifting step the hundredths place of the column totalizer 12 is in operating position and the registering wheel 8 is in mesh with the hundredths gear Ht of the multiplicand train of wheels 3. In this position of the coupling rods 18, 27, 46 and so on, the strip-off edge 82 of the pawl 18 engages from the right with the second strip-off pin 64 of the supporting member 66.

Now the key of the calculating keyboard 5 (Fig. 1) corresponding to the value "5" is depressed in order to enter the "5" of the multiplicand "3,25", whereby said value is entered into the hundredths place Ht (Fig. 3) of the multiplicand gear set 3 and the gear ratchet system B, as well as into the hundredths place of the column totalizer 12, and the type lever corresponding to "5" is made to strike.

The falling-back movement of the type lever releases another shifting step of the paper carriage again and simultaneously the coupling rods 18, 27, 46 are likewise carried along towards left by means of the coupling connection 16, 17 (Figs. 3, 4 and 13). Consequently the oblique edge 62 of the pawl 18 slides past the pin 64 of the supporting member 66 whereby pawl 18 and pawl 46 are swung further clockwise (Fig. 3) around the pivot screw 25 against the spring 57 (Fig. 4). Thereby the catch 17 of the pawl 18 clears edge 16 of coupling hook 14, so that the coupling rod system is set free. Through the action of the contracted spring 37 (Fig. 3) the coupling rods 18, 27, 46 at this moment are jerked towards right (direction of arrow 39) into their initial

position in accordance with Figs. 3 and 4, the right end 40 of the slide 27 striking against the rubber stop 41 to reduce the noise. At the beginning of the movement towards right of the rods 18, 27, 46, the rear edge 62a of the catch 82 of the pawl 18 slides off the pin 64, whereupon pawl 18 and pawl 45 are moved anticlockwise around the pivot screw 25 by action of spring 57. The movement of said pawl 18 is halted in the rest position by the edge 60 striking against the pin 81 and the movement of the said pawl 46 is halted by the edge 46a striking against the pin 52. The pawl 46 is again swung out clockwise against the spring 47 around the rivet pin 45 shortly before reaching the right end-position of the rod system 18, 27, 45 by action of pin 49 sliding along the inclined 50 of the control member 51 (Fig. 5). Consequently the pawl 46 with its control or locking edge 53 is located outside of the path of movement of the coupling hook 22 which is positioned on the bar 10 in the plane of the column totalizer 19 storing the multiplier, whilst the pawl 18 with its catch 17 extends into the pathway of the catch 23 of the coupling hook 22.

During the return movement of the coupling rod system 18, 27, 46 into rest position, simultaneously the sliding carriage 111 by means of the ratchet gears 104, 105, 106, 109, 110 and the registering wheel 6, and the catch member 123, 125 by means of the setting member 118, are returned into the rest position towards left, according to Fig. 3. In this position the registering wheel 6 is in mesh with the wheel M pertaining neither to the gear set 3 nor to the gear set 4.

#### *Entering of the multiplier*

After the multiplicand "3.25" has been registered in the multiplying mechanism of the booking machine in the above-described manner, that is, in the corresponding decimal places of both the gear set 3 and the ratchet system B and stored in the column totalizer 12, the operator of the machine can write any desired text in the space between the column totalizer 12 and the column totalizer 19, by operating the keyboard 5 (Fig. 1). Then he depresses the units-tabulator key of the decimal tabulator keyboard 9, in order to enter the multiplier "1.40", whereby another tabulating leftward movement of the paper carriage is released. During this movement, the coupling hook 22 (Fig. 14) of the tabulator rider 20 having been set on the tabulator rail 10 opposite the column totalizer 19 storing the multiplier value, with its catch 23 engages the hook 17 of the pawl 18 and carries the coupling rod system 18, 27, 46 along towards the left against the spring 37. The pawl 46 with its pin 49 now leaves the control member 50 and—moved anticlockwise around the pivot against the spring 47—comes to lie with its edge 53 against the surface 22a, of coupling member 22, thereby ensuring the driving connection 23, 17 for entering (Fig. 14). It will be noted that the driving connection 23, 17 for entering the multiplier is established at a later moment than the driving connection 15, 17 (Fig. 10) for entering the multiplicand in the tabulating motion, the delay being defined by the distance marked *a* (Fig. 10), since the coupling hook 22 is secured directly on the tabulator and comma rider 20 for the column totalizer 19. The additional shifting through distance *a* was necessary, since the registering wheel had to cover the additional distance "C" corresponding to the width of the multiplier value.

Owing to this leftward sliding movement of the coupling rod system 18, 27, 46 (Fig. 14), the carriage 111, by means of the gear system 104 (Figs. 3 and 9), 105, 106, 109, 110, and the registering wheel 6 as well as the locking members 123, 125, by means of member 118, are simultaneously moved towards right in such a way that the registering wheel 6 meshes with the units wheel *e* of the multiplier gear set 4 (Fig. 14). At this moment the tabulating movement of the paper carriage 8 is completed and simultaneously the column totalizer 18 with its units place has been moved into its operating position.

Whilst the units place is moving into its operating position, the roller 94 (Figs. 2 to 4 and 14) of the supporting member 86, which moved along with the paper carriage 8, simultaneously acts upon the oblique surface 91 of rail 98 of flap 89 and consequently moves the latter as well as the members 81 and 75 against action of spring 77 and in the opposite direction of the arrow 78 around the bearing brackets 72 and 73. Consequently the pins 67 and 68 of the flap 89 are moved into the pathway of the surface 82 of the pawl 18.

The tabulating process completed, the key marked "1" of the calculating keyboard 5 is depressed in order to enter the "1" of the multiplier "1.40." Thus the "1" by means of the registering members 152 (Fig. 3), 151, 150, 7 and the registering wheel 8 are entered into the units-place *e* (Fig. 14) of the gear set 4 and by means of the corresponding ratchet of the ratchet system B are entered into the respective place of a multiplying mechanism C not explained in detail which is arranged beside the product mechanism P after the former at this moment had been brought to mesh with the ratchet system 3. On the other hand, the value "1" is entered into the units-place of the column totalizer 19 and by means of the corresponding type lever has been typed upon the sheet on the platen. The falling-back of the type lever then again releases a shifting step of the paper carriage 8 and, in dependence of the coupling connection 23, 17, also a leftward switching step of the coupling rod system 18, 27, 46. Simultaneously, the registering wheel 8 is moved by one shifting step towards right (Fig. 15) by means of the gears 104, 105, 106, 109, 118, 111, 116, so that the said wheel 8 is brought into mesh position towards the tenths gear Zt of the multiplier gear set 4.

During this leftward shifting step of the coupling rod system 18, 27, 46, the oblique edge 62 of the pawl 18 comes into sliding contact with the pin 87 of the flap 89, whereby the pawls 18 and 48 against action of spring 57 are moved slightly clockwise around the pivot screw 25. For the present, however, the coupling connection 23, 17, still remains intact.

The paper carriage shifting step released by the falling-back of the type lever also caused the comma place of the column totalizer 19 to move into operating position. Consequently the distance-skipping device of the machine thereby placed into operative position in dependence of the catch 20a of the tabulator-and-comma rider 20, so that a further leftward shifting step of both the paper carriage 8 and the coupling rod systems 18, 27, 46 is positively effected. During this shifting step the oblique edge 82 of the pawl 18 slides off the pin 67 of the flap 89, whereby the pawls 18 and 48 are moved clockwise around the pivot screw 25 against the spring 57 and con-



sequently the catch 17 of the pawl 18 clears the catch 23 of the coupling hook 22 and thereupon connects with the catch 24 (Fig. 16) which is recessed by the shifting step distance from the catch 23. Consequently the paper carriage 8 is switched by two steps, whilst the registering wheel 6 is moved further by one step only, so that now the tenths place of the column totalizer 19 is moved into operative position and the registering wheel 6 is in mesh with the tenths wheel ZT of the gear set 5.

In order to enter the "4" of the multiplier value "1.40," the particular key corresponding to the figure "4" on the calculating keyboard 5 (Fig. 13) is depressed, whereby the "4" is entered into the tenths place Zt (Fig. 16) of the multiplier gears 4 which is driven as explained above. Simultaneously the "4" by means of the opposite ratchet of the ratchet system B is also entered into the respective place of the multiplying mechanism C as well as into the tenths place of the column totalizer 19 and printed on the sheet held in the paper carriage. The subsequent shifting step of the paper carriage 8 and of the coupling rod system (18, 27, 46) then moves the hundredths place Ht of the gear system 4 as well as the hundredths place of the column totalizer 19 into operative position. In this position the particular key of the calculating keyboard 5 corresponding to "0" is depressed, whereby no value is entered but only the type lever is moved causing a further leftward shifting step of the paper carriage 8 as well as of the coupling rod system 18, 27, 46. Simultaneously the slanting edge 62 of the pawl 18 slides along the second pin 68 of the flap 69, whereby the pawls 18 and 46 are moved further clockwise around the screw 25 against the spring 57 and consequently the catch 17 of the pawl 18 leaves the edge 24 of the coupling hook 22. The movement towards left of the coupling rod system having contracted the spring 37, the coupling rods 18, 27, 46 now tend to move towards right again whilst the registering wheel 6 on the shaft 7 slides towards left again by means of the gears 104, 105, 106, 109, 110, 111, 118 (Figs. 3 and 9).

As soon as the catch 17 of the pawl 18 has been moved out of the path of the coupling hook 22, the pawls 18 and 46 by the spring 57 are swung back into rest position, according to Figs. 3 to 5.

The movement of the coupling rod system 18, 27, 46 towards right (direction of arrow 39) and the movement of the sliding carriage 111 and the registering wheel 6 towards left is limited in that moment in which the registering wheel 6 is in mesh with the respective gear of the gear system 4 corresponding to the tens position z (Fig. 17). This limitation takes place as follows:

#### *Setting of the coupling rod system during total-taking of the product*

When tabulating the column totalizer 19 into operative position—as already explained above—the flap 69 and the roller 71 as well as its lever 75 were moved in dependence of the roller 94 (Fig. 4) of the supporting member 95 against action of spring 77 in the opposite direction of arrow 79. This swing movement was shared by the locking lever 82 by means of the spring connection 78, 81, 83 (Fig. 5). Said locking lever 82 thereby comes to lie with its catch 86 upon the surface of the supporting bridge 26 (Fig. 17).

As soon as, after setting the "0" of the multiplier value (1.40) the shifting step of the pa-

per carriage has been effected and, in dependence of the same, the coupling rod system 18, 27, 46 has been unhooked from the coupling connection 24, 17 and the latter is moved towards right in dependence of the spring 37, the right side-edge 87 of the catch 88 of the slide 27 now contacts with the left side surface of the locking catch 86 of the locking lever 82 in order to check this movement. In this position, as illustrated in Fig. 17, the registering wheel 6 is now in mesh with the tens gear Z of the gear system 4, the reason for this position will be hereinafter explained:

The shifting step of the paper carriage following the typing of the "0" of the multiplier "1.40" moves the column totalizer 19 into operative position with respect to its right control position (Platine). In this position a comma rider is suitably placed on the tabulator bar 10, which at this moment by means of its nose operates the distance skipping device of the machine, so that the paper carriage 8 is shifted by one further step. Consequently, after registering the hundredths place of the multiplier value, the paper carriage is moved automatically by two shifting steps towards left, whereby the column totalizer 98, which later on receives the product, moves into operating position with its highest calculating place (Fig. 17). The coupling rod system is not changed thereby in any way since at this moment no coupling connection is established any more.

Now the result key R (Fig. 1) of the booking machine is depressed, whereby the product of the two factors,  $3.25 \times 1.40$ , that is "4.5500" is automatically calculated in the product mechanism P (Fig. 17) of the multiplying mechanism which does not belong to the invention and is therefore not shown. Simultaneously the multiplying mechanism automatically starts operation of the total taking mechanism of the booking machine, not shown. The total-taking from the product mechanism in the present case is effected first by means of the tens place Z (Fig. 7) of the gear set 40 by means of the ratchets D of the ratchet system B located within their reach. Consequently the four highest denominations of the product register P remain unnoticed during the product total-taking, which is due to the fact that the capacity of the column totalizer was selected for values having only nine places. In dependence of the efficiency of the total-taking mechanism, the stepwise shifting of the product mechanism P towards left is controlled simultaneously. In this way all denominations of the product mechanism P corresponding to the units place and places of a higher magnitude are subsequently shifted past the ratchet D (Fig. 17) and also past the tens place of the gear system 4, in order to be set on "zero" by the total-taking process. Those denominations of the product mechanism which correspond to the tens place and the places of a higher order such as hundreds, thousands, ten thousands position and so forth, have in case of the present product "4.5600" already been turned to zero. Consequently, by means of a suitable device, not shown, for preventing the registration of zeros before integers, the printing of zeros on the sheet is made impossible. Besides the shifting by steps of the product mechanism, the paper carriage 8 is also moved towards left in shifting steps until the units place of the column totalizer 98 is placed in calculating position. It may be noted that during the previously mentioned shifting

steps of the paper carriage 8 the roller 94 (Fig. 4) of the supporting member 96 is still rolling on the upper edge 92 of the rail 90 of the flap 69 and consequently the latter remains in the swung-out position (Fig. 17), so that during the shifting of the paper carriage 8 the registering wheel 5 remains in mesh with the tens place of the gear set 4.

Owing to the above mentioned shifting steps of the paper carriage 8 and the product register P towards left, the particular place of the product register P embodying the "4" of the product "4,5500" was also moved into a position opposite the ratchet D, that is, the tens place Z of the gear set 4. Now, through the total-taking process, by means of the ratchet D and the tens place z of the gear set 4, the value "4" is entered from the said place of the product mechanism into the units place of the column totalizer 98. Simultaneously by positively striking the type lever of the figure "4", the same is printed upon the sheet on the platen. During the falling back of the type lever a shifting step of the paper carriage is started, whereby the comma position of the column totalizer 98 is moved into its operative position. Owing to the fact that during the leftward shifting step of the paper carriage 8 also the product mechanism P is positively shifted leftward through one decimal place by the total-taking mechanism, it will be found that at the completion of said shifting steps the column totalizer 96 with its comma place is in operative position and the product mechanism P—not having a common position—with its place embodying the "5" of the tenths place of the product "4,5500" is in total-taking position, that is, opposite the ratchet D of the tens place z of the gear set 4.

In the operative position of the comma place of the column totalizer 98 the comma rider 99 is mounted on the bar 10 and with its catch 99a during the total-taking, brings a distance skipping mechanism into operation for an additional shifting step of the paper carriage 8. The shifting of the additional shifting step of the paper carriage is carried out in dependence of another revolution of the drive shaft and simultaneously shifts the product mechanism by a further shifting step. Consequently the place of the product mechanism P embodying the "5" of the hundredths place of the product "4,5500" is automatically into total-taking position, that is, opposite the ratchet D of the tens place z of the gear set 4, without the "5" of the tenths place of the product "4,5500" having previously been set on "0" by total-taking. Consequently, the tenths place after the comma of a product value would be skipped during total-taking. To avoid such faulty calculation the following device has been installed:

#### *Comma skipping during product total-taking*

The automatic engagement of the total-taking mechanism of the booking machine after calculating the product is effected by positive moving of the total-taking key lever 155 (Fig. 2) clockwise around its shaft 166. Simultaneously the arm 157 of the key lever 155 moves backward a bar 158 jointed to the same. A roller 159 of this bar 158 consequently bears upon a slanted surface 168 of a slide 161 which is mounted to slide along the rear wall of the machine frame by means of pin and slot connections and moves said slide 161 upwards against the spring 162. A supporting member 164 is mounted to slide on

the upper part of the slide 161 by means of a screw 163 (Fig. 4) and acted upon by a pressure spring 167 which is attached at one end to the pin of the screw 163 and at the other end to a pin 166 riveted into said supporting member and protruding through a longitudinal guiding slot 165 of the slide 161. The supporting member 164 is also guided by a recess 168 of the supporting bridge 28.

The supporting member 164 participates in the upward movement of the slide 161 by means of the flexible connection 163, 167, 166 and thereby is moved into the path of a catch 169 of the slide 27 of the coupling rod system 18, 27, 46, which at this moment assumes the position shown in Fig. 17, the catch 169 being spaced from the left of the supporting member 164 by one shifting step.

As soon as on product total-taking the "4" of the product "4,5500" has been printed, the shifting step of the paper carriage has been positively effected and consequently the comma place of the column totalizer 98 has moved into operative position, the roller 94 of the member 96 (Figs. 4, 5 and 18) will also slide down the slant 93 of the rail 90 of the flap 69. Consequently the members 69, 71, 75 and 82 under action of spring 77 are returned to rest position in the direction of the arrow 79 and the edge 80 of the lever 75 strikes against the rear edge 28a of the supporting bridge 28. Simultaneously the lock-catch 88 of the locking lever 82 is again moved out of the pathway of the edge 87 of the catch 86 of the slide 27 so that now the coupling rod systems 18, 27, 46 are moved towards right by means of the spring 37. After having traversed a distance corresponding to one shifting step of the paper carriage, the movement of the coupling rod systems 18, 27, 46 towards right is stopped by the right lateral surface of the catch 169 of the slide 27 striking against the left lateral surface of the supporting member 164 (Fig. 18). Simultaneously the registering wheel 6 is moved by one shifting step towards left by means of the gears 104, 105, 106, 109, 110, 111, 118, so that thereafter the same is in mesh with the ratchet F of the ratchet system B corresponding with the hundreds gear h of the gear set 4, as shown in Fig. 18.

It follows from the above that on skipping the comma place of the column totalizer 96 during the product total-taking, the paper carriage 8 and the product mechanism P of the multiplying mechanism are moved by two shifting steps, the registering wheel 6, however, is also moved by one shifting step, so that the latter now faces the hundreds place h of the gear set 4 and serves to drive the same for the purpose of total-taking from the product mechanism.

As explained above, the "5" of the tenths place of the product "4,5500" after skipping the comma place faces the hundreds place h of the gear system 4, so that for the present the tenth place of the product "4,5500" is set to zero by total-taking. Thereupon the type print of the "5" starts a further shifting step of the paper carriage 8 as well as of the product mechanism P, so that thereafter the "5" of the hundredths place of the product "4,5500" is moved into total-taking pick-up position, i. e., facing the hundreds place h of the ratchet F of the ratchet system B co-ordinated with the gear system 4, and is reset.

Subsequently, the thousandths- and ten thousandths places of the product "4,5500" are cleared by total-taking. Since, however, these places in the present product "4,5500" already contain

"zeros", no clearing takes place by product total-taking. By means of a convenient cancelling mechanism, not shown and described, the values of the third and fourth places to the right of the comma are prevented from being printed. Neither can these values be included in the calculation of the comma totalizer 98, since this column totalizer commands only two calculating places to the right of the comma.

The product total-taking completed, the total-taking mechanism is also arrested automatically in a suitable manner since the key lever 155 (Fig. 2) is returned anti-clockwise into its rest position. Consequently the bar 158 is again moved towards front, the roller 159 releasing the slant 16 of the slide 161. The slide 161 and its supporting member 164 are now moved downwards again by the spring 162 whilst the member 164 is again placed out of reach of the catch 169 of the slide 27. Consequently the coupling rod system 18, 27, 46 is released and at this moment is jerked back into rest position in the direction of arrow 39 by means of the spring 37, the catch 40 of the slide 27 striking against the rubber stop 41 (Fig. 4). The registering wheel 6 is also moved towards left into rest position (Figs. 3 and 5) by means of the gears 104, 105, 106, 109, 110, 111, 118. Simultaneously the products register P and the multiplier register C are suitably moved towards right into rest position, according to Fig. 10.

As soon as the entries upon the line of the sheet have been completed, the paper carriage 6 is again moved to its outer right position by de-

pressing the carriage sliding key 170 (Fig. 1). During this movement of the paper carriage towards right, the roller 94 (Fig. 4) of the supporting member 96 slides along the surface 93, 92 of the rail 90 of the flap 69, whereby the latter as well as the members 71, 75 and 82 are swung out in the opposite direction of the arrow 79 against action of spring 77. Since, however, after a short while the catch lever 82 by means of its catch 86 strikes against the upper side of the catch 88 of slide 27 of coupling rod system 18, 27, 46, the catch lever 82 does not participate any more in the further movement of the members 69, 71, 75, but only the spring 81 is contracted.

During the subsequent movement towards right of the paper carriage the roller 94 again slides down the slant 91, whereby the members 90, 89, 71, 75, 82 are returned into rest position by the spring 77.

On further sliding movement of the carriage, the coupling hook 22 by means of its slanted edge 22a (Fig. 7) also bears upon the slant 17a of the hook 17 of the pawl 18. The latter recedes clockwise against action of spring 57 and, after releasing the coupling hook 22, returns again into its normal position. The same process is repeated as soon as during the sliding movement of the carriage the coupling hook 14 gets in contact with the catch 17 of the pawl 18. The locking pawl 46 is not touched thereby since in the rest position of the coupling rod system 18, 27, 46 it is kept outside of the path of movement of the coupling hooks 14 and 22 by the controls 48, 50.

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