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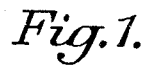
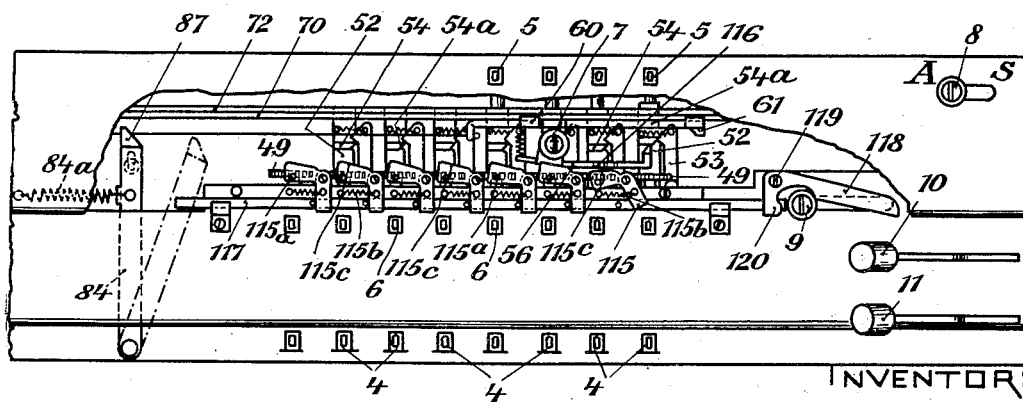


Fig.3.



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Aug. 8, 1933.

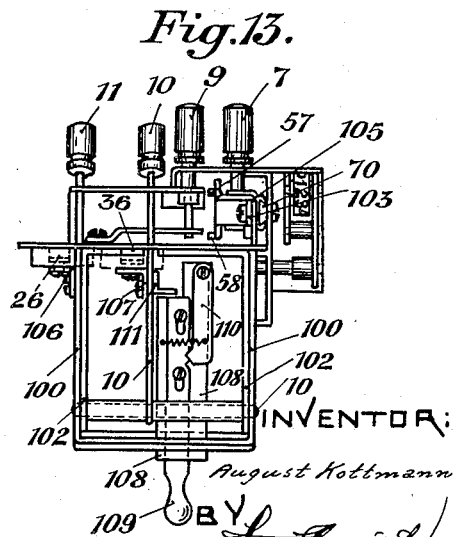
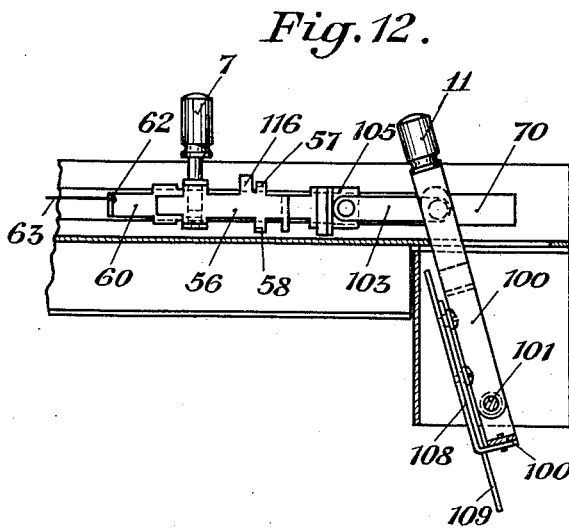
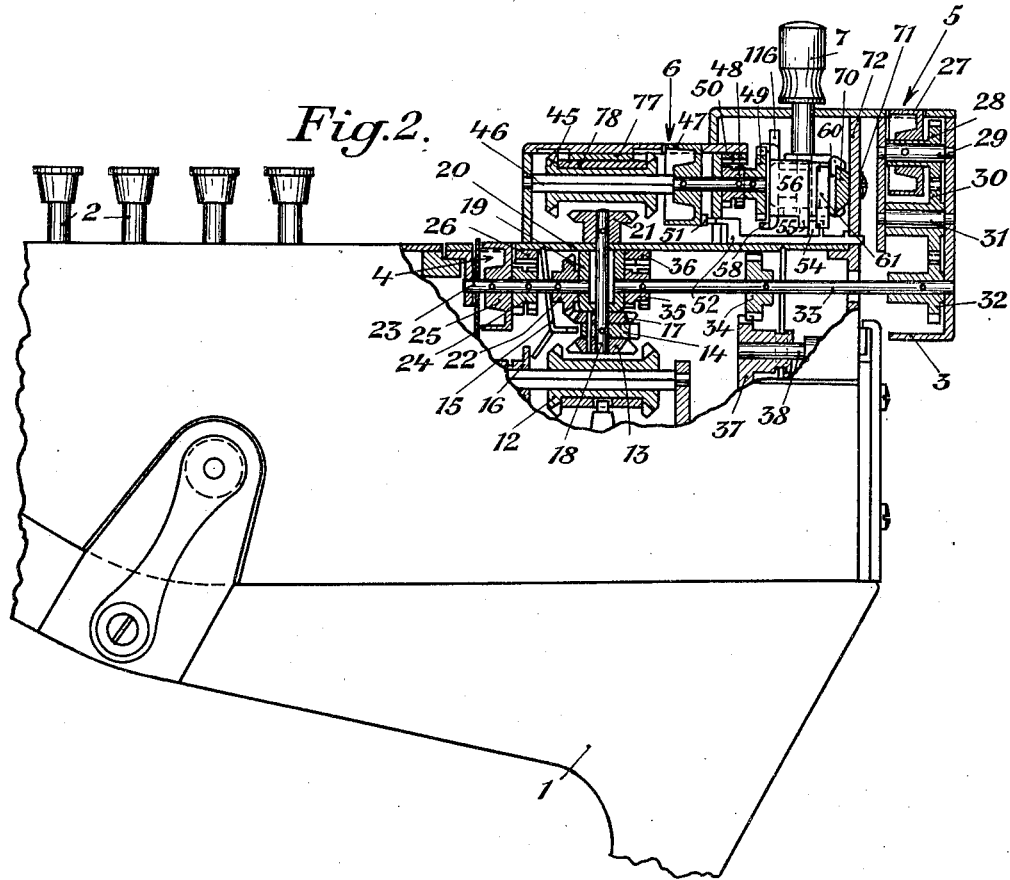
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1,921,529

CALCULATING MACHINE WITH TWO COUNTING MECHANISMS

Filed May 20, 1930

4 Sheets-Sheet 2



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1,921,529

CALCULATING MACHINE WITH TWO COUNTING MECHANISMS

Filed May 20, 1930

4 Sheets-Sheet 3

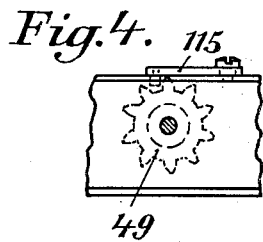
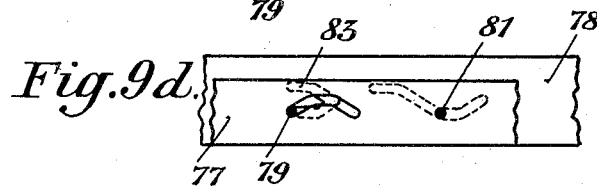
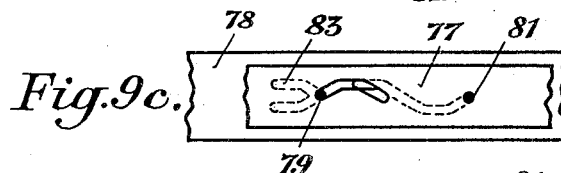
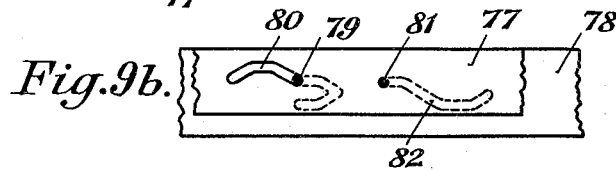
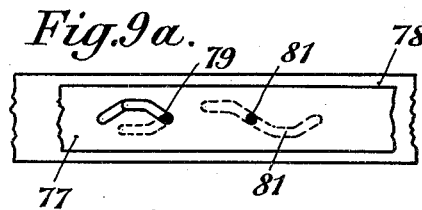
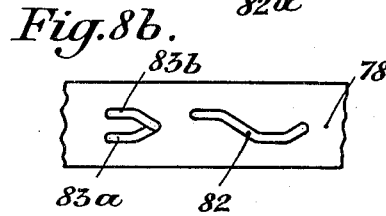
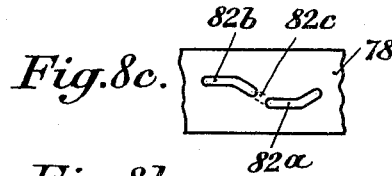
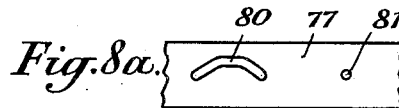
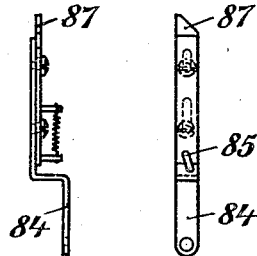


Fig. 5.



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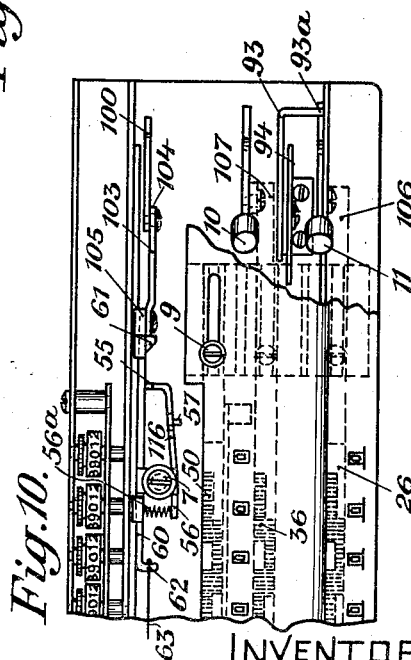
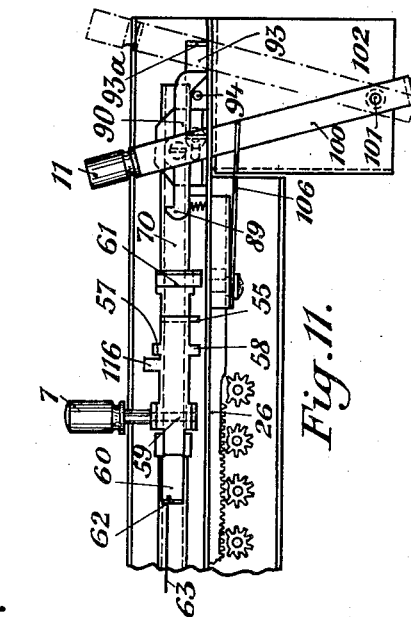
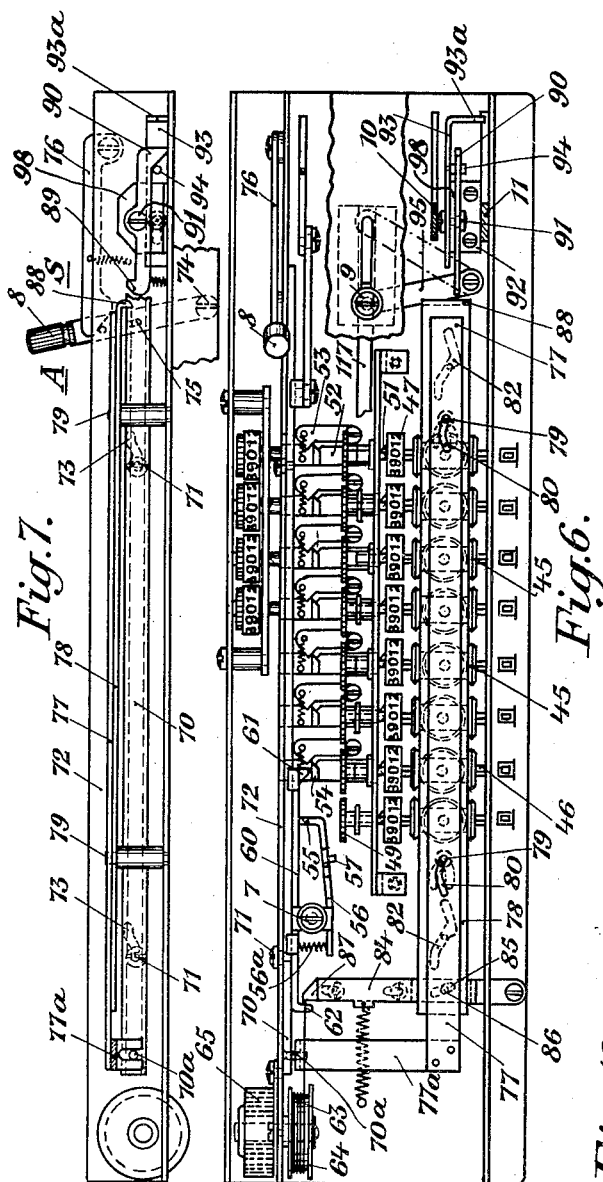
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1,921,529

CALCULATING MACHINE WITH TWO COUNTING MECHANISMS

Filed May 20, 1930

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

1,921,529

CALCULATING MACHINE WITH TWO
COUNTING MECHANISMS

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Application May 20, 1930, Serial No. 454,031, and
in Germany May 30, 1929

16 Claims. (Cl. 235—75)

The invention relates to calculating machines having two counting or register mechanisms, only one of which is driven by the drive mechanism of the machine, while the second is moved by the first register and takes up only numerical values which are transferred therefrom, so that it indicates the sums thereof. The invention relates particularly to such calculating machines wherein both register mechanisms are supported in a register carriage and the transfer of numerical values from one register to the other is accomplished in that the number rolls of the same digit position in the two registers are connected together and then the register which contains the numerical value which is to be transferred is set to zero and wherein reversing gears arranged between the number rolls permit an additive as well as a subtractive transfer of the numerical values.

In the following specification the register which is driven directly by the drive means will be called either simply a product or result register or an individual product register, and the other register will be known as the summation or totalizing register.

A transfer of numerical values from the individual product register to the summation product register is to be known simply as a transfer, and a transfer of numerical values, on the other hand, from the summation to the individual product register will be known as a reverse transfer.

The invention consists in a new structure and arrangement of the two registers which is accommodated to the special conditions and requirements in stepped gear calculating machines and which makes it possible to arrange both registers upon the customary register carriage of stepped gear roller calculating machines with only a single register mechanism. As a result it becomes possible in stepped gear roller calculating machines having a single register as well as those having two registers to use the same machine frame without any changes whatever. The register carriage also requires only slight changes, so that here also on the whole it is possible to use the same parts for the carriage with a single register and for the one having two registers.

The invention consists essentially in that the totalizing register is arranged upon the upper side of the cover plate of the register carriage.

Shafts driven by the number wheels of the product or result register, which in the ordinary stepped gear roller calculating machines lie perpendicular or approximately perpendicular to the

cover plate of the register slide, are somewhat extended at the ends which are directed toward the cover plate and pass through bores of the cover plate, so that they project beyond the upper side of the cover plate. Bevel gears are secured upon these ends of the shafts which project beyond the cover plate, said bevel gears thus lying above the cover plate. Double bevel gears which serve as reverse gears may be brought into mesh with these bevel gears, which are arranged shiftably, but non-rotatably, upon the extended shafts of the number rolls of the totalizer register.

The bevel gears of the register gearing mentioned, in their middle position are not in mesh with one another, and are brought into mesh with one another only upon actuating the transfer element.

An embodiment of the invention is represented in the drawings, in which,

Figure 1 is a diagrammatic plan of a calculating machine according to the invention.

Fig. 2 is a broken away, partially sectioned elevation of the machine.

Fig. 3 is a partially sectioned elevation, showing the means for preventing an unintentional change of position of the number of wheels when the accumulating counting mechanism is stationary.

Figs. 4 and 5 are detail views.

Fig. 6 is a plan of the counter mechanism.

Fig. 7 is a side view of Fig. 6.

Figs. 8a to 8c and 9a to 9d are detail views of the reversible driving mechanism.

Fig. 10 is a partial plan of the mechanism for transferring the product from the product number mechanism into the accumulating number mechanism.

Fig. 11 is a side elevation of the mechanism of Fig. 10.

Fig. 12 is a partially sectioned detail view showing the mechanism for throwing out the latch levers, and

Fig. 13 is a detail elevation of the throw-out mechanisms with their coupling devices.

The calculating machine, Fig. 1, consists of the base frame 1, the keyboard 2, and the counter-mechanism carriage 3, which carries the product number mechanism 4, the rotary number mechanism 5, and the accumulating or totalizing number mechanism 6. A slide 60, actuated by the knob 7, Figs. 2, 3, 10, 11, and which is moved back and forth the length of the slot 7a over the entire width of the counter-mechanisms 4

and 6, serves to transfer the individual products from the product number mechanism 4 into the accumulating number mechanism 6. By throwing over the lever 8, either additive or subtractive transfer of the product is prepared for. The throw-out knob 9 belongs to the accumulating number mechanism, the knob 10 to the rotary number mechanism and the knob 11 to the product number mechanism. The latter is driven in the usual way by the stepped tooth rollers, not shown, through the double bevel gear 12, Fig. 2. With the main drive crank in its initial position, said gear 12 is out of mesh with the bevel gear 13, but it comes into mesh with the latter as soon as said crank is moved from its initial position. The transfer of products from the mechanism 4 to the accumulating mechanism 6 always takes place when the drive is not operating, that is when bevel gears 12 and 13 are out of mesh. The zero position of the number wheels 25 of the product counter 4 results from the zero setting gears 24, in which engages the zero setting bar 26, moved by throw-out 11 through the link 106, Figs. 10, 11 and 13.

The tens transfer into the product number mechanism takes place in the usual manner. On the shafts 18 of the bevel gears 13, which drive the number wheels 25 through the bevel gears 17, 22, and through the shafts 23, are carried the "get ready" lugs 14, which move the levers 15 and thereby displace the tens control gears 16, so that they come into engagement with the tens control cams of the stepped tooth roller shafts.

The shafts 18 of the bevel gears 13, which are journaled in the plate 20 of the counter-mechanism and in the U-shaped rib 19, carry, in addition to the gears 13, 17 and the tens "get ready" teeth 14, the bevel gears 21 above the plate 20.

The accumulating mechanism 6 is composed of the numeral wheels 47. To transfer number values into or from the accumulating mechanism, the double bevel gears 45 are brought into mesh with the bevel gears 21. Gears 45 are carried on square shafts 46, which are also the shafts of the numeral wheels 47, and which carry the zero setting dog 48, as well as the tens control gears 49. In the dog 48 engages the throw-out bar 50, moved by the throw-out 9.

The numeral wheels 47 of the accumulating number mechanism 6 carry tens "get ready" lugs 51. When said wheels are turned from 0 to 9 or from 9 to 0, these lugs 51 move the tens "get ready" slides 52 to the right in Fig. 2. The slides 52 carry upstanding projections 54, provided with inclined surfaces 54a and are held in the right and left end positions by latch levers 53, Fig. 3.

The slide 60, causing the transfer of the products and moved by means of handle 7, Figs. 2 and 3, slides on the rails 70 on the wall 72. A spring, contained in the casing 65, pulls the slide 60 to the left in Fig. 6 by a cord, wound on the roller 64 and secured to a shoulder 62 of the slide 60. The shoulder 62 encounters, when the slide 60 is moved to the right and shortly after it leaves its initial position, the slide 87 of the lever 84 and swings the latter to the right, whereby it brings the driving gears 21, 45 into mesh, as will be described later on. The slide 60 then moves freely past the numeral wheels of the accumulating number mechanism 6 and finally strikes, just before the end of its travel, against the slide 105, also guided on the rails 70, Fig. 10, the slide 105 being connected by the link 103 to the yoke 100

of the throw-out 11, Fig. 13. Since the slide 60 moves the slide 105, it also swings the throw-out 11, thereby sets the product mechanism to zero and, in consequence of the engagement of the gears 21, 45, causes the transfer of the product into the accumulating mechanism 6. After the zero setting, slides 60 and 105 are moved still further to the right, whereby throw-out 11 is given an additional displacement, and the gears 21, 45 are again disengaged, as will be later described.

On a pin 59 of slide 60 is mounted a swinging lever 56, Figs. 10 and 11, which carries the laterally projecting tens control cams 57, 58, as well as the upwardly directed projection 116 and the downwardly extending projection 55. Lever 56 is normally held by spring 56a with its bent end, carrying projection 55, against slide 60. The latter carries on its right end a projection 61, the purpose of which will be later explained.

After the transfer of the product and after the redisengagement of the driving gears 21, 45 by the movement of the slide 60 to the right, said slide is returned to its initial position by the pull of the spring in casing 65. In its return travel, it slides past all the numeral wheels 47 of the accumulating mechanism. Now in whatever places of the latter, tens transmissions have been made ready in the transfer of the product, that is, the tens "get ready" slides 52 have been displaced, their projections 54, provided with inclined surfaces 54a, come into the path of the downwardly directed projections 55 of the swinging lever 56, so that the latter is pressed against the tens control gears 49 in consequence of the movement of slide 60. By this swinging of lever 56, the tens control cams 57 are engaged in the tens control gears 49, Fig. 2, of the next higher place and turns them a step further in consequence of the movement of slide 60. If tens are ready in other places of the collecting mechanism, lever 56 completes here also the tens transfer as it passes such places. The same tens control cam completes, consequently, in all the ready places of the counting mechanism, the tens transfer. Projection 61 on slide 60 again displaces the prepared tens "get ready" slides back into their inoperative position.

The bar 70, on which the slide 60 slides, is guided in curved slots 73, Fig. 7, in the wall 72. When the lever 8 is thrown over for subtraction (i. e., for subtractive transfer of the product), the bar 70 is moved somewhat to the right in Fig. 7 by the pin 75 of lever 8 and is raised somewhat by the curved slots 73, thereby also raising the slide 60 and the lever 56, whereby, instead of the tens control cams 57, the tens control cams 58 engage in the tens control gears of the numeral wheels 47 of the intermediate counter-mechanism. Said rollers are, therefore, now turned in the opposite direction by the tens transfer.

A pin 70a of the bar 70 engages in a fork of the connecting arm 77a, Fig. 6, on longitudinal bar 77 and displaces the same to the right for subtraction, when the lever 8 is thrown over.

The bar 78, lying under bar 77, displaces the double bevel gears 45, thereby bringing the bevel gears 21, 45 of the drive into or out of engagement. Both bars 77 and 78 are carried and guided by the supporting pins 79.

The bar 77 is movable on said pins in two cam slots 80, Fig. 8a, and the bar 78 in the cam slots 83 with straight portions 83a and 83b, Fig. 8b. The pin 81 of bar 77 engages in a cam slot 82, Fig. 8b, of the bar 78, which, as shown in Fig. 8c, is composed of three portions 82a, 82b and 82c.

Part 82a is of the same shape as part 83a, and part 82b as 83b. The part 82 merely forms a connection between the cam parts 82a and 82b. The cam slot 80 of bar 77 is a reflected image of the laterally joined cam slot sections 82a and 82c of the cam 82. When lever 8 is set for addition, the relative position of the two bars 77 and 78 is that represented in Fig. 9a. Movement of bar 78 to the right then causes the cam 82 (portion 82b) to move the bar 78 slightly downwardly on pin 81, as represented in Fig. 9b. Pin 79 slides then in portion 8b. The double bevel gears 45 are brought, by this displacement of bar 78, into mesh with bevel gears 21, Fig. 2, as is required for additive transfer into the accumulating number mechanism.

By throwing over lever 8 for subtraction, bar 78 moves in cam slot 80 on the pin 79 to the right. Pin 81 slides (in consequence of the reflected image form of the cams 80 and 82a+82c) along the cam 82 up to its right end, Fig. 9c. If now the bar 78 is moved to the right, Fig. 9d, pin 81 and cam 82 (section 82a) force it downwardly, instead of upwardly as before. Pin 79 then slides in slot part 83a. Gears 45 now come into mesh with gears 21, as required for subtractive transfer.

Bar 78, Fig. 6, is connected with lever 84 by slot 85 and pin 86. Lever 84 is swung by shoulder 62 when slide 60 is moved and so moves bar 78 that the gears 21, 45 are put in mesh. Slide 87 on the end of lever 84, in the return movement of the slide 60, causes shoulder 62 to come again behind the lever 84.

The bar 78, when it is moved to the right, engages by its downwardly bent end 88 behind the nose 89 of the spring-pressed pawl 90, which is pivoted with the pin 91 on the holder 98. On the latter is also guided a slide 93, Fig. 6, with right-angularly bent end 93a. In the transfer of a product and the corresponding zero setting of the product number mechanism, the throw-out 11, which is additionally swung after the zero setting has taken place, strikes against the bent end of the slide 93 and moves it slightly to the right. At the same time, the pawl 90 is slightly swung by the pin 94 and the rail 78 is released. Only after the zero setting and transfer are completed consequently, are the reversing driving gears disengaged.

To transfer back a sum, obtained in the accumulating number mechanism, into the product number mechanism, the transmission slide is first moved slightly from its initial position, but no further than is necessary to just swing the lever 84 and to move the bar 78 and thereby to engage the gears 21, 45. Then the accumulating mechanism 6 is brought to zero by the throwout 9, whereby the numeral wheels of the product mechanism adjust themselves. Throw-out 9, after the zero setting, moves an additional amount, in doing which it strikes against slide 93 by means of lever 95, Fig. 6, thereby again disengaging the gears 21, 45. If, before the return transfer into the product countermechanism, a number value has already been obtained and if, during the return transfer the numeral wheels have been turned in any place from 0 to 9 or vice versa, then, in order to actuate the tens transfer the driving crank of the machine must be turned once with the keyboard released.

With the accumulating mechanism at rest, the numeral wheels 47 are secured against unintentional movement by latch levers 115, Fig. 3, which engage with stop pins 115a in the tens control gears 49. Said levers 115 must be first dis-

gaged when the wheels 47 are to be turned. To this end, they are formed as bell-crank levers, the free arms of which rest against pins of a longitudinally slidable pin-rail 117, the left end of which lies in the path of movement of the lever 84, which, through the bar 78, engages the gears 21, 45 and is, consequently, always displaced when said lever is swung to the left and bar 78 thereby moved, and gears 21, 45 are in mesh, i. e., always for the transfer or return transfer. After the release of bar 78, it is returned to normal position by the spring 84a of lever 84, and similarly, springs 115b return latch levers 115 and the pin-rail 117 to their initial positions.

In order that the latch levers may also be disengaged when only the accumulating mechanism is out of operation (without transfer), angle lever 118 is provided, which is pivoted at 119 and has one of its arms in the path of movement of the throw-out 9, while its other arm 120 engages behind the bent right end of the pin-rail 117.

In the tens transfer into the accumulating mechanism, the latch levers 115 of the numeral wheels to be turned are disengaged by the projection 116 of the lever 56 carrying the tens control cams. Therefore, if the lever 56 is forced by the inclined surface 54a of a tens "get ready" slide 52, which is in "ready" position, towards the tens control gears 49 and the latch levers 115, as shown in Fig. 3, then the nose 116 engages the incline 115c of the lever 115 of the next higher place and thereby brings the pin 115a out of engagement with the tens control gears 49. At the same time, one of the cams 57 or 58 engages in the gear 49. After the slide 60 has turned the gear 49 through one step, the lever 56 snaps off the nose 54 of the tens "get ready" slide 52. Latch pin 115a then enters the next tooth space of the gear 49.

The numeral wheels 27, Fig. 2, of the rotary number mechanism, are driven in the usual way by means of gears 28, 30 and 32 and shaft 33 from a single tooth, not shown, carried by a shaft running synchronously with the stepped tooth rollers. The zero setting of the rotary number mechanism is performed by the zero setting pinion 35, in which the bar 36, moved by throw-out 10 through link 107, Fig. 13, engages.

In the zero setting of the product mechanism and in the transfer of products into the accumulating mechanism, the rotary number mechanism must usually also be set at zero. The zero setting of the rotary mechanism may take place equally well at the same time as the zero setting or as the transfer of the product, since a device, coupling the throw-out 10 of the rotary mechanism with the throw-out 11 of the product mechanism, is provided. This device is shown in Figs. 12 and 13.

To the yoke 100, which is swung about the shaft 101 by the throw-out knob 11 of the product mechanism, is secured an angle-iron 108, on which moves a slide 109, held in its end positions by pawl 110. In its upper position, slide 109 takes with it the throw-out 10 of the rotary mechanism on angle-iron 111.

The manipulation and mode of operation of the machine in additive transfer of a product, obtained in mechanism 4, into the accumulating mechanism 6, is as follows:

Lever 8 is set for addition, whereby rail 70 is brought into its lower position, Fig. 7, by cam slots 73, so that only the upper tens control cam 57 of lever 56 comes into action. Rail 77 is moved

with rail 70 by the arm 77a, so that its pin 81 stands in portion 82b of cam slot 82. Then the transfer slide is moved to the right by knob 7, until the slot 7a limits its further movement, and it is then released, and returned to the left by the spring in casing 65.

During the first part of its travel, slide 60 swings lever 84 by its shoulder 62, thereby moving pin-rail 117, Fig. 3, and bar 78, Fig. 6, to the right. Pawl 90 locks the two rails or bars 117 and 78, in their right-hand end positions. By the displacement of said bars, latch levers 115 are thrown out and the gears 21, 45 are engaged for additive transfer. Towards the end of its travel, slide 60 strikes with its right-hand end against the slide 105, Fig. 12, which moves, through link 103, the yoke 100 of the throw-out 11 of the product counter. The latter is, therefore, set to zero, and, in consequence of the engagement of gears 21, 45, the numeral wheels 47 of the accumulating counter are turned through the same angle in order that the numeral wheels 25 of the product counter may be brought to zero. After this zero setting and the transfer have taken place, the throw-out 11 is swung slightly further to the right, whereby the yoke 100, Fig. 11, moves the slide 93 by the shoulder 93a slightly to the right, so that the pawl 90 is disengaged and the bars 117 and 78 are returned to the left by spring 84a of lever 84 and springs 115b of latch levers 115. The driving gears 21, 45 are, therefore, again disconnected and the latch levers 115 are again in engagement. If, in the transfer of the product, in any places of the accumulating counter, the numeral wheels 47 are turned from 9 to 0, then the tens "get ready" nose 51 has brought the corresponding tens "get ready" slide 52 into "ready" position.

In the return of the transfer slide 60 by the spring in the casing 65, the projections 54 of the "ready" slides 52, force, by their inclines 54c, the lever 56 of the moving slide 60, Figs. 2 and 3, against the latch levers 115 and the tens control gears 49. In consequence of this, projection 116 of lever 56 encounters the inclines 115c of the latch lever 115 of the next higher place of the counter and, therefore, disengages the stop-pin 115a from the tens control gear 49. At the same time, due to this movement of lever 56, the tens control cam 57 engages a tooth space of the tens control gear 49 of the same place, so that the slide 60, moving to the left, takes said gear with it at the beginning. After the tens control gear 49 is turned through one tooth, the lever 56 snaps off the nose 54 of the "get ready" lever 52 and is returned to normal position by spring 56a, Fig. 10. Latch lever 115, therefore, swings back and engages the stop pin 115a in the next tooth space of the gear 49, while the tens control cam is disengaged.

In subtractive transfer, the operations are substantially the same, but the pin 81 of bar 77, Figs. 9c and 9d, in consequence of the opposite position of lever 8, engages in slot 82a, Fig. 8c, instead of in slot 82b, as before. Bar 70 is in its upper position. The gears 21, 45, are therefore, engaged for subtractive transfer and tens control cam 58 now comes into operation instead of cam 57.

If the rotary counter is to be set to zero simultaneously with the transfer, the product throw-out 11 is coupled with a rotary throw-out 10 by means of slide 109, Fig. 13.

In the return transfer of product sums from the accumulating counter into the product coun-

ter, the manipulation and mode of operation are as follows:

First the lever 8 is again set for addition or subtraction. The effect of this has already been described. Then the transfer slide is moved by handle 7 so far to the right as is necessary to swing lever 84 and to move slides 78 and 117, as well as engage gears 21, 45 and disengage latch lever 115. Also by moving the accumulating throw-out 9 to the right, the accumulating counter is disconnected, whereby the numeral wheels of the product counter are turned, in consequence of the engagement of said gears 21, 45, through the same distance, as the numeral wheels of the accumulating counter are turned in the zero position. After the throwing out of the accumulating counter, its throw-out 9 continues to move and strikes through the lever 95, swung by it, against the end of the slide 93, whereby the gears 21, 45 are again disengaged and the latch levers are again thrown in. This completes the return transfer.

To set the accumulating counter to zero with return transfer, the throw-out 9 is moved to the right. It first swings the bell-crank lever 118, thereby moving bar 117 so that the latch levers 115 are disengaged. Only now is the zero setting performed.

I claim as my invention:—

1. A calculating machine comprising a carriage having a cover plate, two registering mechanisms having numeral wheels supported on said carrier, one of which registers the separate products and the other registers the sums of said products, and transfer mechanism whereby the transfer of the separate products from the first-mentioned mechanism into the second-mentioned mechanism is accomplished by setting the first-mentioned mechanism to zero, reversing gears arranged between the corresponding numeral wheels of said two mechanisms, and means to shift said gears, said gears being so arranged that by suitably shifting them the separate products can be transferred into said second-mentioned mechanism either additively or subtractively, said sum registering mechanism being arranged above the said cover plate.

2. A calculating machine as in claim 1, wherein the transfer mechanism includes shafts extending perpendicular to the cover plate of the register carriage and driven from the number wheels of the product register, passing through the said cover plate and provided with bevel gears lying above the said cover plate and double bevel gears with which they may be brought into engagement, said double bevel gears acting as reverse mechanism, and being arranged to be longitudinally shiftable but non-rotatable upon the extended shafts of the number wheels of the sum registering means.

3. A calculating machine comprising a carriage having a cover plate, two registering mechanisms having numeral wheels supported on said carriage, one of which registers the separate products and the other registers the sums of said products, and transfer mechanism whereby the transfer of the separate products from the first-mentioned mechanism into the second-mentioned mechanism is accomplished by setting the first-mentioned mechanism to zero, including reversing gears arranged between the corresponding numeral wheels of said two mechanisms, means to shift said gears, said gears being so arranged that by suitably shifting them

the separate products can be transferred into said second-mentioned mechanism either additively or subtractively, said sum registering mechanism being arranged above the said cover plate, shafts driven by the number wheels of the product register and extending perpendicular to and through the cover plate of the carriage, bevel gears lying above said cover plate, said reversing gears acting as reverse mechanism and being arranged to be longitudinally shiftable but non-rotatable upon the shafts of the number wheels of the sum registering means which are extended for this purpose, the gears of the reverse mechanism being normally out of mesh with one another, so that the product register is disconnected from the sum register, and a means whereby said gears are brought into mesh by the transfer mechanism at the beginning of its movement.

4. Calculating machine as in claim 1, having tens transfer mechanism in the sum registering mechanism and including tens transfer fingers swingably arranged upon the transfer means, and a tens preparing slide, whereby the tens transfer is accomplished by means of said transfer fingers which are brought into readiness for bringing the said slide into action as required.

5. A calculating machine comprising a carriage having a cover plate, two registering mechanisms having numeral wheels supported on said carriage, one of which registers the separate products, and the other registers the sums of said products, and transfer mechanism whereby the transfer of the separate products from the first-mentioned mechanism into the second-mentioned mechanism is accomplished by setting the first-mentioned mechanism to zero, including reversing gears arranged between the corresponding numeral wheels of said two mechanisms, means to shift said gears, said gears being so arranged that by suitably shifting them the separate products can be transferred into said second-mentioned mechanism either additively or subtractively, said sum registering mechanism being arranged above the said cover plate, having tens transfer mechanism in the sum registering mechanism and including two tens transfer fingers swingably arranged upon the said transfer means, and a tens preparing slide, whereby the tens transfer is accomplished by means of said transfer fingers which are brought into readiness for bringing the said slide into action as required, one of said tens transfer fingers being active only upon additive transfer and the other only upon subtractive transfer.

6. A calculating machine comprising a carriage having a cover plate, two registering mechanisms having numeral wheels supported on said carriage, one of which registers the separate products and the other registers the sums of said products, and transfer mechanism whereby the transfer of the separate products from the first-mentioned mechanism into the second-mentioned mechanism is accomplished by setting the first-mentioned mechanism to zero, including reversing gears arranged between the corresponding numeral wheels of said two mechanisms, means to shift said gears, said gears being so arranged that by suitably shifting them the separate products can be transferred into said second-mentioned mechanism either additively or subtractively, said sum registering mechanism being arranged above the said cover plate, shafts driven by the number wheels of the product reg-

ister and extending perpendicular to and through the cover plate of the carriage, bevel gears lying above said cover plate, said reversing gears acting as reverse mechanism and being arranged to be longitudinally shiftable but non-rotatable upon the shafts of the number wheels of the sum registering means which are extended for this purpose, the gears of the reverse mechanism being normally out of mesh with one another, so that the product register is disconnected from the sum register, and a means whereby said gears are brought into mesh by the transfer mechanism at the beginning of its movement, including also two cam gear devices, whereby the engaging of the reverse gearing is prepared for additive or subtractive transfer by selectively actuating one of said two cam gear devices, one of which engages the actuating device for the transfer element for additive transfer and the other for subtractive transfer, tens shifting fingers, and shifting means which causes one of said cam gear devices to become active and simultaneously also causes one or another of the tens shifting fingers to become active.

7. Calculating machine in accordance with claim 3 including also a rectilinearly reciprocating transfer slide whereby the clearing and transfer of the products takes place, wherein this transfer slide upon the forward motion and shortly after leaving the starting position, causes the reverse gears to mesh, whereby the number wheels of both registers are connected together in pairs.

8. Calculating machine in accordance with claim 3, including also a rectilinearly reciprocating transfer slide whereby the clearing and transfer of the products takes place, wherein this transfer slide upon the forward motion and shortly after leaving the starting position causes the reverse gears to mesh, whereby the number wheels of both registers are connected together in pairs, wherein said transfer slide upon the forward motion and after the engaging of the reverse gears, first in inactive operation, slides past all the number wheels of the registers and only shortly before the end of its stroke produces the zero setting of the product register and thereby the transfer of the product.

9. Calculating machine in accordance with claim 3, including also a rectilinearly reciprocating transfer slide whereby the clearing and transfer of the products takes place, wherein this transfer slide upon the forward motion and shortly after leaving the starting position causes the reverse gears to mesh, whereby the number wheels of both registers are connected together in pairs, wherein said transfer slide upon the forward motion and after the engaging of the reverse gears, first in inactive operation slides past all the number wheels of the registers and only shortly before the end of its stroke produces the zero setting of the product register and thereby the transfer of the product, wherein the zero setting mechanism of the product register to which the transfer slide gives an excessive stroke, during this excessive stroke moves a device, which again disengages the reverse gears between the product register and the sum register.

10. Calculating machine in accordance with claim 3, including also a rectilinearly reciprocating transfer slide whereby the clearing and transfer of the products takes place, wherein this transfer slide upon the forward motion and shortly after leaving the starting position causes the reverse gears to mesh, whereby the number wheels

of both registers are connected together in pairs, wherein said transfer slide upon the forward motion and after the engaging of the reverse gears, first in inactive operation slides past all the number wheels of the registers and only shortly before the end of its stroke produces the zero setting of the product register and thereby the transfer of the product, wherein the zero setting mechanism of the product register to which the transfer slide gives an excessive stroke, during this excessive stroke moves a device, which again disengages the reverse gears between the product register and the sum register, wherein the transfer slide upon the return motion and during the passing of the number wheels of the registers, by means of a single tens shifting finger provides for the additive or subtractive tens shifting in all the positions of the sum register.

11. Calculating machine in accordance with claim 3 including also a rectilinearly reciprocating transfer slide whereby the clearing and transfer of the products takes place, wherein this transfer slide upon the forward motion and shortly after leaving the starting position, causes the reverse gears to mesh, whereby the number wheels of both registers are connected together in pairs, the return movement of the transfer slide being produced by means of a spring which is tensioned in the forward movement.

12. Calculating machine as in claim 1, wherein when the machine is at rest the number wheels of the registers are latched by locking levers, which are disengaged upon transfer, reverse transfer, and tens transfer, and wherein in order to disengage the locking levers the latter are constructed as angle levers which abut with their free arms against pins on a common longitudinally shiftable pin bar so that upon suitable shifting of this bar all the locking levers will be disengaged.

13. Calculating machine as in claim 1, wherein when the machine is at rest the number wheels of the registers are latched by locking levers, which are disengaged upon transfer, reverse transfer, and tens transfer, and wherein in order to disengage the locking levers the latter are constructed as angle levers which abut with their free arms against pins on a common longitudinally shiftable pin bar so that upon suitable shifting of this bar all the locking levers will be dis-

gaged, and wherein the pin bar together with the bar which shifts the reverse gears is so shifted that the locking levers are always disengaged when the reverse gears are in mesh.

14. Calculating machine as in claim 1, wherein when the machine is at rest the number wheels of the registers are latched by locking levers, which are disengaged upon transfer, reverse transfer, and tens transfer, and wherein in order to disengage the locking levers the latter are constructed as angle levers which abut with their free arms against pins on a common longitudinally shiftable pin bar so that upon suitable shifting of this bar all the locking levers will be disengaged and wherein the zero setting device of the sum register executes a preliminary stroke, and during this preliminary stroke shifts the pin bar in such manner that the locking levers become disengaged upon the zero setting.

15. Calculating machine as in claim 1, wherein when the machine is at rest the number wheels of the registers are latched by locking levers, which are disengaged upon transfer, reverse transfer, and tens transfer, and where in order to disengage the locking levers the latter are constructed as angle levers which abut with their free arms against pins on a common longitudinally shiftable pin bar so that upon suitable shifting of this bar all the locking levers will be disengaged and wherein during the tens transfer only those locking levers of the number wheels are disengaged, at which, at that time, the tens transfer is taking place.

16. Calculating machine as in claim 1, wherein when the machine is at rest the number wheels of the registers are latched by locking levers, which are disengaged upon transfer, reverse transfer, and tens transfer, and wherein in order to disengage the locking levers the latter are constructed as angle levers which abut with their free arms against pins on a common longitudinally shiftable pin bar so that upon suitable shifting of this bar all the locking levers will be disengaged and wherein during the tens transfer only those locking levers of the number wheels are disengaged, at which, at that time, the tens transfer is taking place and wherein the oscillating lever carrying the tens shifting fingers brings the locking lever out of engagement with the number wheel moved thereby.

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