Aug. 10, 1937. H. SUTER ET AL 2,089,770

COUNTING MECHANISM CARRIAGE FOR CALCULATING MACHINES

Filed Oct. 27, 1933 4 Sheets-Sheet 1

Fig. 1

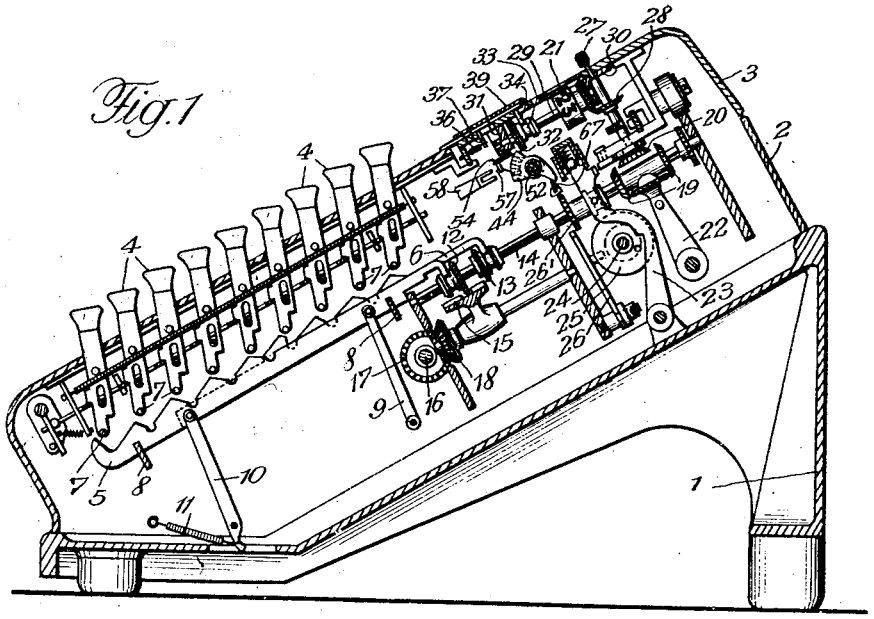


Fig. 5

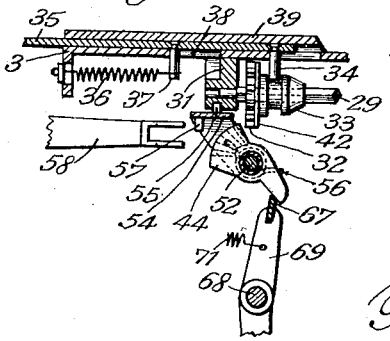


Fig. 6

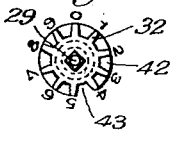


Fig. 7

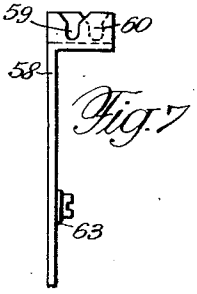
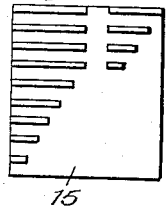


Fig. 8

Fig. 9



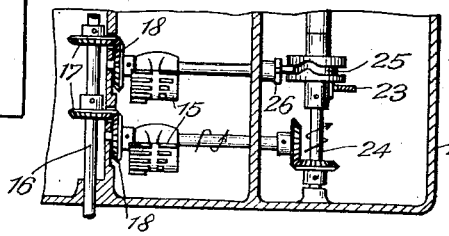


Fig. 10

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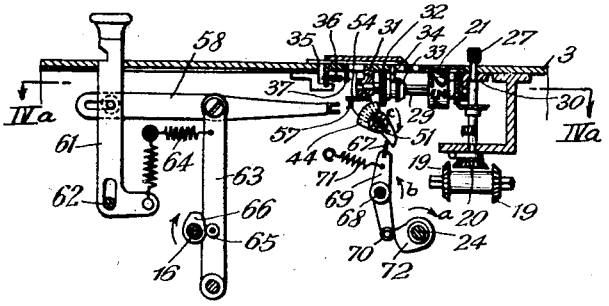

Fig. 4

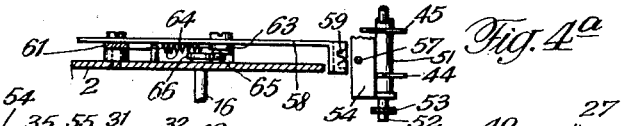

Fig. 4a

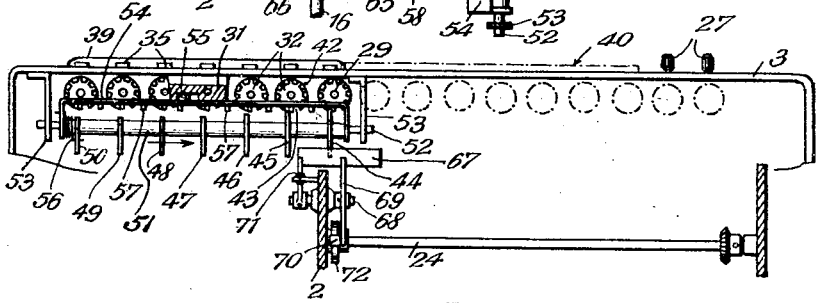

Fig. 3

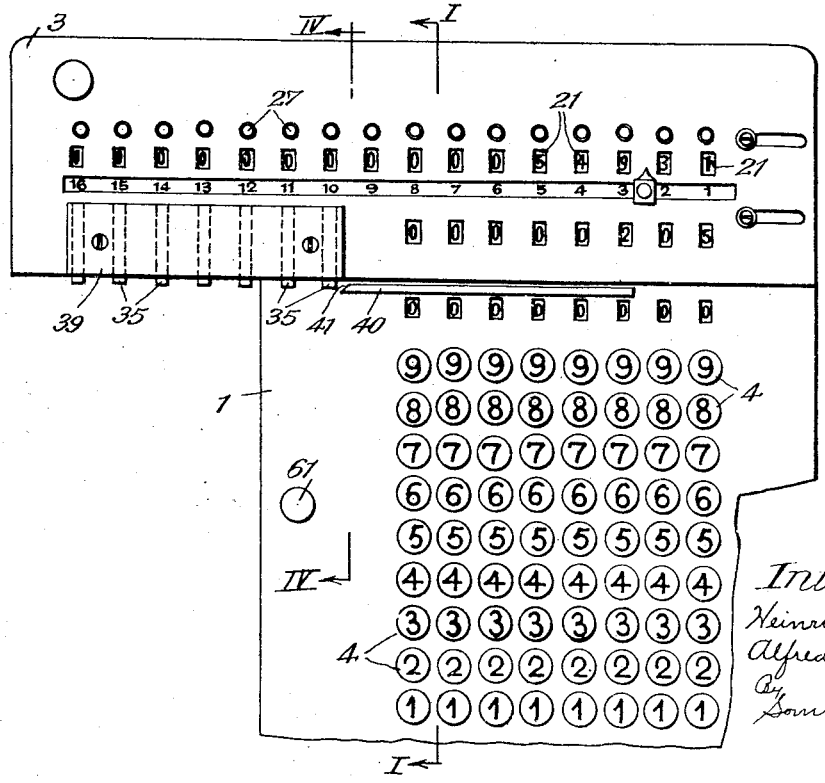

Fig. 2

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COUNTING MECHANISM CARRIAGE FOR CALCULATING MACHINES

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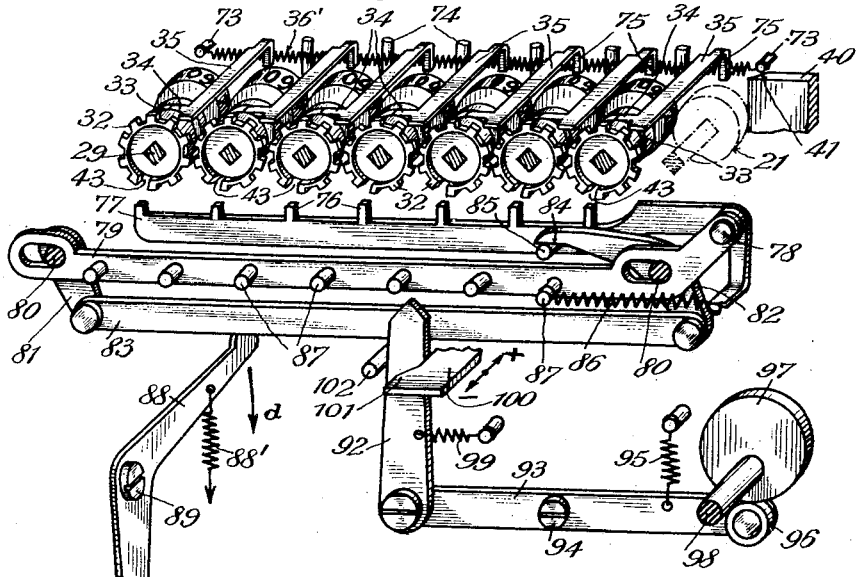
Fig. 11



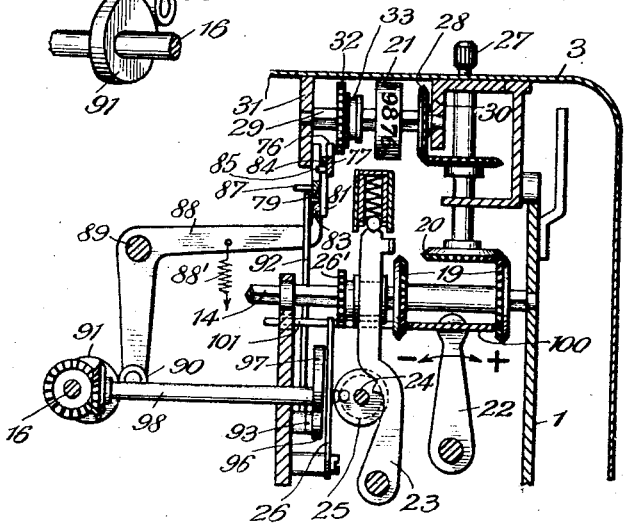


Fig. 12

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COUNTING MECHANISM CARRIAGE FOR CALCULATING MACHINES

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Fig. 13

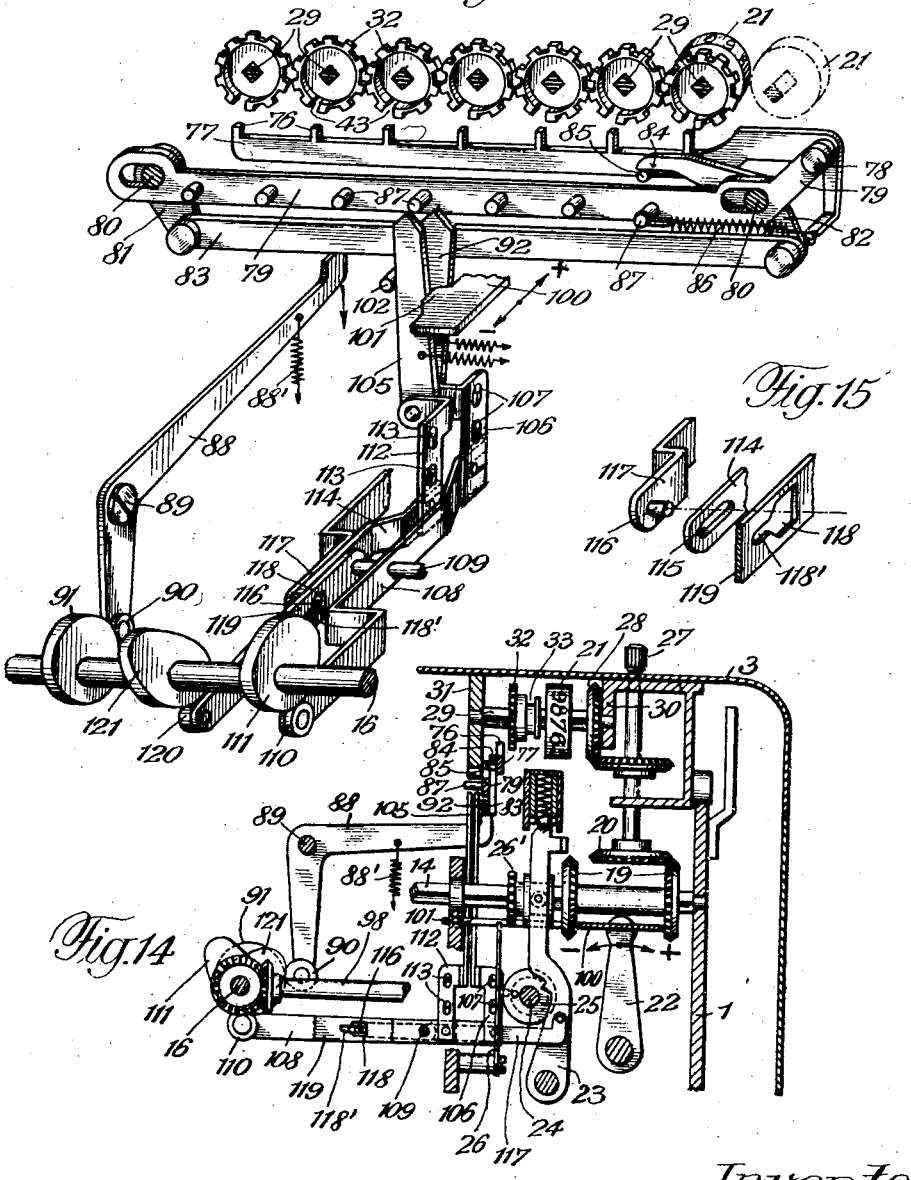

Fig. 15

Fig. 14

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UNITED STATES PATENT OFFICE

2,089,770

COUNTING MECHANISM CARRIAGE FOR CALCULATING MACHINES

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Application October 27, 1933, Serial No. 695,522
In Germany November 5, 1932

23 Claims. (Cl. 235—75)

This invention relates to calculating machines.

The known calculating machines the counting mechanism carriage of which, with a view to economizing space, projects in its initial position beyond the left side of the machine have the drawback that no provision is made for transferring the tens up to the last digit wheel for indicating the highest result indicating numeral concurrently, as the tens transfer device of the machine cooperates only with a main group of result indicator digit wheels provided within the machine frame and beginning with the lowest result indicating numeral. In consequence of this discontinuity in the operation of transferring the tens, the operator of the machine is obliged to wait for the bell signal in order to be enabled to subsequently execute the additional tens feed by hand, provided that the machine is of a type to permit this. Otherwise the operator must keep the respective number to be added to the result as indicated by the machine in his memory which is apt to cause errors of calculation.

According to the present invention this drawback is eliminated in the machine by providing in the counting mechanism carriage a series of auxiliary tens transfer wheels which are adapted for effecting the additional tens transfer operation mechanically and by providing coupling means traveling together with said auxiliary wheel series for setting the same and permitting of connecting certain auxiliary tens transfer wheels temporarily to the highest main digit wheel setting unit of the correlated main tens transfer device, as required by the calculation to be carried out, thus affording an uninterrupted mechanical tens transfer operation.

In the accompanying drawings the invention is illustratively exemplified by three embodiments in which

Fig. 1 shows a vertical section of a first embodiment of the invention taken on the line I—I in Fig. 2;

Fig. 2 shows a plan view of Fig. 1;

Fig. 3 represents a partial sectional front elevation;

Fig. 4 is a fragmentary section similar to Fig. 1, but taken along the line IV—IV in Fig. 2, and showing certain movable members in different positions;

Fig. 4*a* is a section on the line IV*a*—IV*a* in Fig. 4;

Fig. 5 is a view of a detail on a larger scale;

Fig. 6 shows in a side elevation a part of Fig. 5;

Fig. 7 is a view of another detail;

Fig. 8 shows a series of tens feed members;

Fig. 9 is a view of a further detail;

Fig. 10 shows a fragmentary sectional plan view;

Fig. 11 is a perspective elevational view of a second embodiment;

Fig. 12 shows a cross sectional view of Fig. 11;

Fig. 13 shows a perspective view of a third embodiment;

Fig. 14 shows a cross sectional view of Fig. 13, and

Fig. 15 is a view of a detail.

In all three embodiments, the invention is assumed to be applied to a calculating machine including, in a known manner, cylinders about the circumference of which teeth of graduated lengths are arranged, only the parts of the machine being shown which are necessary for a proper understanding of the invention.

In the first embodiment of the invention, as shown in the Figs. 1 to 10, 1 denotes the frame of the machine which is encased by a wall 2, the machine comprising a counting mechanism carriage 3 and a key board 4 (Figs. 1 and 2) for the setting mechanism. To each row of setting keys 4 carrying the numerals "1" to "9", two setting bars 5 and 6 (Fig. 1) are correlated, the bar 5 being operable by the keys carrying the numerals "1" to "5" and the bar 6 by the keys carrying the numerals "6" to "9". To this end, the spring influenced keys 4 each carries a lateral stud 7 adapting the keys to cooperate with a corresponding inclined face of the bars 5 and 6 respectively. The bars 5 and 6 are held by guides 8, and two swing supports 9 and 10 are connected with each bar. To the swing support 10, a tension spring 11 is attached which tends to retract this bar into zero position. Each pair of bars 5 and 6 serves for axially displacing two driving gear wheels 12 and 13, the former being coupled to the bar 5 and the latter to the bar 6. The driving gear wheels 12 and 13 are carried in pairs on common square shafts 14, and each pair is adapted to cooperate with a cylinder 15 having circumferential teeth of graduated lengths which are divided in two separate axial groups, one of these groups being associated with the driving gear wheel 12, and thus with the numerals adapted to be set up by the bar 5, respectively, whereas the other group is associated with the driving gear wheel 13, and thus with the numerals adapted to be set up by the bar 6 (Fig. 9). By correlating two setting bars 5 and 6 to each other as well as two driving gear wheels 12 and 13, for cooperation with a cylinder 15 having circumferential teeth of graduated lengths, the advantage of shortening the

travel of the individual setting bar as well as that of the driving gear wheel is obtained. The drive of the main shaft 16 is derived from an electric motor (not shown), this shaft actuating in turn the respective cylinder 15 at the individual rows of keys by means of bevel gear drives 17, 18.

Thus, if any one of the two driving gear wheels 12 and 13 engages with the toothed portions of the cylinder 15, the square shaft 14 is correspondingly turned. The square shaft 14 in turn cooperates, in a known manner, when connected by means of a reversing gear drive 19, 20, with a digit wheel 21 of the result indicating mechanism provided on the counting mechanism carriage 3.

By 22, the operating lever for the displaceable part 19 carried by the square shaft 14 of the reversing gear is designated and by 23 a lever which belongs to a known main tens transfer device, for example as disclosed in the U. S. A. Patent specification No. 1,900,776, which device includes ten digit wheel setting units for setting ten consecutive result indicator digit wheels 21 (Fig. 2). 24 denotes the correlated tens feed shaft carrying a control disc 25 for each setting lever 26 of each individual setting unit 26, 26' of the main tens transfer device these levers each being adapted to cooperate with a gear wheel 26' which is axially displaceably arranged on the correlated square shaft 14, for preparing for the tens transfer operation to take place, that is, effecting preliminary operations therefor.

To all the individual digit wheels 21 of the set of sixteen such wheels, in a known manner, a turn button 27 and a driving wheel 28 arranged on the counting mechanism carriage 3 are correlated. This set of result indicator digit wheels 21 thus comprises a main group of ten wheels "1" to "10" and a group of additional wheels 21 including the wheels "11" to "16" as illustrated for the three embodiments of the invention shown in the drawings. It will, however, be understood that any number of wheels 21 may be provided in the complete set and the set may be subdivided at any convenient point for the main and the additional wheel group each to include as many wheels of the set as required. In the present instance, the main wheel group beginning with the lowest result indicating numeral 1 ends with the intermediate result indicating numeral 10, whereas the group of additional digit wheels 21 begins with the indicating numeral next higher to the latter, thus the numeral 11, and ends with the highest result indicating numeral 16.

The digit wheels 21 of the additional wheel group inclusive of that displaying the tenth result indicating numeral are arranged on extended square shafts 29. These extended square shafts 29 are mounted at one end in a rail 30 of angular cross section and at the other end in a rib 31 on the carriage 3, a tens transfer wheel 32 being mounted on each of these extended shafts 29 by means of a hub 33 (Fig. 5). As the tens transfer wheel 32 mounted on the shaft 29 of the tenth digit wheel 21 is actuated in the initial position of the carriage 3 by the highest, that is, the tenth digit wheel setting unit without the aid of any further coupling means, this wheel 32 will be hereinafter referred to as the special tens transfer wheel, whereas the wheels 32 allotted to the additional digit wheels 21 will be called auxiliary tens transfer wheels. The individual tens transfer wheel 32 is coupled to an adjusting slide 35 by a driving element in the form of a stud 34 engaging in an annular groove of the wheel hub 33.

The slide 35 is influenced by a tension spring 36 which is attached to a pin 37 on the slide and which tends to hold the latter in retracted position, wherein the pin 37 bears against one of the end portions of a slot 38 in the counting carriage 3 through which slot the pin projects, as shown in Fig. 5. In this position of the slides, the tens transfer wheels 32 carried thereby assume their operative positions. The slides 35 are also arranged on the counting mechanism carriage, so as to be situated on the top surface thereof and are inserted in grooves of a common guide plate 39 connected to the counting mechanism carriage (Figs. 2 and 3). On the upper surface of the casing wall 2 of the machine frame 1, a cam rail 40 is provided (Fig. 2) the one end of which is formed with an inclined ascending face 41, for cooperation with the slides 35 during the displacements of the counting mechanism carriage 3 from the initial position of the same.

On one side of each individual tens transfer wheel 32, a feed disc 42 having a gap 43 in its circumference is arranged (Figs. 5 and 6) which is situated between the teeth of the wheel 32 which correspond to the numerals "4" and "5", as will be seen in Fig. 6. To each wheel of the series of the seven tens transfer wheels 32, a member of a mating series of feed members 44 to 50 (Fig. 3) is correlated. The feed members 44 to 50 are secured to a common hollow mounting shaft 51 (Fig. 3) which is longitudinally displaceably arranged on an axle 52 which is mounted in the counting mechanism carriage 3 by means of brackets 53. With the hollow shaft 51, a setting member in the form of a stirrup 54 is combined in such manner that the stirrup shares in the longitudinal displacements of this shaft, but is kept from rotating together with the same by an upper stud 55 of the stirrup 54 engaging in a longitudinal groove in the mounting rib 31. As is evident from Fig. 3, the outermost feed member 50 to the left is influenced by a torsion spring 56 the other end of which is connected to the stirrup 54, thereby influencing the hollow shaft 51 in one sense of rotation.

The yoke of the stirrup 54 is provided with lower setting elements in the form of pins 57 each situated in a plane between adjacent tens transfer wheels 32. A control lever 58 (Figs. 4 and 7) cooperates with the pins 57 of the stirrup 54, this lever being provided for this purpose with a forked end (Fig. 4) formed with terminal recesses 59 and 60 provided in the two arms of the fork that are disposed above each other respectively (Fig. 7). These two terminal recesses 59 and 60 on the control lever 58 are provided with inclined ascending faces and are offset relatively to each other as regards the vertical direction, the recess 59 being intended for cooperation with the pins 57 on the stirrup 54, when the machine is used for adding, and the recess 60, when it is used for subtracting. The control lever 58 is coupled to a spring pressed key 61, which is displaceably guided by a bolt 62, and also connected with an auxiliary lever 63. The auxiliary lever 63 is urged, by means of a guide roller 65, on a cam disc 66 carried on the main shaft 16 of the machine.

The feed members 44 to 50 arranged on the hollow shaft 51 are each provided with two arms, the corresponding arms of one set of arms being of similar shape, whereas the arms of the other set differ from one member to the other. While the depending arms of the feed members 44 to 50, when viewed longitudinally of the hollow

shaft 51, are in registry, the arms of the other set have upper radial edges (Fig. 8) that are circumferentially offset relatively to each other, the entirety of these radial edges being stepped up to form a helix about the hollow shaft 51. The feed members 44 to 50 are influenced by the torsion spring 56, so that their depending arms are urged in the direction towards a stop rail 67. This stop rail 67 is connected to the ends of supports 69 arranged on a shaft 68, the support 69 shown in Fig. 4 being provided with a lower projecting arm carrying a roller 70 which is urged under the influence of a tension spring 71, acting on this support, on a cam disc 72 provided on the tens transfer shaft 24.

When the counting mechanism carriage 3 occupies its initial position by projecting to the left as shown in Fig. 2, the main tens transfer device is adapted to be effective up to the tenth digit wheel. Assuming now that the counting mechanism carriage be set to zero position and that the key of the extreme row of keys to the right carrying the numeral "1" be depressed and the machine adjusted for subtraction. Then during the next following rotation of the main shaft 16, the tens transfer operation as now being prepared for by action of the shaft 24, is not interrupted at the tenth digit wheel, i. e. the highest setting unit of the main tens transfer device, but rather amplified due to auxiliary means being provided, as will be hereinafter explained.

While setting the machine for subtraction, also the key 61 had been depressed, so that the control lever 58, on being advanced towards the stirrup 54 by action of cam disc 66 and auxiliary lever 63, moves the terminal recess 60 on the lower arm of its forked end into engagement with that driving pin 57 of the said stirrup which is disposed on the extreme right side in Fig. 3. During this engaging movement, the stirrup 54 and the hollow shaft 51 together with the feed members 44 to 50 are conjointly displaced slightly to the right in Figure 3, due to the terminal recess 60 being correspondingly shaped, whereafter each feed member is juxtaposed to the gap 43 of the feed disc 42 of the tens transfer wheel 32 correlated to the respective feed member.

During the rotation of the tens transfer shaft 24 of the main tens transfer device taking place in the direction of the arrow *a* in Fig. 4, the spring pressed support 69 performs at a certain time a rocking movement together with the stop rail 67 in the direction of the arrow *b* shown in this figure. This rocking movement of the stop rail 67 is followed by corresponding rocking movements of the feed members 44 to 50 in the direction of the arrow *c* in Fig. 4 in accordance with the rotational movement of the hollow shaft 51 caused by action of the torsion spring 56 correlated thereto. The engagement of the feed members 44 to 50 with the gaps 43 in the feed discs 42 registering with said members is thus effected consecutively and at the same time a coupling engagement between all the tens transfer wheels 32 takes place. When the cam discs 66 and 72 occupy a certain relative position, the control lever 58 returns into inoperative position under the influence of the tension spring 64 as soon as the highest feed member 50 engages into the gap 43 of the correlated feed disc 42. In the meantime the transfer of the tens in the main tens transfer device has reached the tenth digit wheel to the effect that also this tenth digit wheel 21 is adjusted to exhibit "9" instead of "0" by the setting lever 26 of the highest setting unit cooperating with the correlated wheel 26'.

As this tenth digit wheel 21 as well as all those of a higher order are firmly secured to the appertaining square shafts 29 on which the tens transfer wheels 32 are axially displaceably arranged together with the feed discs 42, consequent on the adjustment of the tenth digit wheel, also the special tens transfer wheel 32 correlated to the tenth digit wheel is turned in unison with its feed disc 42 through a corresponding angular range, thus displacing the feed member 44 and thereby the hollow shaft 51 and the stirrup 54 to the left, thus in the opposite direction of the arrow in Fig. 3. Since at this time, all the feed members 44 to 50 are moved into engagement with the correlated feed discs 42, all the digit wheels situated further to the left are adjusted from "0" to "9" simultaneously with the adjustment of the tenth digit wheel, whereby the stirrup 54 is reset into initial position by the main tens transfer device actuating also the special tens transfer wheel 32 which is fixed on the shaft 29 of the tenth digit wheel as previously explained. Thus, it will be seen that the special tens transfer wheel 32 provides in conjunction with the parts 42, 44 to 57 a coupling arrangement for the auxiliary tens transfer wheels 32. During the end portion of the rotational movement of the main shaft 16 and that of the tens transfer shaft 24 respectively, the stop rail 67 is rocked by action of the cam disc 72 in the direction opposite to that indicated by the arrow *b*, so that the feed members 44 to 50 are moved out of engagement with the feed discs 42 of the tens transfer wheels 32 again in the initial position of the stirrup 54.

On the counting mechanism carriage 3 being shifted to the right in Fig. 2, the tens transfer wheels 32, which then move to the right past the (tenth) setting unit of the main tens transfer device, must be moved clear of the paths of movement of the correlated feed members 44 to 50. This is effected by axially displacing the respective tens transfer wheels 32 on the appertaining square shafts 29 by means of the corresponding slides 35 riding up on the ascending face 41 of the fixed cam rail 40 during shifting the counting mechanism carriage 3 to the right, thus shifting the individual slides against the influence of the correlated tension springs 36 inwards on the carriage 3. At each step of the shifting movement of the carriage 3 to the right, the next following pin 57 of the row on the stirrup 54 is moved in the path of the periodically reciprocating control lever 58.

During each revolution of the tens transfer shaft 24, the feed members 44 to 50 swing, as explained above, in the direction towards the correlated tens transfer wheels 32. The additional tens transfer device is, however, rendered operative in this manner only, when one or more of the feed members 44 to 50 are adapted to interengage with the recess 43 of the correlated feed disc 42 in dependency on the adjustment of the feed discs 42 as required by the calculating operation to be carried out. From this and the previous explanations follows without any further comment that the additional tens transfer operation is continued from a lower digit wheel to the next higher one in such a manner that at the lower digit wheel the respective feed member of the series 44 to 50 feels the correlated feed disc 42, i. e. enters into the gap 43 thereof, whereafter at the next higher digit wheel the tens transfer is effected. This operation is carried out by the

feed member of the next higher digit wheel engaging in the gap of the appertaining tens transfer wheel 32, and the hollow shaft 51 being turned through an angular range of such an extent that this feed member hits the correlated feed disc 42, except of course, when the correlated digit wheel 21 is already adjusted for by itself causing the tens transfer operation at the next higher digit wheel to take place.

Subsequently, the special tens transfer wheel 32 of the lower (tenth) digit wheel, which is rotated by the tenth setting unit of the main tens transfer device, causes the auxiliary tens transfer wheel 32 of the next higher digit wheel, which is connected with the special tens transfer wheel 32 by the hollow shaft 51, to be fed by axially displacing the hollow shaft 51 and the stirrup 54 together with it. Thereupon the said feed members are again moved out of engagement with the correlated tens transfer wheels 32 and so forth, all in the manner as previously explained. The stirrup 54, when operated by the control lever 58, is moved into that preliminary position in which it permits the respective feed members to engage with feed discs 42 of the tens transfer device.

When the machine is set for adding instead of subtracting, the terminal recess 59 of the control lever 58 is applied with the result that the stirrup 54 and the hollow shaft 51 inclusive of the feed members 44 to 50 are shifted to the left in Fig. 3. Thus, if the digit wheel 21 correlated to the tenth result cipher viewing aperture be so adjusted that in this viewing aperture of the counting mechanism carriage 3 a numeral different from "9" is exhibited, in course of the next addition, for mathematical reasons, at the next higher digit wheel, i. e. the eleventh digit wheel, the performance of a tens transfer operation is inhibitive.

Now, if the additional tens transfer wheel 32 separately shown in Fig. 6 assumes a position according to this assumption, to the feed member 44 thus having been shifted to the left this time not the gap 43 of the correlated feed disc 42 is juxtaposed, the feed member 44 being simply inserted in a tooth gap of the respective wheel 32 until it is brought to bear on the correlated feed disc 42.

Owing to the fact that the upper radial edges of the feed members 44 to 50 are situated in a helix (Fig. 8), aside from member 44 no other feed member is inserted in any gap of correlated wheels 32, the tenth digit wheel 21 thus being adapted to be fed by one unit depending on requirements of the calculating operation to be carried out without the digit wheels 21 situated to the left being disturbed.

If, on the other hand, the tenth digit wheel 21 is so adjusted that in the corresponding viewing aperture of the counting mechanism carriage 3 the number "9" is displayed and the next following (eleventh digit wheel 21) is adjusted to display a numeral different from "9", and if the tenth digit wheel 21 is shifted one digit, from "9" to "0", during the next following adding operation, it is indispensable that at the eleventh digit wheel a tens transfer operation takes place.

To this end, it will be assumed that the special transfer wheel 32 correlated to the tenth digit wheel is rocked clockwise one division from the position shown in Fig. 6, so that the recess 43 of the respective feed disc 42 is positioned on the left of the vertical middle plane.

The feed member 44 previously shifted to the left by means of control lever 58 and stirrup 54 enters during the following rotational movement of the hollow shaft 51 into the recess 43 of the feed disc 42, whereas the next following feed member 45 of the series interengages with a gap of the correlated tens transfer wheel 32, so as to be coupled with the tenth digit wheel. If then, in accordance with the above assumption, the tenth digit wheel 21 is adjusted by the main tens transfer device from its position to exhibit the numeral "9" to "0" position, it will be seen that, due to the described coupling operation, the required tens transfer operation is actually effected at the eleventh digit wheel by means of the auxiliary tens transfer device, whereas all the digit wheels 21 situated on the left thereof remain unaffected in consequence of the relatively offset disposition of the upper edges of the feed members 44 to 50. Otherwise the parts participating in this transfer operation are moved in the manner as explained in connection with the subtracting operation.

With the two further embodiments of the invention represented by the Figs. 11, 12 and Figs. 13 to 15 respectively, 14 refers again to the square shafts which are mounted in the frame 1 of the machine and adapted to cooperate, in a known manner, by means of reversing gears 19, 20 with digit wheels 21 of the result indicating mechanism arranged on the carriage 3. The reference numeral 22 denotes also here the reversing lever for the portion 19 of the reversing gear which is displaceably arranged on the square shaft 14, and by 23 the lever for effecting the operations preparatory to the tens transfer operation of the main tens transfer device is designated, which may again span the digit wheels "1" to "10" to the initial position of the carriage 3. The correlated tens transfer shaft is indicated by 24 and carries a feed cam 25 for the setting lever 26 of each setting unit which lever, for effecting the tens transfer operation, is adapted for cooperation with a gear wheel 26' axially displaceably arranged on the square shaft 14.

The digit wheels 21 for which additional mechanical tens transfer operation is provided and which have correlated thereto a turn button 27 and a drive wheel 28, are each arranged similarly as before on extended square shafts 29 mounted between an angle bar 30 and a rib 31 of the counting mechanism carriage 3, and each carries a tens transfer wheel 32, so as to be displaceable thereon by means of a hub 33. Each individual tens transfer wheel 32 is coupled to a correlated slide 35, not shown in the Figs. 12 to 14, by means of a flap 34 taking into an annular groove in the hub of the wheel (Fig. 11). The slides 35 are situated underneath the cover plate of the counting mechanism carriage 3 and advantageously inserted in grooves in the angle bar 30 and the rib 31. To two studs 73 of the counting mechanism carriage a coiled spring 36' is attached (Fig. 11) which is afforded occasional points of support along its span by pins 74 connected to the carriage and which cooperates with bent-over flaps of the slides 35. This spring has the tendency to retain the slides 35 in their respective retracted positions whereby the correlated tens transfer wheels 32 are in operative position. By 40 (Fig. 11), again a cam rail secured to the machine frame is designated which extends in the longitudinal direction of the counting mechanism carriage and is provided at the end showing up in this figure with an inclined ascending face 41. This cam rail 40 cooperates

with the flaps 75 of the slides 35, when the counting mechanism carriage is moved out of initial position.

The tens transfer wheels 32 are provided on the circumference between two teeth corresponding to the numerals "4" and "5" respectively with a deeper tooth gap 43. As will be seen in the Figs. 11 and 13, teeth 76 of a control lever 77 are oppositely disposed to these gaps 43, the lever 77 being mounted on a slide 79 by means of a bolt 78. The slide 79 in turn is longitudinally displaceably guided on the counting mechanism carriage by two pins 80 on the latter projecting through slotted holes in this slide. In addition, on these two pins 80 two supporting arms 81 and 82 are mounted the other ends of which are interconnected by a link 83 which thus completes an adjustable lever parallelogram. The supporting arm 82 is provided with another arm projecting beyond its fulcrum and having a straight guide face 84 for cooperation with a stop pin 85 connected to the control lever 77.

To an extension of the control lever 77 projecting beyond the fulcrum 78 of the same, a tension spring 86 is attached the other end of which is secured to a feed control stud 87 of the slide 79. The slide 79 carries a series of uniformly spaced control studs 87 in an equal number as tens transfer wheels 32 are provided. The supporting arm 82 influenced by the tension spring 86 tends to retain the control lever 77 in inoperative position, as shown, in which the teeth 76 of this lever are spaced apart from the tens transfer wheels 32 by a certain distance.

In the Figs. 11 to 14, the numeral 88 refers to a control lever which is mounted on the machine frame by means of a bolt 89. The control lever 88 is of angular shape, one arm of this lever serving for cooperation with the link 83 of the adjustable lever parallelogram, whereas the other arm of the lever 88 cooperates with a cam disc 91 through the intermediary of a guide roller 90 which is maintained in contact with the periphery of the cam disc 91 by a tension spring 88' acting on the control lever 88. The cam disc 91 is connected to the main shaft 16 of the machine.

In the embodiment of the invention, shown in the Figs. 11 and 12, a setting lever 92 for cooperation with the studs 87 of the slide 79 is mounted on a control lever 93. The lever 93 is mounted in turn on the machine frame by means of a pin 94 and acted upon by a tension spring 95, so as to be urged on the circumference of a cam disc 97 with an intervening guide roller 96. The cam disc 97 is secured to a shaft 98 which takes its drive from the main shaft 16 by the aid of a bevel gear wheel drive (Fig. 12). The setting lever 92 is maintained in contact with an end face of a reversing rail 100 by a tension spring 99, the rail being adapted to be actuated in the transverse direction by means of the operating lever 22 for shifting the displaceable portion 19 of the reversing gear.

This end face of the reversing rail 100 cooperating with the setting lever 92 is situated on a cantilevered end portion of this rail and is provided with a projection 101. In Fig. 11, the setting lever 92 is shown to bear against the portion of the end face, rearwardly of the projection 101. A stationary pin 102 serves as a stop member for the side of the setting lever 92 remote from the end face of the reversing rail 100, for limiting the swinging movement of the setting lever 92 about its pivot on the control lever 93. The outer end of the setting lever 92 is beveled to both sides to form a central apex, so that the lever is adapted to engage during its upward movement by means of one or the other beveled portion with that stud 87 of the slide 79 which has been entered in its path, depending whether the machine, that is, the reversing rail 100 is set for addition or subtraction by adjusting the rail 100 in one or the other transverse direction, as indicated by the double arrow marked "+" and "—" and in Fig. 11.

In this figure, the reversing rail 100 and thus also the setting lever 92 are shown to be set for subtracting with the aid of the machine. After shifting the reversing rail 100 into position for adding, the setting lever 92 is positioned opposite the front face of the projection 101 and thus rocked somewhat to the left as compared with the position shown in Fig. 11. The forward and rearward end face portions of the lever 100 are interconnected by a slanting portion, for facilitating the shifting movements of the setting lever 92 by means of the rail 100.

When the counting mechanism carriage occupies its initial, that is, its extreme left hand position, the main tens transfer device is, as previously assumed, adapted to operate up to the tenth digit wheel by cooperation with the individual setting units for the main group of digit wheels "1" to "10" of the set of such wheels. To the tenth digit wheel 21 the special tens transfer wheel 32 on the right side in Fig. 11 is connected for conjoint rotation therewith. The additional tens transfer operation is effected by the mechanism just described in the following manner:

As it is assumed that the machine is set for subtraction, the beveled end face of the setting lever 92 on the left in Fig. 11 is caused to engage with that stud 87 of the slide 79 which has been entered in the path of this bevel, when the lever 92 is moved upwardly by action of the cam disc 97, by means of the control lever 93, so that the slide 79 is shifted from its previous right hand position to the left hand position, as shown in this figure which represents the normal position of the slide 79 during subtracting.

Thereupon the control lever 88 actuated by the cam disc 91 is rocked under the influence of the spring 88' in the direction of the arrow *d* shown in Fig. 11. Due to this rocking movement the link 83 of the adjustable lever parallelogram is moved downwards by the influence which the tension spring 86 exerts on the control lever 77 and thereby by direct bearing engagement on the supporting arm 82 of the link 83, whereby the control lever 77 swings upwardly. During this upward swing of the control lever 77 the latter engages with the tens transfer wheel 32 which is to be rocked, for example by the respective tooth 76 entering into the gap 43 of this wheel 32. Depending on the position of adjustment of the gaps 43 of the various tens transfer wheels 32, one or more teeth 76 of the control lever 77 can be rendered operative or even all of these teeth, as will be hereinafter more explicitly explained.

Immediately after the control lever 77 has completed its swinging movement in the direction towards the wheels 32 or entered into operative engagement respectively, the setting lever 92 actuated by the cam disc 97 is moved downwardly, thus permitting the slide 79 to move freely. In the meantime, in the main tens transfer device, the transferring of tens has been continued up to the tenth digit wheel at which the

transfer operation is being completed by cooperation of the respective setting lever **26** with the correlated gear wheel **26'**, which has been moved into the arcuate path of movement of the lever **26** by the lever **23**, so that the special tens transfer wheel **32** to the right in Fig. 11, which as previously explained, is the wheel associated with this digit wheel, is rocked. By this rocking movement the correlated digit wheel **21** is moved from "0"-position to the position for exhibiting "9". At the same time, the control lever **77**, coupled to the tens transfer wheel **32** of the tenth digit, by engagement of the respective parts **76** and **43**, is moved in the same sense together with the slide **79**, that is to the right in Fig. 11, which movement can be shared by one or more auxiliary tens transfer wheels **32** that may be coupled to the lever **77**, for the purpose of transferring tens, to the effect that the respective wheels **32** are rocked to the extent of one digit. In this manner the tens transfer operation is continued over to the additional digit wheels "11" to "16" without interruption. Thus, also here similarly as in the preceding embodiment the special tens transfer wheel provides in conjunction with the parts **77—87** a coupling arrangement for the auxiliary tens transfer wheels.

On the completion of the individual feed motion of the control lever **77**, the link **83** of the adjustable parallelogram is moved back in the direction towards the slide **79** by the control lever **88** returning into the position as shown. During this movement the control lever **77** is swung downwardly by the conjointly moving supporting arm **82** bearing against the stop pin **85** on the lever **77**, thus moving its teeth **76** out of engagement with the tens transfer wheels **32**. Thereafter the slide **79** is again displaced to the left in Fig. 11, that is into its end position, as shown in this figure, by the subsequent periodically repeated vertical reciprocation of the setting lever **92** which thereby, as previously explained, cooperates with one of the studs **87** of the slide **79**.

At the proper time, the control lever **88** is again rocked at certain intervals in the direction of the arrow *d* in Fig. 11 in consequence of which the link **83** of the adjustable lever parallelogram is moved downwards again by action of the spring **86**, while at the same time the control lever **77** swings upwards. But so long as no tens feed operation is to be effected by means of the control lever **77**, this lever is not caused to interengage with any tens transfer wheel **32**, the lever merely striking at each upward swing the bottom of a normal tooth gap of less depth than the gaps **43** of the special tens transfer wheel **32** to the right in Fig. 11 with the correlated innermost tooth **76**. During the subsequent feed motion of the special tens transfer wheel **32**, caused by the lever **26**, and consequent displacement of the control lever **77** together with the slide **79**, none of the auxiliary tens transfer wheels correlated to the digit wheels "11" to "16" is actuated by this control lever, as the same has not entered into engagement with any of these tens transfer wheels by means of one of its teeth having all different lengths as required.

Only after further feed motions of said tens transfer wheel **32**, the control lever **77** enters into the gap **43** of the same, whereupon this lever is adapted to actuate the next following auxiliary tens transfer wheel **32** and for further auxiliary tens transfer wheels by engagement into the normal tooth gaps of these wheels or the gap **43** of the same respectively, so that the tens transfer operation is continued in accordance with requirements. The auxiliary tens transfer device is thus only rendered operative on the occurrence of simultaneous interengagement of the control lever **77** with the gap **43** of the special tens transfer wheel **32** associated with the tenth digit wheel and one or more auxiliary tens transfer wheels **32**. From there on the feed of the auxiliary tens transfer wheels **32** of a higher order is effected, by means of the control lever **77**, from the special tens transfer wheel **32** which is actuated by the main tens transfer device. Then the control lever **77** swings back into inoperative position in the manner hereinbefore described, during the link **83** of the adjustable lever parallelogram being returned into initial position by action of the back swing of the control lever **88**.

When the counting mechanism carriage is shifted, to the right in Fig. 11, out of initial position, during which movement the link **83** of the adjustable lever parallelogram slides on the control lever **88**, the tens transfer wheels **32**, which are then moved past the tenth, i. e. the highest setting unit of the main tens transfer device, must be brought out of the range of movement of the control lever **77**. This is effected by axially displacing the respective individual tens transfer wheel **32** on the appertaining square shaft **29** by means of the respective slide **35** by virtue of the flap of the latter riding up on the stationary cam rail **40** during the displacement of the counting mechanism carriage to the right, so that the slide is longitudinally displaced in its guide in accordance with requirements by influence of the tension spring **36**. Thereafter the control lever **77** operates on the right hand side, as regards Fig. 11, of the second, third and so forth tens transfer wheels, as these wheels are successively arriving at the tenth setting unit.

When the machine is set for addition instead of subtraction, the forward projection **101** of the end face of the reversing rail **100** cooperates with the setting lever **92**. Consequently, the right hand beveled end face of the setting lever **92**, when looking at Figure 11, is caused to cooperate with the studs **87** of the slide **79** during the periodical vertical reciprocation of the setting lever **92**, thereby shifting this lever temporarily from its previous left hand position to the right, the latter position being the normal position of the slide **79** for adding.

Whereas, in the position of the tens transfer wheels **32** for subtracting, as assumed in Fig. 11, the gaps **43** of the same are situated to the left from the vertical middle planes through the axes of the shafts **29**, these gaps **43** are positioned on the right hand side of the vertical middle planes through the axes of the shafts **29**, when the machine is set for adding. For the purpose of continuing the tens transfer operation beyond the tenth result indicating numeral, the control lever **77**, after having entered into engagement with any of the tens transfer wheels **32** by swinging upwardly, shifts from its right hand position to the left, whereupon the operations of the parts are similar to those as described in connection with subtraction.

While in the embodiment described immediately above with the highest result indicator digit wheel of the main tens transfer device a special tens transfer wheel **32** must be associated, the further embodiment described below dispenses with this special wheel. In this way, the highest main tens setting lever **26** of the machine is relieved and thus the continuous tens transfer op-

eration performed in a more gentle manner, as the setting of the auxiliary tens transfer wheels 32 is no longer effected by the main tens transfer device in a positive manner through the intermediary of the special tens transfer wheel or one of the auxiliary tens transfer wheels, depending on the relative disposition of the carriage and the machine frame, but rather in an indirect manner, as will be hereinafter explained.

To this end, a second setting lever 105 is provided, as will be seen in the Figs. 13 and 14, which has the office to carry out the conjoint displacements of the slide 79 and the control lever 77 in the opposite direction to the displacement to be effected by the setting lever 92, by this setting lever 105 also being caused to cooperate with the respective stud 87 of the slide 79. In order to enable to adjust the two spring pressed setting levers 92 and 105 into positions as required by the setting of the machine for subtraction or addition, the projection 101 on the reversing rail 100 merges on both sides with depressed end face portions, as shown in Fig. 13.

Depending on the respective position of adjustment of the reversing rail 100, the projection 101 cooperates with either one of the levers 92 and 105 while the other one bears against the respective depressed portion of the front end face, so that the two setting levers 92 and 105 are always set for opposite directions of movement as required. By action of the two alternately operating setting levers 92 and 105 which thus successively engage one and the same stud 87 of the slide 79 during the upward throws of their vertical reciprocating movements, the slide 79 and the control lever 77 together with it are moved to and fro in the longitudinal direction, as the two setting levers contact with the respective stud 87 on opposite sides thereof.

The feed motion of the auxiliary tens transfer wheels 32 is thus effected in a similar manner as explained in connection with the preceding embodiments of the invention, the control lever 77 being rocked back and forth by means of equivalent elements to those previously described. When it is assumed that the main tens transfer device operates in the same manner as described in the preceding embodiments up to the tenth digit wheel, the auxiliary tens transfer wheel of the present embodiment, which lies on the extreme right hand side in Fig. 13, is associated with the eleventh digit wheel.

In this case, the setting lever 92 is mounted on a slide 106 which is displaceably arranged on the machine frame by means of slots 107 and guide pins engaging the latter. To this slide 106, the forked end of a two armed control lever 108 is coupled which is mounted on a bolt 109 and provided with a roller 110 for cooperation with a cam disc 111. By a tension spring, not shown, the roller 110 of the control lever 108 is maintained in peripheral contact with the cam disc 111 secured on the main shaft 16 of the machine, the lever 92 thus being periodically moved to and fro in the vertical direction as required, in order to be adapted to reset the slide 79 into inoperative position when necessary.

The additional setting lever 105 is mounted on a slide 112 which is guided by means of slots 113 by corresponding studs on the machine frame so as to be displaceable on the latter. To the slide 112, the forked end of one arm of a two armed lever 114 also mounted on the bolt 109 is connected, the other arm of which is provided with a slot 115 for receiving a pin 116 fastened to a connecting rod 117 (Fig. 15). This connecting rod is coupled in turn to the lever 23 serving for effecting preparatory operations for the tens transfer at the highest setting unit of the main tens transfer device (Fig. 14). On the other hand, the pin 116 of the connecting rod 117 projects into an aperture 118 of a control lever 119 which is also mounted on the stationary bolt 109 and which cooperates by means of a roller 120 with a cam disc 121 carried by the main shaft 16. This roller 120 is maintained in bearing engagement with said cam disc by spring action exerted on the control lever 119 by a tension spring not shown, in a known manner.

Thus, when the lever 23 at the highest setting unit of the main tens transfer device is rocked, for the purpose of carrying out a preparatory operation for the tens transfer, the connecting rod 117 is so shifted that the pin 116 thereof is displaced in the slot 115 of the lever 114 to enter a narrowed portion 118' of the aperture 118 in the control lever 119 (Fig. 15). In this figure, for the sake of clearness the parts 114, 117 and 119 are shown in an exploded fashion.

By the pin 116 entering into the portion 118', the control lever 119 is coupled to the lever 114 in such a manner that the latter is adapted to reciprocate in unison with the control lever 119, so that the setting lever 105 is also reciprocated in the vertical direction for resetting the slide 79 into inoperative position. This operation takes place after the control lever 77 has been rocked towards the auxiliary tens transfer wheels 32 for coupling engagement with the same, whereupon the tens transfer operation is effected. The rocking movement of the control lever 77 is carried into effect by moving the link 83 of the adjustable lever parallelogram downwards similarly as described in connection with the first embodiment of the invention.

As long as the lever 23 correlated to the highest setting unit of the main tens transfer device remains in the inoperative position, as not being required for assisting in the calculating operation, no tens transfer operation being necessitated at the respective result indicating numeral viewing aperture, the pin 116 of the connecting rod 117 is situated in the wider portion of the aperture 118. With this disposition, the swinging movement of the control lever 119 is not transmitted to the lever 114 coupled to the connecting rod 117. Thus the control lever 105 remains inoperative also and consequently the slide 79 together with it, so that the control lever 77 merely performs a swinging motion in accordance with the control lever 83, but is kept from shifting longitudinally.

We do not limit ourselves to the particular size, shape, number or arrangement of parts as shown and described, all of which may be varied without going beyond the scope of our invention as shown, described and claimed.

What we claim is:

1. In a calculating machine, in combination, a machine frame, a counting mechanism carriage displaceably arranged on said frame and projecting in the initial position beyond one side thereof, a set of result indicator digit wheels mounted in said carriage and comprising a main wheel group beginning with the lowest and ending with any desired intermediate result indicating numeral and an additional wheel group beginning with the next higher to said intermediate and ending with the highest result indicating numeral, a main tens transfer device arranged in

said frame, setting units provided in said main tens transfer device in the number of said main digit wheels, a series of auxiliary tens transfer wheels provided on said carriage for said additional wheel group, coupling means mounted on said carriage, a special tens transfer wheel comprised by said coupling means and adapted for actuating said auxiliary tens transfer wheels in the initial position of said carriage by conjoint movement with said wheels in accordance with the highest digit wheel setting unit, a feed member provided in said coupling means for said special and each of said auxiliary tens transfer wheels, cam means situated on said machine frame so as to clear said special tens transfer wheel in the initial position of said carriage, adjusting means on said carriage for said special and said auxiliary tens transfer wheels for shifting these wheels axially into inoperative position by engagement with said cam means, and control means mounted on said machine frame for temporarily adjusting said coupling means for coupling certain tens transfer wheels occupying their operative positions to the mating feed members for connecting these tens transfer wheels with said highest setting unit in dependency on requirements of calculation and irrespective of the displacements of said carriage, for mechanically continuing the transferring of tens up to the highest result indicating numeral by influence of said main tens transfer device.

2. In a calculating machine, in combination, a machine frame, a counting mechanism carriage displaceably arranged on said frame and projecting in the initial position beyond one side thereof, a set of result indicator digit wheels mounted in said carriage and comprising a main wheel group beginning with the lowest and ending with any desired intermediate result indicating numeral and an additional wheel group beginning with the next higher to said intermediate and ending with the highest result indicating numeral, a main tens transfer device arranged in said frame, setting units provided in said main tens transfer device in the number of said main digit wheels, a series of auxiliary tens transfer wheels provided on said carriage for said additional wheel group, coupling means mounted on said carriage, a special tens transfer wheel comprised by said coupling means and adapted for actuating said auxiliary tens transfer wheels in the initial position of said carriage by conjoint movement with said wheels in accordance with the highest digit wheel setting unit, a feed member provided in said coupling means for said special and each of said auxiliary tens transfer wheels, a cam rail fixed on the machine frame opposite said carriage to extend substantially in the direction from said highest setting unit towards lower setting units, adjusting slides on said carriage for said special and said auxiliary tens transfer wheels each carrying one of said wheels and adapted to cooperate with said cam rail, for shifting said wheels individually into inoperative position by engagement with said stop rail, and control means mounted on said machine frame for temporarily adjusting said coupling means for coupling certain tens transfer wheels occupying their operative positions to the mating feed members for connecting these tens transfer wheels with said highest setting unit in dependency on requirements of calculation and irrespective of the displacements of said carriage, for mechanically continuing the transferring of tens up to the highest result indicating numeral by influence of said main tens transfer device.

3. In a calculating machine, in combination, a machine frame, a counting mechanism carriage displaceably arranged on said frame and projecting in the initial position beyond one side thereof, a set of result indicator digit wheels mounted in said carriage and comprising a main wheel group beginning with the lowest and ending with any desired intermediate result indicating numeral and an additional wheel group beginning with the next higher to said intermediate and ending with the highest result indicating numeral, a main tens transfer device arranged in said frame, setting units provided in said main tens transfer device in the number of said main digit wheels, a series of auxiliary tens transfer wheels provided on said carriage for said additional wheel group, coupling means mounted on said carriage, a special tens transfer wheel comprised by said coupling means and adapted for actuating said auxiliary tens transfer wheels in the initial position of said carriage by conjoint movement with said wheels in accordance with the highest digit wheel setting unit, a feed member provided in said coupling means for said special and each of said auxiliary tens transfer wheels, a cam rail fixed on the machine frame opposite said carriage to extend substantially in the direction from said highest setting unit towards lower setting units, spring pressed adjusting slides on said carriage for said special and said auxiliary tens transfer wheels each carrying one of said wheels and adapted to cooperate with said cam rail for shifting said wheels individually into inoperative position by engagement with said stop rail, a driving element on each slide for engagement with an annular groove in the respective tens transfer wheel, and control means mounted on said machine frame for temporarily adjusting said coupling means for coupling certain tens transfer wheels occupying their operative positions to the mating feed members for connecting these tens transfer wheels with said highest setting unit in dependency on requirements of calculation and irrespective of the displacements of said carriage, for mechanically continuing the transferring of tens up to the highest result indicating numeral by influence of said main tens transfer device.

4. In a calculating machine, in combination, a machine frame, a counting mechanism carriage displaceably arranged on said frame and projecting in the initial position beyond one side thereof, a set of result indicator digit wheels mounted in said carriage and comprising a main wheel group beginning with the lowest and ending with any desired intermediate result indicating numeral and an additional wheel group beginning with the next higher to said intermediate and ending with the highest result indicating numeral, a main tens transfer device arranged in said frame, setting units provided in said main tens transfer device in the number of said main digit wheels, a series of auxiliary tens transfer wheels provided on said carriage for said additional wheel group, coupling means mounted on said carriage, a special tens transfer wheel comprised by said coupling means and adapted for actuating said auxiliary tens transfer wheels in the initial position of said carriage by conjoint movement with said wheels in accordance with the highest digit wheel setting unit, a feed member provided in said coupling means for said special and each of said auxiliary tens transfer

wheels, a common displaceable mounting shaft for said feed members, means for periodically reciprocating said feed members relatively to said tens transfer wheels, control means mounted on said machine frame for displacing said mounting shaft longitudinally of said tens transfer wheels together with said feed members in position for engagement with said wheels, and means for moving said feed members into engagement with certain tens transfer wheels, for connecting these tens transfer wheels with said highest setting unit in dependency on requirements of calculation and irrespective of the displacements of said carriage, for mechanically continuing the transferring of tens up to the highest result indicating numeral and simultaneously resetting said mounting shaft into initial position by influence of said main tens transfer device.

5. In a calculating machine, in combination, a machine frame, a counting mechanism carriage displaceably arranged on said frame and projecting in the initial position beyond one side thereof, a set of result indicator digit wheels mounted in said carriage and comprising a main wheel group beginning with the lowest and ending with any desired intermediate result indicating numeral and an additional wheel group beginning with the next higher to said intermediate and ending with the highest result indicating numeral, a main tens transfer device arranged in said frame, setting units provided in said main tens transfer device in the number of said main digit wheels, a series of auxiliary tens transfer wheels provided on said carriage for said additional wheel group, coupling means mounted on said carriage, a special tens transfer wheel comprised by said coupling means and adapted for actuating said auxiliary tens transfer wheels in the initial position of said carriage by conjoint movement with said wheels in accordance with the highest digit wheel setting unit, a feed member provided in said coupling means for said special and each of said auxiliary tens transfer wheels, a common displaceable mounting shaft for said feed members, a setting member connected to said mounting shaft, setting elements on said setting member spaced in accordance with the positions of engagement of said feed members with said tens transfer wheels, means for periodically reciprocating said feed members relatively to said tens transfer wheels, periodically reciprocating control means arranged on said machine frame for cooperation with said setting elements for displacing said mounting shaft longitudinally of said tens transfer wheels together with said feed members in position for engagement with said wheels, and means for moving said feed members into engagement with certain tens transfer wheels, for connecting these tens transfer wheels with said highest setting unit in dependency on requirements of calculation and irrespective of the displacements of said carriage, for mechanically continuing the transferring of tens up to the highest result indicating numeral and simultaneously resetting said mounting shaft into initial position by influence of said main tens transfer device.

6. In a calculating machine, in combination, a machine frame, a counting mechanism carriage displaceably arranged on said frame and projecting in the initial position beyond one side thereof, a set of result indicator digit wheels mounted in said carriage and comprising a main wheel group beginning with the lowest and ending with any desired intermediate result indicating numeral and an additional wheel group beginning with the next higher to said intermediate and ending with the highest result indicating numeral, a main tens transfer device arranged in said frame, setting units provided in said main tens transfer device in the number of said main digit wheels, a series of auxiliary tens transfer wheels provided on said carriage for said additional wheel group, coupling means mounted on said carriage, a special tens transfer wheel comprised by said coupling means and adapted for actuating said auxiliary tens transfer wheels in the initial position of said carriage by conjoint movement with said wheels in accordance with the highest digit wheel setting unit, a feed member provided in said coupling means for said special and each of said auxiliary tens transfer wheels, a common displaceable mounting shaft for said feed members, a setting member connected to said mounting shaft, setting elements on said setting member spaced in accordance with the positions of engagement of said feed members with said tens transfer wheels, means for periodically reciprocating said feed members relatively to said tens transfer wheels, periodically reciprocating control means arranged on said machine frame for cooperation with said setting elements, a forked arm of said control means provided with two recessed cam portions for respective cooperation with said setting elements for displacing said mounting shaft in either direction longitudinally of said tens transfer wheels together with said feed members in position for engagement with said wheels, depending whether the machine is set for adding or subtracting and means for moving said feed members into engagement with certain tens transfer wheels, for connecting these tens transfer wheels with said highest setting unit in dependency on requirements of calculation and irrespective of the displacements of said carriage, for mechanically continuing the transferring of tens up to the highest result indicating numeral and simultaneously resetting said mounting shaft into initial position by influence of said main tens transfer device.

7. In a calculating machine, in combination, a machine frame, a counting mechanism carriage displaceably arranged on said frame and projecting in the initial position beyond one side thereof, a set of result indicator digit wheels mounted in said carriage and comprising a main wheel group beginning with the lowest and ending with any desired intermediate result indicating numeral and an additional wheel group beginning with the next higher to said intermediate and ending with the highest result indicating numeral, a main tens transfer device arranged in said frame, setting units provided in said main tens transfer device in the number of said main digit wheels, a series of auxiliary tens transfer wheels provided on said carriage for said additional wheel group, coupling means mounted on said carriage, a special tens transfer wheel comprised by said coupling means and adapted for actuating said auxiliary tens transfer wheels in the initial position of said carriage by conjoint movement with said wheels in accordance with the highest digit wheel setting unit, a feed member provided in said coupling means for said special and each of said auxiliary tens transfer wheels, a common displaceable mounting shaft for said feed members, a stirrup-shaped setting member connected to said mounting shaft with

its yoke extending longitudinally thereof, setting elements on said yoke of said stirrup opposite said mounting shaft and spaced in accordance with the position of engagement of said feed members with said tens transfer wheels, means for periodically reciprocating said feed members relatively to said tens transfer wheels, periodically reciprocating control means arranged on said machine frame for cooperation with said setting elements for displacing said mounting shaft longitudinally of said tens transfer wheels together with said feed members in position for engagement with said wheels, and means for moving said feed members into engagement with certain tens transfer wheels, for connecting these tens transfer wheels with said highest setting unit in dependency on requirements of calculation and irrespective of the displacements of said carriage, for mechanically continuing the transferring of tens up to the highest result indicating numeral and simultaneously resetting said mounting shaft into initial position by influence of said main tens transfer device.

8. In a calculating machine, in combination, a machine frame, a drive shaft rotatably mounted in said frame, a counting mechanism carriage displaceably arranged on said frame and projecting in the initial position beyond one side thereof, a set of result indicator digit wheels mounted in said carriage and comprising a main wheel group beginning with the lowest and ending with any desired intermediate result indicating numeral and an additional wheel group beginning with the next higher to said intermediate and ending with the highest result indicating numeral, a main tens transfer device arranged in said frame, setting units provided in said main tens transfer device in the number of said main digit wheels, a series of auxiliary tens transfer wheels provided on said carriage for said additional wheel group, coupling means mounted on said carriage, a special tens transfer wheel comprised by said coupling means and adapted for actuating said auxiliary tens transfer wheels in the initial position of said carriage by conjoint movement with said wheels in accordance with the highest digit wheel setting unit, a feed disc combined with said special tens transfer wheel and each of said auxiliary tens transfer wheels for common rotation therewith and provided with an actuating recess, a feed member provided in said coupling means for said special and each of said auxiliary tens transfer wheels, said feed members being mounted with their actuating portions in gradually stepped up relation, means for periodically reciprocating said feed members relatively to said tens transfer wheels from said drive shaft for successive engagement of their gradually stepped up actuating portions in the respective actuating recesses of said feed discs, and control means mounted on said machine frame for temporarily adjusting said coupling means for connecting certain tens transfer wheels with said highest setting unit by engagement of said actuating portions with said actuating recesses in dependency on requirements of calculation and irrespective of the displacements of said carriage, for mechanically continuing the transferring of tens up to the highest result indicating numeral by influence of said main tens transfer device.

9. In a calculating machine, in combination, a machine frame, a drive shaft rotatably mounted in said frame, a counting mechanism carriage displaceably arranged on said frame and projecting in the initial position beyond one side thereof, a set of result indicator digit wheels mounted in said carriage and comprising a main wheel group beginning with the lowest and ending with any desired intermediate result indicating numeral and an additional wheel group beginning with the next higher to said intermediate and ending with the highest result indicating numeral, a main tens transfer device arranged in said frame, setting units provided in said main tens transfer device in the number of said main digit wheels, a series of auxiliary tens transfer wheels provided on said carriage for said additional wheel group, coupling means mounted on said carriage, a special tens transfer wheel comprised by said coupling means and adapted for actuating said auxiliary tens transfer wheels in the initial position of said carriage by conjoint movement with said wheels in accordance with the highest digit wheel setting unit, a feed disc combined with said special tens transfer wheel and each of said auxiliary tens transfer wheels for common rotation therewith and provided with an actuating recess, a feed member provided in said coupling means for said special and each of said auxiliary tens transfer wheels, said feed members being mounted with their actuating portions in gradually stepped up relation, spring means for urging said feed members towards said tens transfer wheels, for successive engagement of their gradually stepped up actuating portions in the respective actuating recesses of said feed discs, an abutment common to said feed members for imparting a back swing to the same against the action of said spring by virtue of said drive shaft, and control means mounted on said machine frame for temporarily adjusting said coupling means, for connecting certain tens transfer wheels with said highest setting unit by engagement of said actuating portions with said actuating recesses in dependency on requirements of calculation and irrespective of the displacements of said carriage, for mechanically continuing the transferring of tens up to the highest result indicating numeral by influence of said main tens transfer device.

10. In a calculating machine, in combination, a machine frame, a drive shaft rotatably mounted in said frame, a counting mechanism carriage displaceably arranged on said frame and projecting in the initial position beyond one side thereof, a set of result indicator digit wheels mounted in said carriage and comprising a main wheel group beginning with the lowest and ending with any desired intermediate result indicating numeral and an additional wheel group beginning with the next higher to said intermediate and ending with the highest result indicating numeral, a main tens transfer device arranged in said frame, setting units provided in said main tens transfer device in the number of said main digit wheels, a series of auxiliary tens transfer wheels provided on said carriage for said additional wheel group, coupling means mounted on said carriage, a special tens transfer wheel comprised by said coupling means and adapted for actuating said auxiliary tens transfer wheels in the initial position of said carriage by conjoint movement with said wheels in accordance with the highest digit wheel setting unit, a feed disc combined with said special tens transfer wheel and each of said auxiliary tens transfer wheels for common rotation therewith and provided with an actuating recess, a feed member provided in said coupling means for said special

and each of said auxiliary tens transfer wheels, said feed members being mounted with their actuating portions in gradually stepped up relation, spring means for urging said feed members towards said tens transfer wheels, for successive engagement of their gradually stepped up actuating portions in the respective actuating recesses of said feed discs, an abutment common to said feed members for imparting a back swing to the same against the action of said spring by virtue of said drive shaft, means for reciprocating said abutment in timed relation with said drive shaft for influencing the relative positions of said actuating portions and said tens transfer wheels, and control means mounted on said machine frame for temporarily adjusting said coupling means, for connecting certain tens transfer wheels with said highest setting unit by engagement of said actuating portions with said actuating recesses in dependency on requirements of calculation and irrespective of the displacements of said carriage, for mechanically continuing the transferring of tens up to the highest result indicating numeral by influence of said main tens transfer device.

11. In a calculating machine, in combination, a machine frame, a counting mechanism carriage displaceably arranged on said frame and projecting in the initial position beyond one side thereof, a set of result indicator digit wheels mounted in said carriage and comprising a main wheel group beginning with the lowest and ending with any desired intermediate result indicating numeral and an additional wheel group beginning with the next higher to said intermediate and ending with the highest result indicating numeral, a main tens transfer device arranged in said frame, setting units provided in said main tens transfer device in the number of said main digit wheels, a series of auxiliary tens transfer wheels provided on said carriage for said additional wheel group, a swingable control lever operatively associated with said auxiliary tens transfer wheels for coupling said lever to said wheels during swinging in one direction and adapted for conjoint movement with said wheels for setting said wheels, mounting means for said swingable control lever provided on said carriage adapting said lever for longitudinal displacement relatively to said auxiliary tens transfer wheels, and control means mounted on said machine frame for temporarily adjusting said swingable control lever for connecting certain auxiliary tens transfer wheels with said highest setting unit in dependency on requirements of calculation and irrespective of the displacements of said carriage, for mechanically continuing the transferring of tens up to the highest result indicating numeral, by displacement of said swingable control lever by influence of said main tens transfer device.

12. In a calculating machine, in combination, a machine frame, a counting mechanism carriage displaceably arranged on said frame and projecting in the initial position beyond one side thereof, a set of result indicator digit wheels mounted in said carriage and comprising a main wheel group beginning with the lowest and ending with any desired intermediate result indicating numeral and an additional wheel group beginning with the next higher to said intermediate and ending with the highest result indicating numeral, a main tens transfer device arranged in said frame, setting units provided in said main tens transfer device in the number of said main digit wheels, a series of auxiliary tens transfer wheels provided on said carriage for said additional wheel group, a special tens transfer wheel correlated to the highest main digit wheel setting unit for setting said auxiliary tens transfer wheels in the initial position of said carriage, said special and each of said auxiliary tens transfer wheels having an actuating recess, a swingable control lever operatively associated with said special and said auxiliary tens transfer wheels for coupling said lever to said wheels during swinging in one direction and adapted for conjoint setting movement with said wheels, actuating teeth provided on said swingable control lever for engagement with said actuating recesses in said tens transfer wheels, mounting means for said swingable control lever provided on said carriage adapting said lever for longitudinal displacement relatively to said tens transfer wheels, and control means mounted on said machine frame for temporarily adjusting said swingable control lever for connecting certain tens transfer wheels with said highest setting unit in dependency on requirements of calculation and irrespective of the displacements of said carriage, for mechanically continuing the transferring of tens up to the highest result indicating numeral, by displacement of said swingable control lever by influence of said main tens transfer device while the corresponding actuating teeth and recesses engage.

13. In a calculating machine, in combination, a machine frame, a counting mechanism carriage displaceably arranged on said frame and projecting in the initial position beyond one side thereof, a set of result indicator digit wheels mounted in said carriage and comprising a main wheel group beginning with the lowest and ending with any desired intermediate result indicating numeral and an additional wheel group beginning with the next higher to said intermediate and ending with the highest result indicating numeral, a main tens transfer device arranged in said frame, setting units provided in said main tens transfer device in the number of said main digit wheels, a series of auxiliary tens transfer wheels provided on said carriage for said additional wheel group, a special tens transfer wheel correlated to the highest main digit wheel setting unit for setting said auxiliary tens transfer wheels in the initial position of said carriage, a swingable control lever operatively associated with said special and said auxiliary tens transfer wheels for coupling said lever to said wheels during swinging in one direction and adapted for conjoint setting movement with said wheels, mounting means for said swingable control lever provided on said carriage adapting said lever for longitudinal displacement relatively to said tens transfer wheels, spring means for retracting said swingable control lever from said tens transfer wheels, an adjustable lever parallelogram associated with said swingable control lever, a control link in said lever parallelogram operatively connected with said swingable control lever, an operating lever mounted on said machine frame and contacting with said control link, and control means arranged on said machine frame and adapted for temporarily adjusting said swingable control lever for connecting certain tens transfer wheels with said highest setting unit in dependency on requirements of calculation and irrespective of the displacements of said carriage, for mechanically continuing the transferring of tens up to the highest result indicating numeral by displacement of said swingable control lever by influence of said main tens transfer device

while said control link slides across said operating lever.

14. In a calculating machine, in combination, a machine frame, a counting mechanism carriage displaceably arranged on said frame and projecting in the initial position beyond one side thereof, a set of result indicator digit wheels mounted in said carriage and comprising a main wheel group beginning with the lowest and ending with any desired intermediate result indicating numeral and an additional wheel group beginning with the next higher to said intermediate and ending with the highest result indicating numeral, a main tens transfer device arranged in said frame, setting units provided in said main tens transfer device in the number of said main digit wheels, a series of auxiliary tens transfer wheels provided on said carriage for said additional wheel group, a special tens transfer wheel correlated to the highest main digit wheel setting unit for setting said auxiliary tens transfer wheels in the initial position of said carriage, a swingable control lever operatively associated with said special and said auxiliary tens transfer wheels for coupling said lever to said wheels during swinging in one direction and adapted for conjoint setting movement with said wheels, a stop member on said swingable control lever, mounting means for said swingable control lever on said carriage adapting said lever for longitudinal displacement relatively to said tens transfer wheels, spring means for retracting said swingable control lever from said tens transfer wheels, an adjustable lever parallelogram associated with said swingable control lever, a control link in said lever parallelogram for said swingable control lever, a supporting link in said lever parallelogram for said control link cooperating with said stop member on said spring influenced swingable control lever, an operating lever mounted on said machine frame and contacting with said control link, and control means arranged on said machine frame and adapted for temporarily adjusting said swingable control lever for connecting certain tens transfer wheels with said highest setting unit in dependency on requirements of calculation and irrespective of the displacements of said carriage, for mechanically continuing the transferring of tens up to the highest result indicating numeral by displacement of said swingable control lever by influence of said main tens transfer device while said control link slides across said operating lever.

15. In a calculating machine, in combination, a machine frame, a counting mechanism carriage displaceably arranged on said frame and projecting in the initial position beyond one side thereof, a set of result indicator digit wheels mounted in said carriage and comprising a main wheel group beginning with the lowest and ending with any desired intermediate result indicating numeral and an additional wheel group beginning with the next higher to said intermediate and ending with the highest result indicating numeral, a main tens transfer device arranged in said frame, setting units provided in said main tens transfer device in the number of said main digit wheels, a series of auxiliary tens transfer wheels provided on said carriage for said additional wheel group, a special tens transfer wheel correlated to the highest main digit wheel setting unit for setting said auxiliary tens transfer wheels in the initial position of said carriage, a swingable control lever operatively associated with said special and said auxiliary tens transfer wheels for coupling said lever to said wheels during swinging in one direction and adapted for conjoint setting movement with said wheels, a mounting slide for said swingable control lever provided on said carriage adapting said lever for longitudinal displacement relatively to said tens transfer wheels, and control means arranged on said machine frame for temporarily adjusting said swingable control lever for connecting certain tens transfer wheels with said highest setting unit in dependency on requirements of calculation and irrespective of the displacements of said carriage, for mechanically continuing the transferring of tens up to the highest result indicating numeral by displacement of said swingable control lever by influence of said main tens transfer device.

16. In a calculating machine, in combination, a machine frame, a counting mechanism carriage displaceably arranged on said frame and projecting in the initial position beyond one side thereof, a set of result indicator digit wheels mounted in said carriage and comprising a main wheel group beginning with the lowest and ending with any desired intermediate result indicating numeral and an additional wheel group beginning with the next higher to said intermediate and ending with the highest result indicating numeral, a main tens transfer device arranged in said frame, setting units provided in said main tens transfer device in the number of said main digit wheels, a series of auxiliary tens transfer wheels provided on said carriage for said additional wheel group, a special tens transfer wheel correlated to the highest main digit wheel setting unit for setting said auxiliary tens transfer wheels in the initial position of said carriage, a swingable control lever operatively associated with said special and said auxiliary tens transfer wheels for coupling said lever to said wheels during swinging in one direction and adapted for conjoint setting movement with said wheels, a mounting slide for said swingable control lever provided on said carriage adapting said lever for longitudinal displacement relatively to said tens transfer wheels, feed control studs provided on said mounting slide, and a setting lever arranged on said machine frame and adapted for periodically cooperating with one of said feed control studs at a time for adjusting said mounting slide together with said swingable control lever in either direction relatively to said tens transfer wheels depending whether adding or subtracting is required, for connecting certain tens transfer wheels with said highest setting unit in dependency on requirements of calculation and irrespective of the displacements of said carriage, for mechanically continuing the transferring of tens up to the highest result indicating numeral by displacement of said swingable control lever by influence of said main tens transfer device.

17. In a calculating machine, in combination, a machine frame, a counting mechanism carriage displaceably arranged on said frame and projecting in the initial position beyond one side thereof, a set of result indicator digit wheels mounted in said carriage and comprising a main wheel group beginning with the lowest and ending with any desired intermediate result indicating numeral and an additional wheel group beginning with the next higher to said intermediate and ending with the highest result indicating numeral, a main tens transfer device arranged in said frame, setting units provided in said main tens transfer device in the number of said main digit wheels, a series of auxiliary tens transfer wheels provided

number of said main digit wheels, a series of auxiliary tens transfer wheels provided along said initially projecting length portion of said carriage for said additional wheel group, coupling means mounted on said carriage for common displacement therewith relative to said frame, a special tens transfer wheel comprised by said coupling means and adapted for actuating said auxiliary tens transfer wheels in the initial position of said carriage by conjoint movement with said wheels in accordance with the highest main digit wheel setting unit, and control means mounted on said machine frame for temporarily adjusting said coupling means for connecting certain auxiliary tens transfer wheels with said highest setting unit in dependency on requirements of calculation and irrespective of the displacements of said carriage, for mechanically continuing the transferring of tens up to the highest result indicating numeral by influence of said main tens transfer device.

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