

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

H. E. KÄMMEL  
COMPLEMENTARY TOTALISER  
Filed Feb. 28, 1939

Serial No.  
259,030  
17 Sheets-Sheet 1

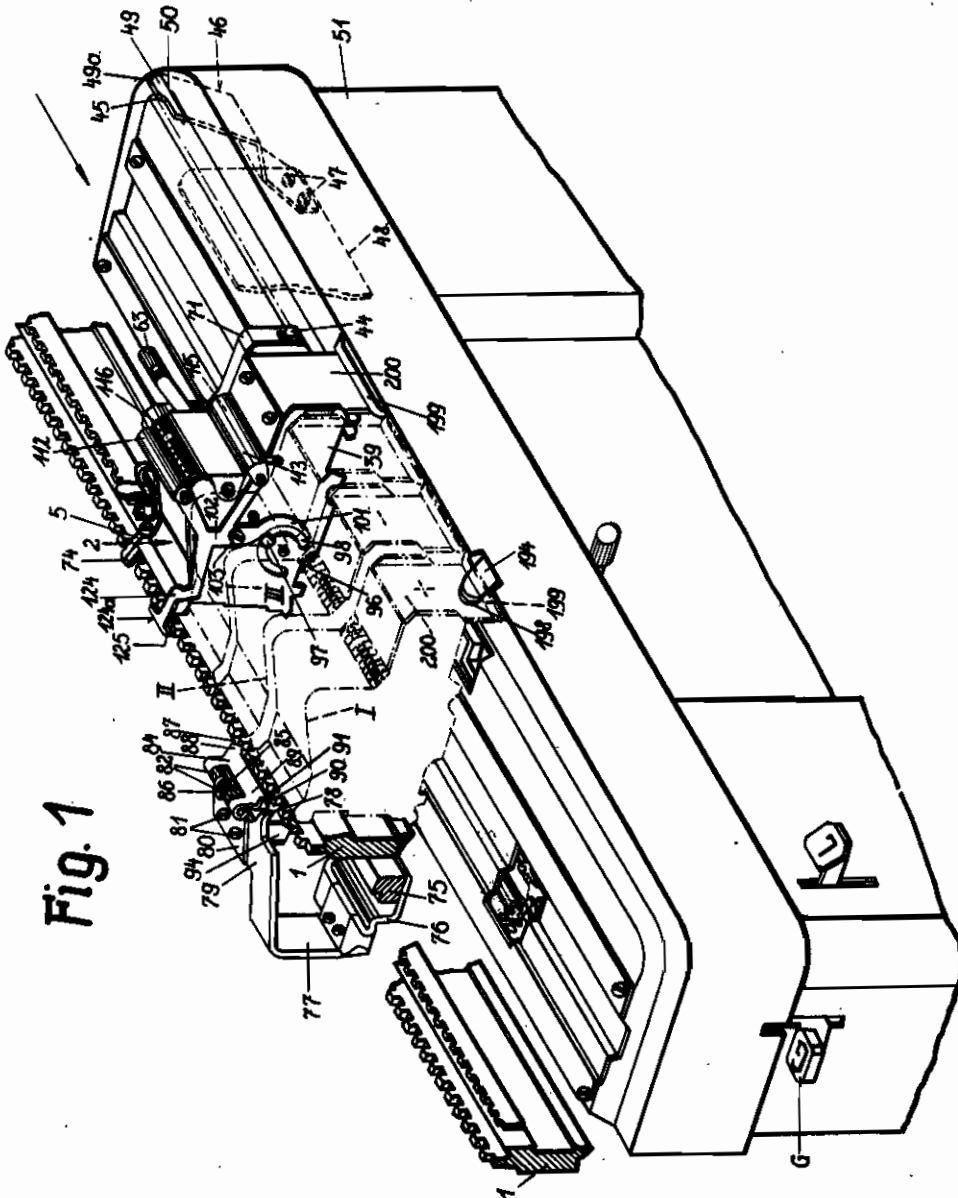


Fig. 1

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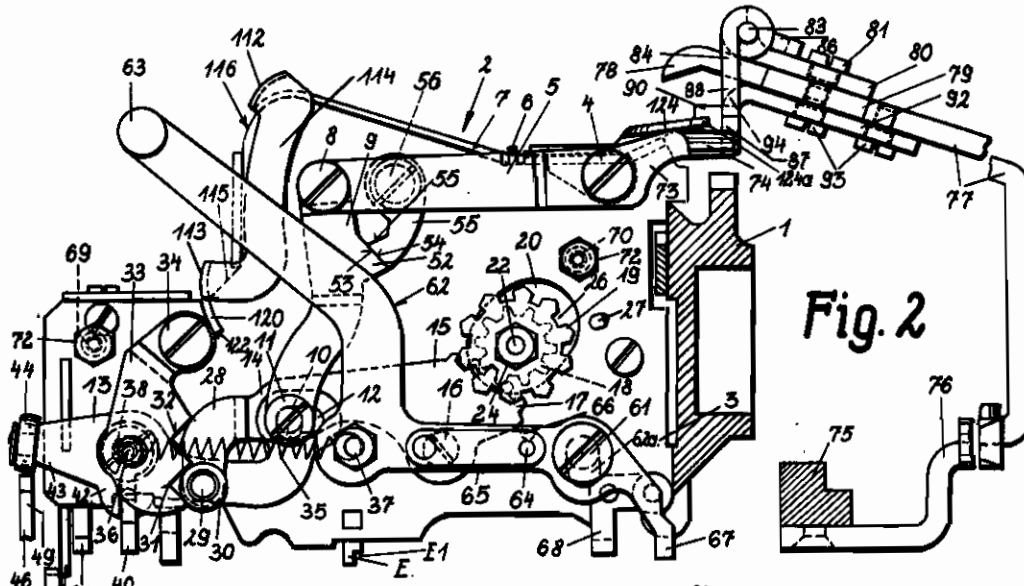


Fig. 2

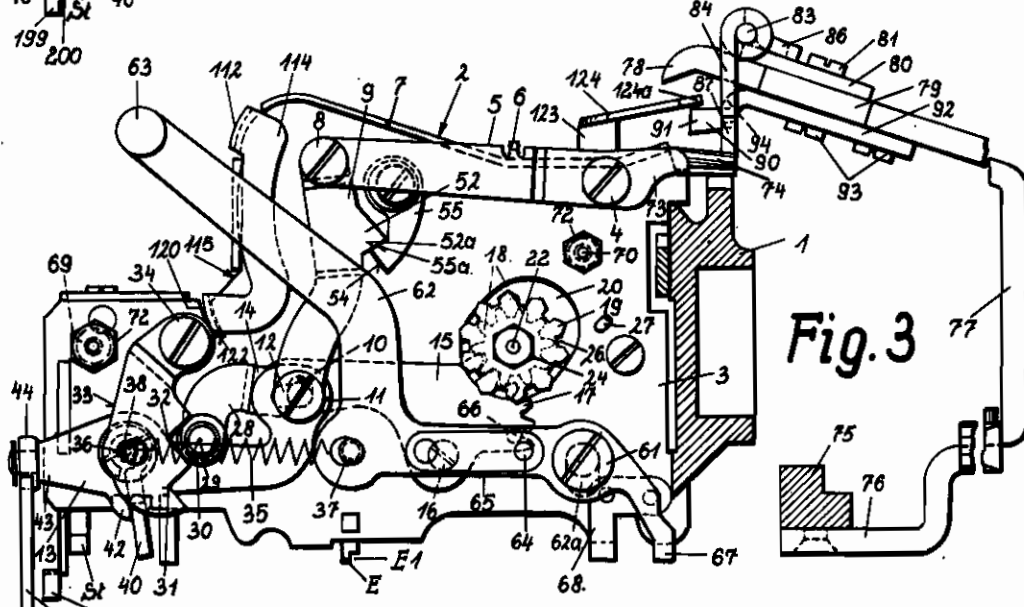


Fig. 3

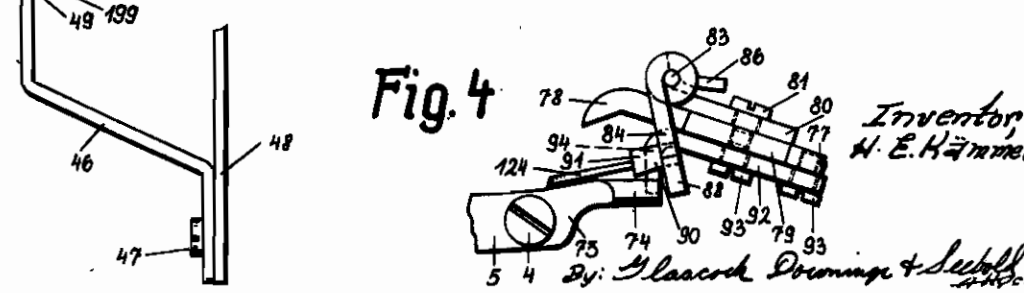


Fig. 4

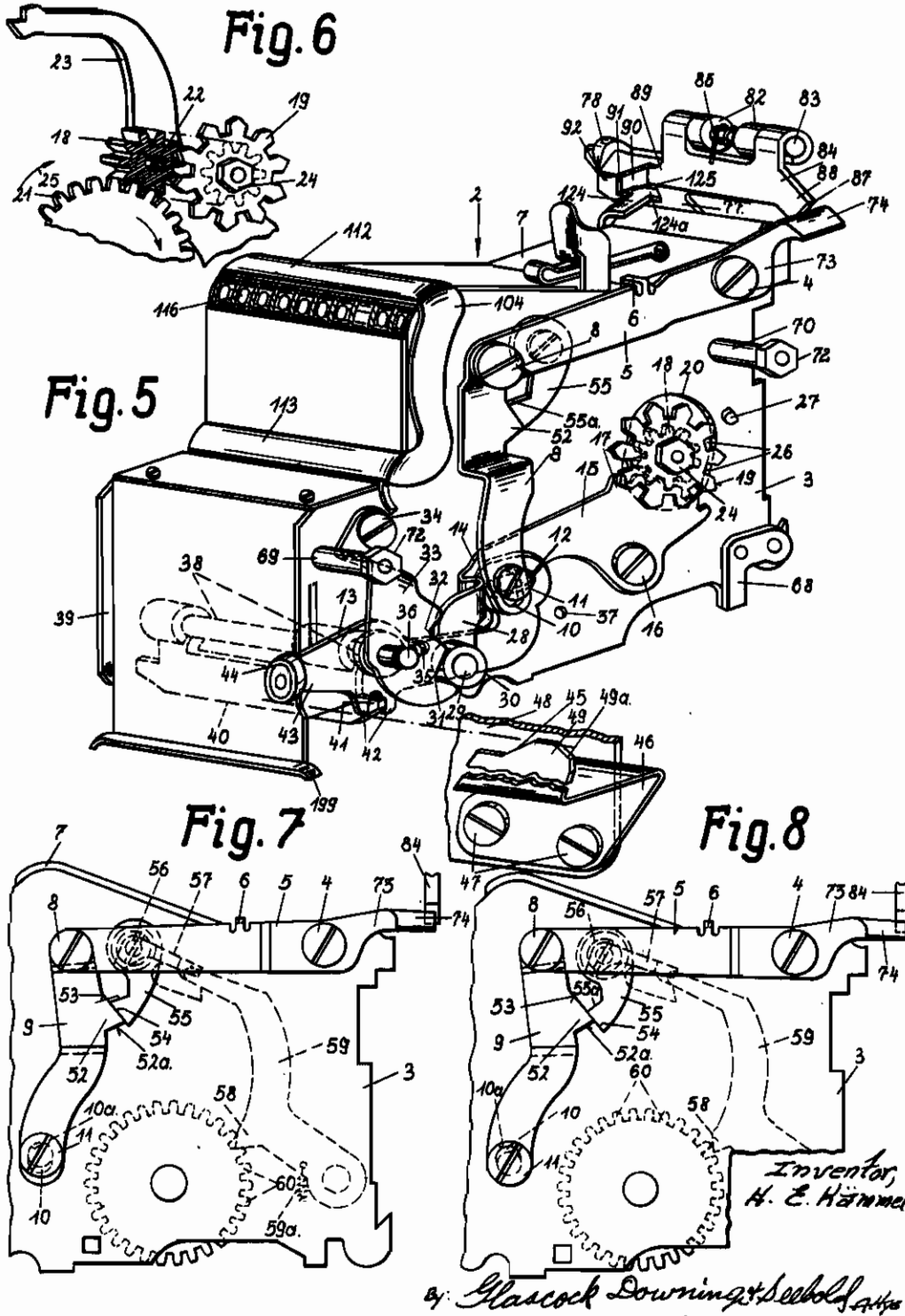
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17 Sheets-Sheet 3



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Serial No.  
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17 Sheets-Sheet 4

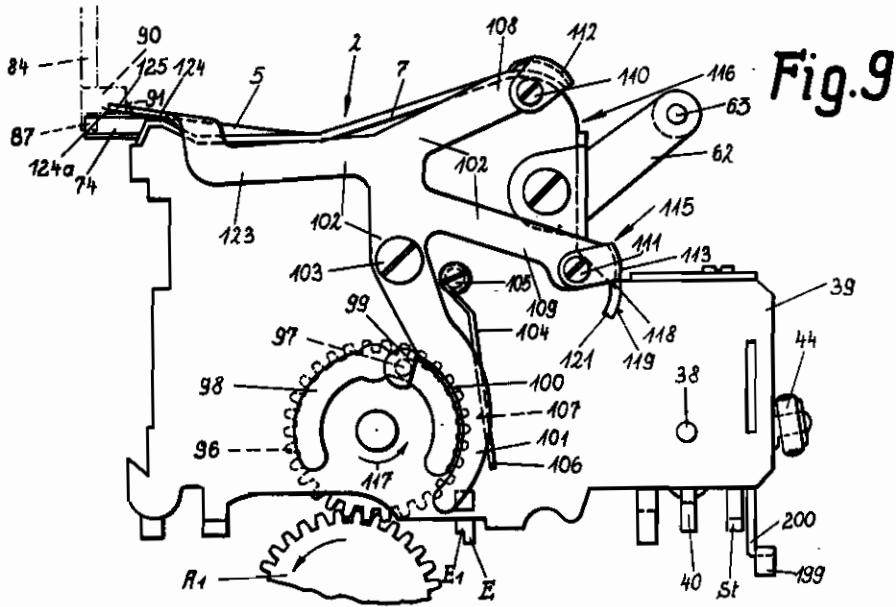


Fig. 9

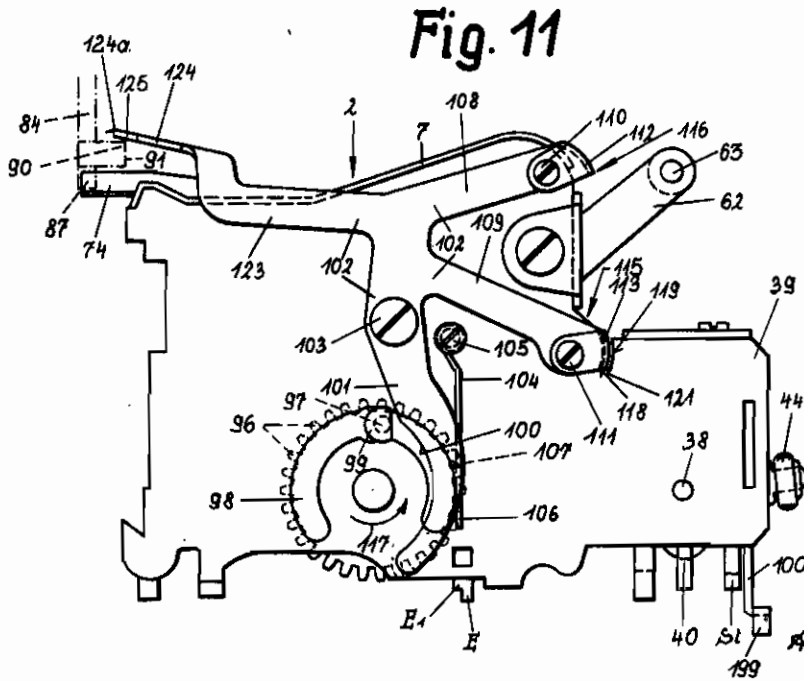


Fig. 11

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Serial No.  
259,030  
17 Sheets-Sheet 5

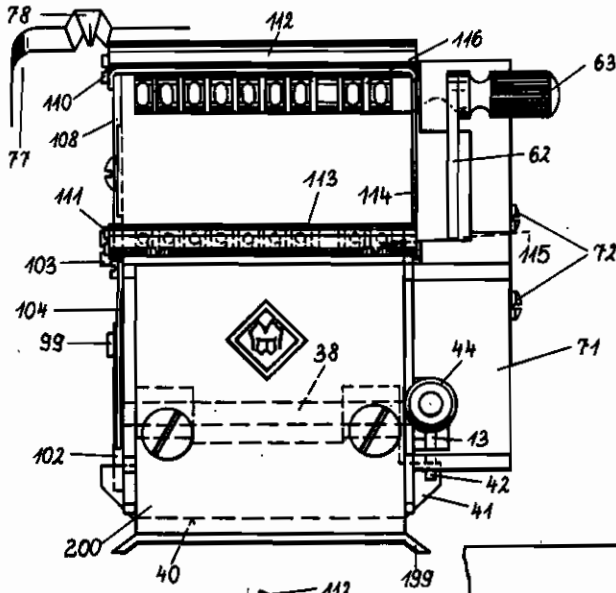


Fig. 12

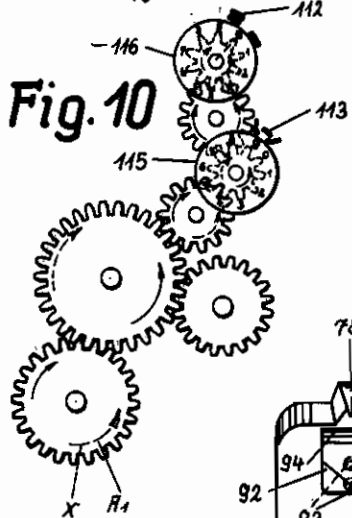


Fig. 10

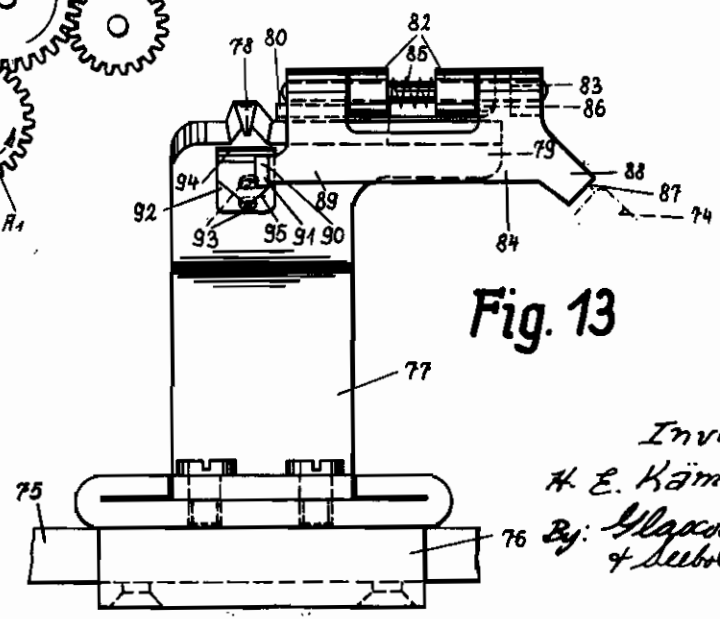
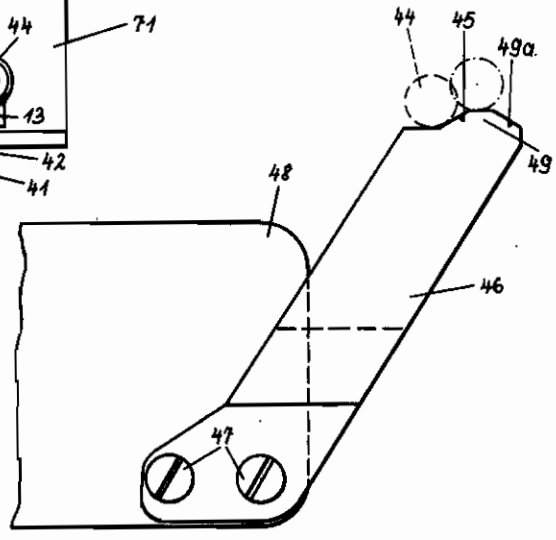


Fig. 13

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Serial No.  
259,030  
17 Sheets—Sheet 6

Fig. 14

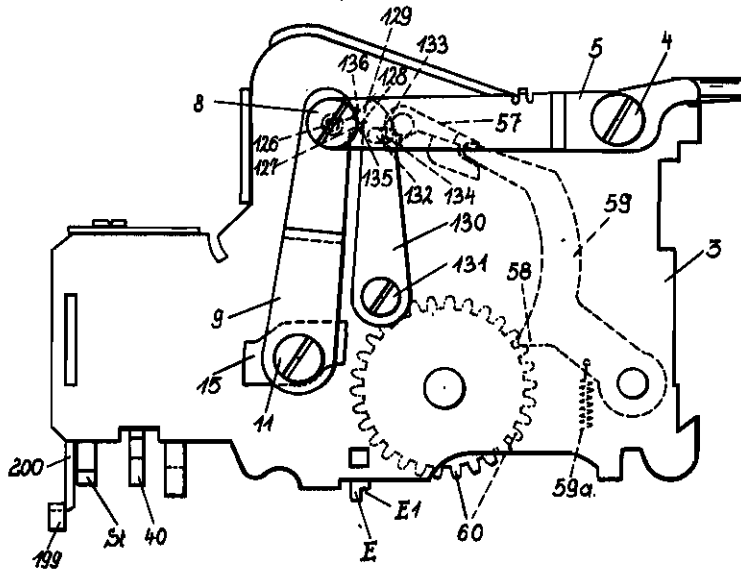


Fig. 15.

A	B	C	D
Debit	Credit	Old Debit	New Debit
	135.25	20.10	115.15 *
525.32		115.15	410.17 * F

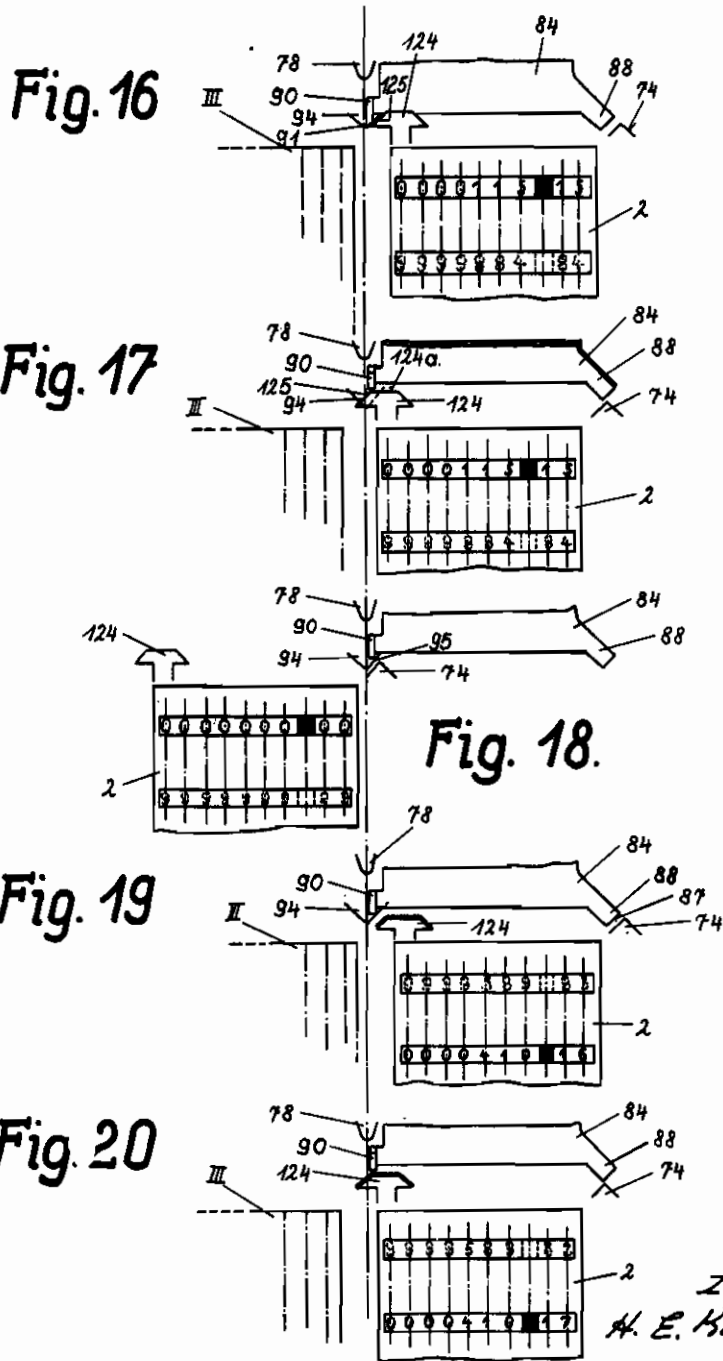
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259,030  
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Serial No.

259,030

17 Sheets-Sheet 8

Fig. 21

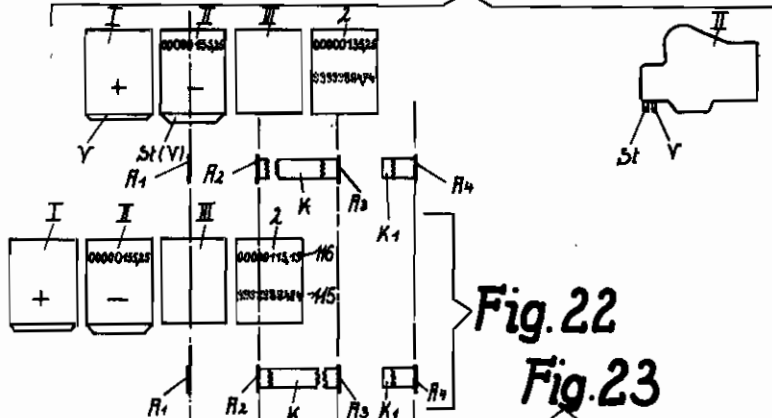


Fig. 22

Fig. 23

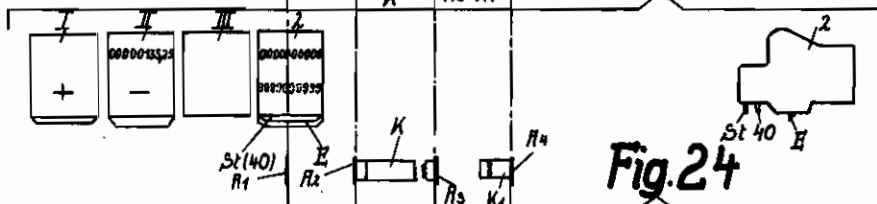


Fig. 24

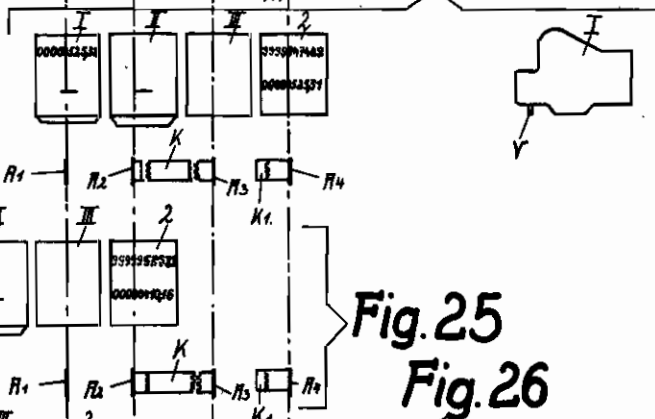
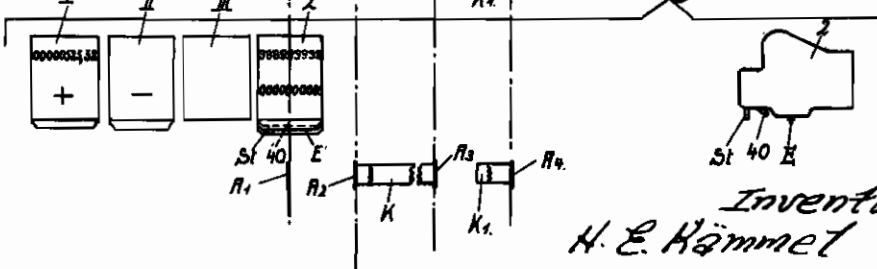


Fig. 25

Fig. 26



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Serial No.  
259,030  
17 Sheets—Sheet 9

Fig. 27

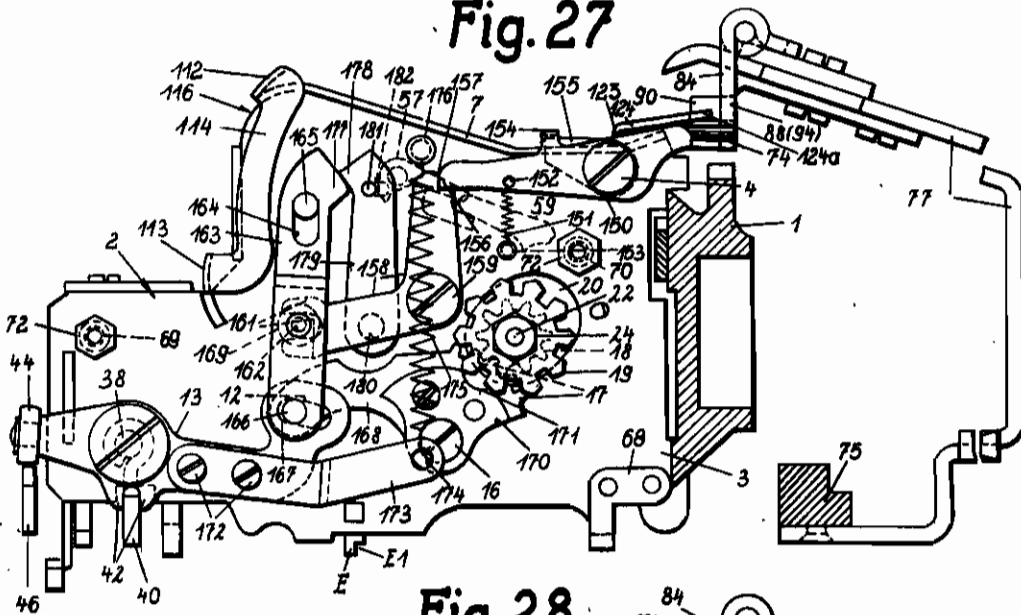
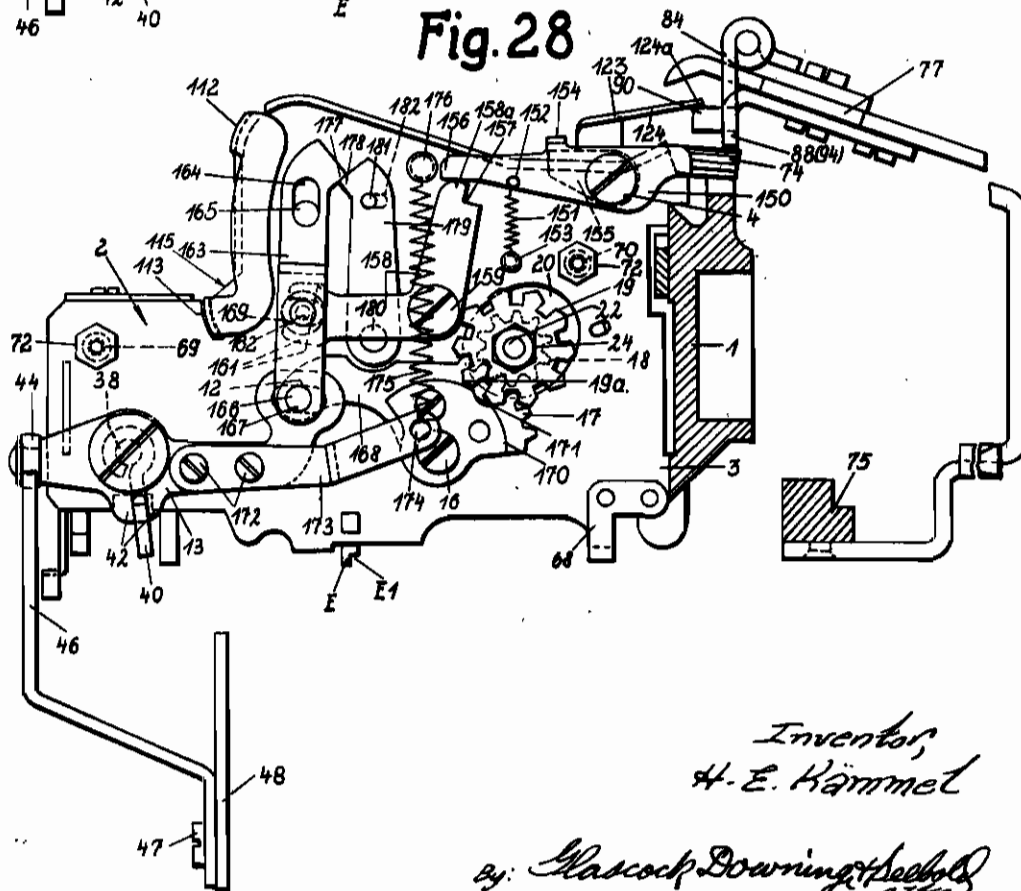


Fig. 28



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MAY 25, 1943.  
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COMPLEMENTARY TOTALISER  
Filed Feb. 28, 1939

Serial No.  
259,030  
17 Sheets—Sheet 10

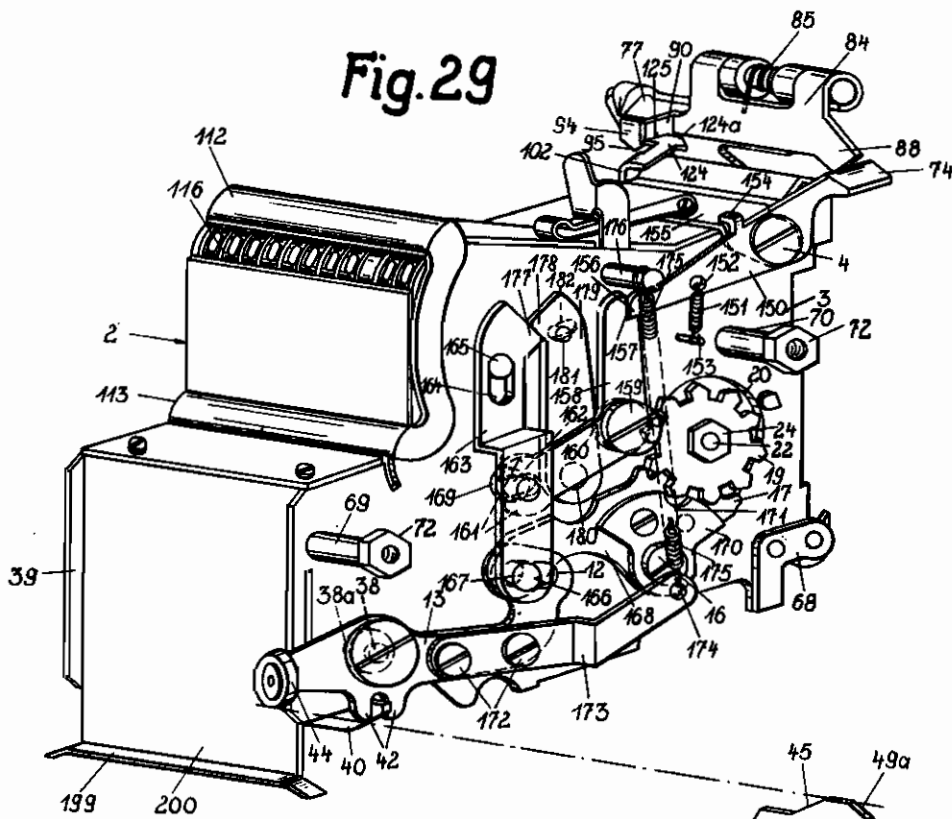
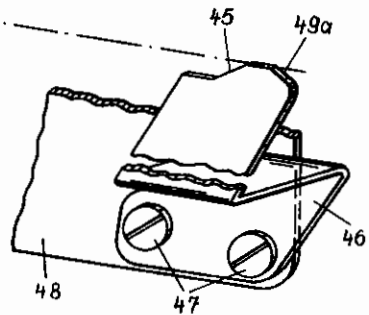
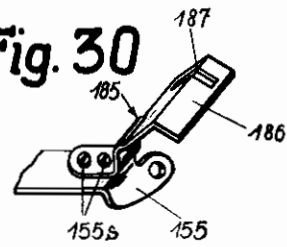


Fig. 30



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Serial No.  
259,030  
17 Sheets-Sheet 11

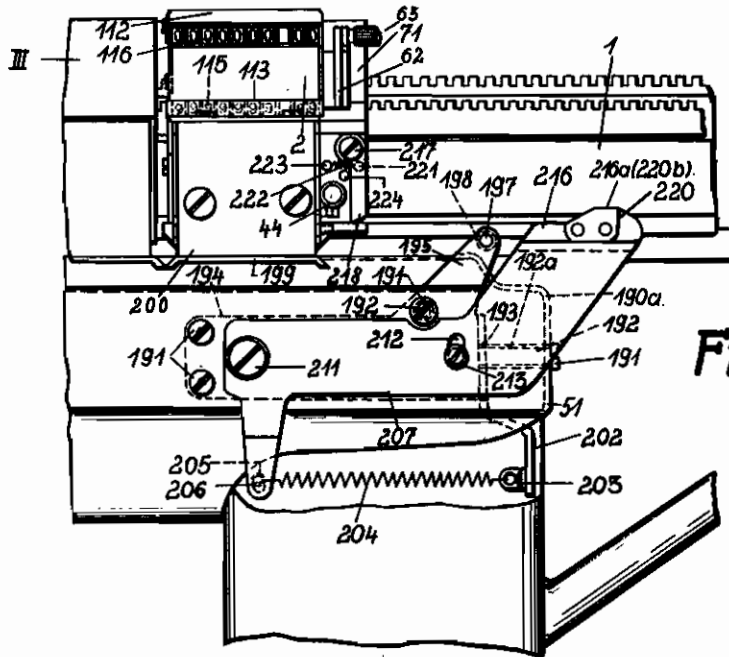


Fig. 31

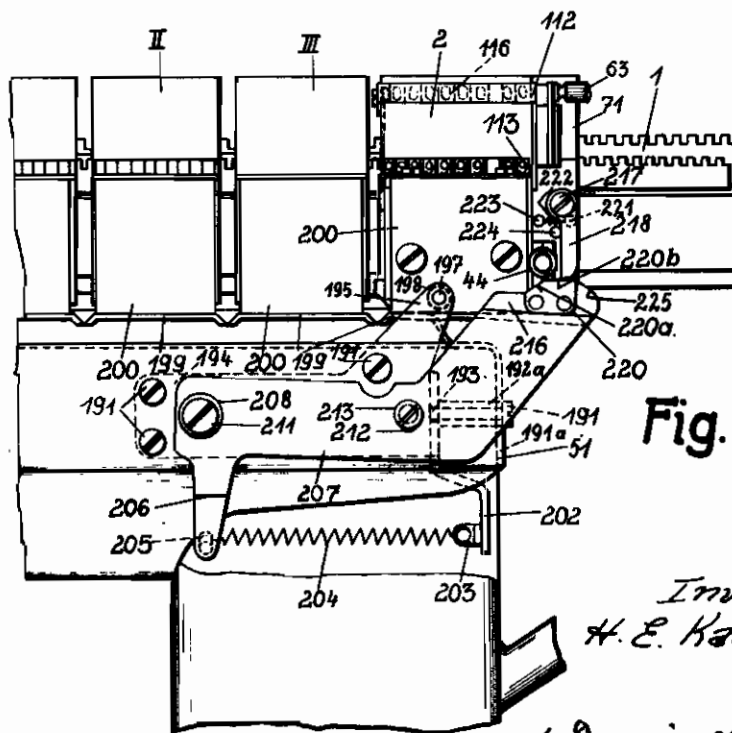


Fig. 33

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Serial No.  
259,030  
17 Sheets-Sheet 12

Fig. 32

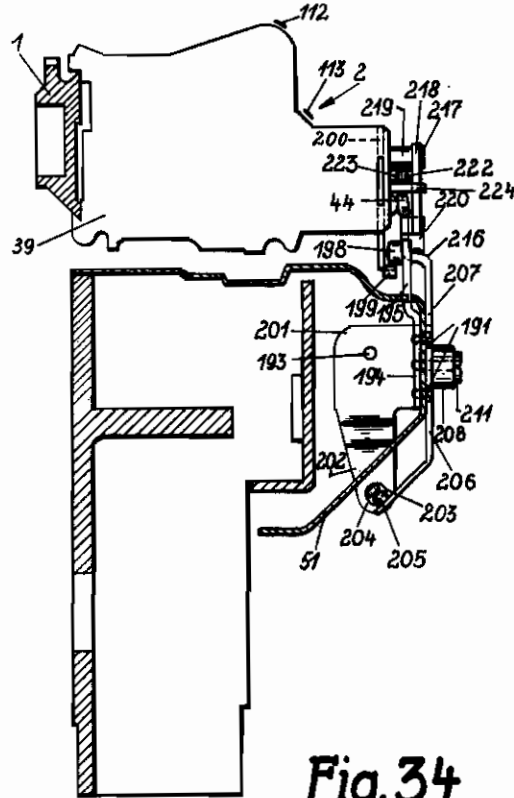
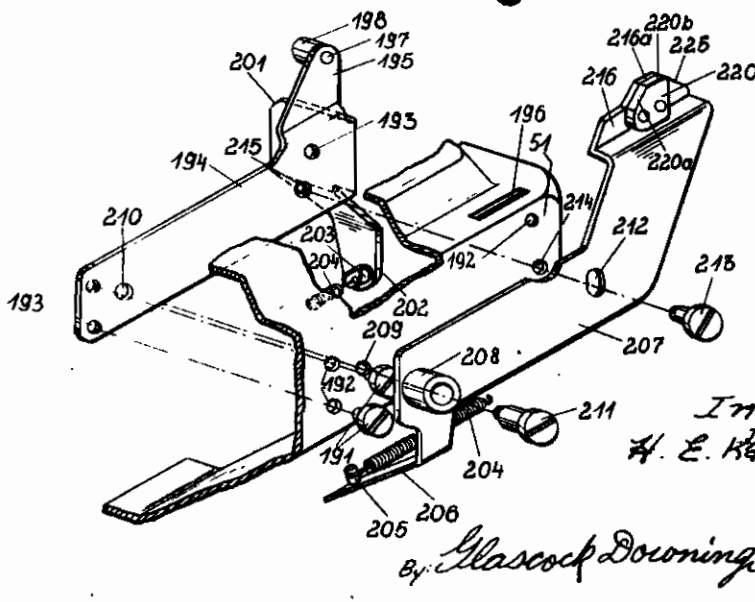


Fig. 34



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Serial No.  
259,030  
17 Sheets—Sheet 13

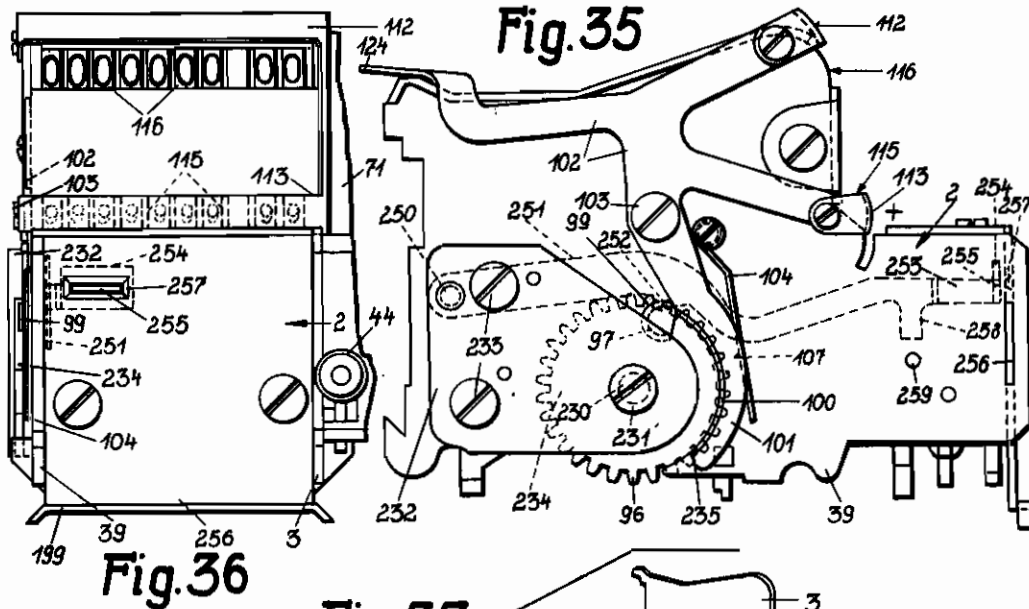


Fig. 36

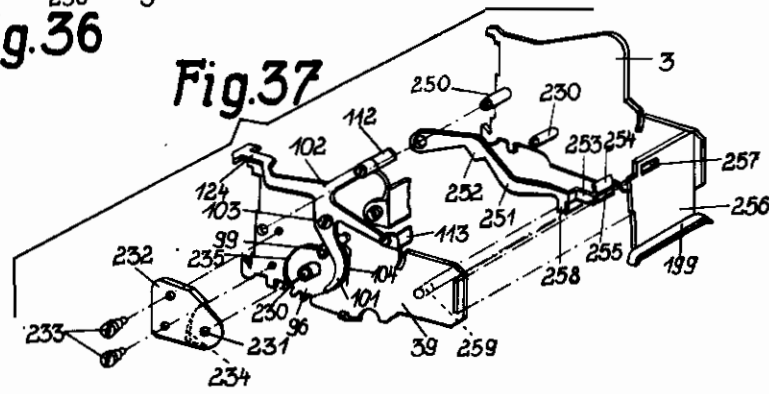


Fig. 37

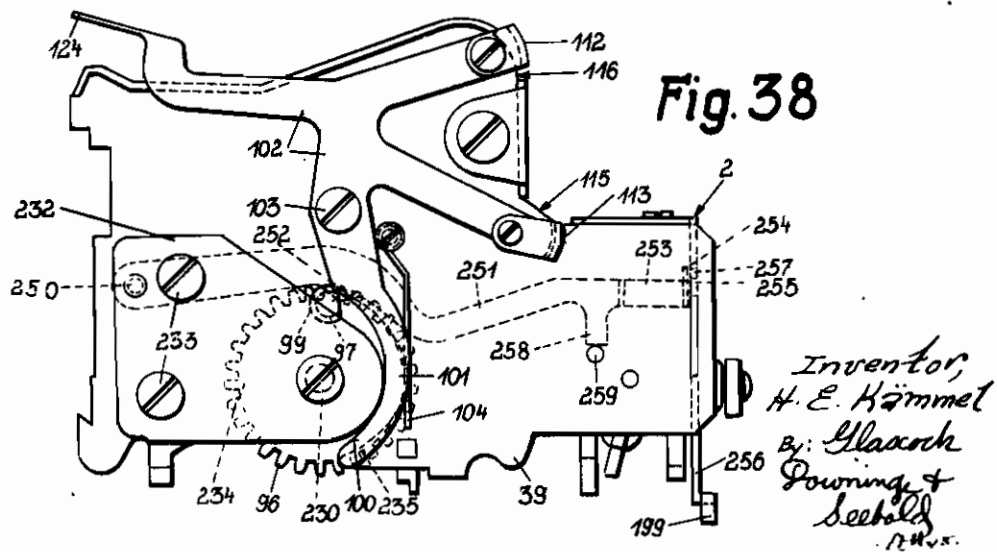


Fig. 38

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Serial No.  
259,030  
17 Sheets--Sheet 14

Fig. 39.

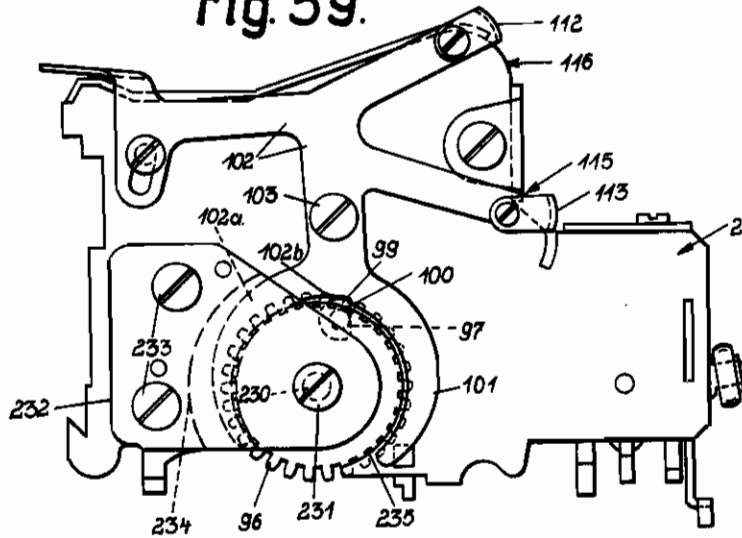
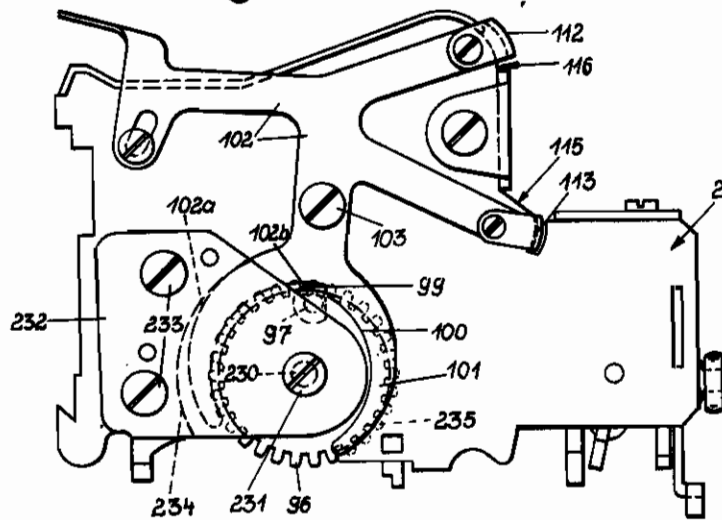


Fig. 40.



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7-1-42

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MAY 25, 1943.  
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Serial No.  
259,030  
17 Sheets-Sheet 15

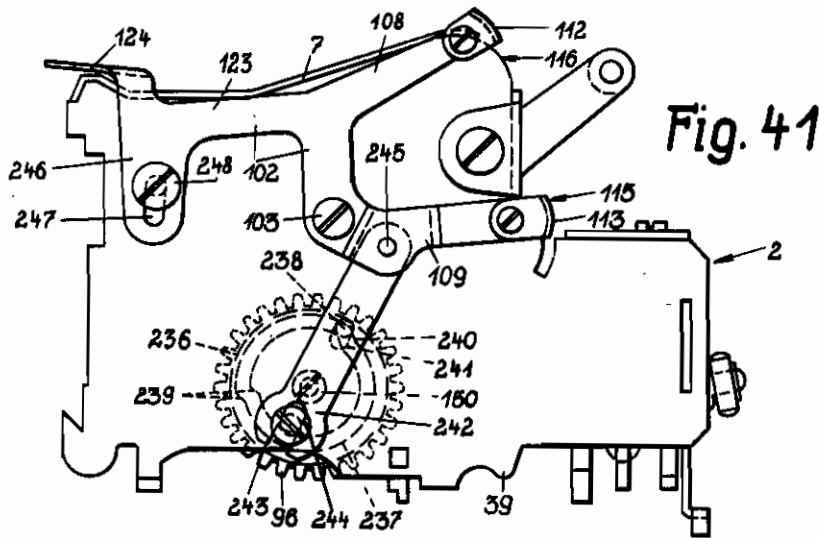


Fig. 41

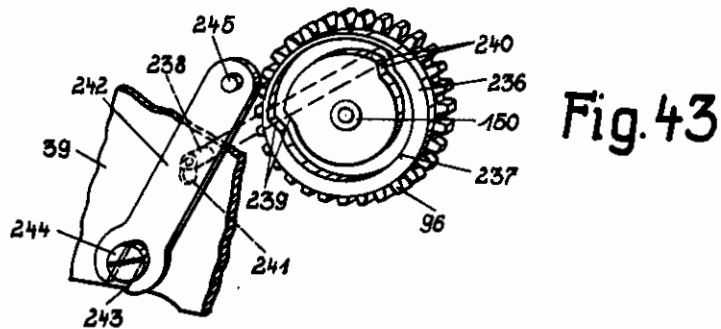


Fig. 43

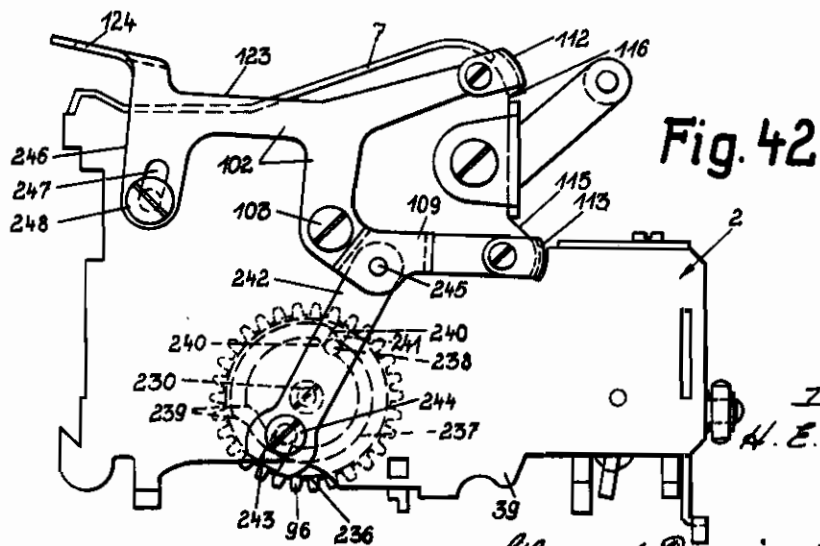


Fig. 42

Inventor,  
H. E. Kämmel

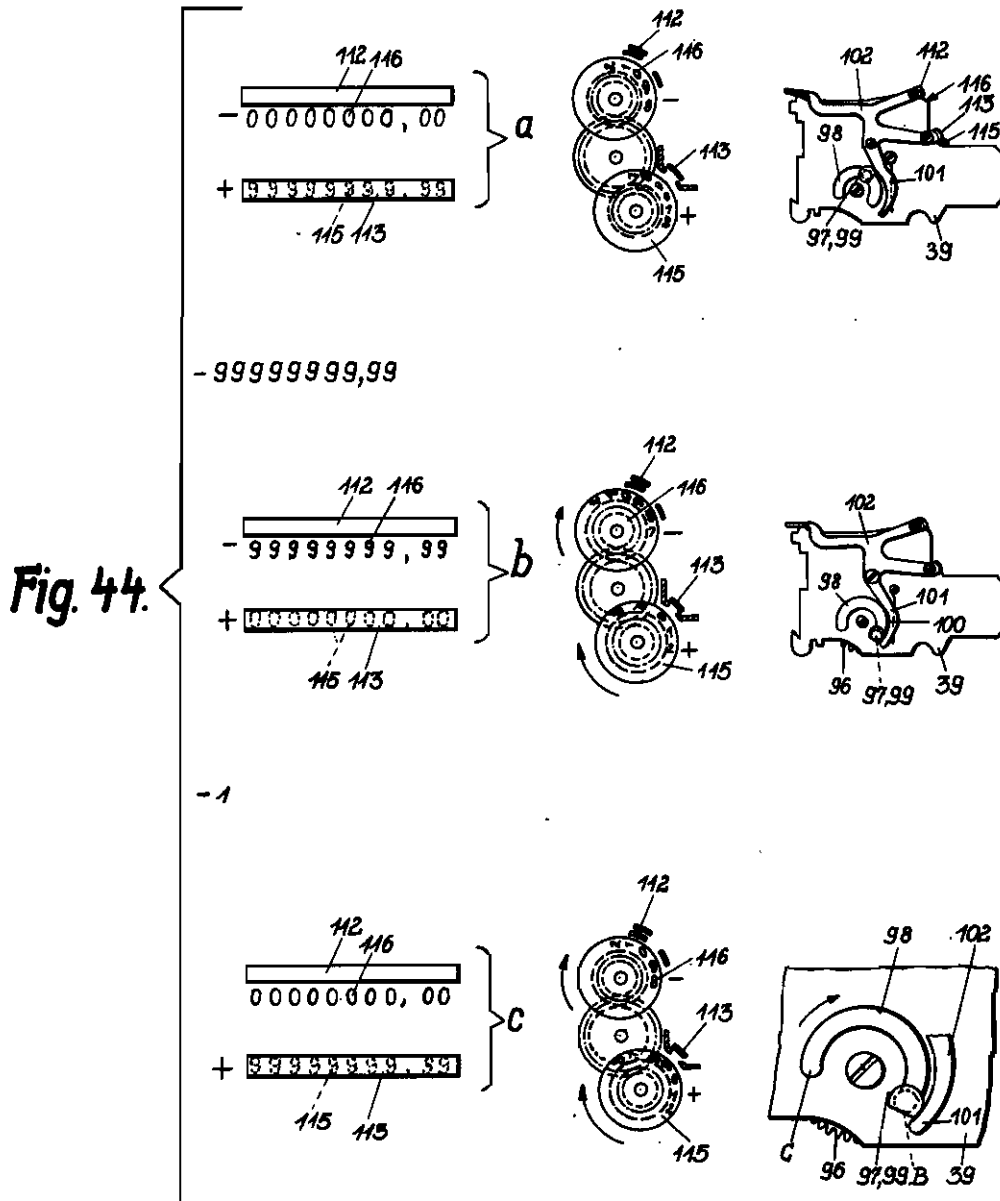
BY: *Glascott Downing & Sebold, Attys.*

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Filed Feb. 28, 1939

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259,030

17 Sheets-Sheet 16



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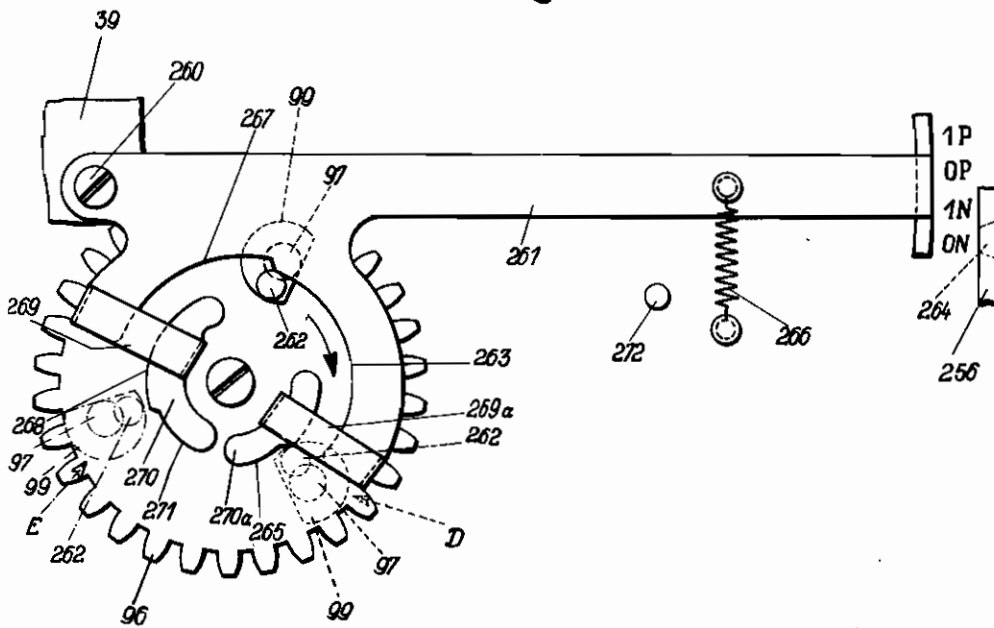


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Serial No.  
259,030  
17 Sheets-Sheet 17

Fig. 45



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# ALIEN PROPERTY CUSTODIAN

## COMPLEMENTARY TOTALISER

Hugo Ernst Kämmel, Zella-Mehlis, Germany;  
vested in the Alien Property Custodian

Application filed February 28, 1939

This invention relates to a complementary totalizer, especially for typewriting-calculating machines equipped with total taking means and with mechanism for controlling the "fugitive 1."

Machines of this kind have already become known in which, however, the "fugitive 1" was introduced manually. Later, the introduction of the "fugitive 1" was performed automatically in dependence on the carriage movement, but these machines had the drawback that the proper total taking of the amounts could not be checked by a clear sign testing or printing device.

These drawbacks are eliminated according to the invention by the mechanism for controlling the "fugitive 1" being arranged to be automatically reversed in dependence on the position of the numeral wheels at the highest calculating place in the direction of the carriage steps, if a value in positive form is present in the set of negative numeral wheels after the complementary totalizer has left its active position, and, if a value in positive form is present in the set of positive numeral wheels before the complementary totalizer arrives in its active position, in such manner that the "fugitive 1" is transferred to the set of positive numeral wheels in additive sense.

In the accompanying drawings, several constructions of the subject matter of the present invention are illustrated by way of example, as follows:

Figs. 1 to 13 illustrate the first construction.

Fig. 1 is a perspective illustration showing a typewriting-calculating machine viewed from the left and the front, the calculating mechanism of the machine being concealed in a casing, the complementary totalizer being shown in full lines and a normal, a minus, and an idle column totalizer being shown in dot-and-dash lines.

Figs. 2 and 3 are elevations of the complementary totalizer, viewed from the right, that is, in the direction of the arrow in Fig. 1, and showing the mechanism for controlling the "fugitive 1" in its initial and reversed position, respectively.

Fig. 4 is a detail.

Fig. 5 is a perspective illustration of the complementary totalizer, viewed from the right and the front of the machine.

Fig. 6 shows part of a locking wheel lever in the complementary totalizer.

Figs. 7 and 8 are elevations of the complementary totalizer, viewed from the right in Fig. 1 and partly broken away, showing one of its locking and setting levers in its active and inactive position, respectively.

Figs. 9 and 11 are elevations of the complementary totalizer, viewed from the left in Fig. 1 and showing the mechanism which operates a pair of screens for alternately concealing the positive and the negative set of numeral wheels in the complementary totalizer, in the initial position in which a "minus" value is calculated, and in the position in which the "minus" value is replaced by a "plus" value, respectively.

Fig. 10 shows diagrammatically the two sets of numeral wheels in the complementary totalizer, and a train of gears connected thereto.

Fig. 12 is a front elevation of the complementary totalizer.

Fig. 13 is a front elevation of the place indicator.

Fig. 14 is an elevation, viewed as in Figs. 7 and 8, of a second construction in which the mechanism controlling the "fugitive 1" is modified.

Fig. 15 shows part of a form to be filled in by the typewriting-calculating machine.

Figs. 16 to 20 are diagrams showing various relative positions of an abutment plate forming part of the screen-operating mechanism at the left of the complementary totalizer, Figs. 9 and 11, and of lugs on the place indicator.

Figs. 21 to 26 show the positions of the complementary and column totalizers for performing the calculating operations required for filling in the form, Fig. 15.

Figs. 27 to 30 illustrate the third construction of the complementary totalizer.

Figs. 27, 28, and 29 correspond to Figs. 2, 3 and 5.

Fig. 30 is a detail.

Figs. 31 to 34 illustrate the fourth construction which is distinguished by a modified tensioning member.

Figs. 31 and 33 are front elevations of the complementary totalizer in its initial position and in its active position with respect to the tensioning member, respectively.

Fig. 32 is a vertical section of the frame of the machine, viewed from the left in Figs. 31 and 33.

Fig. 34 is a perspective illustration of the parts shown in Figs. 31 to 33.

Figs. 35 to 38 illustrate the fifth construction of the complementary totalizer.

Figs. 35 and 38 are elevations corresponding to Figs. 9 and 11.

Fig. 36 is a front elevation of the complementary totalizer, partly broken away at the right.

Fig. 37 is a perspective illustration of the com-

plementary totalizer, with its side plates taken apart.

Figs. 39 and 40 which illustrate the sixth construction, are elevations corresponding to Figs. 9 and 11.

Figs. 41, 42, and 43 illustrate the seventh construction.

Figs. 41 and 42 are elevations corresponding to Figs. 9 and 11.

Fig. 43 is a detail.

Fig. 44 is a diagram illustrating a calculating example illustrating the object for which the fifth, sixth, and seventh construction were designed.

Fig. 45 is an elevation of a device for indicating the overstepping of the capacity of the complementary totalizer.

#### General description

Before the subject matter of the invention proper will be described, it should be noted for a better understanding of the invention, that the entries made in the form F (Fig. 15) may be performed, by way of example, in a typewriting-calculating machine with automatic total taking mechanism, but obviously the complementary totalizer is not limited to typewriting-calculating machines with automatic total taking mechanism, and may be adapted to any other typewriting-calculating, or calculating machine.

A totalizer suspension rail 1 which is attached to the paper carriage, not shown, supports three column totalizers I, II and III, shown in dotted lines and a complementary totalizer 2 shown in full lines at the right of the column totalizers. I is a normal column totalizer, II is a minus column totalizer in which the sequence of the numeral on its numeral wheels is reversed, and III is an idle column totalizer.

The column totalizers I and II are opposite the columns A and B, respectively, of the form F (Fig. 15) and the idle totalizer III is opposite the column C.

Arranged opposite the column D of the form F is the complementary totalizer 2. This totalizer is equipped with a lower positive set 115 (Fig. 12) of numeral wheels and an upper negative set 116 of numeral wheels which are displayed through slots in the front plate of the complementary totalizer. A screen 113 is provided for concealing the positive set 115, and a similar screen 112 is arranged for the negative set 116. The screens are attached to the free ends of a pair of arms on a four-armed screen controlling lever 102 (Figs. 1, 9, 11 and 12) which is fulcrumed at the left-hand side plate 39 of the complementary totalizer 2. In the normal position of the lever 102 the screen 113 conceals the positive set 115, and the screen 112 exposes the negative set 116. The lower end of the front plate 200 of each totalizer is provided with a horizontal rib 199 which, cooperating with a roller 190, Figs. 1, 31 to 34, at the upper end of a retaining plate 194, prevents rising of the totalizers.

#### The arrangement of the mechanism for controlling the "fugitive 1" at the right-hand side plate of the complementary totalizer

The complementary totalizer 2 has a side plate 3 at the right (Figs. 2 and 5) and a side plate 38 at the left, as described. A controlling plate St (Figs. 2 and 3) for determining the kind of calculation, and an unlocking plate E, with a recess

E1, are arranged between the side plates of the complementary totalizer 2.

A pulling lever 5 (Figs. 2, 3 and 5) is mounted to swing about a bearing screw 4 in the side plate 3, and a roof-shaped cam 74 is provided at its tall end 73. In the normal position of the pulling lever 5, Fig. 2, a lug 6 which extends to the left at right angles from the pulling lever 5, bears on the cover plate 7 of the complementary totalizer 2 and thereby limits the swinging movement of the lever 5 in anti-clockwise direction. A pulling rod 9 is pivoted to the front end of the pulling lever 5 with its upper end by a headed screw 6. At its lower end, the pulling rod 9 has an elongated hole 10 through which extends a headed screw 11. This headed screw is inserted in the front arm 14 of a sector lever 15 which is mounted to swing on a bearing screw 16 in the side plate 3. Further, the headed screw 11 engages in a slot 12 in the rear end of a reversing lever 13 which is mounted to swing about the right-hand end of a shaft 38 whose left-hand end is threaded and engages in a hole in the left-hand side plate 38, (Figs. 5, 9 and 11), it will appear that in this manner the reversing lever 13 and the sector lever 15 are swung when the pulling rod 9 is shifted.

Teeth 17 at the rear end of the sector lever 15 mesh with a pinion 18. This pinion which extends through an elliptical hole 20 in the right-hand side plate 3 of the complementary totalizer 2, is rigidly connected to a locking wheel 19. The pinion 18 and the locking wheel 19 are mounted together on a pin 22 (Fig. 6) which is secured to the locking-wheel lever 23 allotted to the lowest calculating place of the complementary totalizer 2, and are held by a nut 24. The pinion 18 meshes with a driving spur gear 21 (Fig. 6) at the lowest calculating place of the complementary totalizer 2. When the lowest calculating place of the complementary totalizer 2 moves into active position and the locking wheel lever 23 is swung in the direction of the arrow 25 (Fig. 6), one of the gaps 26 in the locking wheel 19 engages over a fixing rod 27 which projects from the right-hand side plate 3, to prevent rotation of the pinion 18 and the locking wheel 19 during the operation of the lowest calculating place.

At the crooked front end 28 of the arm 14 of the sector lever 15, a roller 30 is mounted to rotate a rivet 29 for cooperation with notches 31 and 32 in a spring catch 33. The spring catch 33 is mounted to swing about a bearing screw 34 in the side plate 2 of the complementary totalizer 2 and is permanently turned anti-clockwise by a spring 35 (Figs. 2, 3, and 5) whose front end is secured to a pin 36 riveted into the catch 33 and whose rear end is anchored on a bearing member 37 (Figs. 2 and 3) secured in the side plate 3, so that one of the notches 31 or 32 in the spring catch 33 engages the roller 30 on the sector lever 15 holding the sector lever 15, and, through, the headed screw 11, also the pulling rod 9 and the reversing lever 13 in their positions.

The reversing lever 13, is mounted to swing on the threaded shaft 38 which extends through a hole in the right-hand side plate 3 and is screwed into the left-hand side plate 38 of the complementary totalizer 2. Mounted to swing on the threaded shaft 38 between the side plates 3 and 38 is a general reversing flap 40 whose extension 41 (Fig. 5) projects beyond the side plate 3 at the right and is engaged by a forked part 42 of the reversing lever 13 so that it is held in the posi-

tion to which it has been swung in this manner and in conformity with the position of the lever 13. When the reversing flap 40 is in its vertical position (Fig. 2) it effects the reversal of the kind of operation of the typewriting calculating machine, setting the machine to subtraction so that when total taking the value calculated in the complementary totalizer 2, italics are printed. In the rocked position (Fig. 3) of the reversing flap 40, it is in inactive position.

An arm 43 projects forwardly from the reversing lever 13 and on this arm *t* a roller 44 is mounted to rotate which upon the carriage return cooperates with a cam 45 (Figs. 1, 5 and 12) of a tensioning member 46. An incline 49a is arranged at the rear of the cam 45. The tensioning member 46 which is crooked as best seen in Fig. 3, is secured to the right-hand end of the front wall 48 of the calculating casing by screws 47 and its upper end 49 projects through a slot 50 (Fig. 1) in the top plate of the calculating casing 51.

The pulling rod 9 is equipped with a wedge 52 (Figs. 5, 7 and 8) whose inclined edge 53 is arranged for cooperation with the inclined end 54 of a pawl 55. This pawl is secured on the right-hand journal 56 of a locking flap 57, Figs. 7 and 8. When the pulling rod 9 is shifted upwards the inclined edge 53 of its wedge 52 slides along the inclined end 54 of the pawl 55, turning the pawl end the locking flap 57 anti-clockwise (Fig. 8). The locking pawl 57 engages below the front ends of locking and setting arms 59 arranged at the comma places, whereby a locking tooth 60 (Figs. 7 and 8) on each lever 59 is moved clear of the teeth of the corresponding drive wheel 60. The driving wheels are now released during the reversal of the control members described in the section entitled "The operation of the complementary totalizer and the mechanism parts cooperating with it", for introducing the "fugitive 1" into the lowest calculating place.

Springs 59a, Fig. 7, at the locking and setting levers 59 tend to turn the locking flap 57, and with it the pawl 55, permanently clockwise, the inclined end 54 of the pawl acting on the upper incline 53 of the wedge 52 and moving the pulling rod 9 in such manner that the upper edge 10a of its elongated hole 10 bears upon the shank of the screw 11 (Fig. 7). This has for its consequence that the pulling rod 9 can be raised for the distance limited by the elongated hole during the raising of the locking and setting levers 59 (Fig. 8), before the pulling rod 9 can act on the reversing lever 13 and the sector lever 15.

Mounted to swing on the bearing member 37 (Figs. 2 and 3) at the right-hand side plate 3 of the complementary totalizer 2 is a carriage-return releasing bellcrank 62 with a handle 63 at its front end. The rear end of the bellcrank 62 is guided by means of a screw 61 extending through an elongated hole 62a in the bellcrank. Spacing sleeves, not shown, hold the bellcrank at the proper distance from the side plate 3. The bellcrank is arranged for releasing the automatic carriage return of the typewriting-calculating machine, the bellcrank 62 being turned anti-clockwise about the bearing member 37 until a pin 64 at the free end of a flat spring 65 which is riveted to the bellcrank, engages in a depression 66. At the same time a lug 67 at the rear end of the bellcrank 62 acts on not illustrated parts which have been shown in the patent 2,046,524 the end of the movement of the carriage to the left, effecting the carriage return.

A check 68 (Figs. 2, 3 and 5) is secured to the right-hand side plate 3 of the complementary totalizer 2, for preventing release of the calculating mechanism of the typewriting-calculating machine while the controlling members of the complementary totalizer 2 are reversed.

Two stays 69 and 70 (Fig. 5) are fixed on the right-hand side plate 3 of the complementary totalizer 2 to which is attached by screws 72 (Fig. 12) a casing 71 (Figs. 1 and 12) adapted to the shape of the side plate 3.

As mentioned, a roof or inverted V member 74 is arranged at the tail end 73 of the pulling lever 5 (Fig. 5).

*The controlling parts at the place indicator of the typewriting-calculating machine for reversing the controlling members of the complementary totalizer*

A holder 76 for a place indicator 77 (Figs. 1, 2, 3 and 13) is secured to the front carriage rail 75 (Fig. 1) and its pointer 78 indicates that calculating place of a column totalizer which is in calculating position at the time. A plate 79 extends to the right from the place indicator 77 and a hinge member 80 is held on the plate 79 by screws 81. Eyes 82 (Fig. 5) of the hinge member 80 support a bearing shaft 83 on which a controlling flap 84 for the pulling lever 5 is mounted to swing. By a torsion spring 85 (Figs. 1, 5 and 13) which is wound about the bearing shaft 83, the controlling flap 84 is turned permanently anti-clockwise (Fig. 2) until an abutment 86 (Fig. 1) which is arranged the flap 84, engages the hinge member 80 and holds the flap 84 in its normal, that is, vertical, position. In this position of the flap 84, an inclined edge 87 (Figs. 1 and 13) at the lower end of a right-hand extension 88 of the flap 84 can cooperate with the roof-shaped cam 74 on the pulling lever 5. A lug 90 extends at right angles and in forward direction from a left-hand extension 89 (Figs. 1, 2, 3, 5 and 13) of the flap 84. The front edge 91 (Fig. 1) of the lug can cooperate with a trapezoidal plate 124 at the rear end of the four-armed lever 102 (Figs. 1, 9 and 11) which is at the left-hand side plate 30 of the complementary totalizer 2.

A controlling lug 92 (Figs. 2 to 4 and 13) is secured to the lower side of the place indicator 77 by screws 93. A projection 94 extending downwards from this lug 92 has an incline 95 (Fig. 13) projecting into the plane of the extension 88 on the flap 84 and can act in the same manner on the roof shaped cam 74 on the pulling lever 5 at the complementary totalizer. However, this projection 94 will act on the cam 74 of the pulling lever 5 only if the flap 84 has been swung so far to the rear that its extension 88 is beyond the path of the cam 74 (Fig. 4), as will be fully described in the section entitled "The operation of the complementary totalizer and the parts of the mechanism cooperating with it." The arrangement of the extension 88 and the projection 94 has in the present instance been advantageously so determined that in the normal position (Fig. 2) of the flap 84 its inclined edge 87 acts on the cam 74 for two carriage steps earlier than the highest calculating place of the complementary totalizer 2 moves into active position while the incline 95 of the lug 92 can act on the cam 74 only upon the second feeding step of the paper carriage of the typewriting-calculating machine, after the lowest place of the complementary totalizer 2 has calculated.

*The arrangement of the screen-controlling mechanism at the complementary totalizer*

At the driving wheel 96 (Figs. 1, 9 and 11) which is allotted to the highest calculating place in the complementary totalizer 2 a cam 87 is secured which slides in an arcuate slot 98 in the left-hand side plate 39 of the complementary totalizer 2. The thicker head 99 (Figs. 9 and 11) of the cam projects beyond the side plate 39. This head 99 of the cam 87 can act on an arcuate edge 100 at one arm 101 of the four-armed lever 102. The four-armed lever 102 is mounted to swing at the side plate 39 of the complementary totalizer 2 about a bearing screw 103. A power accumulator, here shown as a spring 104 which is clamped to the side plate 39 by a headed screw 105 (Figs. 9 and 11) and whose downwardly projecting spring arm 106 engages in a recess 107 of the arm 101, tends to turn the four-armed lever 102 permanently clockwise about the screw 103, forcing the arcuate edge 100 of the arm 101 of the lever 102 against the head 99 of the cam 87, (Fig. 9).

Two arms 108 and 109 project forwardly from the four-armed lever 102 to which the screens 112 and 113 (Figs. 9 to 12) are secured by screws 110 and 111, respectively. The screens are connected by a strip 114 (Fig. 2) to constitute a frame as described, when the four-armed lever 102 is in its normal position according to Fig. 9, the screen 113 conceals the positive set of numeral wheels 115 in the complementary totalizer 2 (Fig. 12) while the screen 112 exposes the negative set of numeral wheels 116 of the totalizer 2. It should be noted that in this case the "fugitive 1" is already introduced into the lowest calculating place by cooperation of the roller 44 (Figs. 2, 3 and 5) on the reversing lever 13 and the tensioning member 45, as will be described in the section entitled: "The operation of the complementary totalizer and the parts of the mechanisms cooperating with it," whereby all numeral wheels of the negative set 116 are moved to "zero" (Fig. 1).

When the negative numeral wheels 116 (Fig. 12) of the column totalizer 2 after reversing by the lever 13 show "zero" (Fig. 10), the concealed positive numeral wheels 115 show "9". If in this case a value, for instance, 0.80, is introduced positively into the complementary totalizer 2, the exposed negative numeral wheels 116 indicate the value "9 999 999.20", while the concealed positive numeral wheels 115 indicate the value "0 000 000.79". Since during the introduction a tenth transfer as far as the highest place has occurred, the driving wheel 96 is rotated in the direction of the arrow 117 (Fig. 9 and 11). The head 99 of the cam 87 on the driving wheel 86 now moves from the position in Fig. 9 into the position in Fig. 11, releasing the edge 100 of the arm 101 on the four-armed lever 102. The lever is now free to swing clockwise under the action of the spring 104 until the lower edge 118 of the screen 113, which engages in a slot 119 in the left-hand side plate 39 of the complementary totalizer 2, and in a slot 120 in its right-hand side plate 3 (Figs. 11 and 3) abuts against the respective lower ends 121 and 122 of the slots 119 and 120. The screen 112 now conceals the negative set of numeral wheels 116 in the complementary totalizer 2, while the screen 113 exposes the positive set of numeral wheels 115.

A rearwardly extending arm 123 is arranged on the four-armed lever 102 which is crooked to the right at right angles and made into a trapezoidal plate 124 (Fig. 1), the inclined edge 125

at the left of the plate 124 projecting into the path of the lug 80 (Figs. 1, 2, 3 and 5) at the flap 84 in the normal position of the four-armed lever 102, as shown in Fig. 9. In the position of the lever 102 according to Fig. 11, the plate 124 has been swung so as to place its inclined edge 125 above the path of the lug 80 of the flap 84, sliding past the lug and not influencing it.

*The operation of the complementary totalizer and the parts of the mechanism cooperating with it*

In the following, the operation of the complementary totalizer 2 and its controlling members according to the invention, in cooperation with the controlling parts of the place indicator 77 and the tensioning member 46 (Fig. 1), will be described for the accounting entries in the form F (Fig. 15).

It is assumed that all members of the complementary totalizer 2 and all parts of the place indicator 77 occupy their normal positions, as shown in Figs. 1, 5 and 9. In the normal position of the members of the complementary totalizer 2 as shown in Figs. 5 and 9, the "fugitive 1" has already been added to the lowest calculating place of the negative set of numeral wheels 116 in the complementary totalizer 2. The consequence was that the train of gears of this calculating place was turned from "9" to "0" and due to the tens transfer which occurs during this and is transmitted from one calculating place to the next higher calculating place of the complementary totalizer 2, all numeral wheels of the negative set of numeral wheels 116 have been turned to "zero". During this rotation of the driving wheel 96 (Fig. 9) at the highest calculating place of the complementary totalizer 2 against the direction of the arrow 117, the head 99 of its cam 87 has acted on the edge 100 of the arm 101 and turned the four-armed lever 102 anti-clockwise against the action of the spring 104, so that the screen 112 exposes the negative set of numeral wheels 116 (Fig. 12) while the screen 113 conceals the positive set of numeral wheels 115 which has now been turned to "9". The trapeze plate 124 of the four-armed lever 102 (Figs. 1 and 9) is moved into the path of the lug 80 on the flap 84 of the place indicator 77.

The first operation is that of entering a "credit" amount, for instance, RM. 135.25, in the column B of the form F, as shown in Fig. 15, and of calculating this value in the minus column totalizer II (Fig. 1) and in the complementary totalizer 2. As mentioned, the sequence of the numerals on the numeral wheels in the minus column totalizer II is the reverse of the normal sequence. The minus totalizer II is equipped with a controlling plate St (Figs. 2, 3, 9, 11 and 21) by which the kind of operation of the machine is set for subtraction, and the main driving wheels A1, A3 and A4 (Fig. 21) are driven in the direction of the arrow in wheel A1 (Fig. 9). By a clutch-controlling plate V (Fig. 21) which is also arranged at the minus column totalizer II, a clutch K is operated to connect the main driving wheel A3 to the drive of the machine. As also mentioned, the unlocking plate E (Figs. 9 and 11) of the complementary totalizer 2 which normally unlocks the calculating mechanism of the typewriting-calculating machine in the frame 51, is recessed at E1. This recess is provided for preventing uncoupling of the main driving wheel A4 from the drive by the unlocking plate E when the complementary totalizer 2 moves into active position with respect to the main driving wheel A4.

By depressing the corresponding tabulator key, not shown, the hundreds calculating place in the minus column totalizer II is moved into calculating position, whereupon by depressing the calculating key in the calculating keyboard, not shown, of the typewriting calculating machine, which corresponds to the value "1", the number "1" is typed in the column B of the form F, and entered in negative sense into the hundreds calculating place of the minus column totalizer II. The numeral wheels at the hundreds calculating place now displays "1". At the same time, a "1" is entered into the complementary totalizer 2 in negative sense and the hundreds calculating place of the negative set of numeral wheels 116 in the complementary totalizer displays "1". After the carriage has moved on for one step, a "3", and, as the carriage moves further, the other numbers of the "credit" amount 136.25 are typed similarly in the column B of the form F and calculated in the minus column totalizer II and in the complementary totalizer 2, so that the minus totalizer II and the negative numeral wheels 116 of the complementary totalizer 2 indicate the value "135.25" (Fig. 21).

Now, an "Old Balance" of RM 20.10, which was taken over as a plus value an earlier form, is to be typed in the column C of the form F and to be calculated in the complementary totalizer 2. As the idle column totalizer III is without the clutch-controlling plate V, Fig. 21, the clutch K remains in its normal position in which the driving wheels A1 and A2 (Fig. 22) are coupled to the drive. Nor has the idle column totalizer III a controlling plate St, for controlling the kind of operation so that amounts entered by depression of keys are so in additive sense.

When the idle column totalizer III has been tabulated into active position with its tens place, the value "20.10" is typed in the column C and at the same time is entered in positive sense into the corresponding calculating places in the complementary totalizer 2 so that the value "115.15" (Fig. 22) is indicated at the close of the calculating operations by the exposed negative set of numeral wheels 116 of the complementary totalizer 2. The complementary totalizer 2 has now moved to the left so far that the inclined side 125 (Fig. 1) of the trapeze plate 124 of the four-armed lever 102 is at the right of the lug 90 on the pulling-lever controlling flap 84 (Fig. 16).

The value "115.15" which has been entered in the complementary totalizer 2 is now to be registered as new balance in the column D of the form F by total taking. For this purpose, the complementary totalizer 2 is moved into active position with respect to the main driving wheel A1 (Fig. 23) of the calculating mechanism in the frame 51 of the typewriting-calculating machine with its hundreds calculating place by depression of the corresponding tabulator key. During the carriage movement which has been started by the tabulating operation, and two steps before the complementary totalizer 2 arrives in the active position with its highest calculating place, the inclined side 125 of the trapeze plate 124 at the fourarmed lever 102 engages the front edge 91 of the lug 90 at the pulling lever controlling flap 84 (Fig. 17) and swings the flap anti-clockwise against the torsion spring 85, as shown in Fig. 4, about the bearing shaft 83, and the extension 88 at the right of the flap 84 moves beyond reach of the roof-shaped cam 74 of the pulling lever 5 (Figs. 4 and 14). During the following moving on of the paper carriage to the

left, the rear edge 124a (Fig. 1) of the trapeze plate 124 holds the flap 84 in its swung-out position until the roof-shaped cam 74 of the pulling lever 5 has moved past the extension 88 of the flap 84. When the edge 124a of the trapeze plate 124 releases the lug 90 of the flap 84, the flap swings back into its normal position, as shown in Fig. 2, under the action of the torsion spring 85, in which the abutment 86 of the flap 84 bears on the hinge member 80. Since, the complementary totalizer 2 has a controlling plate St for controlling the kind of operation (Fig. 23), the kind of the calculating mechanism concealed by the frame 51 is reversed to subtraction when the plate St moves into active position. Due to the general reversing flap 40 (Figs. 2 and 5) of the complementary totalizer 2 being held in its vertical or normal position by the reversing lever 13, this flap reverses to addition the calculating mechanism of the typewriting-calculating machine—which had been set to subtraction by the controlling plate St of the complementary totalizer 2—by operating the general reversing key G for reversing the kind of operation (Fig. 1) because the "minus" value 115.15 indicated by the negative set of numeral wheels 116 in the complementary totalizer 2 can be withdrawn from the complementary totalizer only by addition. When the general reversing key G for reversing the kind of operation of the typewriting calculating machine is operated, the value "115.50" is typed in italics upon total taking, characterizing it as a negative balance.

The calculating mechanism concealed by the frame 51 is uncoupled by the unlocking plate E of the complementary totalizer 2.

After the hundreds calculating place of the complementary totalizer 2 has been moved into calculating position, the value "115.50" is withdrawn from the complementary totalizer 2 and typed in column D of the form F (Fig. 15) and the automatic total taking effected thereby.

After the last number "5" of the value "115.50" has been withdrawn from the negative set of numeral wheels 116 in the complementary totalizer 2, and typed in the column D of the form F, the negative numeral wheels 116 again show "zero" and the value "135.25" appears in the minus column totalizer II (Fig. 23). In consequence of the typing of the last number "5" of the value "135.25" a step of the carriage is released and when this step has been performed, the lefthand incline of the roof-shaped cam 74 on the pulling lever 5 (Fig. 1) is at the righthand side of the projection 94 on the controlling lug 92. (Figs. 1, 13, and 18). Now the paper carriage of the typewriting-calculating machine is brought one step further to the left. At the same time, the left-hand incline of the roof-shaped cam 74 on the pulling lever 5 slides along the incline 95 of the fixed controlling lug 92, and the pulling lever 5 (Figs. 3 and 5) is swung clockwise about its bearing screw 6. The screw 8 now raises the pulling rod 9 and the locking and setting levers 59 (Fig. 7 and 8) are raised by means of the incline 53 of the wedge 52, the incline 54 of the pawl 55, and the locking flap 57, as shown in Fig. 8, unlocking the driving wheels 89 of the complementary totalizer 2. As the pulling rod 9 rises further, the lower end of its elongated hole 10 acts on the screw 11 in the front arm 14 of the sector lever 15 and turns the sector lever 15 clockwise about its bearing screw 16. The roller 30 arranged at the crooked front end 28 of the sector lever 15 leaves the notch 31 in

the spring catch 33 to which the spring 35 is connected, and is engaged by the notch 32, holding the sector lever 15 in this position (Fig. 3). The swinging movement of the sector lever 15 is transmitted to the reversing lever 13 by the screw 11 and the slot 12. The reversing lever 13 is swung anti-clockwise about the shaft 38 and, with its forked part 42, swings the general reversing flap 40 for reversing the kind of operation into the position shown in Fig. 3.

When the sector lever 15 swings clockwise, its teeth 17 turn the pinion 18 and the locking wheel 19 anti-clockwise for one unit, and the pinion 18 (Fig. 6) turns the driving wheel 21 of the lowest calculating place in the complementary totalizer 2, with which it meshes, clockwise for one unit. In consequence, the "fugitive 1" is added to the lowest calculating place of the complementary totalizer 2, so that the numeral wheel of the said calculating place in the positive set of numeral wheels 115, which was at "9," is now turned from "9" to "0." In consequence of the positive tens transfer all numeral wheels of the positive numeral wheel set 115 are progressively turned from "9" to "0." When the driving wheel 96 which is allotted to the highest calculating place of the complementary totalizer 2 (Fig. 9) is rotated in the direction of the arrow 117, the head 99 of its cam 97 releases the arcuate edge 100 of the arm 101 and the four-armed lever 102 is now swung clockwise and into the position shown in Fig. 11 under the action of the power accumulator, or spring, 104. In this position, the lower edge 116 of the lower screen 113 is seated on the lower ends 121 and 122 of the respective slots 119 and 120 in the side plates 3 and 39 of the complementary totalizer 2. The screen 113 thus exposes the positive set of numeral wheels 115 in the complementary totalizer 2, and the screen 112 conceals the set of negative numeral wheels 116.

This reversing of the controlling members and the introduction of the "fugitive 1" achieved thereby are necessary for printing the clear sign asterisk at the end of each total taking from the complementary totalizer 2. This is effected by depression of a key, not shown.

The arrows shown in full lines in Fig. 10 indicate the direction of rotation of the several wheels for additive calculation and the arrows shown in dotted lines indicate the direction of rotation for subtractive calculation.

When the clear sign has been printed in the column D of the form F, the lug 67 at the bell-crank 62 (Fig. 3) which has previously been manually moved into its active position, releases the automatic carriage-return device of the machine upon the subsequent step of the paper carriage as described in the patent 2,046,524 for the right hand marginal stop Ra.

When the paper carriage of the typewriting-calculating machine is moved to the right, the roller 44 at the front end of the reversing lever 13 (Fig. 3) ascends the inclined edge of the cam 45 of the tensioning member 46 (Figs. 1 and 12) whereby the reversing lever 13 is returned into its normal position, as shown in Figs. 2 and 5. Due to the connection of the reversing lever 13, the sector lever 15, and the pulling rod 9 by the screw 11, this rod is pulled down. The incline 52a (Fig. 3) of the wedge 52 acts on the upper edge 55a of the pawl 55, swinging the pawl anti-clockwise and moving the locking levers 50 into inactive position through the locking flap 57 (Fig. 8).

When the reversing lever 13 (Fig. 3) is swung back, it swings back the sector lever 15 anti-

clockwise about its bearing screw 16 through the screw 11. The roller 30 at the front end 26 of the sector lever leaves the notch 32 in the spring catch 33 and enters the notch 31. The teeth 17 of the sector lever 15, through pinion 18 (Fig. 6) rotate the driving wheel 21 (Fig. 6) which is allotted to the lowest calculating place of the complementary totalizer 2, in anti-clockwise direction, whereby in consequence of the tens transfer which is continued from calculating place to calculating place, the negative set of numeral wheels 116 is again turned to zero. Upon rotation of the driving wheel 98 (Fig. 11) which is allotted to the highest calculating place, against the direction of the arrow 117, the cam 97 on the wheel 98 swings the four-armed lever 102, through its arm 101, anti-clockwise and the screens 112 and 113 are so moved that the screen 112 exposes the negative set of numeral wheels 116. All parts of the complementary totalizer 2 and the controlling members operating them, are again in the normal positions shown in Figs. 5 and 9.

In the next line of the form F, a "debit" amount of RM "525.32" is to be entered. The normal column totalizer I (Figs. 1 and 24) is without a controlling plate St for determining the kind of operation of the calculating mechanism which is concealed by the frame 51, and therefore the value "525.32" is entered additively into the complementary totalizer 2. However, the normal column totalizer I has a clutch-controlling plate V (Fig. 24) which so controls the clutch K that the driving wheel A2 which is normally coupled to the drive, is now uncoupled therefrom (Fig. 24). When the first number "5" of the value "525.32" is entered into the complementary totalizer 2, the screens 112 and 113 are swung, for the following reasons.

When the train of gears at the hundreds calculating place in the complementary totalizer 2 is rotated in additive sense for five units, a tens transfer to the next higher calculating place occurs when the numeral wheel at the hundreds calculating place of the—positive set of numeral wheels 115 turns from "9" to "0." This tens transfer is continued as far as the highest calculating place of the complementary totalizer 2. In consequence, the driving wheel 96 (Fig. 9) at the highest calculating place is turned in the direction of the arrow 117 for one unit. The head 99 (Fig. 9) of the cam 97 on the wheel 96 releases the arcuate edge 100 of the arm 101 on the four-armed lever 102, as shown in Fig. 11. Under the action of the power accumulator or spring 104, the four-armed lever 102 now swings clockwise, the screen 112 conceals the set of negative wheels 116 (Fig. 11) in the complementary totalizer 2, and the screen 113 exposing the positive set of wheels 115. The trapezeshaped plate 124 of the four-armed lever 102 is moved beyond reach of the lug 90 on the pullug-lever controlling flap 84 (Fig. 11). The positive numeral wheel in the set 115 at the hundreds calculating place of the complementary totalizer 2 now shows "4" when the calculating operation has been completed. The "1" that still misses here is added by tens transfer to the "4" at the hundreds calculating place when the second number "2" of the value "525.32" is introduced into the tens calculating place, so that the numeral wheel at the hundreds place shows the correct value "5." The other numbers of the "debit" amount "525.32" are introduced in the same way, so that the positive

set of numeral wheels 115 in the complementary totalizer 2 shows the value "523.32." The missing "1" of the last number is automatically added later.

Obviously the correct value "525.32" is introduced into the column totalizer I whose set of numeral wheels, as mentioned, has the normal sequence of numerals, and the value is typed in the column A of the form F. For entering the new balance in the complementary totalizer 2 it is necessary to depress the general reversing key G which reverses the kind of operation (Fig. 1), for printing the old or negative balance "115.15" in the column C of the form F in italics, since it is a negative item, after the idle totalizer III has been tabulated into its active position, and to transfer the value "115.15" into the complementary totalizer 2 in subtractive sense. Since the idle totalizer III is without the clutch controlling plate V, the clutch K remains in its normal position when the idle totalizer III moves into active position in which the driving wheel A2 partakes in the rotation of the driving wheel A1 (Fig. 25). At the close of these calculating operations, the set of positive numeral wheels 115 in the complementary totalizer 2 will indicate the value "410.16" (Fig. 25). The "1" which misses in the lowest calculating place, is automatically entered as follows.

When the value "115.15" has been entered and typed, and after the carriage step released by the typing down of the "5" in the lowest calculating place, the left-hand inclined face of the roof-shaped cam 74 (Fig. 1) of the pulling lever 5 is at a short distance from the incline 67 of the extension 60 of the pulling-lever controlling flap 84 (Fig. 19) which flap has remained in vertical position because, the trapezoidal plate 124 of the four-armed lever 102 has occupied the position shown in Fig. 11, in which it slides along and above the lug 90 of the flap 64.

For typing the new balance "410.16" (Fig. 25) which has been entered in the complementary totalizer 2, the totalizer is tabulated into active position. At the start of the carriage movement to the left, the roof-shaped cam 74 of the pulling lever 5 (Figs. 5 and 13) is engaged by, and descends along, the incline 87 at the extension 89 of the pulling-lever controlling flap 84. The pulling lever 5 (Fig. 9) is swung clockwise about its bearing screw 4, and the pulling rod 9, the reversing lever 13, and the sector lever 15 are thrown over into the positions shown in Fig. 3. Through the teeth 17 of the sector lever 15, the pinion 18, and the driving wheel 21 (Figs. 5 and 6) the "fugitive 1" is added to the lowest calculating place of the positive set of numeral wheels 115 in the complementary totalizer 2 which now indicates the correct value "410.17" (Fig. 20). The four-armed lever 102 is not influenced by this, as a tense transfer which could rotate the wheel 96 at the highest calculating place, does not occur. After the hundreds calculating place of the complementary totalizer 2 has moved into active position, the value "410.17" is withdrawn by total taking from the complementary totalizer 2 and the value is typed in the column D of the form F. It should be noted that since the general reversing flap 40 for controlling the kind of operation is swung into the position shown in Fig. 3 in which the flap is inactive with respect to the control of the kind in the calculating mechanism of the typewriting-calculating machine which is concealed by the frame 51, the value "410.17" is typed in straight

figures indicating a "plus" balance, and the non-cambeared positive numeral wheels in the set 115 of the complementary totalizer 2 are returned to "zero." (Fig. 26.) By the step of the carriage which is started by the typing of the number "7" in the value "410.17" the complementary totalizer 2 moves into active position with its right-hand platine place. In this position of the complementary totalizer 2, a further step of the carriage is released, the roof-shaped cam 74 of the pulling lever 5 (Fig. 1) sliding below the fixed controlling lug of the place indicator 77 of the typewriting calculating machine. In this position of the complementary totalizer, the clear sign is printed by depression of the clear sign key, not shown, whereupon the automatic carriage return as described in the Patent 2,046,524 for the right hand marginal stop occurs again. During this movement of the paper carriage of the typewriter-calculating machine to the right, the roller 44 of the reversing lever 43 rises on the incline 45 of the cam on the tensioning member 46, and the controlling members of the complementary totalizer 2 are returned into their normal positions (Figs. 5 and 9).

The purpose for which the second incline 49a is provided at the tensioning member 46 (Figs. 1 and 5) is as follows.

At the end of the carriage return, that is, in the right hand final position of the paper carriage of the typewriting-calculating machine, it may happen that the operator inadvertently knocks against the roller 44 on the reversing lever 13 and, without knowing it, reverses the controlling members of the complementary totalizer 2 (Fig. 3). This would result in a miscalculation during the operation of the complementary totalizer 2.

During tabulation, that is, during the movement of the paper carriage to the left, the roller 44 of the reversing lever 13 in this case rises on the incline 49a of the tensioning member 46 and returns the controlling members of the complementary totalizer 2 into the normal positions according to Fig. 2.

A second construction of the mechanism for rendering inactive the locking and setting levers 59 for the driving wheels 90 of the complementary totalizer 2 is shown in Fig. 14. In this construction, the pulling rod 9 is equipped with a tooth 127 having an inclined edge 128. When the pulling lever 5 is swung clockwise about its bearing screw 4, the ascending pulling rod 9, with the incline 126 of its tooth 127, acts on an incline 128 at the lower side of a hook 129 at the upper end of an arm 130 which is mounted to swing about a bearing screw 131 in the right-hand side plate 3 of the complementary totalizer 2, and swings the arm 130 clockwise about its bearing screw 131. A pin 132 is riveted into the arm 130 and extends to the rear through a corresponding longitudinal slot 133 in the right-hand side plate 3 of the complementary totalizer 2. When the arm 130 is swung clockwise, the pin 132 acts on a short arm 134 at the locking flap 57, the flap is swung anti-clockwise and moves the teeth 58 of the locking and setting levers 59 clear of the wheels 90. In the reversed position of the pulling lever 5 and the pulling rod 9, as shown in Fig. 3, the tooth 127 of the pulling rod 9 has moved beyond the hook 129 of the arm 130, and the springs 59a return the locking and setting levers 59, the unlocking flap 57, the arm 130, and its pin 132, into their normal positions as shown in Fig. 14.



When the reversing lever 13, the sector lever 15, the pulling rod 8, and the pulling lever 5 return into their initial positions (Fig. 2) the edge 135 of the tooth 127 on the pulling rod 8 acts on an incline 136 on the arm 130, whereby the arm 130 is again swung clockwise and the driving wheels 60 of the complementary totalizer 2 remain unlocked for the duration of the reversal through the pin 132, the short arm 134 of the unlocking flap 57, and the flap itself.

In this construction of the mechanism for rendering inactive the locking and setting levers 50, the unlocking of the driving wheels 60 of the complementary totalizer 2 are unlocked more rapidly and more reliably on account of the action of the pin 132 on the short arm 134 of the unlocking flap 57.

*The arrangement of the controlling members at the complementary totalizer according to the third construction and Figs. 27 to 30*

At the right-hand side plate 3 of the complementary totalizer 2—which is substantially similar to the one described with reference to Figs. 1 to 13—a spring catch 150 is mounted to swing about the bearing screw 4 instead of the pulling lever 5 (Figs. 27, 28 and 29) and the bearing screw 4 is inserted in a bearing bracket 155. A spring 151 which at one end is suspended in a hole 152 in the catch 150, and at the other end is anchored on a pin 153 in the right-hand side plate 3, turns the catch 150 permanently anti-clockwise, the normal position of the catch being defined by a lug 154 at right angles to the catch 150 bearing against the upper surface of the bearing bracket 155. In this normal position, the front end 156 of the catch 150 engages in a rectangular recess 157 at the upper end of a bellcrank 158, holding the bellcrank against swinging clockwise about its bearing screw 159 which is inserted in the side plate 3 (Fig. 27). A washer 160 (Fig. 29) holds the bellcrank 158 at the required distance from the side plate 3 of the complementary totalizer 2. The forwardly projecting end of the bellcrank 158 is a fork 161 engaging a pin 162 in a slide 163. An elongated hole 164 is made in the upper portion of the slide 163 through which extends a pin 165 secured in the side plate 3 of the complementary totalizer 2. By these means, the slide 163 is mounted for vertical reciprocation. A pin 166 at the lower end of the slide 163 engages in the elongated slot 12 at the upper end of the reversing lever 13 and in a hole 167 of a sector lever 168. The falling off of the slide 163 is limited by a head 169 on the pin 162 engaging the left-hand side face of the fork 161 on the bellcrank 158.

The sector lever 168 is mounted to swing about the bearing screw 18 in the side plate 3. Its teeth 17 (Figs. 28 and 29) mesh with the pinion 18 which extends into the complementary totalizer 2 through the elliptical hole 20 in its side plate 3 where it meshes with the driving wheel 21 (Fig. 6) at the lowest calculating place. The pinion 18 and the locking wheel 19 connected thereto are mounted to rotate about the pin 22 and are held by a nut 24. The teeth of the locking wheel 19 cooperates with a locking cam 178 which is connected to the sector lever 168 by screws and pins. A recess in the locking cam permits a rotation of the wheels 16 and 18 for one unit only at a time.

The reversing lever 13 is mounted to swing on the threaded shaft 38 which, extends through a

hole in the right-hand side plate 3 of the complementary totalizer 2 and is screwed into its left-hand side plate 39 (Fig. 29). A washer 38a holds the reversing lever 13 at the required distance from the side plate 3 of the complementary totalizer 2. The forked part 42 of the reversing lever 13 (Figs. 27, 28 and 29) engages the general reversing flap 40 for controlling the kind of operation of the machine. Secured to the rearwardly projecting arm of the reversing lever 13 by screws 172 is a link 173 which has a hole 174 at its rear end. In this hole is secured the lower end of a power accumulator, here shown as a spring 175, whose upper end is suspended from a pin 176 in the right-hand side plate 3 of the complementary totalizer 2. The pull of the spring 175 normally holds the reversing lever 13, the sector lever 168, the slide 163, and the bellcrank 158 normally in their initial positions, as shown in Figs. 27 and 29, through the elongated slot 12 in the reversing lever 13 and the pin 166 in the slide 163 which engages in the hole 167 in the sector lever 168. This initial or normal position is determined by the recess 157 in the bellcrank 158 engaging the front end 156 of the catch 150. In this position the set of negative numeral wheels 116 in the complementary totalizer 2 indicates "zero" (Fig. 29). The set of positive numeral wheels 116 indicates "9". At the same time, the four-armed lever 102, with the screens 112 and 113, has been so operated that the screen 113 conceals the positive numeral wheels 115 and the screen 112 exposes the negative numeral wheels 116. The operations by which the sets of numeral wheels 115 and 116 are exposed and concealed by the screens 112 and 113, have been fully described in the section entitled "The operation of the complementary totalizer and the parts of the mechanism cooperating with it."

The roller 44 is provided at the front end of the reversing lever 13 which, during the carriage return as well as during the movement of the carriage to the left, cooperates with the inclines 45 and 48a (Fig. 29) of the tensioning member 46 which, as described with reference to the first construction is secured to the right hand end of the front wall 48 of the calculating casing by the screws 47.

At its rear end, the catch 150, like the pulling lever 5 of the first construction, is equipped with the roof-shaped cam 74 for cooperation of the controlling parts arranged at the place indicator 77 of the typewriting-calculating machine. These parts have been fully described in the said section entitled "The operation of the complementary totalizer and the parts of the mechanism cooperating with it." So they will not be described again.

At the upper end of the slide 163, a hook 177 is provided for cooperation with a tooth 178 at the upper end of an arm 179 which is mounted to swing on a pin 180 at the side plate 3 of the complementary totalizer 2. A pin 181 secured in the arm 179, projects into the complementary totalizer 2 through an elongated hole 182 in the side plate 3 and cooperates with usual locking flap 57 (Fig. 27). When the slide 163 moves upwards, the arm 179 is slightly swung clockwise and its pin 181 swings the locking flap 57 anti-clockwise. The flap 57 now raises the locking and setting levers 50 which are only partly shown in dotted lines in Fig. 27, moving their teeth 58 clear of the driving wheels 60 (Figs. 7 and 8) of the complementary totalizer 2, so that the wheels can rotate freely when the controlling members are

moved from the positions shown in Fig. 27 into that shown in Fig. 28, and the "fugitive 1" is thereby entered. The same operation occurs when the members move from the position in Fig. 28 into the normal position in Fig. 27, as in this case the hook 177 of the slide 163 can again act on the tooth 178 of the arm 179.

The casing 71 (Fig. 19) is secured to the two stays 69 and 70 (Fig. 29) in the side plate 3 of the complementary totalizer 2. The casing 71 which is adapted to the shape of the side plate 3, conceals the controlling members and the carriage return releasing bellcrank 62 (Figs. 2, 3, and 12) for manual operation.

*The operation of the controlling members of the complementary totalizer of the third construction shown in Figs. 27 to 30*

In the following, the operation of the controlling members of the complementary totalizer 2 and their cooperation with the controlling parts of the place indicator 77, and with the tensioning member 46 will be described for the entries to be made in the form F, Fig. 15. With reference to Fig. 1 it is assumed that a normal, or plus, column totalizer I is opposite the column A of the form F, that a minus column totalizer II is opposite the column B, an idle column totalizer III is opposite the column C, and the complementary totalizer 2 is opposite the column D, on the totalizer suspension rail 1.

First, let it be assumed that the column totalizers are set to "zero"—and that the controlling members of the complementary totalizer 2 occupy their initial positions, as shown in Figs. 27 and 29. In this position, the negative set of numeral wheels 116—which is at "zero"—is exposed by the screen 112 and the positive set of numeral wheels 115—which is at "9"—is concealed by the screen 113.

The first item to be booked is the "credit" value of RM "135.25". This value is typed in the column B of the form F (Fig. 15) in the manner described in the said section entitled "The operation of the complementary totalizer and the parts of the mechanism connected with it", and is subtractively entered in the minus column totalizer II (Fig. 1) and in the complementary totalizer 2, so that at the close of the operation the numeral wheels of the minus column totalizer II and the negative numeral wheels 116 of the complementary totalizer 2 indicate the value "0 000 0135.25" and the positive numeral wheels 115 which are concealed by the screen 113, are at "9 999 9864.74."

The next operation is that of entering the "old balance" RM "20.10" in the column C of the form F which, at the same time is entered in the complementary totalizer 2 as a positive value. The idle column totalizer III which is opposite the column C of the form F effects only the necessary controls of the typewriting-calculating machine. At the end of this operation, the negative numeral wheels 116 of the complementary totalizer 2 indicate the value "0 000 0115.15" and the concealed positive numeral wheels 115 are at 9 999 9884.84."

During these accounting operations, the controlling members of the complementary totalizer 2 have not been operated. The consequence is that, when the complementary totalizer 2 and the column D of the form F are tabulated into writing position for typing the "new balance" by total taking from the complementary totalizer 2, the edge 125 (Fig. 29) of the trapeze plate 124 at the rear of the four-armed lever 102 which carries the screens 112 and 113 acts on the lug

90 of pulling-lever controlling flap 84 on the place indicator 77 and swings the flap anti-clockwise into the position shown in Fig. 4. The extension 88 of the flap 84 is moved out of the path of the roof-shaped cam 14 at the rear end of the catch 150, so that the cam is not operated. The flap 84 is held in its swung-out position by the rear edge 124a of the trapeze plate 124, until the cam 74 of the catch 150 has moved past the extension 88 of the flap 84 during the tabulating movement. When the edge 124a of the trapeze plate 124 has released the lug 90, the flap 84 returns into its initial position (Figs. 27 and 29) under the action of its torsion spring 65.

The tabulating movement of the paper carriage of the typewriting-calculating machine is completed in the present instance when the hundreds calculating place of the complementary totalizer 2 has moved into active position. By automatic total taking operation the value "115.15" is withdrawn from the complementary totalizer 2 and typed in the column D of the form F. The set of negative numeral wheels 116 in the complementary totalizer 2 shows again "zero" after the typing of the value "115.15" and the concealed positive numeral wheels 115 are again at "9". As mentioned, the value "115.15" is typed in italics, to show that it is a negative balance.

After the completion of every total taking from the complementary totalizer 2 it is desirable to check the correctness of the total taking operation in the machine, for which purpose in the present instance the clearsign asterix (Fig. 15) is printed by depression of a clear sign key, not shown, only when all positive numeral wheels 115 of the complementary totalizer 2 are at "zero". The zero position of the positive numeral wheels 115 is maintained by adding the "fugitive 1" to the last calculating place. For this purpose, the controlling members (Fig. 27) of the complementary totalizer 2 are positively reversed as follows:

After the last number of the value "115.15" has been withdrawn from the set of negative numeral wheels 116 of the complementary totalizer 2, and typed in the column D of the form F (Fig. 15), whereby the carriage step which has been positively started, is completed, the roof-shaped cam 74 of the catch 150 has arrived at the right of the fixed projection 94 of the place indicator 77. This relative position of the cam 74 and the projection 94 is shown in Fig. 19 and described in the said section entitled "The operation of the complementary totalizer and the parts of the mechanism cooperating with it." When the paper carriage now moves to the left for one step more, the roof-shaped cam 74 of the catch 150 slides down along the incline 95 (Fig. 29) of the projection 94 and the catch 150 (Figs. 27 and 29) is turned clockwise against the action of its spring 151, so that its front end 156 releases the recess 157 in the bellcrank 158. Under the action of the power accumulator, or spring 175, the reversing lever 13 swings anti-clockwise about the threaded shaft 38 and, through its elongated slot 12 and the pin 166, raises the slide 163. The hook 177 of the slide 163, through the tooth 178 at the arm 179, the pin 181, and the flap 57 (Fig. 27) disengages the locking and setting levers 59 from the driving wheels 60 (Fig. 14) of the complementary totalizer 2. When the slide 163 ascends, its pin 162 turns the bellcrank 158 clockwise into the position shown in Fig. 28. The swinging movement of the reversing lever 13, through its slot 12, the pin 166, and the hole 167,

turns the sector lever 168 clockwise about the bearing screw 16, and the wheels 18 and 19 are rotated for one unit in anticlockwise direction, the pinion 18 adding the "fugitive 1". Here-  
with, through positive tens transfer, all positive  
numeral wheel 115 are progressively turned to  
"zero". At the same time, the screens 112 and  
113 are so operated that the screen 112 conceals  
the negative set of numeral wheels 116—which  
is now at "9"—and the screen 113 exposes the  
"zero" indicating positive set of numeral wheels  
115. The reversing movement of the reversing  
lever 13, the slide 163, the bellcrank 158, and the  
sector lever 168 is limited by the lower end of  
the elongated hole 164 in the slide 163 abutting  
against the pin 165 (Fig. 28). The rotation of  
the wheels 18 and 19 is, after one unit, arrested  
by the locking cam 170, that tooth 19a (Fig. 28)  
which is in the corresponding position at the  
time, bearing against the edge of the cam 170.

After the paper carriage has performed its step  
and the clear sign has been printed, tabulation  
and carriage return are effected automatically  
as described in the Patent 2,046,524.

During the return movement of the paper car-  
riage of the typewriting calculating machine,  
the complementary totalizer 2 moves into active  
position with respect to the tensioning member  
46 (Fig. 29), the roller 44 of its reversing lever  
13 ascending on the incline 45 of the tensioning  
member 46, whereby the reversing lever 13 is  
returned into its normal position, as shown in  
Fig. 27, against the action of the power accum-  
lator, or spring 175. The slide 163 is moved  
downwards and its hook 177 again operates the  
members 178, 179, 181, 57 and 59, for releasing  
the driving wheels 68. At the same time, the  
bellcrank 158 is swung back into its normal posi-  
tion (Fig. 27) anti-clockwise and the catch 150  
is released and is now swung anti-clockwise by  
its spring 151 until its lug 154 again engages the  
upper surface of the bearing bracket 155. The  
front end 158 of the catch 150 again engages in  
the recess 157 in the bellcrank 158 (Figs. 27 and  
29).

When the reversing lever 13 is swung back into  
its normal position, the sector lever 168 is turned  
anti-clockwise by the parts 12, 166, and 167, its  
teeth 17 turning the wheels 18 and 19 for one unit  
and again entering the "fugitive 1" into the low-  
est calculating place of the negative set of num-  
eral wheels 118. By the continuous tens trans-  
fer, the negative numeral wheels 116, on the one  
hand, are turned again to "zero" and the positive  
numeral wheels 115 to "9", and, on the other  
hand, the screens 112 and 113 are returned into  
their initial positions according to Figs. 27 and 29.

In the accounting example which has been de-  
scribed by way of example with reference to Fig.  
15, there was a negative "new balance" amount-  
ing to "115.15". If, with other accounting op-  
erations, a positive "new balance" results, the  
pulling lever controlling flap 84 of the place in-  
dicator 77 remains in its normal position accord-  
ing to Fig. 29 when the complementary totalizer  
2 moves into its active position by tabulation, due  
to suitable reversing of the edge 125 of the trapeze  
plate 124. In consequence, the extension 88 of  
the flap 84, before the complementary totalizer 2  
arrives in its active position, acts on the roof-  
shaped cam 74 of the catch 150, so that the mem-  
bers 13, 163, 158, and 168 are reversed before the  
highest calculating place of the complementary  
totalizer 2 has arrived in its active position.

Providing the catch 150, the bellcrank 158, the

slide 163, the sector lever 168, the reversing lever  
13, the link 173, and the power accumulator, or  
spring 175, has the advantage that the projection  
94, or the extension 88, of the pulling lever con-  
trolling flap 84 of the place indicator 77 have only  
to throw over the catch 150 against the action of  
its spring 151—which is weak—without appreci-  
able effort, while the reversal proper of the con-  
trolling members is effected by the power ac-  
cumulator, or spring, 175. As compared with  
this, in the first and second constructions, Figs. 1  
to 13 and Fig. 14, the members are reversed by the  
projection 94 or the extension 88 of the flap 84 on  
the place indicator 77. This requires a much  
greater effort, and the place indicator 77 must be  
braced for withstanding it. Notwithstanding  
such extra bracing of the place indicator 77, it  
may happen that it springs away to the rear, so  
that the reversal failed or the carriage step was  
not performed. In the third construction, the  
place indicator 77 is not braced, and yet a per-  
fectly reliable reversing of the controlling mem-  
bers is obtained.

A roof-shaped member 185 (Fig. 30) is secured  
on the bearing bracket 155 (Figs. 29 and 30) by  
screws 155s. The roof portion 186 of the mem-  
ber 185 is slotted at 187 for admitting the lug 94  
and the extension 88 (Fig. 29) of the flap 84 to the  
cam 74 of the catch 150. The roof portion 186  
of the member 185 is positioned above the cam 74  
of the catch 150 for preventing inadvertent re-  
versal of the members of the complementary to-  
talizer 2. For instance, it may happen that when  
the paper carriage is at the right-hand end of its  
movement, and the operator inserts a form in the  
paper carriage, he accidentally depresses the cam  
74 so that the catch 150 is thrown out and the  
controlling members are reversed, resulting in a  
miscalculation. This is prevented by the roof  
member 188 which only admits the lug 94 and the  
extension 88 through its slot 187. If, by any cir-  
cumstance, for instance, by an unauthorized per-  
son attempting to tamper with the machine, the  
catch 150 is thrown out and the controlling mem-  
bers are reversed, the roller 44 of the reversing  
lever 13 rises on the incline 49a (Fig. 29) of the  
tensioning member 46 during tabulation, and the  
members are returned into their normal posi-  
tions.

*The arrangement of the parts of a modified ten-  
sioning member for the controlling members of  
the complementary totalizer, fourth construc-  
tion, Figs. 31 to 34*

The modification of the tensioning member for  
the controlling members of the column totalizer  
2, as illustrated in Figs. 31 to 34, will now be de-  
scribed.

The retaining plate 194 is secured to the inner  
side of the vertical portion of the casing 51.  
Three screws 191 extend at right angles to the  
front of the machine through holes 192 (Fig. 34)  
in the casing 51 and their rear ends are inserted  
in threaded holes 193 in the retaining plate 194.  
A fourth screw 191 (Figs. 31 and 33) extends in  
parallel relation to the front of the machine  
through a hole in the side of the casing 51. Its  
rear end engages in a threaded hole 193 in a flange  
201 (Fig. 34) at the right-hand end of the plate  
194 and the screw is surrounded by a distance  
sleeve 192a between the flange 201 of the plate  
194 and the portion 190a of the casing 51 (Figs.  
31 and 33). An extension 195 of the plate 194  
is inserted in a slot 196 in the casing 51 and is  
equipped with a pin 197 on which the roller 188  
is mounted to rotate. During the carriage return,

the roller 198 rolls on the rib 199 at the front plate 200 of each totalizer and prevents rising thereof. The flange 201 at the right-hand end of the retaining plate 104 extends toward the rear and with its lower end 202 supports a spring-suspension eye 203 in which is inserted the right-hand end of a power accumulator, or spring, 204. The left-hand end of the spring 204 is attached to a bolt 205 in a downwardly extending part 206 of a tensioning member 207. A bearing boss 206 on the tensioning member 207 is mounted to turn on a bearing screw 211 which is inserted in a hole 209 in the casing 51 and with its rear end engages in a threaded hole 210 of the retaining plate 194. The spring 204 tends to turn the tensioning member 207 permanently anti-clockwise, and this movement is limited by the lower end of a slot 212 in the member 207 bearing against a headed screw 213 (Fig. 31) which extends through a hole 214 in the casing 51 and with its rear end engages in a threaded hole 215 in the retaining plate 194. The right-hand end 216 of the tensioning member 207 extends upwardly in oblique direction and is crooked, extending into the path of the roller 44 on the reversing lever 13 at the complementary totalizer 2 (Fig. 32). A tensioning arm 216 (Fig. 31 to 33) is mounted to swing about a bearing screw 217 at the front side of the casing 71 (Figs. 31 and 33). A distance sleeve 219 (Fig. 32) on the bearing screw holds the tensioning arm at the proper distance from the casing 71 so that a cam 220 at the upper end of the tensioning member 207 is in the path of the arm 216. A pin 221 is riveted into the arm 216 to which a spring 222 is attached. The spring 222 is anchored on a pin 223 secured in the casing 71 and permanently turns the arm 210 clockwise about its bearing screw 217, the normal position of the arm being defined by a pin 224 riveted into the casing 71.

*The operation of the tensioning means for the controlling members of the complementary totalizer according to the construction illustrated in Figs. 31 to 34*

Let it be assumed that the accounting operation in the first line of the form F (Fig. 15) has been completed, that is, that the value "115.15" has been typed and that in consequence the controlling members of the complementary totalizer 2 are in the positions shown in Fig. 28. When now the carriage return is positively effected, the lower end of the arm 216 (Fig. 33) acts on the incline 220a of the cam 220, swinging the tensioning member 207 clockwise about its bearing screw 211 and into the position shown in Fig. 33, and putting tension on the spring 204. During the further movement of the paper carriage to the right, the lower end of the arm 216 slides on the horizontal upper edge 220b of the cam 220, holding the tensioning member 207 in its swung-out position (Fig. 33). When the arm 216 has cleared the upper edge 220b of the cam, the tensioning member 207, under the action of the tensioned spring 204, swings back into its initial position according to Fig. 31 about the bearing screw 211, and the upper edge 216a (Fig. 34) of its portion 216 acts on the roller 44 of the reversing lever 13. The controlling members of the complementary totalizer 2 are returned into the normal positions illustrated in Figs. 27 and 29 from the positions according to Fig. 28. In consequence of the abrupt swinging up of the tensioning member 207 a safe return of the controlling members of the complementary totalizer 2 can be relied on. As mentioned, the roller 198 of the retaining plate 194 rolls on the rib 199 of its front plate 200 and

this prevents rising of the complementary totalizer 2.

An incline 225 (Fig. 34 and 33) is provided at the right of the crooked portion 210 of the tensioning member 207. The object of this incline is to throw the controlling members of the complementary totalizer 2 back into their normal positions if the operator, with the paper carriage in its final position at the right of the machine, knocks inadvertently against the roof-shaped cam 74 (Fig. 29) of the catch 150, so that the controlling members are moved from their initial positions as shown in Figs. 27 and 29, into the reversed position shown in Fig. 28. In this case, when the paper carriage is tabulated, the roller 44 of the reversing lever 13 rises on the incline 225 at the tensioning member 207 and the controlling members of the complementary totalizer 2 are positively returned into their initial positions (Fig. 27), the spring 204 being so strong as to prevent swinging of the tensioning member 207.

When, during the tabulation of the paper carriage, the arm 216 strikes the cam 220 of the tensioning member 207, the arm yields anticlockwise against the action of its spring 222 so that the tensioning member 207 is not swung.

*General description of the constructions illustrated in Figs. 35 to 43*

In order to promote a quick understanding of the object for which the fifth to seventh constructions are provided, a short reference to the operation of the first construction, as illustrated in Figs. 1 to 13, and explained with reference to Figs. 15 to 26, is required. This will be explained for the calculating example

0	000	000.00
-9	999	999.99
-	-	1
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In the right-hand final position of the paper carriage of the typewriting-calculating machine which is the initial position for accounting work, the four-armed lever 102 which supports the screens 112 and 113 (Fig. 35) has been moved into the position illustrated in Figs. 35 and 36 by the head 99 of the cam 97 at the driving wheel 96 for the highest calculating place in the complementary totalizer 2, as described in the section entitled "The operation of the complementary totalizer and the parts of the mechanism co-operating with it" for the first construction illustrated in Figs. 1 to 13. In this position, the screen 112 exposes the set of negative numeral wheels 116—which indicates "zero" in this case and the screen 113 conceals the set of positive numeral wheels 115 (Figs. 36 and 44) which in this case indicate "9". In conformity with the example, let it be assumed that the value "9 999 999.99" is to be entered subtractively in the complementary totalizer which, by way of example, has ten places. The numeral wheels in both sets 115 and 116 are rotated for nine units in the direction of the arrow in Fig. 44, position b, so that the set of negative numeral wheels 116 indicates the value "9 999 999.99" while the set of positive numeral wheels 115—which is concealed by the screen 113—shows the value "0 000 000.00". The cam 97 with its head 99, on the driving wheel 96 of the highest calculating place—which wheel rotates clockwise, has descended along the arcuate edge 100 of the arm 101 at the four-armed lever 102 and has occupied the position shown in Fig. 44, b.

For the next accounting operation, let it be assumed, by way of example, that the value "1" is also to be entered subtractively in the complementary totalizer 2. The numeral wheels at the lowest calculating place of both sets 115 and 116 of numeral wheels are rotated further for one unit in the direction of the arrows in Fig. 44, position b, and at the moment the numeral wheel of the lowest calculating place in the set of negative numeral wheels 116 is turned from "9" to "0", a tens transfer occurs which progresses from calculating place to calculating place. At the moment the numeral wheel at the highest calculating place in the set of negative numeral wheels 116 is about to move from "9" to "0", that is the capacity of the complementary totalizer 2 is overstepped, the cam 97, 99 of the driving wheel 96 at the highest calculating place—which rotates clockwise—strikes the lower or front end B of the arcuate slot 96 in the left-hand side plate 39 (Fig. 44, position c) of the column totalizer 2, arresting the rotation of this driving wheel 96 at the highest calculating place. This positive arresting of the driving wheel 96 caused damage to the mechanisms of the totalizer and to the calculating mechanism concealed by the casing 51 and so led to miscalculations.

To avoid accidents of this kind, the following arrangements have been made according to the invention.

*Description of the members in the fifth construction, as shown in Figs. 35 to 38*

A shaft 230 is screwed into the right-hand side plate 3 (Figs. 36 and 37) of the complementary totalizer 2 at one end. Its other end extends through a circular hole 235 in the left-hand side plate 39 of the complementary totalizer 2 and is supported by a bearing bracket 232 in which a hole 231 (Fig. 37) is made for its reception. The bearing bracket 232 has a circular recess 234 in its inner face and is secured to the left-hand side plate 39 of the complementary totalizer 2 by screws 233. The driving wheels for the several calculating places, including the driving wheel 96 for the highest place in the complementary totalizer 2, are mounted to rotate on the shaft 230. The head 99 of its cam 97 is free to rotate in the recess 234 in the bearing bracket 232 and in the hole 235 in the left-hand side plate 39 of the complementary totalizer 2, so that the driving wheel 96 can perform a full revolution without obstruction.

The head 99 of the cam 97 operates the screens 112 and 113 which alternately conceal the set of positive numeral wheels 115 and the set of negative numeral wheels 116 (Fig. 36) of the complementary totalizer 2 through the four-armed lever 102. This lever, and the members cooperating with it, have been fully described for the first construction according to Figs. 1 to 13 in the said section entitled "The operation of the complementary totalizer and the parts of the machine cooperating with it," and need not be described again here.

*The overstepping of the capacity of the complementary totalizer when calculating "minus" values*

As mentioned, in the initial position of the complementary totalizer 2 for accounting operations, the driving wheel 96, its cam 97, 99, the four-armed lever 102, and its screens 112 and 113 occupy the initial positions illustrated in Figs. 35 and 36 in which the set of negative numeral wheels 116 indicates "zero" and the four-armed

lever 102 which carries the screens 112 and 113 has been so controlled by the head 99 of the cam 97 that the screen 112 exposes the set of negative numeral wheels 116 and the screen 113 conceals the set of positive numeral wheels 115 which in this case is at "9" (Figs. 35 and 36).

If, by way of example, several "minus" values are subtracted during a given accounting operation whose total is indicated by the set of negative numeral wheels 116, and if such values are entered up to the highest calculating place, the driving wheel 96 is rotated clockwise. The head 99 of its cam 97 slides along the arcuate edge 100 of the arm 101 at the four-armed lever 102, holding the lever in the position illustrated in Fig. 35. The operative connection 99, 100 is maintained as far as into the "9" position of the driving wheel 96, that is, until so many values have been entered into the highest calculating place, that its numeral wheel 116 indicates "9."

If during the subsequent operations of an accounting problem still more "minus" values are introduced for calculation, and if this oversteps the capacity of the complementary totalizer 2, the driving wheel 96 at the highest calculating place is rotated further in blockwise direction, until the zero position, or even beyond. The head 99 of the cam 97 releases the edge 100 of the arm 101 on the four-armed lever 102 so that the lever can swing clockwise about its bearing screw 103, so that the screen 112 conceals the set of negative numeral wheels 116 and the screen 113 exposes the set of positive numeral wheels, 115. This throwing-over of the screens indicates to the operator that he has overstepped the capacity of the complementary totalizer 2.

In this construction, as distinguished from the first construction, Figs. 1 to 13, the driving wheel 96 at the highest calculating place in the complementary totalizer 2 can rotate clockwise beyond a zero position and perform a complete revolution, without obstruction due to the circular hole 235 in the side plate 39 at the left of the complementary totalizer 2 and in this manner damage to the mechanisms of the totalizers and to the calculating mechanism of the machine covered by the casing 51 are avoided when the capacity is overstepped.

*The overstepping of the capacity of the complementary totalizer when calculating "plus" values*

Assume that all members of the complementary totalizer are in their normal positions according to Fig. 35, that is the complementary totalizer 2 has been "clear" written.

If several "plus" values are added during an accounting operation, the total of these values will be indicated by the set of positive numeral wheels 115.

In this case, in the first construction according to Figs. 1 to 13, and in the manner described in the section entitled "The arrangement of the screen-controlling mechanism at the complementary totalizer" due to the throwing-over of the four-armed lever 102 and its screens 112 and 113 from the position shown in Fig. 35 into the position shown in Fig. 38, in consequence of the addition of the "fugitive 1," the set of positive numeral wheels 115 is exposed, and the set of negative numeral wheels 116 is concealed.

If the operator calculates with repeated additions of "plus" values up to the highest calculating place, and the driving wheel 96 at that place is rotated anti-clockwise, and if he oversteps the

capacity of the complementary totalizer 2, the cam 97, with its head 99, moves in the rear portion of the hole 235 in the left hand side plate 39 of the complementary totalizer 2 without interfering with any other parts, and so damage to mechanisms is avoided also in this case when the capacity of the complementary totalizer 2 is overstepped.

*Description of the sixth construction, as shown in Figs. 39 and 40*

In this construction, the four-armed lever 102 (Figs. 39 and 40) in addition to the other parts described in the section entitled "Description of the members in the fifth construction, as shown in Figs. 35 to 38" is equipped with a fifth arm 102a which, with the arm 101, forms an arcuate fork and the spring 104 is dispensed with.

In the normal position of the parts of the complementary totalizer 2, the controlling members occupy the normal positions illustrated in Fig. 39. The operation of the lever 102 when calculating "minus" values is similar to that described in the section entitled "The overstepping of the capacity of the complementary totalizer when calculating "minus" values.

When "plus" values are calculated, the driving wheel 96 at the highest calculating place is rotated into the position shown in Fig. 40 from the position shown in Fig. 39. The head 99 of its cam 97 clears the edge 100 of the arm 101 and engages the inner edge 102b of the arm 102a, whereby the lever 102 is turned clockwise about its bearing screw 103, and into the position Fig. 40. When more "plus" values are added as far as the highest calculating place, and the driving wheel 96 of that place is rotated anti-clockwise, the head 99 of the cam 97 on the wheel 96 slides along the edge 102b of the fifth arm 102a, holding the lever 102 in the position shown in Fig. 40.

As will appear from the above, the lever 102 which supports the screens 112 and 113 is positively thrown over by the head 99 of the cam 97 when calculating "plus" and "minus" values in the construction according to Figs. 39 and 40, and the spring 104 is not required.

*Description of the members of the seventh construction, as shown in Figs. 41 to 43*

In Figs. 41 to 43, a further construction of the means for controlling the screens 112 and 113 is illustrated whose arrangement will be described in the following:

Arranged at the left-hand side of the driving wheel 96 of the highest calculating place, a camplate 236 is arranged (Figs. 41 to 43). A cam groove 237 is made in the camplate 236. A pin 238 engages in the cam groove 237 which has two concentric portions of different radii, and an ascending portion 230 and a descending portion 240 connecting the concentric portions. The pin 238 extends through a slot 241 in the left-hand side plate 39 of the complementary totalizer 2 and is secured in a link 242. At its lower end, the link 242 has a fork 243 which engages the shank of a headed screw 244 in the side plate 39 by which the lower end of the link is guided.

At the upper end of the link 242, a rivet 245 is arranged by which the link is pivoted on a U-shaped portion of the arm 109 on the screen-supporting lever 102 which has but three arms in this instance. Preferably, a lug 246 is formed on the rearwardly extending arm 123 of the lever 102 in which an arcuate slot 247 is made.

A guiding screw 248 which is screwed into the left-hand side plate 39 of the complementary totalizer 2, engages in the slot 247 and serves as an additional guide for the lever 102.

*The normal position of the controlling members when entering "minus" values*

In the normal position, that is, when "minus" values are entered, the driving wheel 96 at the highest calculating place occupies the position shown in Fig. 41, if the corresponding negative numeral wheel 116 shows "zero." In this normal position, the pin 238 of the link 242 is on that portion of the cam groove 237 which has the larger radius. The link 242 and the lever 102 to which it is pivoted at 246, together with the screens 112 and 113, occupy their topmost positions (Fig. 41) in which the set of negative numeral wheels 116 is exposed by the screen 112.

When entering "minus" values up to the highest calculating place, the driving wheel 96 at the highest calculating place of the complementary totalizer 2 is rotated clockwise and the large radius portion of the cam groove 237 moves past the pin 238. If during these calculating operations the capacity of the complementary totalizer 2 is overstepped, the ascending portion 239 of the cam groove 237 reaches the pin 238 and moves the link 242 down at the moment the numeral wheel 116 at the highest calculating place moves from "9" to "0" until the pin 238 slides into the small-radius portion of the cam groove 237. The lever 102 is swung clockwise about its bearing screw 103, the screen 113 exposing the set of positive wheels 115 and the screen 112 concealing the set of negative numeral wheels 116. This indicates to the operator that the capacity of the column totalizer 2 has been overstepped.

*The position of the controlling members when entering "plus" values*

When entering "plus" values, first the driving wheel 96 at the highest calculating place in the complementary totalizer 2 is turned through one unit and anti-clockwise from the position in Fig. 41 to that in Fig. 42. This is effected by adding the "fugitive 1" in the set of positive wheels 115 and by the progressive tens transfer effected thereby. During this anti-clockwise movement of the driving wheel 96 the ascending portion 240 of the cam groove 237 in the camplate 236 at the side of the driving wheel 96 acts on the pin 238 and moves the link 242 down (Fig. 42). By the rivet 245 the link 242 swings the lever 102 clockwise. The screen 112 on the lever 102 now conceals the set of negative numeral wheels 116 which had been exposed—and exposes the set of positive numeral wheels 115 which had been concealed. When adding positive values up to the highest calculating place and if the capacity is overstepped, the small-radius portion of the cam groove 237 moves past the pin 238 without influencing it in any way.

The following arrangement has been provided for indicating to the operator, before he begins with an accounting operation that the complementary totalizer 2 is ready for operation, that is, is in its initial condition in which the set of negative numeral wheels 116 is at "zero," the screen 112 exposes this set, and the screen 113 conceals the set 115, as shown in Figs. 35, 36 and 39.

*Description of the "ready" indicator in the complementary totalizer*

A shaft 250 (Figs. 35, 37 and 38) is secured in side plates 3 and 39 of the complementary totalizer 2, and an indicator arm 251 is mounted to swing about, and to slide on, the shaft 250 near the inner side of the left-hand side plate 39 (Fig. 36). A cam 252 at the lower side of the arm 251 is arranged for cooperation with the cam 97 of the driving wheel 96 at the highest calculating place. The front end 253 of the arm 251 is crooked to the right and a plate 254 at the free end of the crooked portion bears a mark 255, preferably in white. In the initial position of the arm 251 (Fig. 35) the cam 97 on the driving wheel 96 engages the cam 252 on the arm and holds the arm in elevated position in which its mark 255 is visible through an inspection hole 257 in the front plate 256 of the complementary totalizer 2 (Fig. 36), indicating to the operator that the complementary totalizer 2 is ready for operation. When the driving wheel 96 at the highest calculating place is rotated, the cam 97 of the wheel releases the cam 252 on the arm 251, and the arm swings clockwise about the shaft 250 by gravity, until a lug 258 at its lower side is arrested by a stop 259 riveted into the left-hand side plate 39 of the complementary totalizer 2 (Fig. 38). The mark 255 on its plate 254 is now concealed by the solid portion of the front plate 256 below the hole 257.

*The position of the "ready" indicator when the complementary totalizer is in its initial condition*

In the initial or normal condition of the complementary totalizer 2, the "fugitive 1" has been added in the set of negative numeral wheels 110, and the members 96, 97-99, and 102 which control the screens 112 and 113, are in the positions illustrated in Fig. 35. In this position, cam 97 of the driving wheel 96 at the highest calculating position of the complementary totalizer 2, acting on the cam 252 of the arm 251, raises the arm into the position illustrated in Fig. 35 in which its mark 255 is in line with the inspection hole 257 (Fig. 36). The mark 255 which now appears in the hole 257, indicates to the operator that the complementary totalizer is in the initial position at the beginning of a calculating operation.

*The position of the "ready" indicator if the complementary totalizer is not in the proper initial condition*

If, due to any cause, for instance, through inadvertence of the operator at the beginning of an accounting operation, the controlling members of the complementary totalizer 2 have been so operated that the "fugitive 1" has been added to the set of positive numeral wheels 115, the parts 96, 97-99, and 102, positively occupy the position illustrated in Fig. 38.

In this position, the cam 97 of the driving wheel 96 at the highest calculating place in the complementary totalizer 2 has released the cam 252 on the indicator arm 251 which now, by gravity, swings clockwise about its shaft 250 until the lower end of its lug 258 is arrested by the stop pin 259. The mark 255 is now below the inspection hole 257 in the front plate 256 (Fig. 38) and is not visible to the operator. This indicates that the complementary totalizer 2 is not in the proper initial position for operation. The proper positioning of the members in the complementary totalizer 2 is effected positively by the movement

of the paper carriage of the typewriting calculating machine.

The "ready" indicator according to the invention which has just been described, prevents wrong accounting by the operator.

*The capacity-overstepping indicator*

Fig. 45 shows an indicator by which the operator is advised that the capacity of the complementary totalizer 2 has been overstepped, and whether the calculation is positive or negative.

An indicator arm 261 is mounted to swing about a screw 260 in the left-hand side plate 39 of the complementary totalizer 2. At its free end, the arm is equipped with a sector bearing the marks "1P", "0P", "1N" and "0N" which can be observed through an inspection hole 264 in the front plate 266 of the complementary totalizer 2. A spring 266 tends to pull the arm 261 against a stop 272 in the side plate 39. At its rear end, the arm 261 is equipped with a fork-shaped member having two circular steps 263 and 267. Two cams 270 and 270a are secured to the arms of the fork by a U-shaped bracket 269 and 269a.

A pin 262 on the head 99 of the cam 87 on the driving wheel 96 at the highest calculating place in the complementary totalizer 2 controls the arm 261 which is mounted to swing about the screw 260 (Fig. 45) in the left-hand side plate 39 of the complementary totalizer 2.

In the proper initial condition of the complementary totalizer 2 in which the screen 112 exposes the set of negative numeral wheels 116 and the set of negative numeral wheels 115 is concealed by the screen 113 (Fig. 35), as shown in Figs. 35 and 36, the driving wheel 96 of the highest calculating place occupies the position illustrated in Fig. 45 in which the pin 262 of the cam 97, 99 acts on the step 263 of the arm 261 and holds the arm in the position illustrated in Fig. 45. In this position of the arm, the mark "0N" is visible in the inspection hole 264, indicating that no capacity has yet been overstepped, and the calculation is negative. While "minus" values are calculated, the arm 261 remains in this position until the numeral wheel which is allotted to the highest calculating place in the set of negative numeral wheels 116, shows "9". In this "9" position, the cam 97, 99 is in the position D shown in dotted lines in Fig. 45. If more "minus" values are entered and the capacity of the complementary totalizer 2 is overstepped, the driving wheel 96 at the highest calculating place rotates further into the zero position, or beyond, in the direction of the arrow. Now the indicating arm 261 under the action of the spring 266 rocks clockwise until the step 265 of the cam 270a abuts on the pin 262 of the cam 87, 99 of the wheel 96. The mark "1N" is now in line with the inspection hole 264, indicating to the operator that he has overstepped the capacity one time in the negative sense.

Assuming that the parts of the complementary totalizer 2 (Fig. 45) are in their initial positions, and that positive values are to be entered the driving wheel 96 of the highest calculating place is rotated against the arrow and releases the step 263 of the indicator arm 261 by the pin 262 on its cam 97, 99, and the spring 266 swing the arm 261 clockwise, until its step 267 is arrested by the pin 262. When more positive values are entered into the highest calculating place so that the driving wheel 96 rotates further in the direction of the arrow, the pin 262 slides along the edge 268 of the cam 270 which is connected to

the arm 261 by the U-shaped bracket 269 where it remains until it arrives in the position E shown in dotted lines and corresponding to the "9" position of the numeral wheel in the highest calculating position of the set of negative numeral wheels 116.

In both cases, the arm 261 occupies that position in which the mark "OP" is visible through the inspection hole 264. The operator that the calculation is positive, but the capacity of the complementary totalizer has not been overstepped.

If subsequently more positive values are entered into the complementary totalizer 2, and the capacity of the totalizer is overstepped, the driv-

ing wheel 96 at the highest calculating place is rotated further into the zero position or beyond against the arrow. When the numeral wheel moves from "9" to "0", the pin 262 leaves the edge 268 of the cam 270 and the spring 266 swings the arm 261 clockwise until the lower edge 271 of the cam bears against the pin 262. In this position the arm 261 is arrested by the stop pin 272 and the mark "IP" becomes visible in the inspection hole 264 advising the operator that he has overstepped the capacity one time in the positive sense.

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