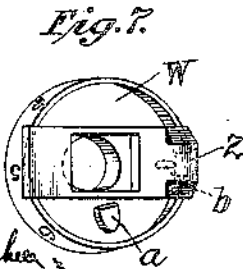
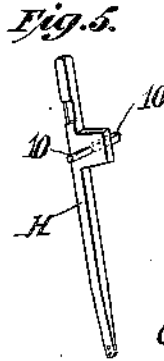
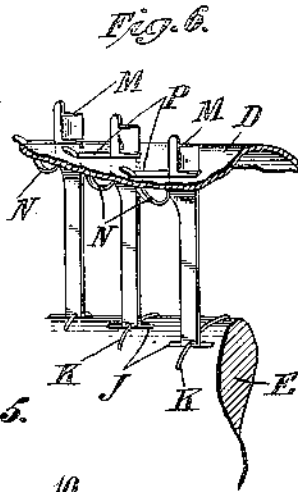
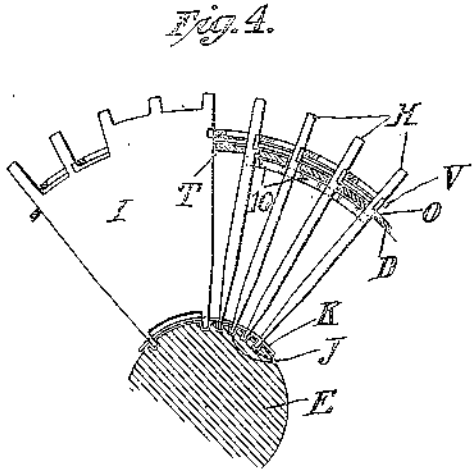
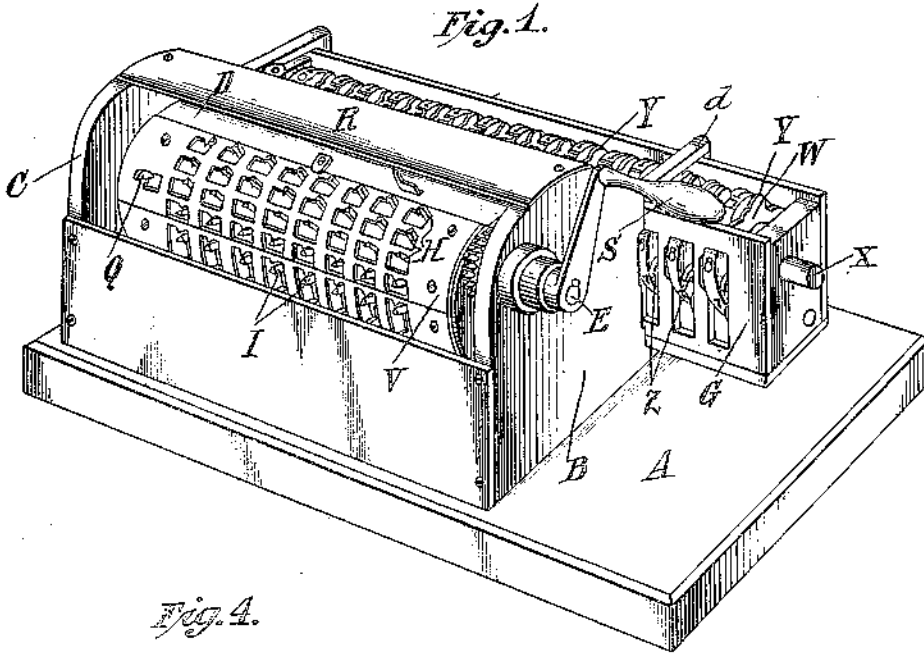


D. YADU.
 AUTOMATIC ABACUS.
 APPLICATION FILED FEB. 11, 1911.

1,029,655.

Patented June 18, 1912.

2 SHEETS-SHEET 1.



Attest:
E. O. Mitchel
 Louis Armour

by

Inventor:
 Doichi Yadu
Doichi Yadu
 Atty

UNITED STATES PATENT OFFICE.

DOICHI YADU, OF SUDAMURA, JAPAN.

AUTOMATIC ABACUS.

1,029,655.

Specification of Letters Patent.

Patented June 18, 1912.

Application filed February 11, 1911. Serial No. 608,152.

To all whom it may concern:

Be it known that I, DOICHI YADU, subject of the Emperor of Japan, residing at 434 Shōe, Sudamura, county of Chikujyo, 5 Fukuoka-ken, Japan, have invented certain new and useful Improvements in Automatic Abaci, of which the following is a specification.

The invention relates to a calculation machine, and more particularly to a type thereof adapted to register the results without recording same.

The main object of the invention is to provide a machine of this character which 15 may be used to add, subtract, multiply and divide.

A further object is to provide a machine wherein the indicating keys may be set in any desired manner so as to cause the desired actuation of the registering wheels, means being provided whereby when the machine is used for addition and subtraction, said indicating keys will be restored to normal after each actuation of the registering wheels, and whereby when the device 25 is used for multiplication or division said keys will be held against restoration to normal until the calculation has been completed.

A still further object is to provide a machine of this character wherein the indicating keys will be so arranged and may be so actuated as to permit said keys to be conveniently set in groups so as to facilitate 35 such setting thereof, while at the same time permitting the manual restoration to normal of any key or group of keys to correct any inaccuracy in the numbers indicated thereby.

A still further object is to provide in connection with a machine of this character a simple carrying or transfer mechanism whereby the total is carried from one wheel to an adjoining wheel of a higher denomination. 45

A still further object is to provide a carrying or transfer mechanism which will be operated to actuate the registering wheels in either direction, to adapt the machine to 50 both addition and subtraction, or multiplication and division.

A still further object is to provide a simple mechanism whereby the machine may be so adjusted as to adapt it for use in 55 multiplication or division, in which connections it is necessary to shift all the reg-

istering wheels in order to vary the order of the registering mechanism in relation to the ordinals of the multiplier or the divisor.

A still further object is to provide registering means whereby the proper relation 60 of the mechanism and the actuating means therefor may be established and maintained during the actuation of the indicating keys. And a still further object is to provide simple means whereby the registering mechanism 65 may be restored to normal.

The invention consists in the novel features of construction and combination of parts hereinafter set forth and described, 70 and more particularly pointed out in the claims hereto appended.

Referring to the drawings:—Figure 1 is a perspective view of a front elevation of the machine with a portion thereof removed; Fig. 2 is a similar view of the rear 75 of the machine with the registering mechanism removed; Fig. 3 is a sectional enlarged view in detail of the stop plate carried by the cylinder or drum and the restoring spring therefor; Fig. 4 is a detail view of one set of indicating keys; Fig. 5 is a detail 80 view of one of the single indicating keys; Fig. 6 is a detail view of several of the carrying or transfer keys; Fig. 7 is a detail view of one of the registering wheels; and 85 Fig. 8 is a detail view of the mechanism by means of which the machine may be set for multiplication or division.

Like letters refer to like parts throughout 90 the several views.

In the embodiment of my invention shown in the drawings, A indicates the base of the machine, and B C parallel frames supporting the actuating mechanism of the device. 95 Mounted in these frames is a shaft E having end plates carrying a cylindrical drum D, the shaft E and drum D being adapted to be rotated by the crank handle S which is geared thereto in any desired manner. 100 Slidably mounted upon one side of the frames B C is a box frame G carrying the registering mechanism which will be more particularly hereinafter described.

Extending circumferentially about one 105 side of the drum D is a series of slots in each of which is mounted a set or bank of keys H I, each set or bank comprising nine keys, the keys H being single, independently movable keys, and the keys I being all included 110 in a single group of five keys, movable together. The bases of these keys H I are

seated in the recesses J in the shaft E and are pivotally connected, so as to be capable of oscillatory movement longitudinally of said shaft, by the hinge rod K. The keys H are single in order that one or more of them may be deflected independently of the others so as to permit any number from 1 to 9 to be indicated upon each set or bank of said keys. To facilitate the grouping of the keys from 1 to 4, and from 6 to 9, the lowermost key H is capable of movement toward the left of the machine independently of the key next above same; but each key above another in the group H is so constructed as to impart to every key H below it movement therewith. This result is accomplished by means of the pins 10 carried by each key H, the two intermediate keys being provided with pins extending on opposite sides thereof as shown more particularly in Fig. 5, the end keys being provided merely with pins extending toward the intermediate keys as shown in Fig. 4. The pins 10 overlap each other so as to secure the result above referred to.

Mounted upon the drum D adjacent to the keys H and I is a restoring plate T, which has reciprocatory movement longitudinally of the said drum, and is provided with slots through which the keys project. Carried by said plate is a stud Q adapted to engage a cam surface upon the frame of the machine for the purpose of restoring all keys to normal upon the completion of one rotation of said drum, or one actuation of the registering wheels. Inclosing said plate T is a keeper plate V having a sequence of openings therein as shown more particularly in Figs. 1 and 4, and retaining means, as the tongues shown, for holding any key in the set position. The tops of the keys H I project beyond the plate V to an extent to bring them into engagement with the star wheels of the several registering wheels in a manner which will be hereinafter more fully referred to.

Mounted in the box G is a shaft X having rotatively mounted thereon a series of registering wheels W having the digits from 0 to 9 thereon in sequence, each said wheel being provided with a star wheel Y projecting into the line of movement of its set of indicating keys H I when said keys are deflected to the left of the machine. Upon that side of each wheel W, opposite to the side carrying the said star wheels, the box frame g has slidably mounted therein an order-changing slide Z having thereon an abutment b adapted to be engaged by a tappet a carried by its wheel W. Hence with each revolution of a wheel W, its slide Z will be projected toward the cylinder D and so position it as to permit it to operate the means for carrying from one wheel to the wheel next higher in denomination.

To accomplish the carrying movement above referred to, I mount upon the drum D a series of order-changing keys M, the lower ends of which are pivotally mounted in the shaft E so as to permit an oscillatory movement thereof longitudinally of the drum D. Each said key has movement in a slot P in said drum D, and the outer ends of each key M project beyond said drum in a manner to permit one portion thereof to engage the slide Z of one registering wheel, when said slide has been projected by the tappet a, and another portion thereof to engage the star wheel of the registering wheel of next higher denomination when the key is deflected by said slide. Each said order-changing key M is normally held in the inoperative relation, and is adapted to be restored to this position after its actuation, by the spring N. The order-changing keys M in order to permit the consecutive transfers from one wheel to another of higher denomination, are arranged spirally about the cylinder or drum D and upon that side thereof opposite to the side occupied by the indicating keys H I.

To adapt the device to either addition and multiplication, or subtraction and division, I provide two series of such order-changing keys, the relation of each series being such that it will operate upon the registering wheels immediately following the actuation thereof by the indicating keys H I. Adjacent to each set of order-changing keys M is a cam rib 1, of a height adapted to engage any one of the transfer slides Z, when it is projected in the manner above referred to, and restore it to its normal position. These cam ribs have a spiral trend following that of the order-changing keys.

In order to insure the transfer in sequence from a lower to a higher order of registering wheels, the pitch of each set of order-changing keys M and of each restoring cam 1 is opposite to that of the other.

In order to adapt the machine for use in multiplication and division, as well as subtraction, the stud Q is mounted in an elongated slot in the keeper plate V so that said stud may be brought out of the operative range of the restoring cam and avoid the restoration of the indicating keys to normal, the reason for which arrangement will more fully appear hereinafter in connection with the description of the operation of the device in multiplication and division. Carried by the drum D is a cam 6 acting upon a crank arm 13 carried by a shaft 12 upon which shaft is also mounted a crank arm 13' adapted to enter a recess in the box G and secure the proper registration of the various registering wheels in said box with the indicating and order-changing keys adapted to actuate same.

When using the machine for multiplica-

tion and division, it is necessary to shift the entire box G, and to accomplish this result, and also to time this shifting of the box, I employ the following mechanism. Mounted upon the drum D so as to be capable of movement longitudinally thereof is a stop plate 2 which is held in position above said drum by having the ends thereof passed through slots in the cam 6 and in an extension of one of the restoring cams 1. This stop plate 2 has upon one end thereof oppositely disposed extensions 3 and 3' carrying cam surfaces 4 and 4' respectively, and upon the opposite side of said plate is an extension 3'' adapted to engage a buffer 8 carried by the frame B. The plate 2 is normally held out of engagement with the buffer 8 by a spring 9 having movement in a slot 7 in the drum D. The cams 4 4' are projected in a manner to engage that order-changing slide Z within the line of movement thereof, which engagement, as a result of the continued rotation of the drum, projects the slide 2 in a manner to bring the tongue 3'' in a position where it will engage the buffer 8.

To adapt the machine to both multiplication and division, the buffer 8 is arranged so as to be engaged by the slide 3'' upon either end thereof as shown more particularly in Fig. 2. The extension of the restoring cam 1 heretofore referred to, is slotted so as to form the oppositely acting cam surfaces 5 and 5' projecting from the drum to an extent to engage any projecting carrying slide Z to effect the shifting of the entire box G. To render the cams 4 4', 5 and 5' operative, it is necessary to provide some means for projecting the transfer slide in line with the movement of said cams in a manner to cause said cams to engage same, and to effect this result, I mount in the frame C a shaft 14 having mounted thereon a gear wheel adapted to engage the similar gear upon the shaft E, this shaft 14 also carrying a tappet adapted to engage the star wheel carried by the registering wheel adapted to actuate the slide to be acted upon by the cams 4 4' and 5 5'. This shaft 14 is adapted to be shifted longitudinally of the drum D so that when it is desired to use the machine for addition or subtraction only, the tappet above referred to is entirely inoperative. Hence, the slide 2 and cams 4 4' and 5 5' are operative only when the machine is set for use in multiplication or division, and the adjustment of said machine for this use is accomplished solely through the movement of the shaft 14.

The operation of the herein described device is substantially as follows:—When it is desired to use the machine for addition, the shaft or spindle 14 is first forced to the right, or toward the drum D so as to render it inoperative. Thereafter, the desired in-

dicating keys H I are forced to the left, carrying with them the plate T, the notches upon the plate V holding each key thus shifted in the set position. The shifting of the plate T brings the stud Q into the desired relation to the restoring cam therefor, so that through the engagement of said cam with said stud, the plate T will be restored to its normal position, carrying with it all of the keys H I. Assuming that the first number to be added is 1239, to set the keys it is necessary to deflect the lowermost key in the fourth column to the left, (see Fig. 1), the movement of this key having no influence whatever upon any other key. In the third column the key next above the bottom is deflected, which key, through the pins 10 thereon and upon the lower key H, will move the two lower keys in unison. In the second column, by moving the key H next to the top, the pins 10 thereon and on the two lower keys H will cause the three lower keys to move in unison. Finally, the uppermost key H in the first column is moved to the left, which key, through the pins 10 will cause a corresponding movement of all of the keys H in that column, it then being merely necessary to deflect the keys I which as stated are arranged in one integral group so as to cause them to move together. The result will be that in the units column nine of the keys will be deflected, in the tens column, three of the keys will be deflected, in the hundreds column, two of the keys, and in the thousands column only one of the keys will be deflected. The keys having been thus set, the box G is positioned so that the star wheel Y of the registering wheel W to the extreme right of the box is in position relative to the unit column, set or bank of indicating keys. When these parts have been so positioned, the handle S is drawn toward the operator and one complete revolution thereof made. As the keys H I come into the operative relation to the registering wheels, or the star wheels carried thereby, said wheels will be partially rotated to an extent determined by the number of keys set or deflected in each column, and the numerals 1, 2, 3 and 9 will appear upon the registering wheels below the sight opening. With the continued operation of the drum D, the plate T will be forced to the right through contact with the cam upon the frame of the machine, and will carry with it all of the deflected keys H I. The next number to be added is then indicated by the keys H I and the drum D again rotated, the deflected keys imparting a further rotative movement to the registering wheels in the manner above referred to. Assuming the second number to be 762, this will necessitate a transfer from each of the wheels in the units, tens and hundreds columns to

the wheel of next higher denomination. This transfer is accomplished in the following manner. As the indicating keys bring each registering wheel to a point where zero is exposed at the top thereof, the tappet *a* upon each wheel will engage the projection *b* upon each transfer slide *Z* and project said slide toward the drum *D*. Thereafter, if the desired total sum necessitates a further movement of the registering wheel, such additional movement will be imparted by the indicating keys without interfering with the said transfer slides. With the continued rotation of the drum, however, the several order-changing keys *M* will engage with any projected transfer or carrying slide *Z* and be deflected to the left, bringing the uppermost tip or projection of the deflected key *M* into a position where it will engage the star wheel of the registering wheel of the next higher denomination to that the slide of which has deflected said order-changing key, whereupon the said order-changing key will impart to said registering wheel of higher denomination, a movement equal to that occupied by one digit on said wheel.

The spiral trend of the order-changing keys *M* will permit the consecutive transfer from one wheel to another of higher denomination, so that if one order-changing key operates its registering wheel to necessitate a carrying to the next higher wheel, this key *M* will accomplish the actuation of the carrying or transfer slide *Z* through its wheel *W*, to cause the next order-changing key to accomplish the desired carrying movement. The cam rib *1* located to the rear of the order-changing keys *M*, with relation to the direction of movement of said keys, will engage all projected carrying or transfer slides *Z* and restore them to their normal position preparatory to the next actuation of the machine.

In subtraction, the minuend is first indicated upon the registering wheels by deflecting the keys in the manner above referred to, the handle *S* being actuated toward the operator to accomplish this result. The subtrahend is then indicated upon the indicating keys, and the drum *D* is rotated in the opposite direction by turning the handle *S* away from the operator. This will cause the said indicating keys to reversely rotate the registering wheels. When the digit 0 appears below the sight opening in the box *G*, the slide *Z* of that wheel will be projected, thus causing the deflection of that one of the set of order changing keys, other than is operative in addition, cooperating with the projected order-changing slide to bring it in a position where it will reversely rotate the registering wheel of next higher denomination in a degree corresponding with one digit indicated upon said wheel. When the machine

is used for multiplication, the shaft or spindle 14 is positioned to the left so as to bring the tappet carried thereby into the operative position relative to the star wheel upon one of the registering wheels *W*. The multiplier is then indicated upon the registering wheels and the digit thereof occupying the unit space is brought into position adjacent to the frame *d* in a manner to cause the star wheel upon said unit registering wheel to be in a position to be engaged by the tappet of the spindle or shaft 14. The multiplicand is then indicated upon the indicating keys and the plate *T* is moved to the left until the lug *Q* thereon is without the operative range of the cam for restoring same to normal. When the keys are so set, they will remain in this position until the computation has been completed. The drum *D* is then rotated by means of the handle *S* in the manner described in connection with addition. With each rotation of the drum, the tappet upon the shaft or spindle 14 is rotated once in a direction opposite to that of the drum *D*, so that while numbers are being added upon the registering wheels being actuated by the indicating keys, the unit space of the multiplier is reduced by one with each rotation of the drum *D*. When the digit 0 appears upon the registering wheel occupying the unit space of the multiplier, the transfer or carrying slide *Z* is projected in the manner described, bringing it into operative relation to the cams 4 and 5' so that with the next rotation of the drum *D*, when the digit 9 will appear through the sight opening in the box *G*, the cam surface 4 will engage said projected slide and force the stop plate 2 to the right, causing the projecting end 3' thereof to engage with the buffer 8, and arresting further rotation of the drum, the total indicated upon the registering wheels being in excess of that desired by the number of the multiplicand and the registering wheel actuated by the tappet on the shaft or spindle 14, showing 9. The carrying from one registering wheel to the other in securing this total is as in addition. When the rotation of the drum *D* is stopped in the manner described, it is reversely rotated, thus deducting from the total indicated upon the registering wheels the number indicated upon the indicating keys, and restoring the unit multiplier to zero. At the same time the cam 5' will engage the projected transfer or carrying slide *Z* of the unit wheel of the multiplier and shift the entire box *G* one space to the left, bringing the wheel occupying the tens column of the multiplier into the operative relation to the tappet upon the shaft or spindle 14. The afore described operation is repeated with relation to the second wheel of the multiplier until the drum *D* is again arrested and reversed, and the operation is repeated as to each order of the mul-

tiplier until the product appears upon the registering wheel.

When using the machine for division, the dividend is first indicated upon the registering wheels W and the indicating keys H I are set in a manner to indicate the divisor. The spindle 14 is then set in the manner described in connection with the use of the machine for multiplication. The box G is next adjusted relative to the drum D so as to position the said keys indicating the divisor relative to the registering wheels of the greatest denomination, care being exercised to have the divisor bear such relation to the dividend that the higher denominations indicated by the registering wheels will be divisible by the divisor. For example, if 17534 is to be divided by 22, the digit in the tens place in the divisor must be opposite to the digit in the thousands place in the dividend. When the parts are so set, the handle S is turned away from the operator as in subtraction, and the operation of the machine will be as in subtraction and the reverse of multiplication. The transfer of numbers will be as described in connection with subtraction with the exception that upon the seventh revolution of the drum D all of the ciphers to the left of the registering wheel occupying the ten thousands place will be turned, so as to show 9, thus projecting the slide Z adjacent to the tappet of the shaft or spindle 14, whereupon the said slide will engage the cam surface 4' actuate the slide 2, and thus through the buffer 8, check further rotation of said drum. In the meanwhile, the tappet of the shaft or spindle 14 will have been rotated in a reverse direction to that of the drum D and will have imparted to the registering wheel in operative relation thereto a rotation in the reverse direction to that of the other registering wheels.

With the rotation of the drum as above described, the registering wheels in the dividend will indicate a digit one ordinal higher than is proper, and the registering wheel actuated by the tappet of the shaft 14 will also indicate a digit one ordinal higher than is proper. When the rotation of the drum D is thus checked, it is necessary to rotate the drum in the reverse direction, turning the handle S toward the operator, which will restore all of the registering wheels to the proper position and will also effect the transfer of the box G to the left, bringing the divisor into the proper relation to the ordinals of the dividend of next lower denomination or order than when the machine is set for the first operation. The operation is then repeated and finally the quotient will appear upon the registering wheels to the left of the frame *d*. To restore all the registering wheels to zero, it is merely necessary to turn the shaft X by hand.

It is not my intention to limit the inven-

tion to the precise details of construction shown in the accompanying drawings, it being apparent that such may be varied without departing from the spirit and scope of the invention.

Having described my invention, what I claim as new and desire to have protected by Letters Patent, is:—

1. A calculating machine, embodying therein a plurality of registering wheels, a rotary drum, a plurality of sets or banks of indicating keys mounted upon said drum, one set to each of said registering wheels, the keys of each said set being normally inoperative but adapted to be brought into the operative relation with the registering wheel cooperating with that set, and a transfer or carrying mechanism operative upon said wheels.

2. A calculating machine, embodying therein a plurality of registering wheels, a rotary drum, a plurality of sets or banks of indicating keys mounted upon said drum, one set to each of said registering wheels, the keys of each said set being normally inoperative but adapted to be brought into the operative relation with the registering wheel cooperating with that set, means whereby all operative keys may be rendered inoperative after actuating said wheels, and a carrying or transfer mechanism operative upon said wheels.

3. A calculating machine embodying therein a plurality of registering wheels, a rotary drum, a plurality of sets or banks of laterally movable indicating keys mounted upon said drum, one to each wheel, said keys of each set being normally inoperative but adapted to be deflected laterally into the operative relation to its registering wheel, and a transfer or carrying mechanism operative upon said wheels.

4. A calculating machine embodying therein a plurality of registering wheels, a rotary drum, a plurality of sets or banks of laterally movable indicating keys mounted upon said drum, one to each wheel, said keys of each set being normally inoperative but adapted to be deflected laterally into the operative relation to its registering wheel, a slidable plate adapted to engage any deflected key and restore it to normal, and a transfer or carrying mechanism operative upon said wheels.

5. A calculating machine embodying therein a plurality of registering wheels, a rotary drum, a plurality of sets or banks of laterally movable indicating keys mounted upon said drum, one to each wheel, said keys of each set being normally inoperative but adapted to be deflected laterally into the operative relation to its registering wheel, a slidable plate adapted to engage any deflected key and restore it to normal, a keeper plate adapted to temporarily hold an indi-

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cating key in its deflected position, and a transfer or carrying mechanism operative upon said wheels.

6. A calculating machine embodying
5 therein a plurality of registering wheels, a rotary drum, a plurality of sets or banks of normally inoperative indicating keys upon said drum, one to each wheel, and a transfer or carrying mechanism operative upon
10 said wheels, each said set or bank of indicating keys comprising four single keys and a group of five keys, said single keys being provided with means whereby one key may be moved laterally independently of the
15 others, or a plurality of said keys may be moved in groups of arithmetical progression.

7. A calculating machine, embodying therein a plurality of registering wheels, a
20 rotary drum, a plurality of sets or banks of indicating keys mounted upon said drum, one set to each of said registering wheels, the keys of each said set being normally inoperative but adapted to be brought into
25 the operative relation with the registering wheel cooperating with that set, a slide actuated by each key, and a series of order-changing keys carried by said drum and adapted to be actuated by said slides respectively, to be brought into the operative relation to the wheel of next higher denomination.

8. A calculating machine, embodying therein a plurality of registering wheels, a
35 rotary drum, a plurality of sets or banks of indicating keys mounted upon said drum, one set to each of said registering wheels, the keys of each said set being normally inoperative but adapted to be brought into
40 the operative relation with the registering wheel cooperating with that set, a slide actuated by each key, and a series of order-changing keys arranged spirally upon said drum and adapted to be actuated by said
45 slides respectively, to be brought into the operative relation to the wheel of next higher denomination.

9. A calculating machine, embodying therein a plurality of registering wheels, a
50 rotary drum, a plurality of sets or banks of indicating keys mounted upon said drum, one set to each of said registering wheels, the keys of each said set being normally inoperative but adapted to be brought into
55 the operative relation with the registering wheel cooperating with that set, a slide actuated by each key, a series of order-changing keys carried by said drum and adapted to be actuated by said slides respectively to be brought into the operative relation to the wheel of next higher denomination, and means independently of said order-changing keys whereby said slides, after actuating said keys, are restored to normal.

65 10. A calculating machine, embodying

therein a plurality of registering wheels, a rotary drum, a plurality of sets or banks of indicating keys mounted upon said drum, one set to each of said registering wheels, the keys of each said set being normally inoperative but adapted to be brought into the operative relation with the registering wheel cooperating with that set, a slide actuated by each key, a series of order-changing keys arranged spirally upon said drum and adapted to be actuated by said slides respectively to be brought into the operative relation to the wheel of next higher denomination, and a cam rib carried by said drum and arranged spirally thereof adjacent to said order changing keys, whereby said slides, after actuating said keys, are restored to normal.

11. A calculating machine, embodying therein a plurality of registering wheels, a
85 rotary drum, means whereby said drum may be rotated in either direction, a plurality of sets or banks of normally inoperative indicating keys upon said drum, one to each wheel, and a transfer or carrying mechanism operative upon said wheels, comprising means actuated by each wheel, two series of order-changing keys carried by said drum and adapted to be rendered operative by said last named means, and a plurality of means arranged between said sets of order-changing keys whereby said means are restored to normal after the actuation of said order-changing keys, and said order-changing keys will be independently and
100 inversely operative upon the registering wheels, according to the direction of rotation of said drum.

12. A calculating machine, embodying therein a plurality of registering wheels, a
105 rotary drum, means whereby said drum may be rotated in either direction, a plurality of sets or banks of normally inoperative indicating keys upon said drum, one to each wheel, and a transfer or carrying mechanism operative upon said wheels, comprising means actuated by each wheel, two series of order-changing keys carried by and extending spirally about said drum and adapted to be rendered operative by said last named means, and a plurality of cams extending spirally about said drum whereby said means are restored to normal after the actuation of said order-changing keys, and said order-changing keys will be independently and reversely operative upon the registering wheels, according to the direction of rotation of said drum, each said set of order-changing keys and restoring cams being pitched oppositely to the other.

13. In a calculating machine, a movable box having mounted therein a plurality of registering wheels, a rotary drum, a series of indicating keys carried by said drum and adapted to actuate said registering wheels,
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a transfer or carrying mechanism, means whereby said indicating keys may be fixed in their set position, means whereby said box may be automatically shifted longitudinally of said drum at a predetermined time to vary the order of said registering wheels and said indicating keys, to adapt the machine to multiplication or division, and adjustable means whereby said last named means may be rendered either operative or inoperative.

14. In a calculating machine, a movable box having mounted therein a plurality of registering wheels, a rotary drum, a series of indicating keys carried by said drum and adapted to actuate said registering wheels, a transfer or carrying mechanism, means whereby said indicating keys may be fixed in their set position, means whereby said box may be automatically shifted longitudinally of said drum at a predetermined time to vary the order of said registering wheels and said indicating keys, to adapt the machine to multiplication or division, adjustable means whereby said last named means may be rendered either operative or inoperative, and means for checking the rotative movement of said drum at a predetermined interval.

15. In a calculating machine a movable box having mounted therein a plurality of registering wheels, a rotary drum, a series of indicating keys carried by said drum and adapted to actuate said registering wheels, a transfer or carrying mechanism, a slidable lock plate carried by said drum and having a cam surface thereon whereby said slide is adapted to be actuated to check the rotation of the said drum, a buffer cooperating with said slide, means carried by said drum adapted to shift said box the space of one registering wheel, and means actuated by said registering wheels adapted to cooperate with said slide and said shifting means whereby at predetermined intervals said box will be shifted to change the order of the said wheels relative to the indicating keys.

16. In a calculating machine, a movable box having mounted therein a plurality of registering wheels, a rotary drum, a series of indicating keys carried by said drum and adapted to actuate said registering wheels, a transfer or carrying mechanism comprising slides actuated by said registering wheels, and cooperating order-changing keys carried by said drum, a slidable lock plate carried by said drum and having a cam surface thereon adapted to engage the slide of the transfer mechanism of one of said wheels to actuate said lock plate and check the rotation of said drum, a buffer cooperating with said lock plate, a cam carried by said drum adapted to engage said transfer slide to shift the box the space of one registering

wheel, and a rotary tappet actuated by said drum and adapted to actuate said wheel carrying the slide cooperating with said cams whereby at predetermined intervals of the rotation of the drum, said box will be shifted to change the order of the said wheels relative to the indicating keys.

17. In a calculating machine, a movable box having mounted therein a plurality of registering wheels, a drum adapted to be rotated in either direction, a series of indicating keys carried by said drum and adapted to actuate said registering wheels, a transfer or carrying mechanism comprising a slide for each said wheel adapted to be actuated thereby, and an order-changing key carried by said drum, a slidable lock plate carried by said drum and having a plurality of oppositely pitched cam surfaces thereon adapted to engage the slide of one of said wheels whereby said lock plate is adapted to be actuated to check the rotation of said drum in one direction, a buffer cooperating with said lock plate, a plurality of oppositely pitched cams carried by said drum and adapted to engage said transfer slide actuating said lock plate, and a rotary tappet actuated by said drum and adapted to actuate said wheel carrying the slide cooperating with said cams whereby at predetermined intervals of the rotation of the drum, said box will be shifted to change the order of the said wheels relative to said indicating keys.

18. In a calculating machine, a movable box having mounted therein a plurality of registering wheels, a rotary drum, a series of indicating keys carried by said drum and adapted to actuate said registering wheels, a transfer or carrying mechanism comprising slides actuated by said registering wheels, and cooperating order-changing keys carried by said drum, a slidable lock plate carried by said drum and having a cam surface thereon adapted to engage the slide of the transfer mechanism of one of said wheels to actuate said lock plate and check the rotation of said drum, a buffer cooperating with said lock plate, a cam carried by said drum adapted to engage said transfer slide to shift the box the space of one registering wheel, and a rotary tappet actuated by said drum and adapted to actuate said wheel carrying the slide cooperating with said cams whereby at predetermined intervals of the rotation of the drum, said box will be shifted to change the order of the said wheels relative to the indicating keys, said tappet being provided with means whereby it may be rendered inoperative.

19. In a calculating machine, a movable box having mounted therein a plurality of registering wheels, a drum adapted to be rotated in either direction, a series of indicating keys carried by said drum and adapted

to actuate said registering wheels, a transfer
or carrying mechanism comprising a slide
for each said wheel adapted to be actuated
thereby, and an order-changing key carried
5 by said drum, a slidable lock plate carried
by said drum and having a plurality of op-
positely pitched cam surfaces thereon adapt-
ed to engage the slide of one of said wheels
whereby said lock plate is adapted to be
10 actuated to check the rotation of said drum
in one direction, a buffer cooperating with
said lock plate, a plurality of oppositely
pitched cams carried by said drum and
adapted to engage said transfer slide actu-
15 ating said lock plate, and a rotary tappet

actuated by said drum and adapted to actu-
ate said wheel carrying the slide cooperating
with said cams whereby at predetermined
intervals of the rotation of the drum, said
box will be shifted to change the order of 20
the said wheels relative to said indicating
keys, said tappet being provided with means
whereby it may be rendered inoperative.

In testimony whereof I hereby affix my
signature in presence of two witnesses.

DOICHI YADU.

Witnesses:

T. KUSAHA,
H. F. HAWLEY.