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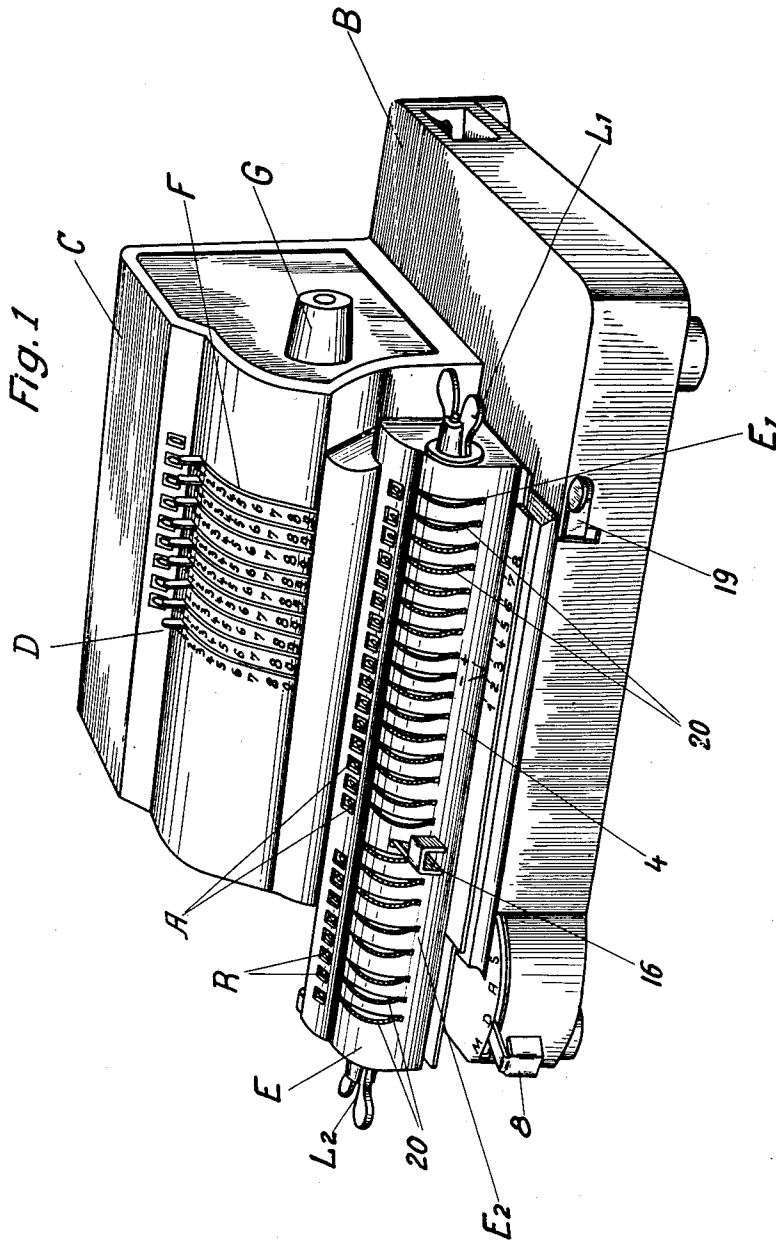
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1,968,201

CALCULATING MACHINE

Filed March 15, 1930

7 Sheets-Sheet 1



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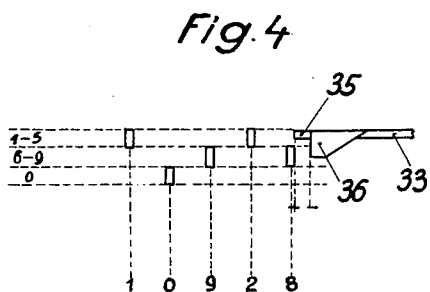
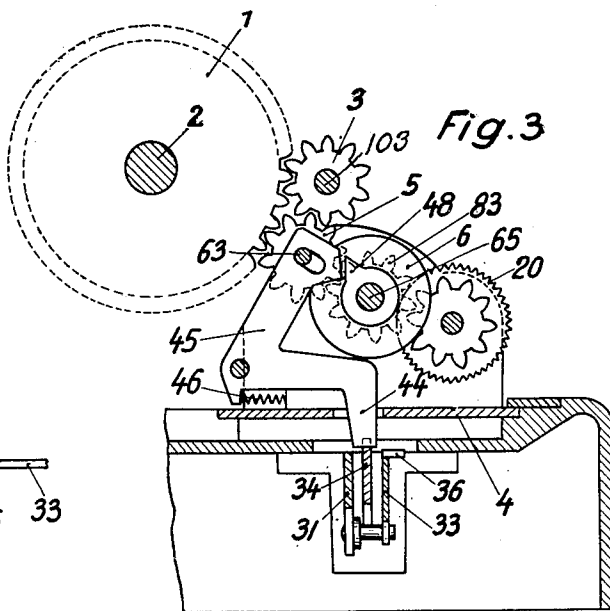
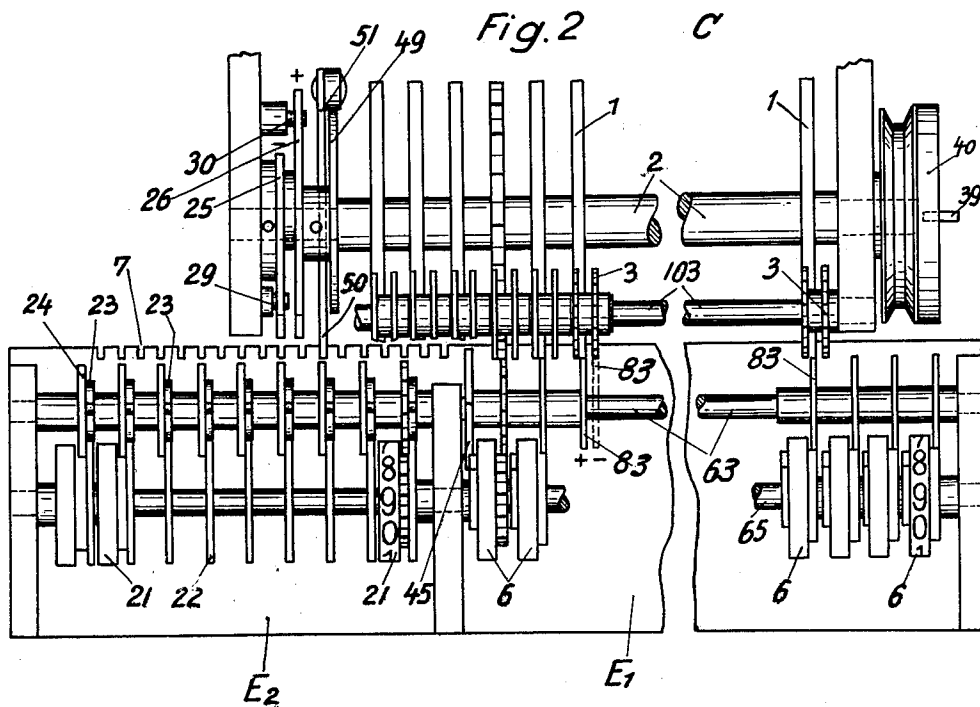
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CALCULATING MACHINE

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7 Sheets-Sheet 2



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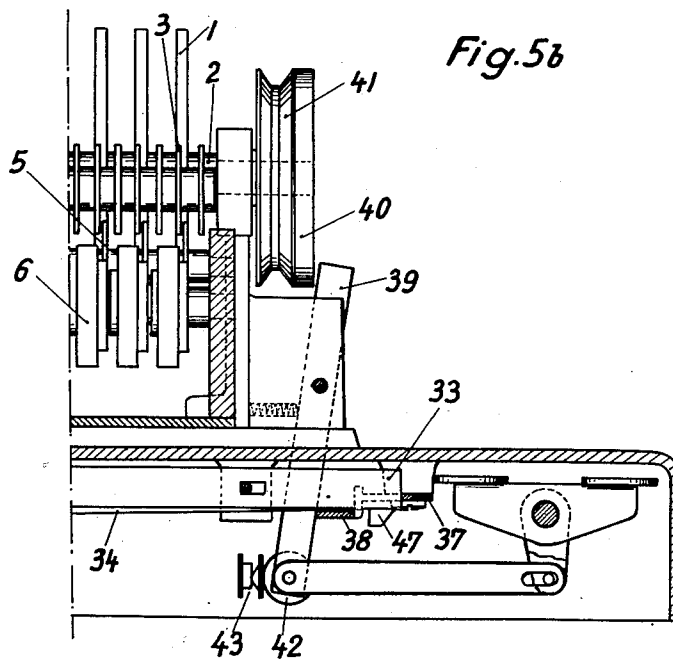
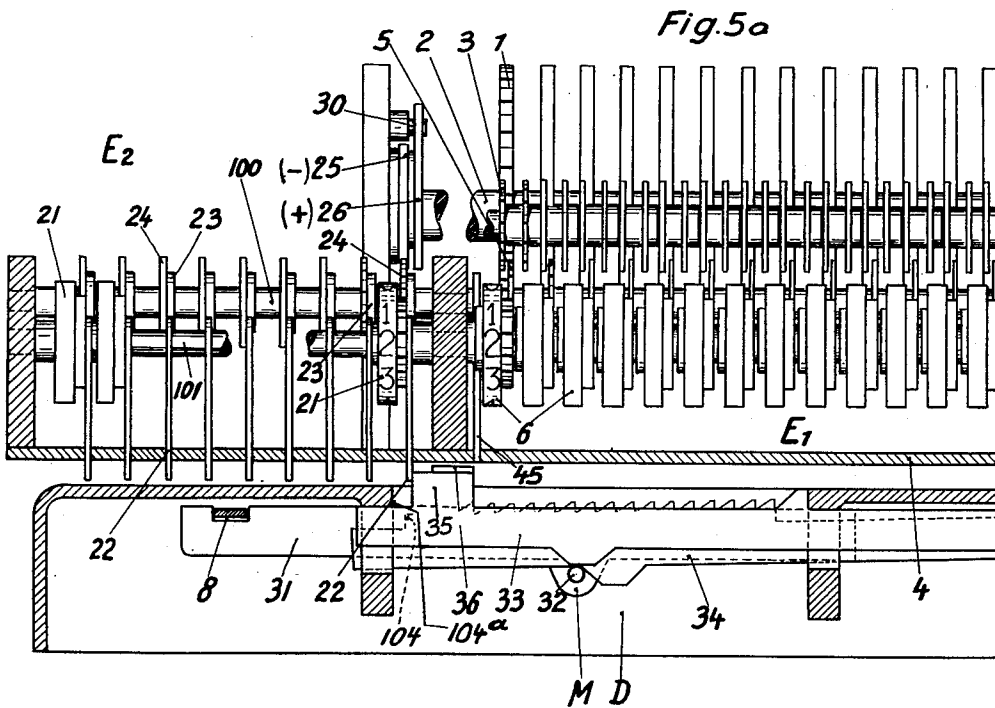
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CALCULATING MACHINE

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7 Sheets-Sheet 3

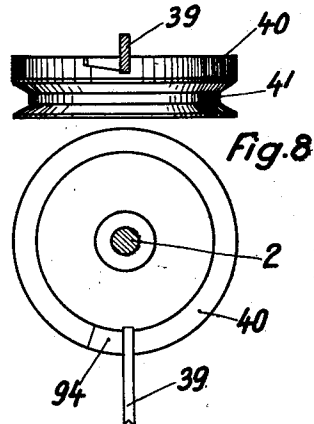
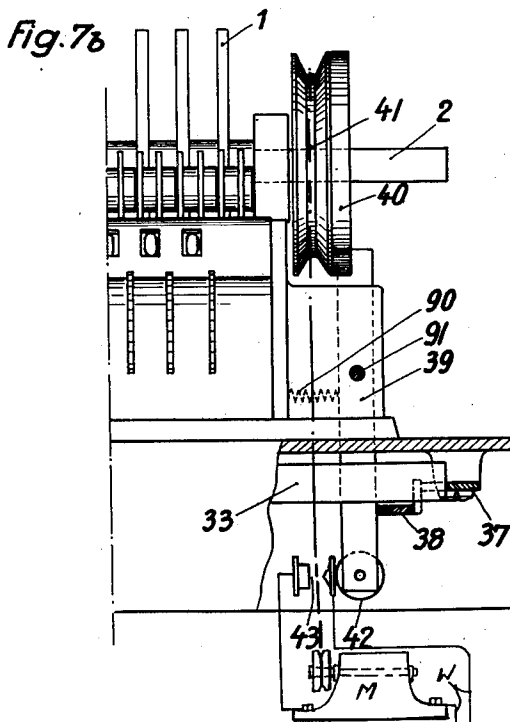


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7 Sheets-Sheet 4



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1,968,201

CALCULATING MACHINE

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7 Sheets-Sheet 6

Fig. 13a

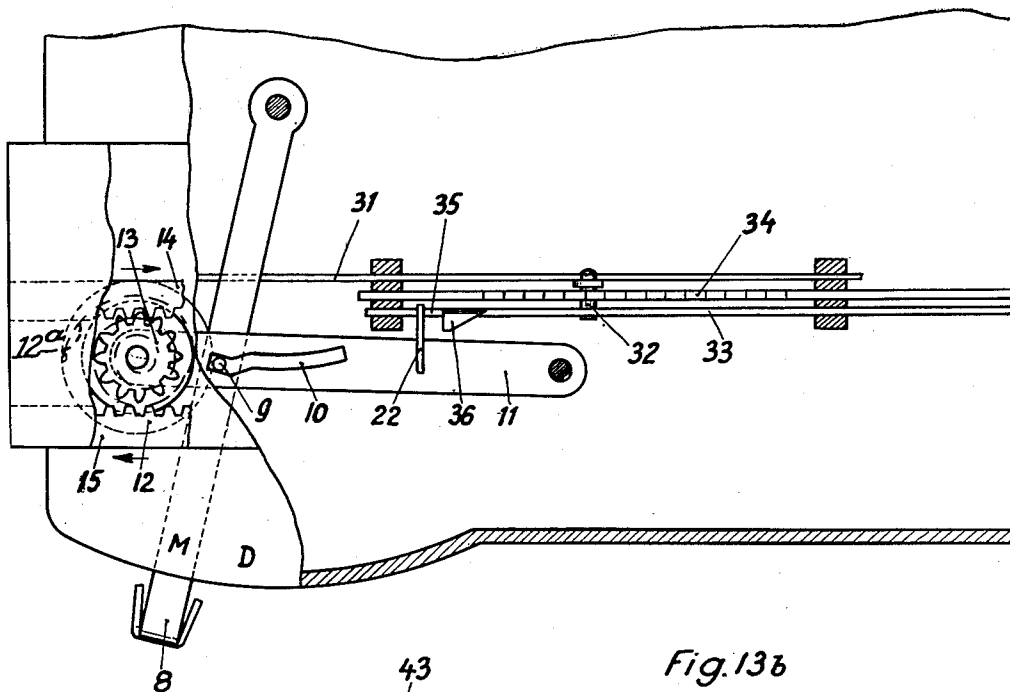
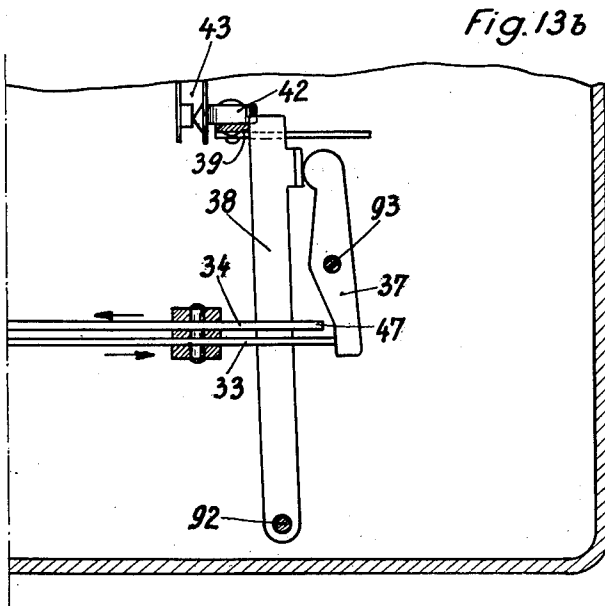


Fig. 13b



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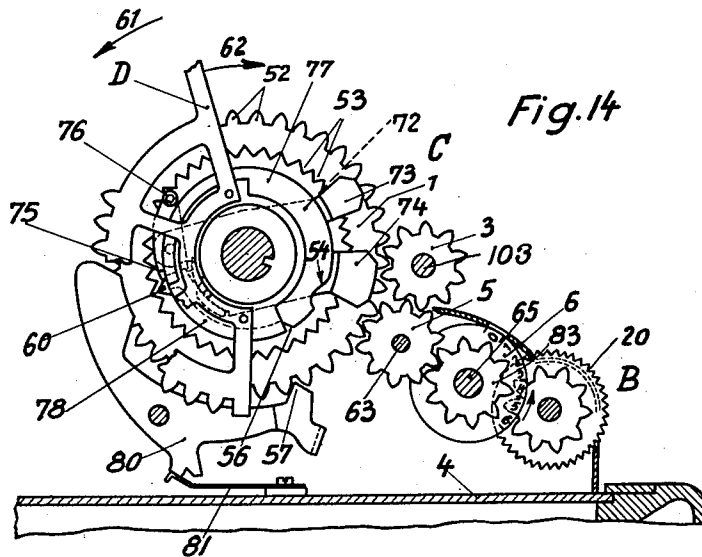
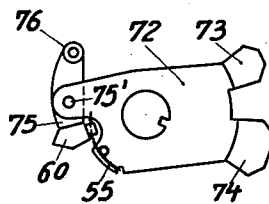


Fig. 15



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UNITED STATES PATENT OFFICE

1,968,201

CALCULATING MACHINE

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Application March 15, 1930, Serial No. 435,994
In Germany July 13, 1929

10 Claims. (Cl. 235—63)

This invention relates to calculating machines for performing automatic multiplication and division comprising an actuator, and a carriage traversable beside it on which are a revolution counter and a totalizer. It comprises a machine of this class in which the revolution counter upon which the quotient of a division operation becomes visible, is used for setting up one factor in a multiplication. It is further characterized by means for propelling the carriage automatically both from right to left during division and from left to right during multiplication.

The invention also includes a construction of actuator and transmission mechanism which enables multiplications to be carried out in shortened form, that is to say by a number of revolutions of the machine less than the sum of the digits of the multiplier. To this end in place of addition operations corresponding to certain digits of the multiplier the machine is caused automatically to carry out subtraction operations corresponding to the complement of such digits, i. e. to the difference between the digit and 10.

The invention is illustrated in the accompanying drawings in which—

Figure 1 is a general view of the machine in its casing,

Figure 2 a plan of the actuator and carriage,

Figure 3 a section through the totalizer on the carriage,

Figure 4 a detail of the revolution counter on the carriage,

Figures 5a and 5b are elevations of the actuator, totalizer and revolution counter.

Figure 6 shows a double pinion.

Figures 7a and 7b are elevations of the actuator, totalizer and revolution counter.

Figure 8 shows the actuator locking disc.

Figures 9–11 illustrate the operation of the revolution counter by counter fingers.

Figures 12, 13a and 13b show the means for controlling the driving electric motor and the carriage.

Figures 14 and 15 are a section and a detail of the actuator.

As appears from Figure 1 the machine comprises a base B upon which is a stationary actuator C the interior parts of which are adjusted by setting elements D in the form of levers moving in slots F, there being one lever for each digit of the number to be set up on the actuator, which may be a number to be added, to be subtracted, to be multiplied, or a divisor. There is also upon the base B in front of the actuator C a carriage E which when a detent 16 is lifted can be shifted

to right or left and is automatically so shifted step by step during automatic multiplication or division, the lever 8 having been set in the appropriate position for the one or other operation, said positions being marked respectively M and D. The lever 8 has two further positions marked A and S for addition and subtraction respectively. The carriage E includes a part (totalizer) E₁ in which the numeral drums 6 are arranged in any customary or approved manner. The numeral drums 6 are geared to knurled discs 20 so that they may be set by hand. By means of these discs the second number to be added, the minuend, or the dividend, may be set up in the inspection openings A (Figure 1).

The operation of the machine exhibits in the inspection openings A the sum, difference, product, or the remainder in the case of division. L₁, L₂ are zeroizing handles for restoring the numeral drums of the carriage to zero. The numeral drums of the actuator C are zeroized by bringing the levers D to zero. G is a boss on the shaft 2 to receive a cord pulley 41 (Figures 2, 7b, 8) through which shaft 2 is driven by an electric motor M receiving current through wires W, Fig. 7b.

The carriage E also contains the revolution counter E₂ (Figure 1). The pinions 24 of this revolution counter are turned forward or backward during the operation of the machine by counter fingers 25, 26 (Figures 2, 9, 10, 11), and thereby, in the case of multiplication, the multiplier originally set up in the inspection openings R of the revolution counter by means of the knurled discs 20, is cancelled, and in the case of division the quotient is set up in the openings R.

The actuator

The actuator of the machine has a toothed disc 1 loosely revoluble upon the shaft 2 for each digit of the number to be set up in it. On its periphery the disc has gear teeth 52 (Figure 14) and it has also internal teeth 53 with which engages the tooth 60 (Figure 15) of a pawl 75 pivoted at 75' upon a plate 72. One of the plates 72 is shown separately in Figure 15. All the plates 72 are secured in the same position upon the shaft 2 and each has two ears 73, 74. The pawl 75 carries at its other end a roller 76 and it is cranked in its length so as to bring its tooth 60 into the plane of the teeth 53, while the ears 73, 74 are bent to lie beside these teeth as seen in Figure 14. During a calculation shaft 2 is turned in the direction of the arrow 61. In this movement the roller 76 of pawl 75 rides in part upon the edge

of disc 77 fastened in the machine frame through which shaft 2 passes freely and in part upon the edge of a segment 78 revoluble upon the shaft 2 which is turned in the direction of the arrow 62 by the setting lever D, when a digit is set up. When lever D is at "0" the edges of the fixed disc 77 and segment 78 form a continuous path for the roller 76. A notch 54 in the disc 77 serves for carrying tens in any well-known or approved manner, see for instance German Patents No. 384,150, page 3, lines 27 to 32, and No. 367,726, page 3, lines 17 to 35. When the lever D is set to any of the numerals 1-9 the segment 78 is turned relatively to the disc 77 so that a gap of a length corresponding to the digit is interposed at 56 in the path of the roller 76. When the roller 76, under the pressure of spring 55, enters such a gap 56 the tooth 60 of pawl 75 engages the internal teeth 53 of disc 1 and turns the disc through a distance corresponding to the length of the gap.

The disc 1 is held at rest by the tooth 57 of a detent 80 which is disengaged when the disc begins to turn and is then held disengaged by spring 81. When the roller 76 leaves the gap 56 the ear 73 of plate 72 continuing its rotation presses detent 80 back into engagement with disc 1 in which position also it is held by spring 81. Thus detent 80 prevents disc 1 over-running. The second ear 74 of plate 72 operates in the same way and for the same purpose on detent 80 upon transfer of tens.

The external teeth 52 of disc 1 mesh with one part of the double pinion 3 (see also Figure 6). Upon a spindle 63 in the carriage are mounted intermediate pinions 5 each of which by movement of the carriage can be brought into engagement either with the second part of the respective double pinions 3 or directly with the teeth 52 of the respective discs 1. There is in the carriage another spindle 65 upon which are loose numeral drums 6 one for each digit and adjacent pinions 83 fastened to said drums and meshing with the intermediate pinions 5.

Fig. 2 shows the carriage E in the position which it has relative to the actuator C during addition and multiplication by 5 or numbers smaller than 5. At this time the pinions 83 are in the position designated by + in Fig. 2, and the pinions 5 (invisible in Fig. 2) which mesh with the pinions 83, are also in engagement with the pinions on the right-hand half of the actuator C. Therefore during the rotation of the shaft 2, these pinions 5 will rotate the numeral drums 6 in the direction of the arrow shown in Fig. 14, that is to say, in the (additive) direction of increasing numbers, from 0 via 5 to 9 etc. By a slight shifting of the carriage E toward the right (Fig. 2) the pinions 5 are brought out of mesh with the toothed discs 1, and into mesh with the right-hand member of a pair of pinions 3, the left-hand member of such pair being in permanent engagement with the respective disc 1. The pinions 5 are then driven from the discs 1 through the medium of the pinions 3, and therefore in the reverse direction, so that they in turn will rotate the numeral drums 6 in a direction contrary to the one indicated by the arrow in Fig. 14, that is to say, in the (subtractive) direction of decreasing numbers, from 0 via 9 to 5 etc. The carriage E will then be in the position which it assumes during subtraction and division, and also during multiplication by numbers greater than 5. Fig. 7a shows the carriage in its extreme left-hand position, in which the

pinions 5 engage neither the toothed discs 1 nor the pinions 3. In this position the carriage is not in any operative relation to the actuator C. The two positions of the carriage E in each decade are insured by notches 7 (Figs. 2 and 9) of the carriage base plate 4, engaged by the arm 50 (Fig. 9) of an elbow lever which does not share the movement of the carriage; this is explained in detail below. Whenever the carriage E passes from one notch to the next, the direction in which the numeral drums 6 rotate is reversed. There will thus be an alternation of additive and subtractive connections between the actuator C and the totalizer E1. This regular change from additive to subtractive connection, and vice versa, in each decade, is of importance in the performance of automatic division and multiplication.

The carriage

At the beginning of an addition or subtraction the carriage is pushed by hand to the right so that the digits of the number set up in it come opposite the corresponding digits of the number set up in the actuator C. In the case of addition the pinion 5 is meshing as indicated by + in Figure 2 and the actuator transmits additively to the totalizer E1. In the case of subtraction the pinion 5 is in the position indicated by - and the transmission is subtractive. These settings of the carriage are determined by the lever 8 (Figure 1). A single revolution of shaft 2 effects one addition or one subtraction and the carriage has not to be stopped either right or left.

To carry out division the detent 16 (Fig. 1) is lifted and the carriage is moved as usual to the right to the proper extent and left free. The calculation is then effected automatically, the carriage being stepped back to the extreme left hand position. For its step-by-step movement the carriage is driven by a spiral spring 12a in the drum 12 (Figure 13a). After each step the carriage is held automatically in the position reached by means of the lever 50, 51 which is engaged by a cam disc 49 (Figures 2 and 9) and engages the notches 7 in the base plate 4 of the carriage. As soon as shaft 2 begins to turn the cam disc 49 rocks bell crank lever 50, 51 so as to engage its arm 50 in a notch 7 and the carriage is thus held while the shaft rotates. Upon the shaft completing one revolution the nose upon disc 49 presses lever 50, 51 out of the notch freeing the carriage which steps on as described below to its next position.

To carry out a shortened automatic multiplication the carriage must move automatically from left to right. For this purpose the drive of the spring drum 12 must be reversed. The drum is carried on the end of a lever 11 (Figure 13a) having a cam slot 10 in which engages a pin 9 upon the lever 8. By moving the lever 8 to the position M lever 11 is rocked so as to disengage the pinion 13 of the spring drum from the rack 15 and engage it with the rack 14. Both racks are secured upon the underside of the carriage base plate 4 while the levers 8 and 11 are mounted in the frame of the machine beneath the base plate 4.

In the extreme left hand position of the carriage a projection 18 upon it (Figure 7a) engages behind a nose 18' on the key 19 for the purpose described below.

Revolution counter

The revolution counter E2 (Figures 2, 5a, 9-11) has numeral drums 21 between which are

bell crank stop members 22 pivoted on the drum spindle 101. One arm of each of these levers projects through the base plate 4 of the carriage B and co-operates with a nose 36 bent at right angles from a projection 35 on the carriage stop 33; the other is spring pressed against the periphery of a non-circular disc 23. The respective discs 23 are secured to intermediate pinions 24 freely revoluble upon a common spindle 100 which serve as described below to transmit revolutions of the shaft 2 to the numeral drums 21.

The non-circular disc 23 has three radii and therefore by its revolution the stop member 22 can be brought to three different positions. When a zero is visible in the inspection opening R the stop member 22 has the position shown in Figure 9; when the numeral visible is over 5 the stop member is in the position shown in Figure 10; and when the numeral visible is 1-5 it has the position shown in Figure 11.

The carriage stop 33 and two other parallel bars 31 and 34 (Figures 12, 5a, 13a and 13b) are mounted beneath the carriage in the base of the machine and are movable longitudinally. The bar 31 (Figure 12) is notched to embrace the lever 8 (Figure 1) and is moved longitudinally by this lever. It carries a pin 32 which co-acts with projections of trapeze form on the bars 33 and 34, raising one bar when it permits the other to fall. When the lever 8 is set to M (multiplication) the pin 32 raises the bar or forward carriage stop 33 and drops the other bar or rearward carriage stop, herein distinguished as the carriage check, 34. When the lever 8 is set to D (division) the carriage stop 33 is down and the check 34 lifted. Thus either the stop 33 or the check 34 is alone in operation in any one calculation. Figures 12 and 5a show the corresponding positions of the pin 32 indicated by M and D. When the stop 33 is lifted, i. e. in multiplication, the nose 36 or projection 35 stands in the path of the stop members 22. When the lever 8 is set to A (addition), or S (subtraction) both stop 33 and check 34 are dropped, taking no part in these calculations.

In Figure 4 the stop members 22 are shown in plan in the positions they assume for a multiplier 10928; the range of each of the three possible positions being indicated at the left of the figure. The figure also shows the left hand end of the carriage stop 33 with its projection 35 and nose 36, and it will be apparent that when the carriage moves to the right the stop member of the units digit will first engage the nose 36, then the stop member of the tens digit will engage the projection 35, next the stop member of the hundreds digit will engage the nose 36, while the stop member of the thousands digit will pass the carriage stop without touching it, and finally the stop member of the ten thousands digit will abut on the projection 35.

The counter fingers 25, 26 (Figures 2, 9-11) are driven by eccentrics 27 on the shaft 2, each common to two counter fingers, and engage the pinions 24. The counter fingers have slots to receive stationary pins 29 and 30. The joint effect of these and of the eccentric 27 is to impart to the nose 25', 26' an elliptical movement which is in opposite directions for the respective fingers 25, 26. The finger 26 (Figure 10) steps the numeral drum 21 in the direction of the arrow shown in that figure, i. e. in the direction of increasing numbers, while the finger 25, (Figure 11) steps it in the reverse direction. The backward movement by the finger 25 takes place when in multiplying the revolution counter E1 is additively op-

erated by the actuator C. The forward movement by the finger 26 takes place when E1 is subtractively operated by C. If therefore the units digit of the multiplier shown in the respective inspection opening R is 5 or a less numeral, say 4, the multiplicand set up in the actuator C is added four times, and as that occurs the finger 25 (Figure 11) steps back the corresponding numeral drum 21 to zero. If, on the other hand, the numeral drum had shown a numeral over 5, say 8, two successive subtractions of the multiplicand set up in the actuator would have taken place and the finger 26 (Figure 10) would have stepped the numeral drum from 8 to zero. The fingers 25 and 26 actuate the revolution counter E2 late enough in the cycle to allow the completion of the tens transfer before the carriage is shifted.

The drive

Upon one of the stop members 22 (Figure 4) abutting upon the carriage stop 33, whether against its projection 35 or its nose 36, the stop 33 is slightly shifted longitudinally to the right and rocks lever 37 (Figures 7b, 13b) about its pivot 93 and lever 38 about its pivot 92, thus rocking lever 39 against the pressure of its spring 90. Ordinarily the upper end of lever 39 engages in a notch 94 in a flange 40 upon the cord pulley 41 which drives shaft 2. The lower end of lever 39 carries a roller 42 which, when the lever is swung as just described, closes a contact 43 as its upper end leaves the notch 94 and so releases shaft 2. The contact 43 closes the circuit of an electric motor which then drives the shaft 2 and the actuator begins its revolution.

The number of revolutions the shaft 2 makes for each digit depends upon the value of the multiplier digit opposite which the counter finger 25, or 26, stands. When the fingers 25, 26 have worked through the digits the machine comes to a standstill and the automatic multiplication or division is finished. At the end of the multiplication, the carriage E moves toward the right under the influence of the spring in the drum 12, all the levers 22 being at this time clear of the carriage stop 33, and such movement continues until the carriage is arrested, in its extreme right-hand position, by a stop provided on the frame of the machine. A brake (not shown) prevents any excessive speed of the carriage during its movement toward the right. Prior to such movement, the motor which drives shaft 2 has been stopped, namely at the moment when the last lever 22 becomes disengaged from the carriage stop rail 33, which is when the corresponding numeral drum 21 reaches its zero position. As soon as said last lever is disengaged, the pressure exerted on the stop rail 33 toward the right ceases, and such rail moves a slight distance toward the left. The lever 37 (Fig. 13b) following this movement permits the levers 38, 39 to return to their position of rest, in which they break the circuit of the motor, and also arrest the rotation of the shaft 2 by the upper end of lever 39 dropping into the notch 94 (Fig. 8).

Automatic division

As the parts used for division are also used in shortened multiplication the operation of division will be first described. To carry out an automatic division lever 8 (Figure 1) is set to D. This has the effect of engaging pinion 13 (Figure 13a) of spring drum 12 with rack 15 as above described. The spring drum, therefore, tends to drive the carriage E to the left. The setting of lever 8 to D

also shifts bar 31 (Figure 12) as above described so that its pin 32 drops the carriage stop 33 and lifts the check 34. The check which hitherto lay in the slanting position shown in Figure 5a is thus brought to the horizontal position shown in Figure 12 and engages the end 44 of the check lever 45 shown in Fig. 3. The check has two teeth for each digit so that the carriage makes two steps for each digit place, taking alternately the positions for subtraction and addition. The check lever 45 is mounted to the left of the left hand digit of E1. A spring 46 presses its lower end which projects through the base plate 4 into engagement with the check 34.

The dividend is set up in the totalizer E1 by means of the knurled discs 20 and the divisor in the actuator by means of the levers D. The key 8 is brought to the position D and thereby the check 34 is raised in such a manner that the arm 44 of the lever 45 will engage the teeth of the check 34. Thereupon the carriage E is moved by hand toward the right until the highest denomination digit of the dividend registers with the highest denomination digit of the divisor. This movement of the carriage tensions the spring in the drum 12. Therefore, when the carriage is released, it will be held stationary, against the pressure of the spring, by the arm 44 engaging the teeth of the check 34. Before the carriage is thus arrested, it will move a short distance toward the left, the check 34 likewise being moved in this direction, by the lower end 44 of the lever 45, where the shoulder 104 of the check 34 (Fig. 5a) abuts against the wall 104a of the machine base B. The carriage E will then be in the position for subtraction, in which the counter finger 25 (Fig. 5a) is in position to engage an opposing pinion 24.

The right hand end of check 34 is formed with a hook 47 (Figs. 12 and 13b) engaging over lever 38. Hence the movement of the check to the left closes the motor contact 43 setting the actuator C in motion. The carriage being in a position for subtraction each rotation of the shaft diminishes the dividend set up in E1 by the amount of the divisor set up in G. The machine continues turning until the left hand numeral drum 6 of E1 is brought from zero to 9. When this overdraft occurs, that is, a transitional carry, the lever 45 is disengaged. When the overdraft is corrected on the subsequent adding of the divisor, the lever 45 is tripped again. As the drum moves from 0-9 the cam 48 moving with it presses back the bevelled end of lever 45 thereby disengaging its lower end from the teeth of the check 34. The check is moved to the right by the pressure of spring 90 on lever 39 (Figure 7b), the contact 43 is broken and the motor switched off so that the machine comes to a standstill. Lever 39 also engages the notch 94 in flange 40 (Figure 8) thus holding actuator C. The end 44 of lever 45 drops immediately the nose of the cam 48 has passed and engages behind the next tooth of the check 34, thus holding the carriage in position for addition, the pressure of the carriage upon the check shifts it again a little to the left, and so puts the motor in action again. The shaft is set in rotation and the dividend which has been subtracted once too often is added once. In the course of this addition the numeral drum which passed from 0-9 returns from 9-0 and so its cam 48 again rocks lever 45 permitting the carriage another step to the left which brings it to the subtraction position of the next digit of the dividend. The machine is mo-

mentarily brought to a standstill and re-starts repeating the above described process for each digit. The division is completed when the end 44 of lever 45 has passed the last tooth of check 34, so that the motor circuit will remain broken, causing the machine to come to a standstill. At the same time the carriage reaches its extreme left hand position against a stop on the frame of the machine. During the division operation counter finger 26 has imparted to the numeral drums 21 of the revolution counter E2 the number of revolutions made by shaft 2 with the carriage in subtracting position, and counter finger 25 has imparted the number of revolutions made in the adding position; hence revolution counter E2 shows the quotient.

Automatic shortened multiplication

For multiplication the multiplier is set up in the revolution counter E2 and the multiplicand in the actuator C. The product appears in the totalizer E1 while the digits of the multiplier disappear in succession beginning with the units digit. Lever 8 is set to M and so, as above described, engages the spring drum with rack 14 (Figure 13a) so that the carriage moves step by step from left to right during the calculation. Pin 32 of bar 31 lifts the stop 33 and drops the check 34 as shown in Figure 5a.

Suppose the multiplier, as above suggested, is 10928 and this having been set up on E2, the key 19 (Figures 1 and 7a) is depressed. The carriage is thus released and moves to the right until the stop lever 22 of the units digit of the multiplier strikes the carriage stop 33. The units digit being 8 the disc 23 associated with the numeral drum 21 is so set that the horizontal arm of stop lever 22 bears against its part of medium radius (as shown in Figure 10 where, however, the numeral drum is set to 9). Accordingly the vertical arm of the stop lever is in position to engage the nose 36 of the carriage stop 33, as may be seen from Figure 4. The nose 36 is marked — to indicate that it arrests the carriage in position for subtraction. The pressure of the stop lever 22 upon the carriage stop 33 moves the latter a little to the right thus rocking lever 37 and closing the motor contact 43. The machine begins to turn and subtracts twice. As it does so counter finger 26 (Figure 10) engages pinion 24 and steps numeral drum 21 forward to zero in two steps. The second step brings the part of the disc 23 of largest radius into register with lever 22 as shown in Figure 9 swinging the lever out of engagement with the carriage stop 33. The carriage therefore moves to the right until the stop lever 22 of the tens digit engages the carriage stop 33, and in this case engages its projection 35 so that the carriage is arrested in position for adding. The movement of numeral drum 21 from 9-0 has also by the tens carrying mechanism shifted the tens numeral wheel one place so that it now shows 3 instead of 2.

Addition is now effected three times in succession and each time counter finger 25 (Figure 11) engages pinion 24 so that the tens numeral wheel 21 is turned backward to zero. As the numeral wheel does not in this movement pass from 9 to 0 there is no carrying to the hundreds numeral wheel.

Upon the third step of the tens numeral wheel its stop lever 22 is shifted to the position shown in Figure 9 by the part of disc 23 of largest radius, freeing the carriage from the stop 33 so that it moves again to the right.

The hundreds digit of the multiplier being 9 its stop lever 22 will be in the mid position shown in Figures 4 and 5 and will engage the nose 36 of the carriage stop 39 and arrest the carriage in the position for subtraction. Here the machine will carry out one subtracting operation and counter finger 26 will turn the numeral wheel from 9 to 0, consequently stepping the thousands numeral wheel one step, i. e. from 0 to 1.

In the fourth digit position therefore the actuator adds once, and the carriage then shifting to the fifth digit it adds once again. In these last two positions stop lever 22 is set as in Figure 11, that is on the part of disc 23 of medium radius.

By this means multiplication by 10928 has been carried out by two subtractions in units position, three additions in tens position, one subtraction in hundreds position, and one addition in each of the thousands and ten-thousands positions, i. e. by eight revolutions of the machine in all instead of by twenty which is the sum of the digits 10928.

Each time a lever 22 is disengaged from the carriage stop 33 the latter makes a small movement to the left thereby opening contact 43 (Figure 13b) and disconnecting the motor and locking the actuator by the engagement of 39 and 40.

I claim:—

1. In a calculating machine the combination of an actuator, means for rotating said actuator, a carriage movable along the actuator, a totalizer and a revolution counter upon said carriage, a carriage stop, and a stop member associated with each denominational order element of the revolution counter, said carriage stop and stop members being adapted to stop said carriage in two positions for each order, means for driving said totalizer from said actuator in additive direction in one of said positions and in subtractive direction in the other of said positions.

2. In a calculating machine the combination of an actuator, means for rotating said actuator, a carriage movable along the actuator, a totalizer and a revolution counter upon said carriage, means for transmitting additively from said actuator to said totalizer, means for transmitting subtractively from said actuator to said totalizer, a stop member associated with each denominational order element of the revolution counter so as to be set in three different positions according to the numeral set up on said element, and a carriage stop co-operating with said stop members in two of three positions to arrest the carriage in position for additive and subtractive transmission respectively.

3. In a calculating machine the combination of an actuator, a carriage movable along it, a totalizer and a revolution counter on said carriage, means for transmitting additively and subtractively from said actuator to said totalizer, and means adapted to be governed by the digits set on the revolution counter for bringing said additive and subtractive transmission means into operation respectively.

4. In a calculating machine the combination of an actuator, a carriage movable along it, means for moving said carriage automatically, a carriage stop, a revolution counter and a totalizer upon said carriage, a disc rotating with each numeral wheel of the revolution counter and having three different radii at different parts, and a stop member bearing on each disc and shiftable by it into position to engage one part or another of the carriage stop or to escape it altogether.

5. In a calculating machine the combination of an actuator, a carriage movable along it, a totalizer and a revolution counter upon said carriage, means for automatically propelling said carriage to right and left respectively according to the operation to be performed, a carriage stop, stop members upon said carriage adapted to co-operate with said carriage stop in one direction of travel and to be disengaged therefrom by the operation of the machine, a carriage check, means on said carriage engaging said check and adapted to co-operate with said carriage check in the other direction of travel and to be momentarily disengaged therefrom by the operation of the machine, and means for bringing either the stop or the check into action according to the operation to be performed.

6. In a calculating machine, the combination of an actuator, a carriage movable along the actuator, means for rotating said actuator, an electrical control for said means, a totalizer upon said carriage, means for stepping said carriage during a multiplying operation of the machine, a revolution counter mounted on said carriage and comprising numeral drums, said drums being operable by hand for setting up a multiplier, a stop member associated with each of said numeral drums so as to be set in stop position by manually setting said numeral drums, a movable abutment common to all of said stop members, arranged in the frame of the machine and adapted to switch in and out of the said electrical control and to release said carriage for stepping in the multiplying operation, means whereby in revolution-counting said numeral drums will be returned to the zero position and the said stop members to a no-stop position of rest.

7. In a calculating machine, the combination of an actuator, means for rotating said actuator, a carriage movable along the actuator, a totalizer and a revolution counter upon said carriage, means for transmitting additively from said actuator to said totalizer, means for transmitting subtractively from said actuator to said totalizer, a stop member associated with each denominational order element of the revolution counter so as to be set in three different positions according to the numeral set up on said element, each stop member being adapted to be brought from the position of rest into two different stop-positions, corresponding to an additive and a subtractive operation of the machine respectively, the said positioning of the stop members determining a shortened multiplying operation of the machine, and a carriage stop co-operating with said stop members in said two stop positions to arrest the carriage in positions for additive and subtractive transmission respectively.

8. In a calculating machine, the combination of an actuator, a carriage movable along the actuator, means for rotating said actuator, an electrical control for said means, a totalizer upon said carriage, means for stepping said carriage from left to right during a multiplying operation of the machine, a revolution counter mounted on said carriage and comprising numeral drums, said drums being operable by hand for setting up a multiplier, a stop member associated with each of said numeral drums so as to be set in stop position by manually setting the said numeral drums, a check lever mounted on said carriage, two movable bars mounted on the frame of the machine, one of them adapted to co-operate with said stop members during a multiplying operation, and the other to co-operate with said check

lever during division, said bars being adapted to switch in and out the said electrical control and to release said carriage for stepping in the multiplying operation, means whereby in revolution-counting said numeral drums will be returned to the zero position and the said stop members to a no-stop position of rest.

9. In a calculating machine, the combination of an actuator, a carriage movable along the actuator, means for rotating the actuator, an electrical control for said means, a totalizer upon said carriage, means for stepping said carriage from left to right during a multiplying operation of the machine, a revolution counter mounted on said carriage and comprising numeral drums, said drums being operable by hand for setting up a multiplier, a disc rotating with each numeral drum of the revolution counter and having three different radii at three different parts, a stop member bearing on each disc and shiftable by it into three different positions, a movable abutment common to all of said stop members, arranged in the frame of the machine and adapted to switch in and out the said electrical control and to release said carriage for stepping in the multiplying operation, and means whereby in revolution-counting said numeral drums will be returned to the zero position and the said stop members to a no-stop position of rest.

10. In a calculating machine, the combination of an actuator, a carriage movable along the actuator, means for rotating said actuator, an electrical control for said means, a totalizer upon said carriage, means for stepping said carriage during a multiplying operation of the machine, a revolution counter mounted on said carriage and comprising numeral drums, said drums being operable by hand for setting up a multiplier, a stop member associated with each of said numeral drums so as to be set in stop position by manually setting said numeral drums, a movable abutment common to all of said stop members, arranged in the frame of the machine and adapted to switch in and out the said electrical control and to release said carriage for stepping in the multiplying operation, means whereby in revolution-counting said numeral drums will be returned to the zero position and the said stop members to a no-stop position of rest, a spring drum and a pinion driven thereby, two racks mounted upon said carriage and located at opposite sides of said pinion, and means for shifting said pinion into engagement with one rack or the other to propel the carriage in one direction or the other, the said abutment being arranged for co-operating with the said stop members in only one of said propelling directions.

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