PATENT SPECIFICATION

Application Date: Jan. 16, 1936. No. 1493/36. **469,034**

Complete Specification Accepted: July 16, 1937.

ERRATA

SPECIFICATION No. 469,034.

Page 6, line 36, *for* " wich " *read* " which "

Page 7, line 13, *for* " 120 " *read* " 129 "

THE PATENT OFFICE,
September 3rd, 1937.

for operating the adding and subtracting totalizer which is mounted above the pivot point of the actuating levers.

In calculating machines as hereinbefore set forth, either there has previously been no provision of printing mechanism or the totalizer has not been visible to the operator and moreover, it has not been previously proposed to adapt a machine as set forth for both decimal and non-decimal calculations.

The present invention has for its object to provide a calculating machine as hereinbefore set forth having printing mechanism and a visible adding and subtracting totalizer and adapted for decimal or both decimal and non-decimal (for example, English currency) calculations.

To this end according to the invention there is provided a calculating machine of the ten key type with printing mechanisms, a visible adding and subtracting totalizer and an item indicator, in which a stepwise moving setting mechanism of known type carrying the item indicator, by which the figures represented by the depressed keys are rendered visible in a window above the keyboard, cooperates with oscillatably mounted two-armed denominational actuating levers which set the type carriers, said levers each carrying a rack for rotating the totalizing wheels of the totalizer which is mounted above the ing is ensured. The especially narrow printing mechanism allows the production of typed matter in a width approximately equal to that produced by a typewriting machine so that the same forms can be used on both kinds of machine.

In a modification of the invention which is adapted for non-decimal as well as decimal calculations, the actuating lever for the pence or duo-decimal calculations is formed from interconnected parts so that the decimal stop pins of the setting device can also effect the setting for 10 and 11 pence.

The totalizing wheels, indicating wheels, actuating levers and type carriers may be conveniently mutually arranged at a distance from middle to middle equal to 1 1/3 times the distance from middle to middle of numerals typed in a row without punctuation on a typewriter the style of which coincides with that of the calculating machine and may be used for typing on the same forms as are printed on by the calculating machine.

Another improvement of the machine consists in that the setting mechanism released by the depression of keys serves at the same time as a carrier for stepping elements designed to regulate the stepwise lateral movement of the stop carriage and operating in conjunction with an abutment mounted on their path. The

[*Price* 1/-]

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COMPLETE SPECIFICATION

Calculating Machine

I, HAROLD BARON, Chartered Patent Agent, of Thanet House, 231, Strand, London, W.C.2, a British subject, do hereby declare the nature of this invention (a communication from Astrawerke Aktiengesellschaft of Chemnitz, Germany, a German Company) and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a calculating machine of the ten key type in which a stepwise moving setting mechanism, carrying the item indicator by which the figures represented by the depressed keys are rendered visible above the keyboard, cooperates with oscillatable denominational actuating levers each carrying a rack for operating the adding and subtracting totalizer which is mounted above the pivot point of the actuating levers.

In calculating machines as hereinbefore set forth, either there has previously been no provision of printing mechanism or the totalizer has not been visible to the operator and moreover, it has not been previously proposed to adapt a machine as set forth for both decimal and non-decimal calculations.

The present invention has for its object to provide a calculating machine as hereinbefore set forth having printing mechanism and a visible adding and subtracting totalizer and adapted for decimal or both decimal and non-decimal (for example, English currency) calculations.

To this end according to the invention there is provided a calculating machine of the ten key type with printing mechanisms, a visible adding and subtracting totalizer and an item indicator, in which a stepwise moving setting mechanism of known type carrying the item indicator, by which the figures represented by the depressed keys are rendered visible in a window above the keyboard, cooperates with oscillatably mounted two-armed denominational actuating levers which set the type carriers, said levers each carrying a rack for rotating the totalizing wheels of the totalizer which is mounted above the pivot point of the actuating levers and is visible through a window, the machine being adapted for decimal or both decimal and non-decimal calculations.

A further object of the invention is to construct such a calculating machine so that it is suitable for use as a table or desk machine and which is as light and compact as possible so that it can be easily carried from one working place to another.

The machine works extraordinary reliably and rapidly and, owing to an arrangement one above the other of the keyboard, the indicating mechanism and the totalizer, the indicated matter is clearly visible, the machine is of good appearance, and a rapid and secure working is ensured. The especially narrow printing mechanism allows the production of typed matter in a width approximately equal to that produced by a typewriting machine so that the same forms can be used on both kinds of machine.

In a modification of the invention which is adapted for non-decimal as well as decimal calculations, the actuating lever for the pence or duo-decimal calculations is formed from interconnected parts so that the decimal stop pins of the setting device can also effect the setting for 10 and 11 pence.

The totalizing wheels, indicating wheels, actuating levers and type carriers may be conveniently mutually arranged at a distance from middle to middle equal to 1 1/3 times the distance from middle to middle of numerals typed in a row without punctuation on a typewriter the style of which coincides with that of the calculating machine and may be used for typing on the same forms as are printed on by the calculating machine.

Another improvement of the machine consists in that the setting mechanism released by the depression of keys serves at the same time as a carrier for stepping elements designed to regulate the stepwise lateral movement of the stop carriage and operating in conjunction with an abutment mounted on their path. The

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stop carriage is governed in such a manner that, contrary to the known arrangements, a figure wrongly set prior to the total or sub-total operation is automatically eliminated at the beginning of such a total-taking operation by returning the stop carriage. This eliminates the correction operation, which otherwise had to be carried out manually.

The essential parts of a calculating machine according to the invention are illustrated in the accompanying drawings in which:—

Fig. 1 is a longitudinal section through the machine on I—I of Fig. 2.

Fig. 2 is a top plan view showing the machine without the totalizer.

Fig. 3 shows in side elevation the arrangement for returning the carriage.

Fig. 4 is part of a top plan view of Fig. 3.

Fig. 5 shows in a similar view to Fig. 3 a control element and the coordinated lever.

Fig. 5a shows in top plan view part of the control element.

Fig. 6 shows in elevation, and view and top plan view the bar for actuating the pawls for liberating the actuator segments for oscillation,

Fig. 7 shows in side elevation and end view a lever for liberating the stop carriage for shifting in lateral direction.

Fig. 8 shows the key lever for the 00 key.

Fig. 9 shows the key lever for the 000 key.

Fig. 9a is a top plan view of Fig. 9.

Fig. 10 is a longitudinal section on line I—I through the machine for non-decimal calculation of calculation on English currency.

Fig. 11 is a top plan view showing the machine without the totalizer.

Fig. 12 shows in top plan view the transmission lever between the pence type carrier and the adjusting segments.

Fig. 13 shows in top plan view the cover plate controlled by the keys 10 and 11.

Fig. 14 is a side elevation of the lever for key 10 and of the cover plate.

Fig. 15 shows in side elevation the key lever for the £-key.

Fig. 16 and 17 illustrate in side elevation and top plan view respectively the mechanism for assuring the jumping movement of the stop pin carriage at the beginning of the machine operation with depressed whole number key.

On the base plate 1 of the calculating machine two vertical parallel plates 2 and 3 are fixed in which a rod 4 is fixed which carries oscillatable key levers 5, each having a key head 7 on its upwardly bent end and each guided in a slot in a key plate 8. Pull springs 10 are attached to the upwardly curved end 9 of the key plate 8 the other end of each spring being attached at 11 to the corresponding key lever 5 and which is thus held in contact with a transverse abutment bar 12. Two comb plates 13 and 14 mounted between the vertical plates 2 and 3 guide the movement of the twelve key levers 5 which set the digits. The heads of these keys are marked as shown in Fig. 2 with the digits 0 to 9 and the figures 00 and 000. These keys impart a stepwise progressive movement in lateral direction to a setting or stop pin carriage slidably mounted on to two rods 15 and 16 arranged between the vertical plates 2 and 3. The two side walls 18 and 19 of the carriage are rigidly connected by a curved sheet metal bar 20, the two ends of which form combs 21 and 22 respectively. The side walls are further connected by an abutment bar 23 and an axle 24 is fixed therein, on which setting segments 25 are oscillatably mounted. These setting segments are guided in the slots in the combs 21 and 22 and have the tendency to oscillate in clockwise direction under the action of gravity or springs: The setting segments, are however, each locked in the inoperative position by a locking pawl 26 as shown in Fig. 1. These locking pawls 26 are mounted on an axle 27 fixed in the side walls 18 and 19 of the carriage and each pressed against a nose 30 of the corresponding setting segment 25 by a spring 28 attached to a transverse bar 29 which is also fixed to the side walls of the carriage.

Adjustable stop pins 31 located in the thickened front portion of the corresponding setting segments 25 are adapted to be pushed inwards by the corresponding digit keys. These stop pins 31 limit the amplitude of oscillation of the setting segments 25 by striking against bar 23. No stop pin 31 is necessary for the numeral "9" as the nine-position of the corresponding setting segment 25 is determined by a shoulder 32 striking against the pawl 26 liberated from the nose 30.

A spring, 33 Fig. 4, attached to the stop carriage and to the frame, has the tendency to pull the stop carriage to the left, said stop carriage being normally securely held in the position shown in Fig. 2 by an escapement consisting of a cage 35 in which a number of stepping elements 34 are housed corresponding to the number of setting segments 25 the number of which in turn corresponds to the number of places of the machine. The cage 35 is fixed between extensions 36

of the side walls 18, 19 of the stop carriage and consequently participates in the lateral movement of this stop carriage. A wire 37 prevents the stepping elements 34 from dropping out laterally. Each stepping element 34 has two recesses in its upper edge forming notches for a spring 38 designed to hold the stepping elements in their actual position. The stepwise movement of the stop carriage in lateral direction is stepwise effected when, by the actuating of the keys, the stepping elements are successively pressed out of the path of a fixed abutment 39 so that the stepwise-released stop carriage can yield to the pull of its spring 33.

The adjustable stop pins 31 corresponding to the numerals 1 to 8 are pushed inwards by push wires 40 connected each one with a key lever 5 at 41 and guided in holes in a fixed sheet metal plate 42. Two universal bars 43 and 44 (Figs. 6 and 7) are oscillatably mounted on the rod 4 of the key levers and are moved by noses 45, 46 of the key levers every time a digit key 1 to 9 is depressed. A projection 47 of the universal bar 43 oscillate by the upper nose 45 of the digit keys 1 to 9 releases the locking pawl 26 actually on its path. These locking pawls 26 serve to release the corresponding setting segments 25 so that the setting segment oscillates in clockwise direction until the stop pin 31 pushed forward according to the value of the depressed digit key strikes against the abutment bar 23 or—if the numeral is 9—until the shoulder 32 of the setting segment 25 is stopped by the upper portion of the pawl 26 so that for the nine-place no stop pin and consequently no push wire is required. The second universal bar 44 is pulled to the right a spring arranged similarly to the key springs 10 until the edge 48 of this universal bar 44 strikes against the nose 46 one of which is provided on each side of the digit keys from 0 to 9 and also on the keys for 00 and 000. As soon as the universal bar 44 is oscillated by the actuation of one of the digit keys a forwardly projecting spur 49 of this universal bar 44 strikes against the stepping elements 34 arrested by the abutment 39 and moves this stepping element out of the path of the abutment 39 so that the stop carriage can be moved to the left by a spring 33 a distance corresponding to the distance between every two stepping elements 34. When the keys for 00 and 000 are depressed, the stop carriage jumps to the left in known manner by double or treble the normal distance.

This is attained in the machine illustrated in that an extension 50 (Fig. 8) of the key lever 5 of the key 00 pushes back at the same time a second stepping element 34 at the right of the stepping element acted upon by the bar 44 so that the stop carriage is moved two steps to the left by its spring 33. The key lever of key 00 (Fig. 9) has an extension 51 the bent end 52 of which extends over two stepping elements so that, when depressing this key, one stepping element 34 is pushed forward by bar 44 and at the same time two other stepping elements are pushed forward by the extension 52 of the key lever, and the stop carriage moves through three steps.

By the oscillation of the setting segments 25 the digits on the scales corresponding to the amplitude of oscillation determined by the depressed keys are brought behind the window 53 so that the figure represented by the depressed keys can be read.

The two-armed actuating levers 54 oscillatably mounted on a stationary axle 55 serve for setting the printing mechanism and the totalizer. The spacing of the levers 54 on the axle 55 is determined by hubs (not shown) the thickness of which corresponds to the spacing of every two setting segments 25. The arm of each lever 54 extending to the rear of the case is hingedly connected with the corresponding type carrier 56. The set digit on the upper end of this type carrier is printed on a paper conducted over a platen 57.

The totalizer is operated by racks 58 each of which has a slot 59 engaging a pin 60 projecting from the rear side (Fig. 1) of the rearwardly extending arm of the corresponding actuating lever 54. Longitudinal slots 61 in the upper curved toothed portions of each rack engage a transverse bar 62 fixed in vertical plates 63 and 64 of the machine frames (Fig. 2). A guide comb 65 fixed on the transverse bar 62 serves to maintain the racks correctly spaced from one another. The upper end of the racks 58 may be connected by slot and pin with the corresponding arm of the actuating levers 54. Moreover the supporting by transverse bar 62 is preferably employed as the transverse bar can also be used as bearing point for the noses for effecting the tens-transfer.

The lateral spacing between the individual type levers 56, the totalizing wheels 66 and 67 and the setting segments 25 is always the same so that the actuating levers 54 can be flat, i.e. not cranked to ensure not only low cost of production, but also easy and smooth operation of the machine. Another object to be attained is that the printing mech-

anism supplies narrow typed matter of almost the same width as that of matter typed by a typewriting machine the style of which coincides with that of the calculating machine so that the same forms can be used on both machines. In determining the spacing between individual type levers 56 which, owing to the plane actuating levers 54, is decisive also for the width of the setting mechanism and the totalizer, the spacing between signs typed by a typewriting machine the style of which coincides with that of the calculating machine has been considered in order to make the typed matter of the calculating machine similar to those of the typewriting machine. A typed figure comprising four digits, for instance 12.50 typed on a pica style typewriting machine, has (measured from the middle of the first digit to the middle of the last digit) a width of 0.4 inches as it comprises together with the dot four spaces each of 0.1 inch. The same amount is printed on the calculating machine by four type carriers and comprises therefore only three spaces as the dot is not represented by a key but fixed on the type at the side of the same and printed together with this type. To bring the typed matter of the calculating machine to the same width 0.4 is divided by 3, so that a type carrier spacing of 0.1333 inches is attained. With this spacing the same width of typewritten matter can be accurately obtained as on a pica style typewriting machine if the types 68 are arranged in a staggered position on the type lever 56, that is, along a line inclined to the right with respect to the centre line of the type carrier. However, even without this special arrangement the width of the matter typed by both kinds of machine is the same in typed figures of 4—7—10 and so forth places when the type carrier spacing is 0.1333 inches. Therefore, in order to make the printing of the calculating machine correspondent with the printing of a typewriting machine in which the same forms may be used as in the calculating machine, the spacing of the type carriers of the calculating machine is made $1\frac{1}{3}$ times the printing space of the said typewriting machine.

The type carriers 56 are constructed as rods with sets of types, for which the small spacing of 3.466 mms. from middle to middle is sufficient. The setting segments of the setting mechanism can also be similarly spaced from middle to middle of the types as owing to the employment of a scale arranged on these segments as indicating device for the degree of the depressed key, its width can be such that the digits are still well readable.

To obtain the same small spacing for the totalizer wheels 66, 67 an adding and subtracting arrangement is provided in which the teeth 69 of the racks 58 and the totalizing wheels 66, 67 remain in the same plane when reversing to the one or other kind of calculation, i.e. they do not carry out any relative shifting in lateral direction. In order to obtain a calculating mechanism which is as reliable as possible, a reversible totalizer has been used the totalizing wheels 66, 67 of which are mounted on two parallel axles 70 and 71, mesh in pairs and are brought at will into engagement with the operating racks in such manner that the one wheel of the pair of totalizing wheels 66 67 is rotated for addition and the other wheel for subtraction. After every changing over from adding to subtracting or vice versa the wheels which have been brought into mesh with the operating racks are in exactly the same position as that occupied by the other wheels of the pairs of totalizing wheels before the changing over so that for the tens transfer only one feed nose 72 on the ten-transfer pawl 73 is necessary.

The mechanism just described is arranged so that the indicating wheels 74 connected with the totalizing wheels 66, 67 render visible in the upper window 94 the sum of the fingers registered in the totalizing mechanism. A totalizer may also be employed which consists only of one row of totalizing wheels, the individual wheels being rotated for addition in the one direction and for subtraction in the other direction in that they come into engagement with the driving teeth, for instance for addition during the backward movement and for subtraction during the forward movement of these driving teeth. Such an arrangement would, however, not allow of the employment of tens-transfer pawls of tens-transfer noses, which engage with the driving teeth in the direction of engagement of the totalizing wheels and are locked in the direction of feed for the purpose of obtaining a great reliability.

The totalizing wheels 66 and 67 meshing in pairs are mounted on the axles 70 and 71 carried by two levers 76 carried on the axle 75. This shaft 75 extends between two levers 77 of which in Fig. 1 only the front one is shown. These levers 77 are fixed on an axle 78 journalled in the side walls 63 and 64, and the totalizing wheels 66 and 67 are brought in and out of gear with the operating racks 69 by rocking with the lever 77 during the operating of the machine. In the position shown in Fig. 1 the adding wheels

66 are in gear with the driving racks 69. The frame of the totalizer is oscillated for changing over to subtraction after the totalizing wheels 66, 67 have been disengaged from the corresponding racks so that the subtracting wheel 67, after it has been brought into mesh with the teeth 59 of the corresponding rack 58 assumes exactly the same position as the totalizing wheel 66 occupies in Fig. 1. 79 is a locking bar the two ends of which are guided in slots of the levers 76 and which locks the row of totalizing wheels as soon as the totalizer comes out of gear with the teeth 69 of the racks.

The tens-transfer pawls are oscillatably mounted on a common stationary axle 80 and carry each on a pin 81 a tens-transfer nose 72, the lower end of which is controlled by a spring 82, the other end of said spring being fixed to a stationary rod 83. A comb 84 rigidly connected with the transverse bar 62 serves for lateral guiding of the noses 72 of the tens-transfer. A tens-transfer is effected in known manner in that the totalizing wheels, during the transition from 9 to 0 or inversely from 0 to 9, push the feed nose 72 off the transverse bar 62 so that the pawl 73 is pulled out of the path of nose 85 by the spring 82 and this nose carries out a transfer movement under the influence of spring 86. The rack 58 oscillated by the tens-transfer by the value of one digit is pushed back into its initial position at the beginning of the next following operation of the machine in known manner by a transverse bar oscillatably mounted on shaft 55 and acting upon a nose 87 on the lower portion of rack 58.

The pinions 88 made in one piece with the indicating wheels 74 of the totalizer are connected by intermediate wheels 89 with the totalizing wheels 67, 66, this presenting the advantage that the indicating wheels 74 may be very thick if the corresponding intermediate wheel 89 is accordingly thin. The indicating wheels 74 and the intermediate wheels 89 are rotatably mounted on axles 90, 91 respectively. These two axles are arranged in links 92 by which they are connected with the axle 71 of the totalizing wheels 67. The extended ends of the axles 90 engage in slots of stationary guide pieces so that, when engaging and disengaging the totalizing wheels and the toothed portions 69 of the racks, the indicating wheels 74 remain almost at standstill, whereas during the reversing from addition to subtraction the axle 90 slides in the two stationary slots so that the indicating wheels remain permanently in the centre of the window 94.

The mode of operation of the elements described is as follows:

If, for instance, the keys for a five-places figure are depressed, the first five setting segments 25 are successively set from left to right according to the numerals of the actually depressed keys and five actuating levers 54 are released at the same time by the stepwise jumping of the stop carriage through five steps, this liberating being effected for instance by the shifting movements of zeroizing bar 95, Fig. 11 also by five units, which bar participates in the movement of the step-carriage and locks in the state of rest in known manner the actuating levers 54. The liberated actuating levers 54 adjust themselves during the operation of the machine so that their noses 96 stand opposite the bulged out portions 97 of the oscillated setting segments 25, whereas the remaining actuating levers 54 remain locked by the zeroizing bar 95 which allows merely so much clearance for these actuating levers that they can be brought into the zero position. The actuating levers 54 controlled by the setting segments 25 are acted upon by spring 98 fixed at one end to a downwardly directed arm 99 of the corresponding lever and at the other end to a transverse rod 100 which, during the operation of the machine, is shifted in known manner by links 101 into the position 102 (Fig. 3), whereby the springs 98 are stretched. The actuating levers 54 are securely held in the position shown in Fig. 1 by a transverse bar 103 which, during the operation of the machine, carries out a movement in upward and downward direction.

The machine can be operated by hand or by motor, the kind of drive being immaterial for the cooperation of the mechanisms. It is therefore sufficient to suppose operation by a crank handle 104 keyed on a shaft 107 journalled in the frames 105 and 106. By suitable transmission elements the shaft 107, which during one operation is moved forward and backward approximately through 90°, drives the intermediate shaft 108 journalled in the side frames 106 and 106^1. By this intermediate shaft 108 the transverse bar 103 is lifted in known manner during the forward rotation of the crank handle. The upwardly directed arms of the actuating levers 54 are thereby set owing to the pull exerted by the springs 98 to the digits of the depressed keys which digits are visible in the window 53, the other arm of the corresponding actuating levers raising the corresponding type carriers 56 so that they type the set figure on the platen 57

as soon as the hammers 109 of the five actuated type carriers are pulled. This is effected in known manner by a mechanism such as is shown and described in British specification 265,140 by means of pawls 111 so that the hammers 109 impart to the corresponding type carriers 56 sufficient force for throwing the set types 68 against the platen 57. Each hammer 109 has on the right hand side a laterally directed extension 110 so that the hammer for a digit higher than 0 cocks the hammers for the other zeros in the figure to be printed and thus automatically prints these zeros. For better explaining the manner of operation of this known printing mechanism in conjunction with the machine described it may be mentioned that the oscillatably mounted pawls 111 are arranged on a movable axle 112 and influenced by springs 113 connected with the hammers and having the tendency to make the pawls 111 engage over the bent off end 114 of the corresponding hammers 109. This is, however, prevented by pins 115 on the lower arms of the actuating levers 54 as the lower ends 115, of those pawls 111 strike against the pins 115 of the actuating levers the type carriers 56 of which have not been raised beyond the zero. If therefore the key of a digit higher than zero has been depressed the nose 117 of the pawl 111 engages over the bent ends 114 of the corresponding hammer wich then is cocked by the pawl as during the forward turning of the crank handle the movable shaft 112 has been moved into the position 112^1 indicated in dotted lines. By a transverse bar 118, also oscillatably mounted on shaft 112 and cooperating with the projecting arm 119 of the pawls 111, the hammers 109 are released again so that they can be thrown forward by the action of their springs 120 until they strike against a comb-like abutment 121. After the printing operation the type carriers 56 are pulled back by the action of the springs 122 into the inoperative position shown in Fig. 1.

During the forward rotation of the crank handle the totalizer has been out of gear with the racks and is brought into gear at the beginning of the backward rotation of the crank handle so that the totalizing wheels 66, 67 are turned in accordance with the typed digit as soon as the transverse bar 103 returns into its initial position.

At the end of the rotation of the crank handle the item which has been set by the keys is registered in the totalizer and visible on the indicating wheels 74 in the window 94.

During the return movement of the crank handle 104 into its initial position, the stop carriage is also returned into its initial position the setting segments 25 carrying the stop pins 31 are returned into the zero position by a transverse bar 124 cooperating with the abutment faces 123 of these setting segments, the stop pins 31 and the stepping elements 34 for the stop carriage movement in lateral direction, which have been adjusted for the calculating proceeding which has been carried out, being returned at the same time.

Means may be provided for returning the stop carriage into the initial position not only during the backward rotation of the crank handle, but also by separate control elements during the forward rotation of the same. In this manner it becomes possible to automatically eliminate before carrying out a total-taking operation any item which has been set erroneously by depressing the keys.

With this object in view the transverse bar 124 is designed to return the setting segments 25 into the initial position, the two arms 125 and 126 (Figs. 3 and 4) of this transverse bar being pivotally mounted in the side plates 2 and 3 of the machine at the height of the axle 24 of the setting segments 25, the bar 124 carrying on its left hand side arm 125 on a suitable bolt a roller 127 co-operating with the nose 128 of a control element 129. In the lower bent portion 130 of this left hand side arm 125 of the transverse bar a second roller 131 is arranged which cooperates with the lower edge 132 of the control element 129, this control element 129 shifting the transverse bar 124 into the position designated by 124^1 and back during the calculating operation of the machine. In the position shown in Fig. 3 the transverse bar 124 is in the inoperative position in which it is pulled against an abutment 133. The control element 129 is hingedly connected with the lower arm of a two-armed lever 134 pivotally mounted on a stationary bolt 135. The upper arm of this lever 134 is connected by a link 136 with a cam disc 137 keyed on the left hand end of the axle 108, said cam also being moved to and from the inoperative position shown in Fig. 3 through about 90° during one operation of the machine, whereby the control element 129 is evidently reciprocated. This control element 129 is guided by a fork 138 fixed on the outer wall of the frame of the machine and having an upwardly extending arm 139 by which the movement of the control element 129 is influenced.

The control element 129 carries on a

pin a roller 140 which, during a normal operation of the machine slides over the projection 141 of the arm 139 of fork 138, the control element dropping by gravity as soon as the roller 140 reaches the left hand end of the upper edge of the projection 141, the portion 154 of the lower edge of this control element dropping then upon the roller 131. If the crank handle is now turned backwards the roller 140 moves under the projection and the corner 142 in the lower edge of the control element 120 then strikes against the roller 131 and thereby oscillates the transverse bar 124 in anti-clockwise direction until it has reached the position indicated by 124^1. In the meantime the roller 140 has passed along the right hand edge of the projection 141 and the control element 129 is then lifted into the position shown in Fig. 3 by the curved portion 132 passsing over the roller 131. As the roller 140 no longer encounters any resistance the transverse bar 124 drops back into its initial position. The bent lower portion 130 of the left hand side arm 125 of the transverse bar 124 has a pin 143 which cooperates with the upper arm 144 of a two-armed lever pivotally mounted on a stationary point of the machine. The downwardly projecting arm 145 of this lever is hingedly connected by a link 146 with an angle lever 147 (Fig. 4). This angle lever 147 is pivotally mounted in a bracket 148 on one of the side walls and with a bifurcated end 149 on its long arm engages a pin 150 fixed in the stop carriage. The spring 33 influences the short arm of the bellcrank 147 and the link 146 so that the stop carriage always tends to move in the direction of the arrow, this movement being carried out over the shorter or longer distances according to whether the keys have been depressed for a one-place figure or for a figure containing several digits. The upwardly projecting arm 144 of the two-armed lever moves accordingly at the depressing of the keys in the direction towards the pin 143 and is brought back into the position shown in Fig. 3 by this pin.

The control element 129 therefore effects at the same time the returning of the setting segments and of the carriage in which the same are mounted, i.e. the returning of the stop carriage into the initial position.

If an item has to be repeated several times, the repeat key R is depressed and, through the lever 151 (Figs. 5 and 5a) prevents the control element 129 from dropping when its roller 140 moves over the projection 141 during the forward stroke of the machine, this lever moving back the same way during the return movement of the machine. Consequently the control element 129 carries out an idle movement and does not in any way influence the stop carriage.

It may happen that a total or sub-total is to be taken with the machine but a key has been previously struck by mistake. This item of course must not be introduced into the totalizer where it would change the total. To eliminate this item during the operation, the control element 129 is lifted by the total key or by the sub-total key or by other suitable means, for instance by a stop or rider on the paper carriage in such a manner that its nose 128 immediately grips the roller 127 during the forward stroke of the machine and thereby effects the eliminating by returning the stop carriage into its initial position immediately at the beginning of the total-taking operation. The lifting of the control element 129 is effected as shown in Figs. 5 and 5a in this instance by the same lever 151 which is pivotally mounted on a fixed pin 152 and situated in the path of the extended bolt 155 which carries the roller 140. During the total taking and sub-total taking operation lever 151 lifts the control element 129 so that the nose 128 acts on the roller immediately at the beginning of the operation of the machine. Whilst the control element 129 is pulled to the left, the pin 155 of the roller 140 slides along the upper edge of the lever 151 up to the bevelled end 153 so that the control element 129 can yield. The nose 128 continues therefore to slide under the roller 127 so that the control element 129 can carry out its complete movement. The eliminating of the set figure prior to the total or sub-total taking operation is effected during the first movement through an angle of 25° which the machine carries out during the forward stroke. Directly after the starting of the backward stroke the total or sub-total key is released so that the lever 151 and the control element 129 drop back into the initial position.

The arrangement described presents the further advantage that, when carrying out a multiplication with the machine by repeated adding, the repeat key can be locked in a notch and need not be released during the total taking and sub-total taking operation. By repeat key the control element 129 is lifted through the intermediary of the lever 151 only so high that it carries out an idle movement whereas the total and sub-total keys lift this control element higher. After the total taking operation the control

element 129 therefore does not drop back into the position shown in Fig. 3, but into the position which has been determined for it by the repeat key through the intermediary of the lever 151 so that a fresh operation can be started. The advantage attained hereby is that totals and sub-totals can be taken with the machine in spite of the repeat key being depressed.

To adapt the above described machine for calculation with English currency it is merely necessary to add additional keys for ¼, ½, ¾, 10 and 11 pence and by the "whole number" key and the mechanisms operated by said "whole number" key designed to render inoperative these additional keys when it is intended to use the machine for decimal calculations.

The additional keys for ¼, ½, ¾, and 10 and 11 pence are arranged in a separate row above the normal digit keys. The keys for the figures 2, 4, 6 and 8 (Figs. 10 and 11) differ from the corresponding keys in Figs. 1 and 2 in that they actuate the push wires 40 not directly but through the intermediary of intermediate levers 160, 161, 162 and 163. These intermediate levers are mounted, like the keys themselves, on the axle 4 and laterally guided in the combs 13 and 14. They are held by springs, similar to the key spring 10, in the position shown in Figure 10, which is determined by the transverse abutment bar 12. The figure keys 2, 4, 6 and 8 have each a flap 164 bent off to the left and extending over the intermediate levers 160—163 so that these intermediate levers are depressed by the depression of the keys. Each intermediate lever 160—163 has a push rod 40 for pushing forward the corresponding stop pin 31. The keys for ¼, ½, ¾ and 10 pence cooperate with these intermediate levers and have each a flap 165 bent off to the right, projecting over the corresponding intermediate levers and depressing them when the keys are being depressed. The additional keys in the upper row of keys mounted on the axle 4, are also guided at the sides in the combs 13 and 14 and are held in the inoperative position shown in Fig. 10 by the action of springs 10. The push wires of the intermediate levers 160—163 push forward the stop pins 2, 4, 6, 8 when the corresponding digit keys and also the ¼, ½, ¾ and 10 pence keys are being depressed.

The setting of the pence type carrier 185 Fig. 10 is effected from the decimal setting segments 25 through the intermediary of a separate actuating lever 166, 167 pivotally mounted on bolt 168 which is rivetted in a side wall of a bearing 169 bent in U-shape and carried by the axle 55 (Fig. 12), the other side wall of this bearing being fixed on the side wall 64 of the frame by a screw 170. The actuating lever for the pence keys consists of two arms 166 and 167 hingedly connected by a bolt 168. A downwardly directed extension 171 of the arm 166 cooperates with a pawl 172 pivotally mounted on a bolt 173 rivetted in arm 167. A spring 175 is attached to a downwardly directed arm 174 of pawl 172, the other end of this spring being attached to an arm 176 of lever 167, a spring 98, designed to actuate the double lever arm 166, 167, being attached to this arm 167. A wire 178, hingedly connected at its other end by an eye 179 and bolt 180 with a universal bar 181 pushes against a bent over flap 177 of arm 174 of pawl 172. The upwardly directed end arms 182, 183 of universal bar 181 are mounted on the axle 4, the position of this universal bar on the machine being determined, like that of the keys, by the combs 13 and 44. This universal bar 181 is actuated only by the 10 and 11 pence keys which, for this purpose, have each an abutment 184. A spring, similar to the spring 10, tends to hold the universal bar 181 in the position shown in Fig. 11.

The pence type carrier 185 carries the ciphers 0 to 11 inclusive and, as mentioned above, is set through the intermediary of the additional actuating lever 166—167 also from the normal decimal setting segments 25. The operation of the elements described is as follows:—

In Fig. 10 the two lever arms 166 and 167 are shown coupled by the pawl 172, and the spring 186 between these two arms has the tendency to uncouple. As long as the coupling exists, the arms 166 and 167 move like a normal actuating lever 54. To set for instance 5 pence in the machine, the key lever 5 is depressed and the corresponding stop pin 31 pushed into its setting segment 25, so that this segment will stop at "5". If the machine is operated, the additional actuating lever 166, 167 is adjusted by the pull of the spring to the segment and the additional type carrier is moved into the printing position. This proceeding is otherwise like that of the normal decimal machine. 1 to 9 pence can be set in a similar manner on the normal segments 25. For 10 and 11 pence, however, the coupling 171, 172 has to be uncoupled in order that arm 167 can carry out its additional movement. The same position of the setting segments 25 which they assume for 8 and 9 serve 10 and 11 pence. Suppose the ten-pence key be

depressed, the flap 165 of this key lever pushing forward, through the intermediary of the intermediate lever 163, the stop pin for an eight for the corresponding setting segment 25, so that this segment is set to 8. At the same time the nose 184 of the ten pence key has actuated the universal bar 181 by the push wire 178 and the pawl 172 is uncoupled. As soon as the pawl liberates the short arm 171, the spring 186 moves the lever arm 166 in anticlockwise direction, until the flap 187 at the lower end of lever 166 again strikes against the bearing 169.

If the ten-pence key is liberated and has returned into the inoperative position, the pawl 172 cannot engage again over the projections 171 by the oscillating of the lever 166. If the machine then carries out one operation, the spring 98 turns the arm 167 in clockwise direction until the bent over flap 188 of this lever strikes against the stop 189 of the upper lever arm 166 and then oscillates this upper lever arm until its upper end strikes against the set segment 25. The flap 188 and the stop 189 permit of the arm 167 oscillating by two more subdivisions so that not the digit 8 but the type 10 prints. The key for 11 pence has the same effect as the key of digit 9 with the difference, however, that it actuates also the universal bar 181 and uncouples the coupling 171, 172, a stop pin is not pushed into the segment 25 at this occasion, but merely the locking pawl 26 is opened which also limits the 9 position of the setting segments. The keys for 10 and 11 pence cooperate evidently with the universal bar 44 so that, when they are depressed, the carriage is moved each time by one step to the left.

As shown in Fig. 10 the totalizing wheels for the pence place have 12 teeth and their driving segment 190 has corresponding pitch. The totalizing wheels 191 and 192 with 12 teeth are mounted on the same axles 70 and 71 which carry the totalizing wheels for decimal calculation and for $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ pence. The arrangement of the totalizing wheels of this machine is similar to that disclosed by the British specification 395,981.

At the right of the carrier 185 of the pence types the type carrier 193 is arranged which carries the types $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ pence and again at the right of this latter carrier the type carrier 194 is arranged with the operation signs for the kinds of calculation to be carried out by the machine. This type carrier is not shown in Fig. 2 for clearness sake. The type carriers 195 and 196 serve for typing the shillings, 195 for the shillings below 10 and 196 for the 10 shillings, whereas the other lever type carriers at the left of 196 designed to type the pounds are constructed and operated in the same manner as the type carrier 56 (Fig. 1).

The stop pin carriage which contains the setting segments 25 is shown in Fig. 11 in its inoperative position which differs from that of the decimal stop pin carriage in Fig. 2 in that the first setting segment 25 is arranged in the front of the transmission lever 197 which is constructed exactly like the normal actuating levers 54. At the left of this setting segment the zero plate 95 is arranged which is situated on the path of the upper ends 96 of all actuating levers and locks these levers where no figure is set so that, when the machine is operated all type carriers can move upwards only so high that the zero comes into the printing position. The zeros are, however, not printed as the printing is released merely by type carriers which are above the zero position. The type carrier 193 or its actuating lever 197, is however, not retained by the zero plate 95 but by the first setting segment 25 which is in the zero position as no cipher key has been depressed.

The setting of the type carrier 193 for $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ pence is effected also by means of the normal setting segments 25 with the aid of the stop pins corresponding to the keys 2, 4 and 6 of these segments. The toothed wheels of these places have each eight teeth and they are rigid with transmission wheels which have ten teeth and permanently intermesh These wheels are also mounted on the axle 70 and 71 and are similar to those shown in Fig. 4 of the above mentioned British specification 395,981. The wheels with eight teeth are driven by racks, such as 58 in Fig. 1, having a corresponding pitch and their setting is effected as already mentioned by a normal lever 54 corresponding with the setting segments 25.

The setting of amounts is effected in the following manner:—

Suppose £5.18.7½ have to be added. The numeral keys will be depressed in known manner consecutively from left to right and the machine is operated once, whereby this amount is printed and transferred into the totalizer. By depressing the numeral keys 5, 1, 8 and 7 the stop pin carriage moves to the left each time by one place, but not at the depression of the key for ½ penny as the type carrier 193 or the actuating lever 197 has already been opposite the setting segment 25 from stop pin corresponding to 4 has already been pushed out by the ½ penny key. The fraction keys $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ do not cause

any movement of the stop pin carriage to the left as they do not act upon the universal bar 44. This arrangement is made in order that ¼, ½ and ¾ can be typed or calculated at will without the necessity of previously effecting a changing over the machine for fraction calculation, for instance by depression of the "whole number" key. To type 7 pence, only the key 7 has to be depressed, whereby the carriage is moved one place to the left so that the first setting segment 25 comes opposite the type carrier 185 or opposite the actuating lever of the same. If then an operation of the machine is carried out, this type carrier sets itself to this setting segment, whereas the transmission lever 197 is stopped by the second setting segment and lifts its type carrier only to the zero position. Whereas the normal hammers 109 are connected by the overlap 110 (Figs. 1 and 10) so that those situated at the right are cocked by the left one as soon as the type carrier of the left one has been set to a figure above zero, such overlap is omitted for the hammer of the type carrier 193 so that this hammer cannot be cocked. For this reason only the 7 is printed in the present instance. If then one of the fraction keys is depressed, for instance ½ the setting pin corresponding to the first setting segment 25 is pushed inwards through the intermediary of the intermediate lever 161 and during an operation of the machine the arm 197 sets itself to this segment as the carriage has not carried out a movement in lateral direction. Consequently the type ½ will be printed because the type carrier 193 has moved beyond the so-called zero position and the pin 115 is no longer in the path of the projection 116 of the pawl 111 (Fig. 1) which now operates its hammer. The stop pins 31, the stepping elements 34 and the setting segments 25 are returned in the inoperative position during the return movement of the carriage. The carriage carries out at this occasion an additional travel to the right and jumps then back into its inoperative position shown in Fig. 11. It is necessary for the coupling 171 and 172 of the arms 166 and 167, which may have been uncoupled, to be re-established during this time. For this reason a bar 198 is fixed to the carriage and has an inclined surface cooperating with the lowermost end 199 of arm 166. During the additional movement of the carriage this inclined surface pushes back the part 199 so far that the pawl 172 can engage again over the projection 171. The carriage then jumps back into its inoperative position, whereby the inclined surface moves away from the projection 199.

The numeral wheels 74 for indicating the pence set in the totalizer have figures 0 to 11 inclusive and those for the fractions have the numerals 0, ¼, ½ and ¾. The numeral wheel for the 10 shillings contains five times the figure one, these figures being equally spaced on the circumference of the wheel. In order to render visible the non-decimal values on the setting a cover plate 201 formed as an extension of the arm 214 of the lever 202—203, adapted to be controlled by the keys 10 and 11 is provided. The lever 202—203 is pivotally mounted at a stationary point 200 of the machine Fig. 13. The cover plate 201 carries the numerals 10 and 11. The arm 202 is connected by a bolt 207 with a link 203 controlled by a spring 204 and locked in the position shown in Figs. 13 and 14 in opposition to the pull of spring 204 by a nose 205 of the 10 pence key. The arm 202 is resiliently pressed against the guide comb 13. If the 10 pence key is then depressed, its nose 205 liberates the lower arm 208 of the link so that this link can move under the pull of the spring 205 until its stop 209 strikes against the nose 206 of the 11 pence key. The cover plate 201 is thus swung so that in the window 53 a 10 appears and covers the 8 which would otherwise be shown by the setting segment arranged thereunder. If the key 11 pence be depressed, the corresponding segment 25 would set to 9 and thereby indicate a wrong figure. This is corrected in a similar manner as just described in that by the key 11 or by the upwardly projecting extension 211 of the same the link 203 is slightly lifted so that it moves out of the path of the higher nose 206 of the key for 11 pence. The spring 204 pulls the link 203 so far downwards that the lever arm 202 strikes against the stationary abutment 212, so that the cover plate 201 indicates the figure "11" in the window 53. A pin 213 is fixed on the zero plate 95 (Figs. 11, 13) which is mounted between the walls 18 and 19 of the carriage. This pin strikes during the return movement of the carriage against the lever arm 214 and thereby returns the cover plate and its link into the inoperative position shown in Fig. 13. This takes place during the additional movement of the carriage so that the pin 213 has liberated again the lever arm 214 when the carriage is in the inoperative position. The decimal setting segments 25 show instead of ¼, ½ and ¾ pence the numerals 2, 4, and 6. This inconvenience is obviated in that below the window in the fraction

place of the machine an 8 is engraved or arranged in any other manner so that these numerals are read as 2/8, 4/8 and 6/8.

In order to be able to calculate with this machine also only decimally, the known whole number key is provided by which places for English currency are rendered inoperative during the calculation proceeding. Such an arrangement is also disclosed in the British Patent 273,130. To make the machine particularly reliable the movement of the carriage which, when the whole number key is depressed, must at the beginning of every operation of the machine instantaneously jump to the left by several places, is facilitated by the fact that this movement is not merely dependent on the spring by which the carriage carries out normally its lateral movement. To attain this a lever 215 (Figs. 16 and 17) is arranged instead of the arm 51 with flap 52 as shown in Figs. 9 and 9a, to cooperate with the " £ " key, which in the decimal system bears the cipher 000. This arm 215 is pivotally mounted on a bolt 216 rivetted in an angle lever 217. This angle lever 217 is also pivotally mounted on a bolt 218 fixed in the machine and carries on a short projection 219 a spring 220, the other end of said spring being attached to the lever 215. The spring has therefore the tendency to pull the lever 215 permanently against the stationary abutment 221. The lever 215 is bent at its bearing point and the upper check 222 of this bent portion has a locking nose 223 cooperating with the lever 224. The downwardly projecting arm 225 of the pound key (Fig. 15.) actuates the lever 215. The projection 226 of lever 215 pushes three stepping elements 34 out of the cage whereby, when the pound key returns into its initial position, the carriage can move three steps towards the left. To prevent the lever 215 and the angle lever 217 carrying the same from participating in this movement, the nose 223 engages over a projection 227 during the oscillating movement of the lever 215.

The lever 215 not only serves to control the carriage feed by three steps when the pound key is depressed but also to effect, if the whole number key is depressed, the necessary lateral movement, of the carriage at the beginning of the crank movement. The cage 35 containing the stepping elements 34 is serrated at its lower edge 228, these teeth cooperating with the finger 229 of lever 215, constructed so that it can engage into the spaces between the locking teeth 228.

The whole number key is arranged in a manner known per se and therefore not illustrated. It can be retained in a notch when it is in depressed position for the purpose of adapting the machine for permanent decimal calculation. The engaging may, however, be omitted if only a few decimal items have to be calculated whereupon the whole number key is returned in the usual manner into the inoperative position after every operation of the machine. The lever 224 is oscillatably mounted on an axle 230 carried by a bracket 231 fixed by means of screws on the base plate of the machine. At the left end of lever 224 (Fig. 16) a pawl 232 is arranged which co-operates with the pin 233 of a disc 234. The disc 234 is fixed by means of a pin on the driving shaft 107 (Fig. 2) and turned during one machine operation through an angle of approximately 90° in the direction of the arrow and then back into its initial position. A spiral spring 235 is attached at one end to a projection 238 of pawl 232, the other end being held by a fixed bolt 236 of the machine. The spring 235 has the tendency to hold the lever arm 224 and the pawl 232 in the position shown in Fig. 16 in which the pawl bears against a pin 237 which is movably arranged in the machine and connected by suitable transmission elements with the whole number key. The whole number key is connected with the pin 237 in such a manner that, if the whole number key is depressed the pin assumes the position indicated in Fig. 16, whereas it is in the position 237^1 if the whole number key is in its normal position. The pin 237 in this position holds the pawl 232 out of the path of pin 233 so that the movement of disc 234 cannot be transmitted to the lever 224 during the machine operation. If the whole number key is depressed, pin 237 moves into the position shown and the pawl 232 is then pulled into the path of pin 233 by the spring 235 so that, during the operation of the machine, the lever 224 is depressed in opposition to the pull exerted by this spring. During this movement the inclined face of the projection 238 of the pawl is freed from pin 237 so that the pawl 232 is pushed away and liberates the pin 233 when the driving shaft 107 has scarcely carried out one third on its forward movement. After the forward stroke of the machine is completed the return movement of shaft 107 begins during which the pin 233 strikes against the inclined face 239 of the pawl 232 which already has been returned into its upper position by the pull exerted by spring 255. The pin 233 now presses

down the pawl 232. As soon as the machine has arrived in its initial position, the pawl 232 slips on a pin 233 and all elements resume the position shown in Fig. 16. The upward movement of lever 224 is limited by a stationary pin 240. The lever 215 is oscillated by the downward movement of lever 224, as the inclined face 241 of this lever 215 presses against the edge of the other lever arm. At the same time projection 227 moves out of the path of the locking nose 223 so that lever 217 can then be oscillated in anti-clockwise direction. This oscillation is produced by a pin or roller 243 fixed on arm 224 and acting during the downward movement against the inclined upwardly turned face 224 of the short arm of lever 217. By the oscillation of lever 215 through the intermediary of the inclined surface 241 three stopping elements 34 are pushed out by the large face 226 of the lever, and the path of the stop pin carriage is liberated for three units. Finger 229 then engages into the gaps between teeth of the rack 228 actually opposite the finger and if then the oscillating movement of lever 217 in the direction of the arrow (Fig. 17) is effected by the roller 243, the stop pin carriage is moved also in the direction of the arrow by finger 229 for three units. As already mentioned this movement takes place immediately at the beginning of the forward strike of the machine. As soon as the inclined face 238 of pawl 232 has liberated the pin 233, the spring 235 pulls the lever 224 and the pawl 232 back into their initial positions, the inclined edge 241 of lever 224 liberating also the lever 215 or the edge 242 of the same (Fig. 17), whereupon lever 215 is pulled against the pin 221 by the action of the spring 220. At the same time the spring 220 moves the levers 215 and 215 back into their initial position in which the lever 217 is stopped by the abutment 244 bearing against the roller 243.

The whole number key controls not only the pawl 232 through the intermediary of the abutment pin 237, but also the printing hammers 109 (Fig. 10) as, by depressing the whole number key, the actuating of the printing hammers for the type carriers 185, 195 and 196 is prevented in order that no zeroes by automatically printed if the machine is used for decimal calculation. To render these printing hammers inoperative their overlaps 110 are hingedly mounted on the hammers. Such arrangements are generally known and are therefore not particularly described.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A calculating machine of the ten key type with printing mechanisms, a visible adding and subtracting totalizer and an item indicator, in which a stepwise moving setting mechanism of known type carrying the item indicator, by which the figures represented by the depressed keys are rendered visible in a window above the keyboard, cooperates with oscillatably mounted two-armed denominational actuating levers which set the type carriers, said levers each carrying a rack for rotating the totalizing wheels of the totalizer which is mounted above the pivot point of the actuating levers and is visible through a window, the machine being adapted for decimal or both decimal and non-decimal calculations.

2. A calculating machine as claimed in claim 1, characterised in that the figure represented by the depressed keys is, in known manner, indicated by setting segments of the setting mechanism to which the upwardly directed arms of the two-armed actuating levers are automatically set.

3. Calculating machine as claimed in claims 1 and 2, characterised in that the driving racks have each a slot in the upper end portion and are guided on a fixed transverse bar which supports in known manner also the tens-transfer pawls.

4. Calculating machine as claimed in claims 1 to 3, characterised in that the totalizing wheels permanently mesh through the intermediary of thin intermediate gear wheels with the pinion of an indicating wheel of large face, the axle of the said indicating wheel being journalled approximately perpendicularly above the fulcrum of the setting segments and of the actuating levers.

5. Calculating machine as claimed in claim 1 to 4, characterised in that the axle of the indicating wheel is journalled in a guide extending at an angle of approximately 90° to the window of the totalizer and that it is connected with the frame of the totalizer or with the axle of the totalizing wheels by two links carrying the axle of the intermediate wheels.

6. Calculating machine as claimed in claim 1, characterised in that the totalizing wheels are arranged side by side and the type carriers are spaced from middle to middle at a distance which amounts to $1\frac{1}{3}$ times the distance from middle to middle of numerals typed in a row without punctuation on a typewriter the style of which coincides with that of

the calculating machine and may be used for typing on the same forms as are printed on by the calculating machine.

7. Calculating machine as claimed in claim 1, characterised in that a number of stepping elements (34) equal to the number of the transverse rows of the setting segments (25) are shiftable together with the stop-in carriage and adapted to control this carriage, said stepping elements being situated on the path of a stationary abutment (39) from which they are successively and singly moved away by the numeral keys or in groups by the auxiliary keys in order to liberate the path for the carriage.

8. Calculating machine as claimed in claims 1 and 7, characterised in that the shiftable stepping elements (34) are arranged on the carriage whereas the stationary abutment (39) is fixed on the machine frame.

9. Calculating machine as claimed in claims 1, 7 and 8, characterised in that the stop-pin carriage can be returned into the initial position during the forward and during the backward stroke of the machine by separate control elements.

10. Calculating machine as claimed in claims 1, and 7 to 9, characterised in that a control element (129), which during the normal operation of the machine, at the end of the backward movement of the same returns the stop-pin carriage in known manner into the inoperative position, is controlled by means, such as "total", "sub-total" and "repeat" keys, so that the said control element (129) brings the carriage into the initial position at the beginning of the forward stroke of the machine.

11. Calculating machine as claimed in claims 1 to 10 characterized in that the additional actuating lever of the pence place (185) consists of two parts (166 and 167) adapted to be coupled the one with the other, by the uncoupling of which the lever (167) connected with the type carrier (185) and with the driving rack for the totalizing wheels is additionally moved by two divisions during the operation of the machine.

12. Calculating machine as claimed in claims 1 to 11, characterised in that the coupling consists of a pawl (172) which is disengaged by the ten and eleven pence keys.

13. Calculating machine as claimed in claims 1 to 12, characterised in that the coupling (171, 172) is coupled again during the return movement of the stop pin carriage, for instance by a bar (198) connected with this carriage.

14. Calculating machine as claimed in claim 1 to 13 in which the numeral keys of the values 1 to 9 are arranged in two rows, one of said rows comprising the odd numerals and the other row the even numerals, characterized in that a third row of keys for fractions and 10 and 11 pence is arranged so that intermediate levers (160—163) extend between every two of these keys extending also between every two key levers for the even numerals and are adapted to be actuated by these as well as by the pence keys in order to push forward the stop pins 2, 4, 6 and 8.

15. Calculating machine as claimed in claims 1 to 14, characterized in that the 10 and 11 pence keys control a shutter (201) marked with numerals, covering the numerals 8 or 9 of the indicating device and indicate instead of these numerals the numerals 10 and 11 respectively.

16. Calculating machine as claimed in claims 1 to 15, characterised in that the shutter (201) is brought back into the initial position during the return movement of the stop pin carriage by a pin (213) fixed on this carriage.

17. Calculating machine as claimed in claims 1 to 16, characterised in that on the place for pence fractions below the indicating point the numeral 8 is arranged so that $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ can be read in the window (210) as 2/8, 4/8 and 6/8.

18. Calculating machine as claimed in claims 1 to 17, characterised in that a device (215—242) controlled by the whole number key is arranged which positively moves the stop pin carriage at the beginning of every machine operation for decimal calculation in order that its pins (31) representing the inserted figure are moved into the decimal calculating places of the machine.

Dated this 16th day of January, 1936.

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231, Strand, London, W.C.2,
Chartered Patent Agents.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1937.

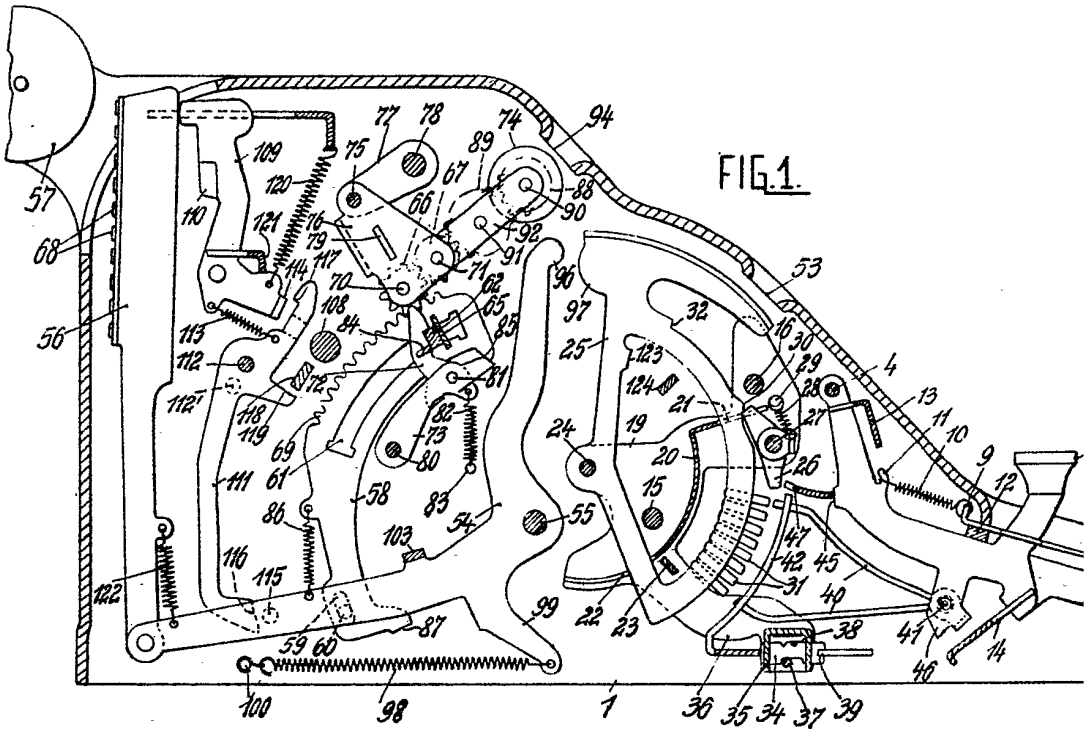


FIG. 1.

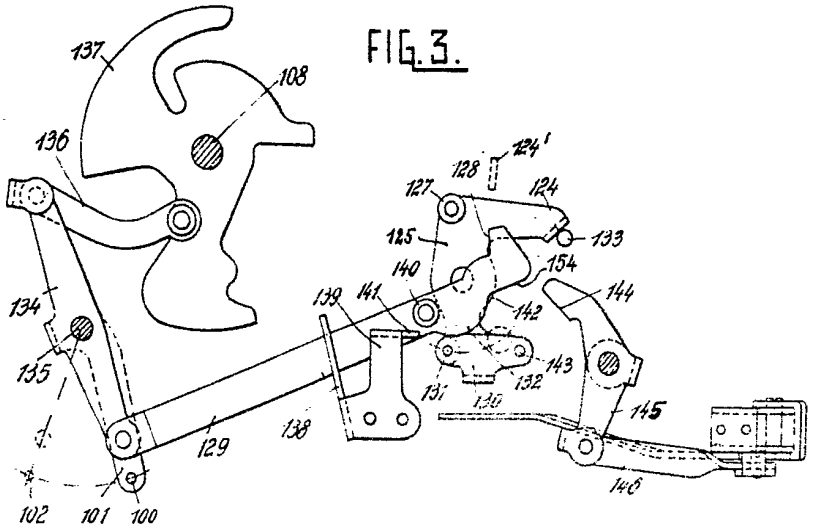


FIG. 3.

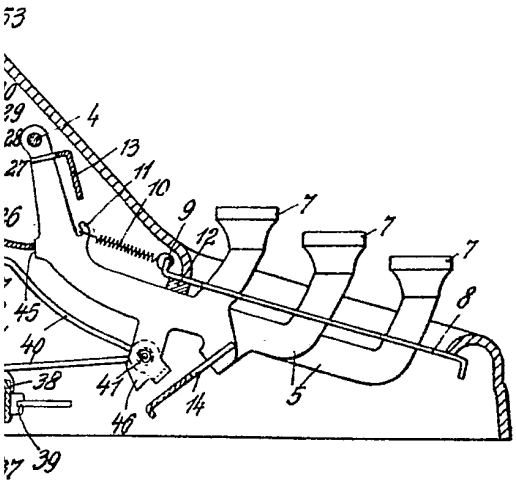


FIG.5.

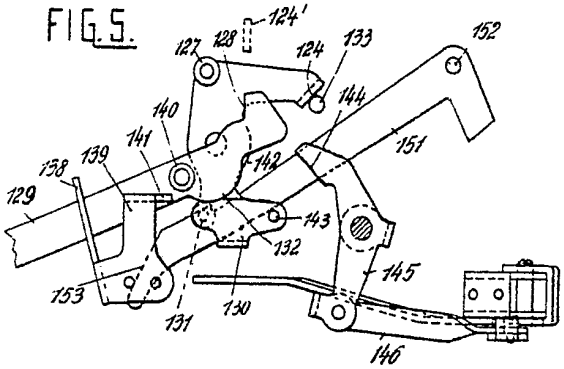
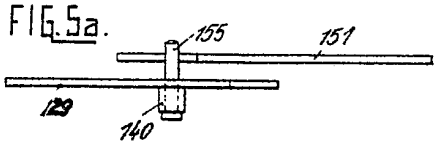


FIG.5a.



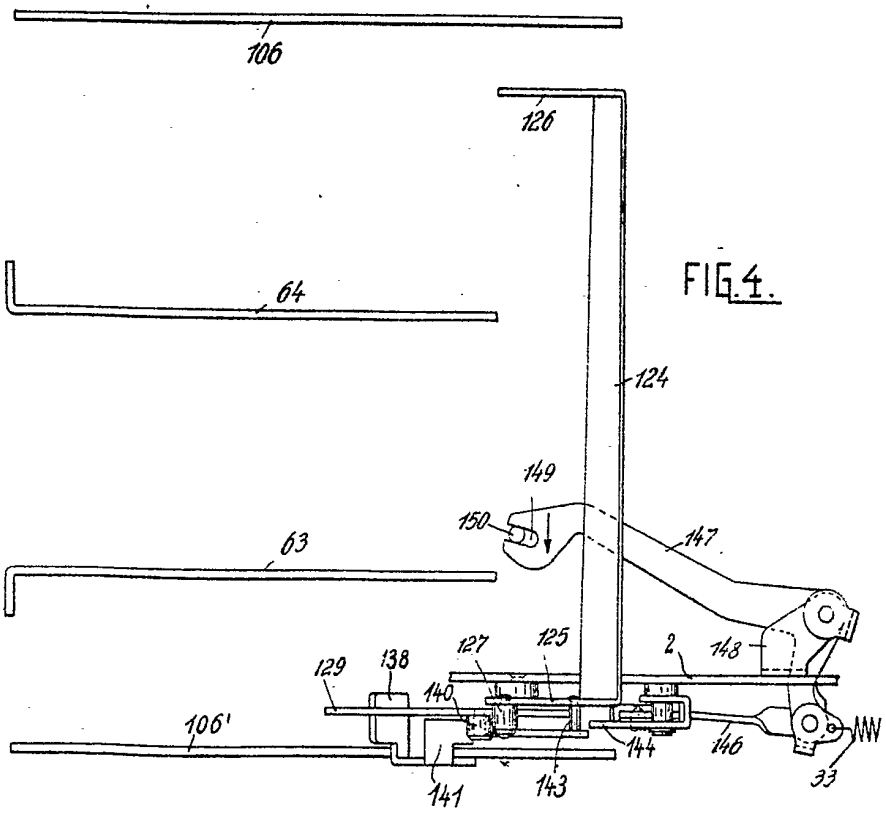


FIG.4.

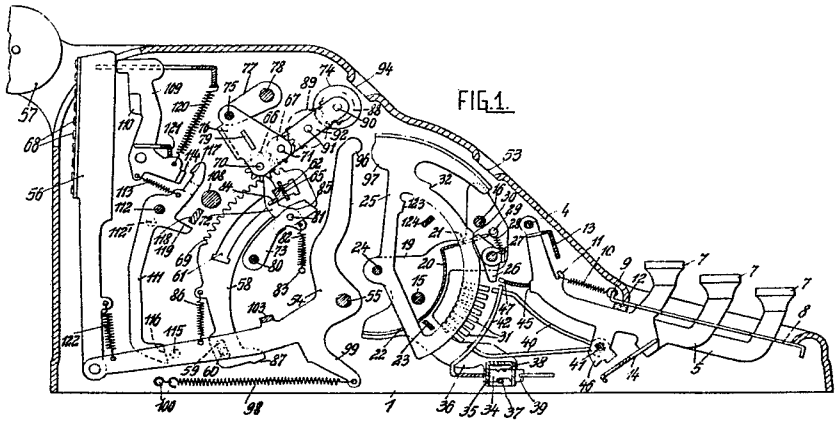


FIG. 1.

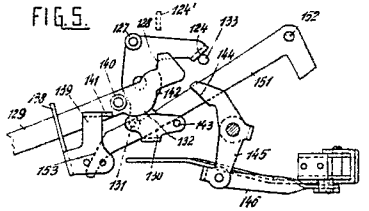


FIG. 5.

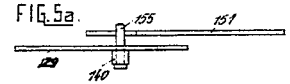


FIG. 5a.

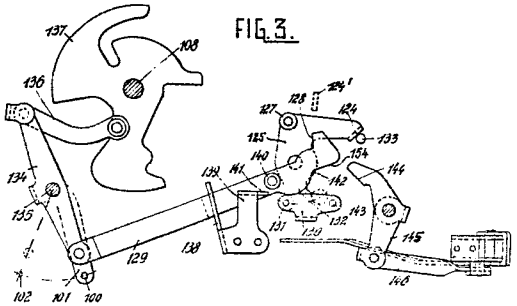


FIG. 3.

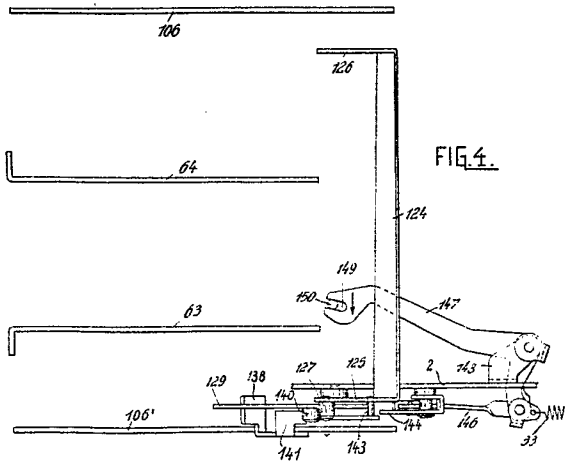


FIG. 4.

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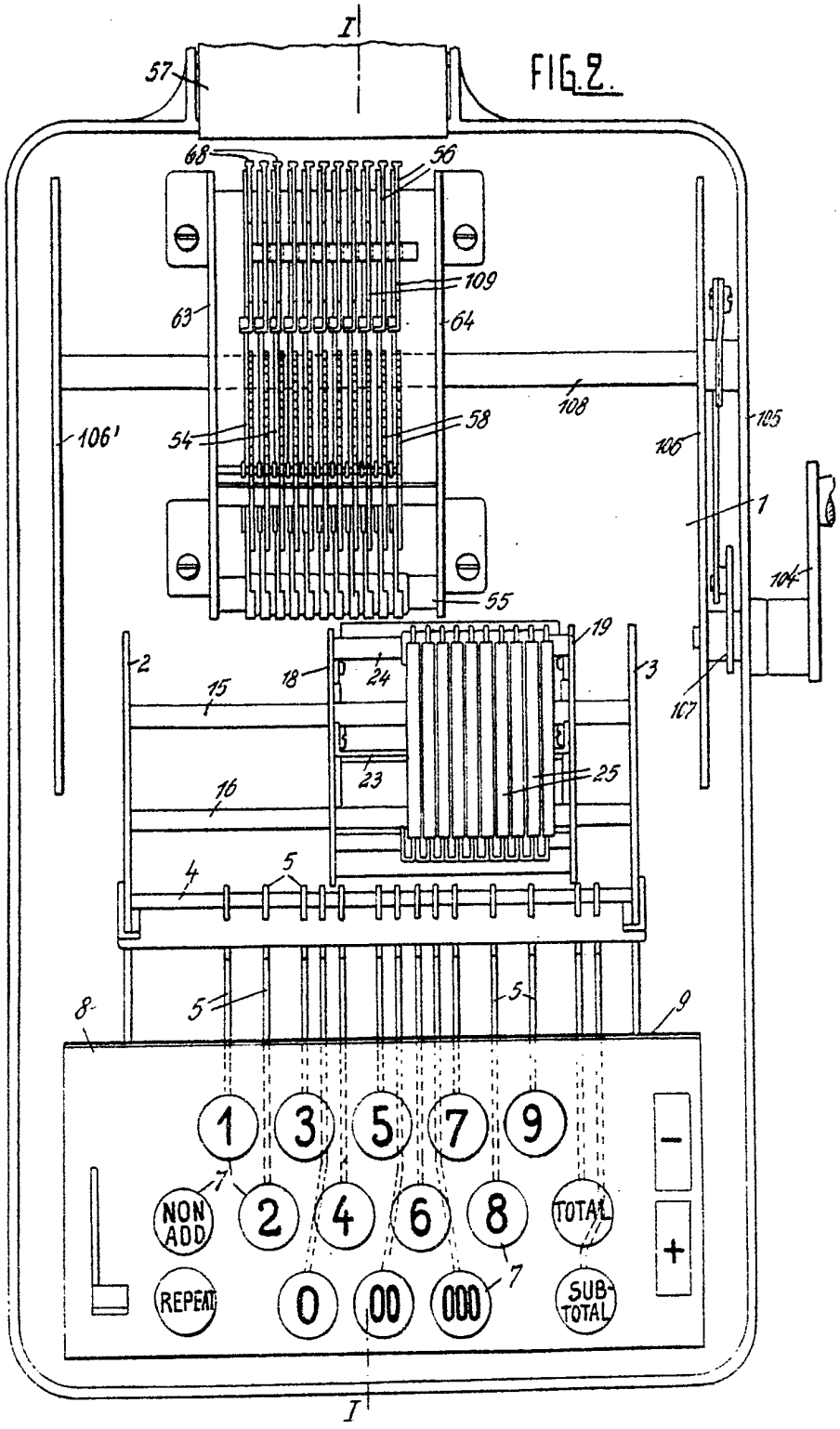
[This Drawing is a reproduction of the Original on a reduced scale.]

FIG. 2.



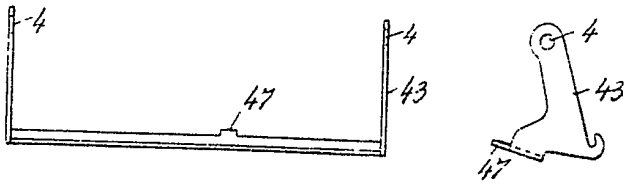


FIG. 6.

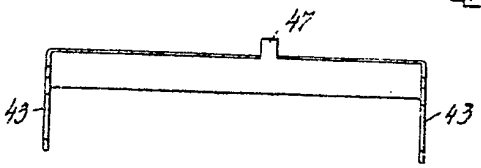
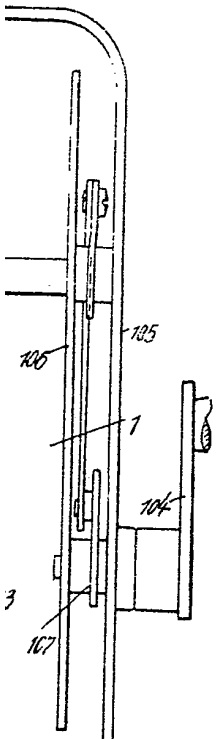


FIG. 7.



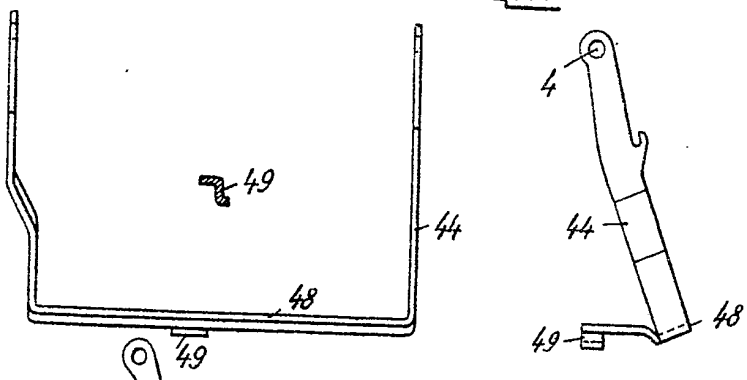


FIG. 8.

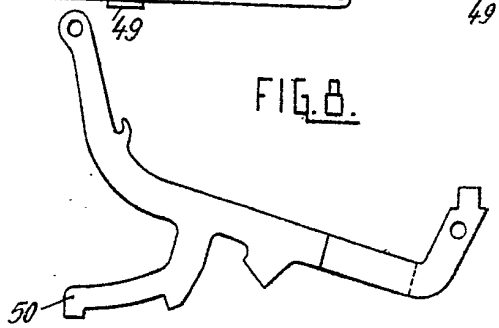


FIG. 9.

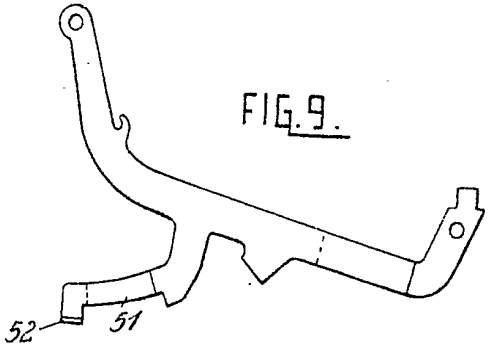
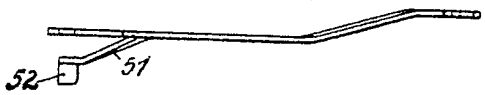


FIG. 9a.



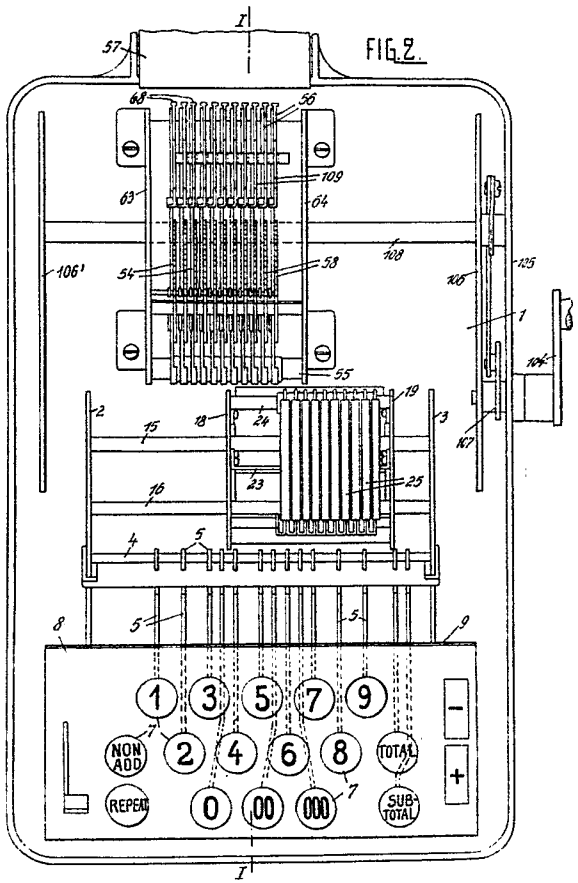
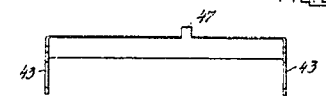


FIG. 2.

FIG. 6.



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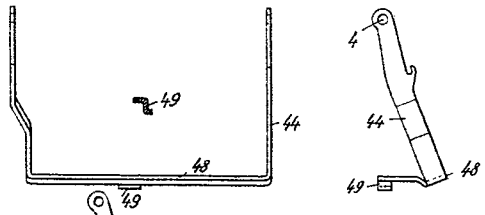


FIG. 8.

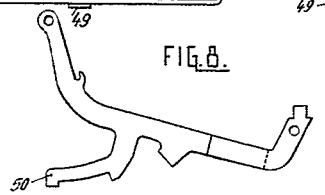


FIG. 9.

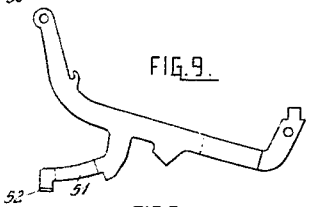
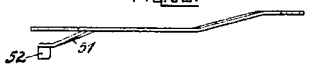


FIG. 9a.



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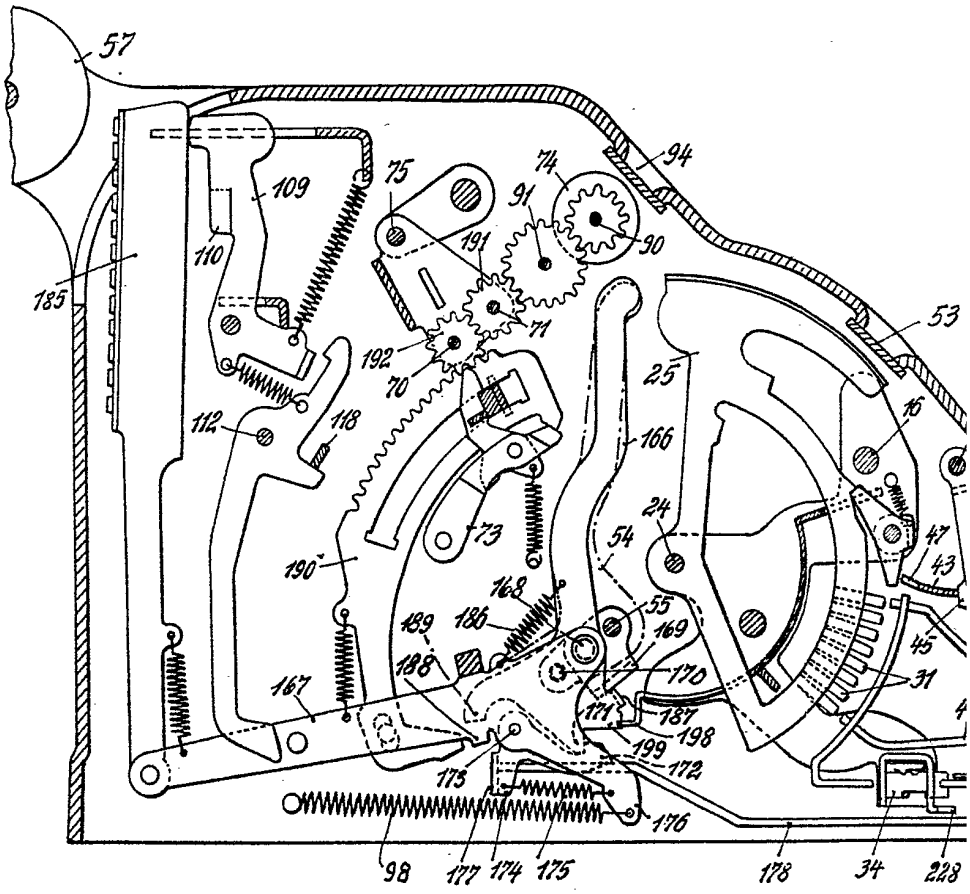


FIG.12

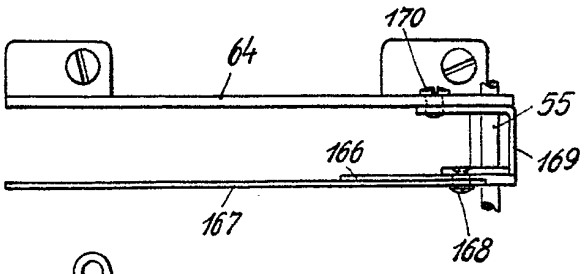
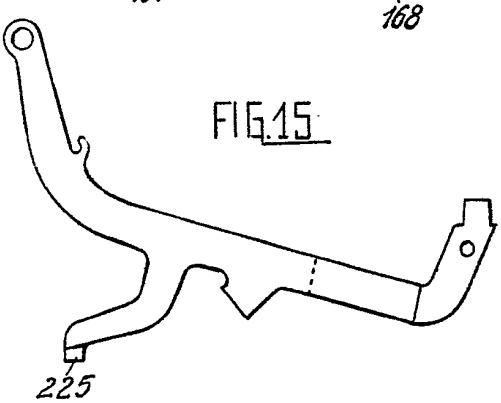


FIG.15



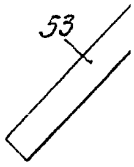


FIG.10.

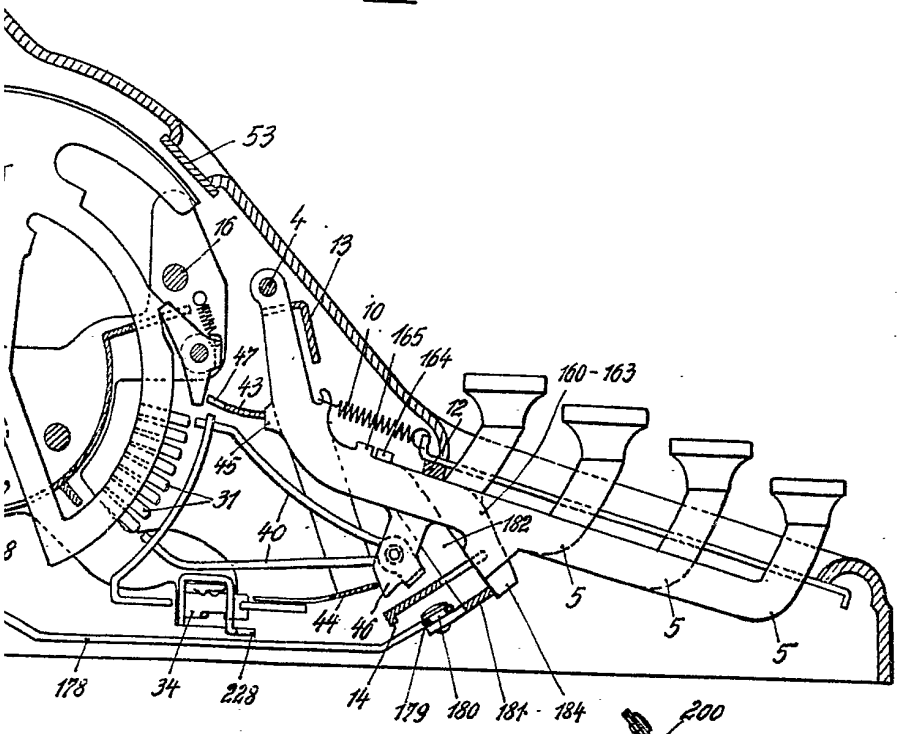


FIG.14

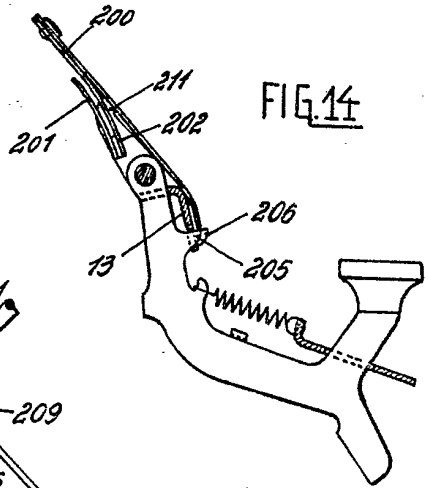


FIG.13

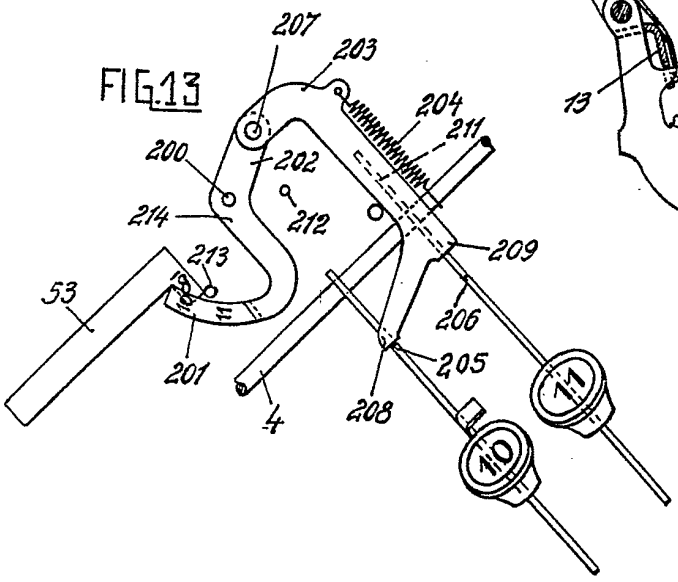


FIG.10.

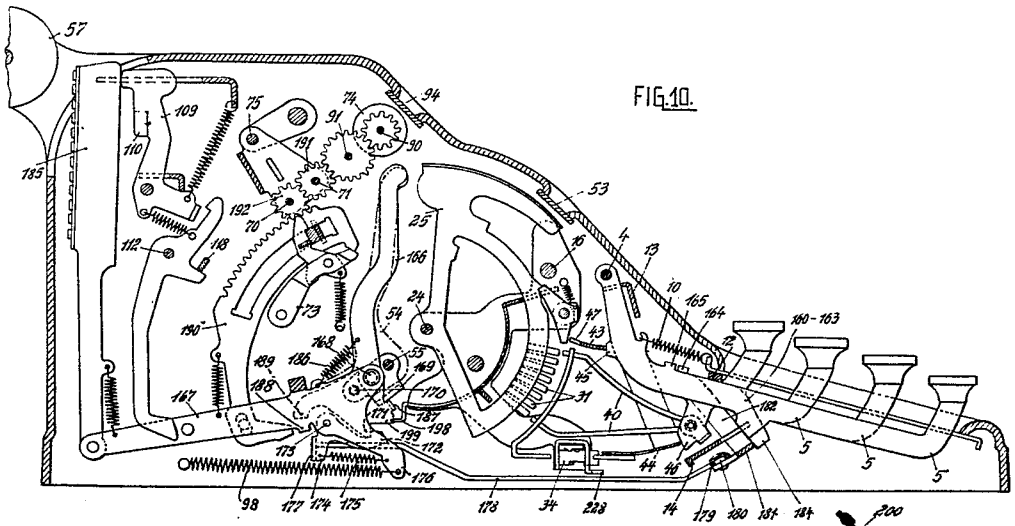


FIG.12

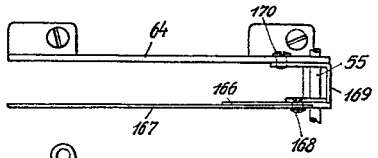


FIG.15

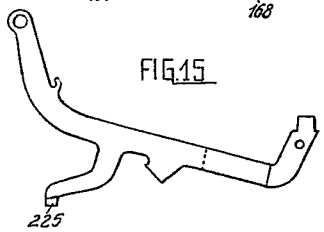


FIG.14

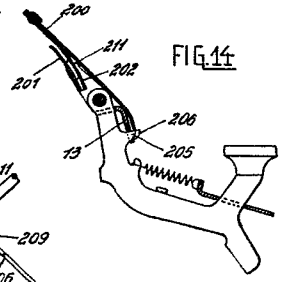


FIG.13

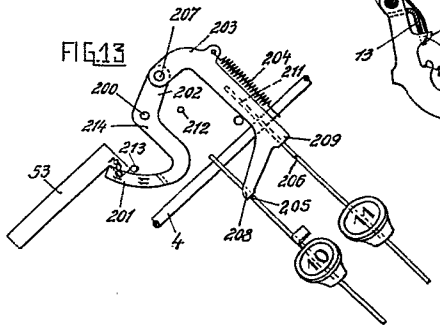


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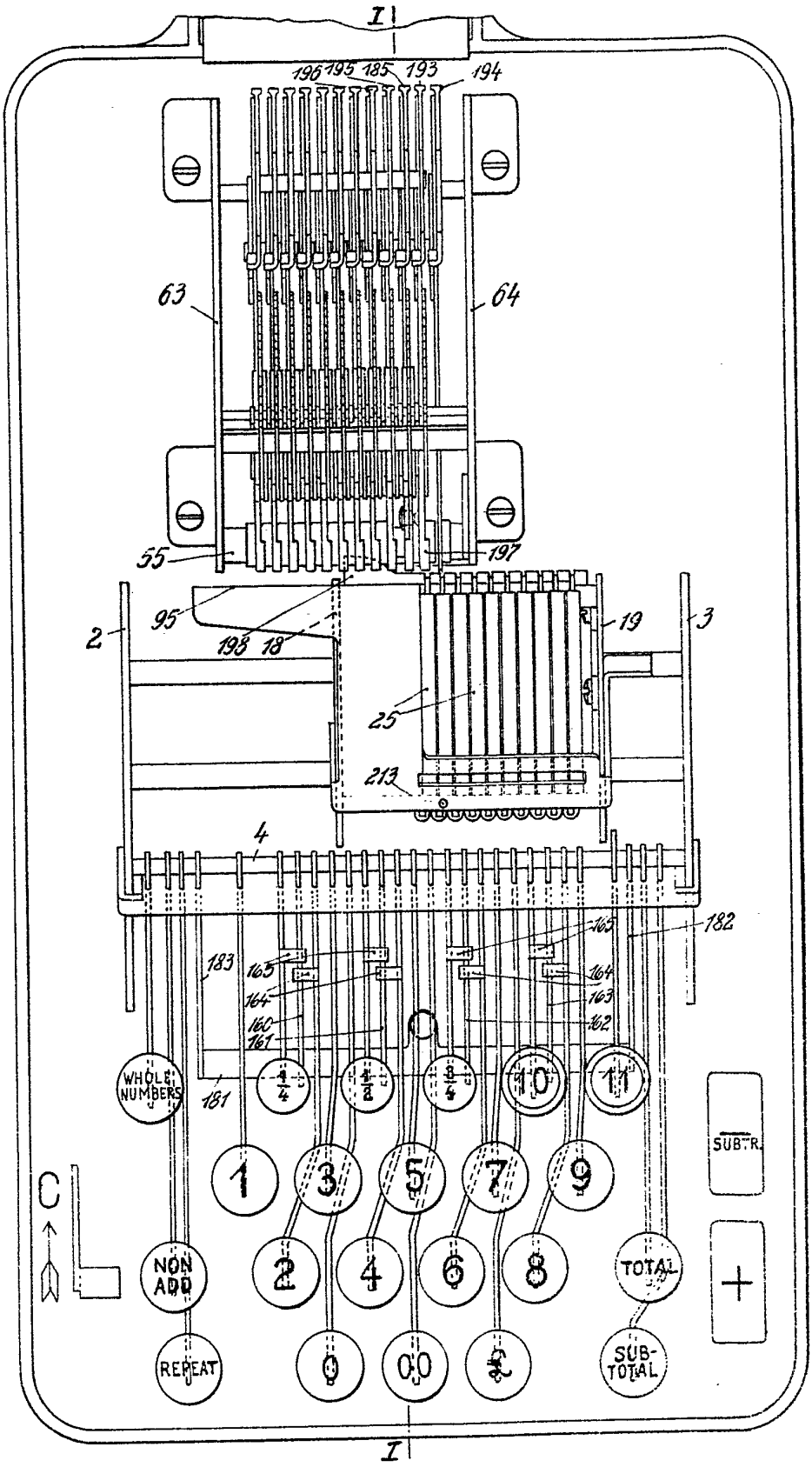
FIG 11



[This Drawing is a reproduction of the Original on a reduced scale.]

FIG.16

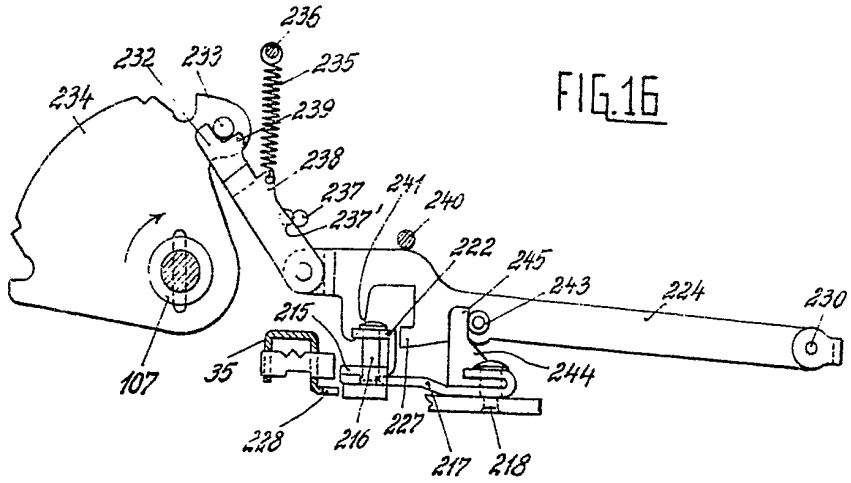

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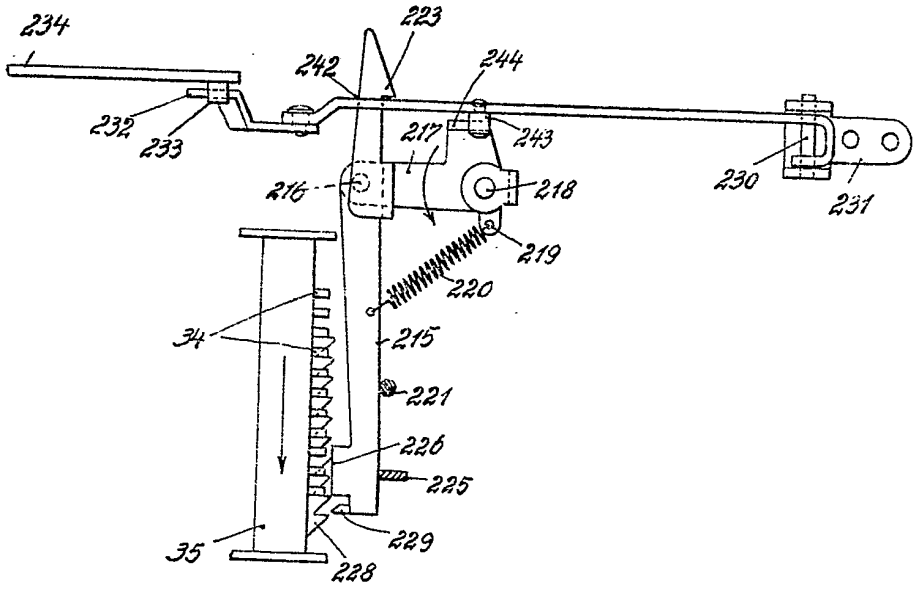
FIG.17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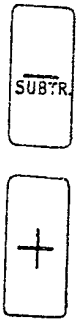
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[This Drawing is a reproduction of the Original on a reduced scale.]

FIG 11

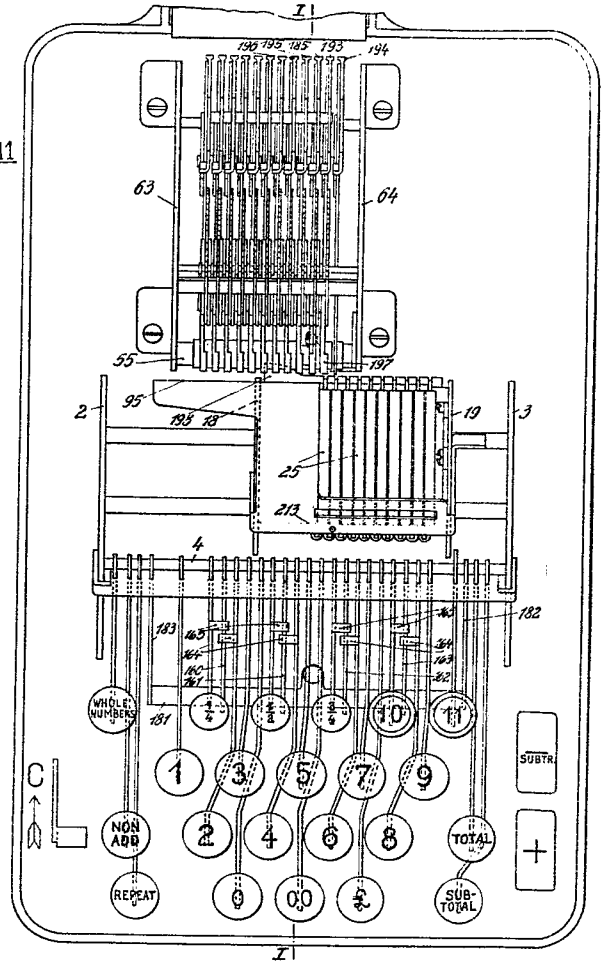


FIG 16

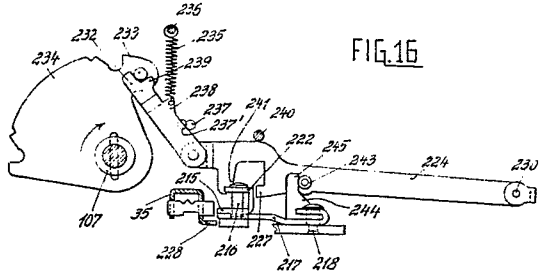
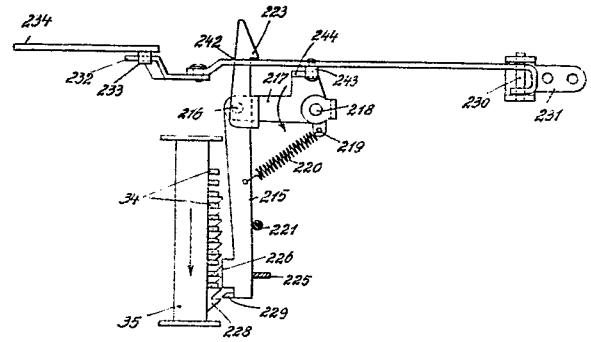


FIG 17



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