

RESERVE COPY PATENT SPECIFICATION

360,376



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PROVISIONAL SPECIFICATION.

No. 23,257, A.D. 1930.

Improvements in or relating to Calculating or Adding Machines.

We, **PETTERS LIMITED**, a British Company, of Westland Works, Yeovil, in the County of Somerset, and **GUY BAZELEY PETTER**, of Westland Works, aforesaid, a subject of the King of Great Britain, do hereby declare the nature of this invention to be as follows:—

This invention relates to calculating or adding machines of the multiple bank type having a series of ordinal keys in each bank in which depression of one of the keys is adapted to rotate a pinion which rotates with a numeral wheel having upon its periphery a series of ordinal numbers, and relates more particularly to transfer mechanism for use in connection with such machines for the purpose of transferring one number of a lower order to the next column of higher order.

The main object of the present invention is to provide an improved form of transfer mechanism in which there is substantially no lost motion in the transfer action, while a further object is to provide an improved form of transfer mechanism suitable for use in connection with partial keyboard machines.

According to the invention a finger or the like is provided and adapted to rotate the pinion in the next higher column at the appropriate time and is preferably arranged so as to rotate about the axis of the pinion and to lie outside the periphery of the pinion teeth until the moment at which transfer takes place. The finger is preferably carried by a spring-controlled pawl which may be mounted upon a bell crank lever pivoted on the same axis as the pinion and rotated by means of a transfer lever which is moved for example by a cam rotated by the pinion associated with the column of lower order. The cam may be provided with a finger or the like which is adapted at an appropriate time to contact with the pawl for the purpose of maintaining the finger on the pawl outside the periphery of the pinion during a predetermined portion of the rotation of the cam. By means of the arrangement

according to the invention the practical difficulty which arises due to a certain amount of over travel of the transfer mechanism is avoided. The invention may be applied to calculating or adding machines employing the decimal notation system or may be applied to machines employing other notations such as English monetary system. Furthermore, the invention may also be applied to machines having a complete range of keys, for example, from 1 to 9 or a machine having only a partial range, for example, 1 to 5 in which case in order for example to add the numeral 9 the keys 5 and 4 may be successively depressed. In connection with the latter type of machine the cam which causes the operation of the transfer lever is arranged only to actuate the lever after the 4 reading has been passed.

According to one specific embodiment of the invention as applied to a machine employing a partial keyboard system a pinion is freely mounted upon a spindle and has, for example, ten teeth upon its periphery. A spring operated ratchet pawl may be provided for co-operating with the teeth of the pinion and is arranged so as to permit rotation, for example, in a clockwise direction and to prevent rotation in the reverse direction. Mounted for rotation with the pinion is a numeral wheel which carries upon its periphery the numerals 0 to 9, for example, one of which is at any time visible through a window of a casing enclosing the machine. A snail cam is provided and adapted to rotate with the pinion and which may be attached thereto. A transfer lever is mounted upon a transverse spindle and has a lug or other projection upon its end which is adapted to contact with the surface of the snail cam. The transfer lever is normally urged into contact with the surface of the cam by means of a spring and the lever is provided with an arm which extends into the next higher column. The arm of the transfer lever is connected by means of a

pin and slot connection to a bell crank lever which is pivoted upon the same axis as the aforesaid pinion. A spring operated pawl is pivoted to the bell crank lever and has a finger or other projection which at the appropriate time is adapted to be brought into engagement with one of the teeth of the pinion of the next higher column. As the pinion and cam in one column rotate the cam lifts the transfer lever which in turn rotates the bell crank lever and its associated pawl about the spindle of the pinion until the finger or other projection upon the pawl engages the next tooth of the pinion in the adjacent higher column. When the transfer lever is released by the cam it moves under the action of its spring to its initial position and the bell crank lever and transfer pawl move back and move the pinion of the next higher column forward one tooth. If, for example, the reading in the lower column happens to be 9 it is possible to move the numeral wheel to 4 by depressing the 5 key. Therefore, the cam is arranged so that it does not commence to actuate the transfer lever until after the 4 reading, otherwise, lifting of the transfer lever might re-commence before completion of the transfer. By suitably shaping and foreshortening the snail cam the actuation of the transfer lever does not take place until the 4 reading has been past. If, for example, the pinion of the next higher column is key actuated the transfer pawl yields without disturbing the operation. In order to avoid the possibility of any over travel which may occur in the feeding movement of the finger or other projection provided on the pawl for example, when using the machines at high speeds, the pawl is provided on its upper edge with a substantially straight portion which is adapted to extend over into the column of next lower order and to co-act with a projection or finger provided upon the cam. The finger or other projection upon the cam rotates therewith and at for example readings 6, 7 and 8 it contacts with the substantially straight surface on the pawl and lifts the pawl and its associated finger or projection outside the path of the rotation of the pinion of higher order. At these three readings, therefore, the projection or finger upon the pawl cannot engage the pinion and falls into the teeth when the 9 reading is registered and when the finger or projection upon the cam just passes clear of contact with the substantially straight portion of the pawl. Thus, any possibility of the projection or finger on the pawl engaging the next tooth of the pinion before the transfer lever is in its correct position for transfer is avoided.

Where the invention is employed in connection with a machine having a full range of keys the aforesaid cam is arranged so as to build up, that is to say, to commence to lift the transfer lever immediately after the nought reading has been registered but instead of the cam being rigidly attached to the pinion the cam is arranged to follow the movement of the pinion through the medium of a spring drive, for example, a coil spring may be located around the spindle carrying the pinion. One end of the coil spring may be attached to a stud on the pinion while the other end of the spring may be attached to a stud on the cam. Normally the two studs are in contact but if the cam is held back the pinion may still be moved forward for nearly one revolution. A spring catch is preferably provided and adapted to lie in the path of a projection or finger provided upon the cam in the region where the transfer lever is permitted to move back for transfer purposes. The spring catch may take the form of a pivoted lever one end of which is connected to a spring. When the cam reaches the 0 position the transfer lever is permitted to move about its pivot to effect a transfer. The cam, however, is held back by the spring catch so that the transfer may be effective irrespective of the fact that the pinion itself may move forward to the 8 reading. At the moment, however, when the transfer is reaching completion a finger or the like provided upon the transfer lever is caused to strike a projection upon the spring catch and to throw the catch out of the path of the projection upon the cam thereby releasing the cam which moves into its normal position with the two studs in contact. It will be appreciated that the mechanisms above described are associated with each bank of keys for the purpose of carrying forward or transferring a unit digit to the tens digit and so on.

The mechanism employed for actuating the pinion may be like that described in our co-pending Application No. 23,256/30 (Serial No. 360,375 and zeroising or cancelling mechanism may be provided like that described in our co-pending Application No. 23,258/30 (Serial No. 360,377)).

Dated this 1st day of August, 1930.

HASELTINE, LAKE & Co.,
28, Southampton Buildings, London,
England, and
19—25, West 44th Street, New York,
U.S.A.,
Agents for the Applicants.

PROVISIONAL SPECIFICATION.

No. 27,805, A.D. 1930.

Improvements in or relating to Calculating or Adding Machines.

We, PETTERS LIMITED, a British Company, of Westland Works, Yeovil, in the County of Somerset, and GUY BAZELEY PETER, of Westland Works, aforesaid, a subject of the King of Great Britain, do hereby declare the nature of this invention to be as follows:—

This invention relates to calculating or adding machines of the multiple bank type having a series of ordinal keys in each bank in which depression of one of the keys rotates a pinion which rotates with a numeral wheel having upon its periphery a series of ordinal numbers, and relates more particularly to transfer mechanism for use in connection with such machines for the purpose of transferring one number of a lower order to the next column of higher order.

The chief object of the present invention is to improve and simplify the transfer mechanism described in our co-pending Application No. 23,257 of 1930.

The transfer mechanism described in the co-pending Application comprises a bell-crank lever pivoted upon a spindle carrying a pinion and its associated numeral wheel. The bell-crank lever has a pin and slot connection with a spring controlled transfer lever pivoted upon another spindle and actuated by a snail cam mounted on the pinion spindle. As the cam rotates it depresses the transfer lever through a predetermined angle until the pinion and cam pass through the 9 to 0 position when the peak of the cam passes from under the transfer lever allowing it to move back under the action of its spring and thereby to carry the bell-crank lever in the next higher column through an angle sufficient to rotate the pinion of higher order forward one tooth. In order to cause such rotation a spring-pressed pawl is provided pivoted on a pin on the bell-crank lever and carrying a finger which is adapted to spring in and engage a tooth of the pinion during anti-clockwise rotation of the bell-crank lever and to rotate the pinion during clockwise rotation of the lever.

According to the present invention the bell-crank lever and spring pawl are replaced by a single member. The member preferably comprises a lever (hereinafter referred to as the "pinion lever") mounted upon the spindle carrying the cams and pinions referred to in the co-pending application. The pinion lever is

mounted upon the pinion spindle by means of a slot for the purpose of allowing the pinion lever to reciprocate along a path transverse to the axis of the spindle. A spring is provided attached for example to the upper end of the pinion lever or an extension thereof and to a fixed point which spring acts substantially in the direction of the slot. The pinion lever is provided with a finger fixed thereto or formed integral therewith the finger being the equivalent of the finger mounted upon the spring pawl referred to in the co-pending application and at the appropriate time engages the pinion to carry it forward one tooth. The pinion lever is provided with a slot or pin at its lower end which engages a pin or slot provided on the extension of the transfer lever in the manner referred to in the co-pending application. Upon rotation of the cam in a clockwise direction the transfer lever which contacts therewith is displaced about its pivot also in a clockwise direction and causes the pinion lever to move in an anti-clockwise direction by virtue of its pin and slot connection therewith. Upon rotation of the pinion in a clockwise direction upon depression of one of the keys the finger upon the pinion lever yields due to the slot connection. During the anti-clockwise rotation of the pinion lever the finger contacts with the edge of the pinion tooth and slips over into contact with the next tooth this action being permitted by means of the slot by which the lever is mounted upon the pinion spindle, the spring at the end of the pinion lever causing the finger to pass into the adjacent tooth. When the transfer lever passes over the peak of the cam the transfer lever moves in an anti-clockwise direction under the action of its spring and causes the pinion lever to rotate in a clockwise direction causing the pinion to be moved forward one tooth. The finger upon the pinion lever is arranged to engage that pinion tooth the driving face of which lies substantially at right angles to the direction of the slot of the pinion lever at the beginning or end of its movement so as to enable the pinion lever and the finger to yield when the pinion is rotated clockwise and to yield when pinion is stationary and the pinion lever is moved anti-clockwise.

An inclined straight ledge is provided

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upon or formed integral with the pinion lever and co-acts with a projection or finger provided upon the cam in the adjacent column of lower order, in order to lift the finger or projection which causes rotation of the pinion out of engagement with the teeth of the pinion of the column of lower order at the readings 6, 7 and 8 in a similar manner and for the purpose described in the aforesaid application.

With the lever and transfer finger made

in one piece it is possible to obtain a lighter construction, a quicker action and a more accurate transfer within finer limits than with the transfer mechanism described in the co-pending application.

Dated this 17th day of September, 1930.

HASELTINE, LAKE & Co.,
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Agents for the Applicants.

COMPLETE SPECIFICATION.

Improvements in or relating to Calculating or Adding Machines.

We, PETTERS LIMITED, a British Company, of Westland Works, Yeovil, in the County of Somerset, and GUY BAZELEY PETTER, of Westland Works, aforesaid, a subject of the King of Great Britain, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to calculating or adding machines of the multiple-bank type having a series of ordinal keys in each bank in which depression of one of the keys is adapted to rotate a pinion which rotates with a numeral wheel having upon its periphery a series of ordinal numbers. The invention relates more particularly to transfer mechanism for use in connection with such machines.

Transfer mechanism heretofore constructed has sometimes comprised a cam rotated from a bank or column of one order which cam co-operates with a transfer lever which in turn actuates a pawl having a transfer element which engages a tooth of a pinion associated with a column of higher order to move it forward one tooth to effect a transfer. The cam moves the transfer lever in one direction and permits the lever to move in the reverse direction during the transfer operation. The transfer lever during its movement under the action of the cam carries the pawl from one position to another position and upon reverse movement of the transfer lever the pawl moves the pinion forward one tooth.

The chief object of the present invention is to provide an improved form of transfer mechanism in which over-travel of the parts due to high speed of operation or to small inaccuracies or tolerances in the working fits of the parts or to both such causes may not promote a partial or complete transfer operation at an inappro-

priate time thereby giving rise to inaccuracies in the result of the additions or calculations.

According to the invention the transfer mechanism comprises a cam rotated from one bank or column, a transfer element actuated by said cam and associated with a pinion in an adjacent column of higher order and normally lying in the path of the pinion teeth and means for moving said transfer element out of the path of the teeth of its associated pinion for a predetermined period until the moment at which transfer is due to take place.

Thus a premature engagement of the transfer element with a tooth of the pinion due to over-travel of the parts is avoided. The transfer element may comprise a transfer finger forming part of a spring controlled pawl. The pawl may be mounted upon a bell crank lever which may be pivoted on the same axis as the pinion one arm of the bell crank lever carrying the pawl while the other arm of the bell crank lever may be connected to a transfer lever by means of a pin and slot connection. The pawl may be normally urged in one direction by means of a spring and may have a lug or finger constituting the transfer finger which engages with the teeth of the pinion to effect the transfer operation. The aforesaid means for moving the transfer finger out of the path of the pinion teeth may comprise a lug or a finger provided on the aforesaid cam which engages the pawl during a predetermined part of the rotation of the cam so as to lift the transfer finger on the pawl outside the path of the pinion teeth, the lug or finger on the cam permitting the transfer finger to move into operative position at the moment when transfer is due to take place. If desired the pawl and bell crank lever may be replaced by a single lever in which case the lever may be formed integral with a

transfer finger which engages with the teeth of the pinion to effect the transfer operation and may be provided with a ledge or projecting part with which
 5 engages a lug or finger on the cam, to move the transfer finger outside the path of the pinion teeth. According to a further form the pawl may be directly
 10 pivoted on one arm of the transfer lever and is provided with the aforesaid transfer finger which engages with the teeth of the pinion the aforesaid lug or finger on the cam co-operating with a part of
 15 said pawl to move the transfer finger out of the path of the pinion teeth. Alternatively, instead of the lug or finger on the cam directly co-operating with the aforesaid pawl a lever may be provided
 20 interposed between the lug or finger on said cam and a projection on the aforesaid pawl.

The invention may be employed in connection with a partial keyboard machine, that is to say, a machine in which for
 25 example only five keys in each bank are employed or in connection with a full keyboard machine in which for example nine keys are employed in each bank. In the former case the aforesaid cam is constructed and arranged so as not to com-
 30 mence actuating the transfer lever until after a predetermined period. In full keyboard machines the cam is arranged so as to actuate the transfer lever immediately after the 0 reading has been
 35 registered and the cam follows the movement of the pinion which rotates the cam through the medium of a spring drive for the purpose hereinafter stated. The
 40 invention may be employed in connection with the actuating mechanism described in the Specification of our co-pending Application No. 23,256/30 (Serial No. 360,375) and with the zeroizing or can-
 45 celling mechanism described in the Specification of our co-pending Application No. 23,258/30 (Serial No. 360,377).

In order that the said invention may be clearly understood and readily carried
 50 into effect, the same will now be more fully described with reference to the accompanying drawings which illustrate several forms of mechanism according to the invention and in which:—

55 Figure 1 is a side elevation of one form of transfer mechanism applicable to a partial keyboard machine;

Figure 2 is a perspective view of the transfer mechanism shown in Figure 1;

60 Figures 3 and 4 are views similar to Figure 1 but showing the parts in different positions;

Figure 5 is a view similar to Figure 1 but showing mechanism applicable to a
 65 full keyboard machine;

Figure 6 illustrates a modified form of transfer mechanism, and Figures 7 and 8 illustrate still further modified forms.

Referring now more particularly to Figures 1 to 4 of the accompanying draw-
 70 ings which illustrate the invention as applied to a partial keyboard machine having for example five keys numbered 1 to 5, and in which in order for example
 75 to add the numeral 9 the 5 and 4 keys are successively depressed and in order to add the numeral 8 the 4 key is depressed twice and so on, reference numeral 1 (Figure 2) indicates a pinion and refer-
 80 ence numeral 2 indicates another pinion associated with a column of higher order adjacent the column with which the pinion 1 is associated. The pinions 1 and 2 are freely mounted on a transverse
 85 spindle 3. The pinions have ten teeth and are maintained in their correct positions by means of spring pressed ratchet pawls 4 (Figure 1) which permit rotation in a
 90 clockwise direction but prevent rotation in the reverse direction. A numeral wheel 5 (Figure 2) rotates with each pinion and carries on its periphery Figures 0 to 9 one of which is at any time visible
 95 through a window in a casing enclosing the mechanism. The pinions may be rotated by means of the actuating mechanism referred to in the Specification of our co-pending Application No. 23,256 of 1930. A snail cam 6 is mounted on the spindle
 100 3 and is attached to and rotated by the pinion 1 in the column of lower order. Co-acting with the cam 6 is a transfer lever 7 pivoted on a transverse spindle 8. The transfer lever has two arms one of
 105 which is provided with a bent portion 9 which makes contact with the acting surface of the cam 6 while the other arm 10 projects into the column of higher order and has a pin and slot connection with a
 110 bell crank lever 11 mounted on the spindle 3. The transfer lever 7 is normally urged in an anti-clockwise direction by means of a spring 12. Pivottally mounted upon the bell crank lever 11 is a
 115 pawl 13 which has a transfer element or finger 14 which engages the teeth of the pinion 2.

The transfer finger 14 is normally urged into contact with the teeth of the pinion by means of a spring 15. The cam 6 is
 120 foreshortened so that it does not commence actuating the transfer lever 7 until after the interval between the readings 0 and 4 has been passed. For example, if the reading in one column stands at 9 and
 125 the key 5 in that column is depressed so as to give the maximum single key stroke addition of the machine the reading will pass to 4 and the transfer will pass to the next higher column without the interfer- 130

ence which might be caused by the cam commencing to actuate the transfer lever again before the transfer is completed.

There is a possibility due to the action of the cam at high speeds of operation that an overthrow of the transfer lever 7 might cause the transfer finger 14 to move into engagement with the following tooth of the pinion 2 before the pinion 1 has reached the 9 position with the result that the movement of the transfer lever 7 in moving back into contact with the cam 6 would move the pinion 2 forward and hold it displaced thus effecting a partial or even a complete transfer at the inappropriate time. The present invention overcomes this disadvantage by the provision of means for moving the transfer finger outside the path of the teeth of the pinion 2 until the moment at which transfer is due to take place. As shown in Figures 1 to 4 these means comprise a lug or finger 16 on the cam 6 which makes contact with the pawl 13 and serves to lift the transfer finger 14 outside the path of the pinion teeth until the parts in the column associated with the pinion 1 have reached the position between 9 and 0. The finger or lug 16 is preferably arranged so that it makes contact with the surface 17 of the pawl 13 at the readings 6, 7 and 8 so that the transfer finger 14 is moved outside the path of the teeth of the pinion 2 during these readings, the finger 14 moving into engagement with the appropriate pinion tooth at or about the 9 reading after the lug 16 has moved out of contact with the surface 17.

In operation, the pinion 1 is rotated by means of suitable actuating mechanism and the cam 6 rotates with the pinion and after the 4 reading moves the transfer lever 7 in a clockwise direction. At the same time the transfer lever causes through the medium of its arm 10 the bell crank lever 11 to be moved in an anticlockwise direction about the spindle 3 moving the transfer finger 14 from the position shown in Figure 4 to a position as shown in Figure 1 in which the transfer finger 14 may engage the following tooth of the pinion 2. At about the reading 6 the lug 16 makes contact with the pawl 13 and moves the transfer finger 14 outside the path of the pinion teeth as shown in Figure 3 and at or about the 9 reading, the lug 16 moves out of contact with the pawl 13 and allows the transfer finger 14 to move into a position in which it may engage the following tooth of the pinion as shown in Figure 1. Thus when the peak of the cam 6 moves out of engagement with the bent portion 9 of the transfer lever 7 the latter is moved in an anticlockwise direction under the action of the

spring 12 and moves the bell crank lever 11 in a clockwise direction about the spindle 3. During this movement the transfer finger 14 moves the pinion 2 forward one tooth to effect the transfer. In the final position of the parts as shown in Figure 4 key actuation of the pinion 2 may nevertheless occur without detrimental disturbance of the pawl 13 which yields and allows the teeth to pass under it. Due to the provision of the means for moving the transfer finger 14 outside the path of the pinion teeth during for example the 6, 7 and 8 readings a premature engagement of the pawl with the following pinion tooth is avoided.

Where the invention is employed in connection with machines having a full range of keys, for example, nine keys ranging from 1 to 9 the aforesaid cam is arranged so as to actuate the transfer lever immediately after the 0 reading has been registered but instead of the cam being rigidly attached to the pinion it is arranged to follow the movement of the pinion through the medium of a spring drive. Figure 5 of the accompanying drawings illustrates such an arrangement. In this Figure the reference numeral 18 indicates a cam which is so arranged as to commence actuating the transfer lever 7 as soon as the 0 reading has been registered. The cam 18 follows the movement of the pinion which rotates it for example the pinion 1 shown in Figure 2 through the medium of a spring drive. In Figure 5 the spring drive is shown in dotted lines and associated with pinion 2 and the cam rotated thereby. As shown a coil spring 19 is located around the spindle 3 carrying the pinions. One end of the coil spring is attached to a stud 20 on the pinion 2 while the other end of the spring is attached to a stud 21 on the cam associated with the pinion 2. Normally the two studs are maintained in contact but if the cam is held back, the pinion may still be moved forward for nearly one revolution. A spring catch 22 pivoted at 23 is adapted to lie in the path of a lug 24 provided on the cam 18 at its peak. The spring catch 22 is held in the path of the lug 24 by means of a spring 26 which normally maintains the catch 22 against a stop 25. When the cam 18 reaches the 0 position it has moved out of contact with the transfer lever 7 which moves back under the action of the spring 12 into its initial position to effect a transfer as described in connection with Figures 1 to 4. The cam however is held back by the engagement of the spring catch 22 with the lug 23 so that the transfer may be effective irrespective of the fact that the pinion itself may move forward to the 8

reading this occurring should for example, the numeral wheel be in the 9 position and the transfer be effected by depressing the 9 key. At the moment however when the transfer is reaching completion a lug 27 on the transfer lever 7 strikes an arm 28 on the catch 22 thereby moving the catch 22 out of the path of the lug 24 and releasing the latter which immediately moves about the spindle 3 to its normal position with the studs 20 and 21 in contact.

Figure 6 illustrates a modified form of the invention in which the bell crank lever 11 and the pawl 14 (Figures 1 to 5) are replaced by a single member in the form of a lever 29, hereinafter referred to as the "pinion lever" mounted upon the spindle carrying the cams and pinions. The pinion lever 29 is mounted upon the pinion spindle 3 by means of a slot 30 which permits the pinion lever 29 to reciprocate along a path transverse to the axis of the spindle 3. A spring 31 is attached at one end to the pinion lever or an extension thereof and at the other end to a fixed point which spring 31 acts substantially in the direction of the slot 30. The pinion lever has a transfer finger 32 fixed thereon or formed integral therewith, the finger being the equivalent of the transfer finger 14 described in connection with Figures 1 to 5, and at the appropriate time engages the pinion 2 to move it forward one tooth. The transfer lever 7 is connected to the pinion lever 29 by means of a pin and slot connection for the purpose of enabling the transfer lever 7 to actuate it. The transfer lever 7 when rotated by the cam 6 rotates in a clockwise direction and causes the pinion lever 29 to move in an anti-clockwise direction by virtue of the pin and slot connection. Upon rotation of the pinion 2 due to key actuation the transfer finger 32 on the pinion lever 29 yields due to the slot connection 30. Attached to the pinion lever is an inclined straight ledge or projection 33 with which a finger or lug 16 on the cam 6 engages during for example the period when the pinion associated with the cam 6 passes through the 6, 7 and 8 readings for the purpose hereinbefore stated. During the anti-clockwise rotation of the pinion lever the finger 32 contacts with the edge of the teeth of the pinion 2 and slips over into engagement with the following tooth this action being permitted by means of the slot 30, the spring 31 causing the finger to pass into the tooth except of course at the readings 6, 7 and 8 when the finger 32 is out of the path of the pinion teeth. When the peak of the cam 6 passes out of engagement with the transfer lever 7 the latter moves back in an anti-clock-

wise direction under the action of its spring 12 and causes the pinion lever 29 to rotate and carry the pinion forward one tooth. The finger 32 upon the pinion lever is arranged to engage with that pinion tooth the driving face of which lies substantially at right angles to the direction of the slot 30 at the beginning or end of its movement so as to enable the pinion lever and the finger to yield when the pinion lever is stationary and the pinion is rotated clockwise or when the pinion is stationary and the pinion lever is rotated anti-clockwise.

Figure 7 illustrates a further form of the invention in which the transfer pawl 13 is pivotally attached to the arm 10 of the transfer lever 7. The pawl 13 is normally urged towards the pinion 2 by a spring 31 connected to the pawl 13 and to transfer lever 7. The pawl 13 has a bent portion 14 constituting the transfer finger which co-operates with the teeth of the pinion 2. The pawl 13 also has a straight portion 17 with which a lug or finger 16 on the cam 6 engages to move the transfer finger 14 outside the path of the pinion teeth at for example the readings 6, 7 and 8 for the purpose above mentioned.

Figure 8 illustrates a further modification in which a lever 32 is interposed between the pawl 13 and the lug or finger 16 on the cam 6. The lever 32 is pivoted on the transverse spindle 8 and projects between a bent part 33 of the pawl 13 and the lug 16 on the cam 6. The pawl 13 has a transfer finger 14 and is normally urged into contact with the lever 32 by means of spring 31.

It will be appreciated that the mechanisms above described are associated with each bank of keys for the purpose of carrying forward or transferring a unit digit to the tens digit and so on. Various changes may be made in the form and arrangement of the parts without departing from the working principles described. For example, the pin and slot are interchangeable between the transfer lever and pinion lever or bell crank lever or the slot of the pinion lever or bell crank lever may be replaced by a surface making contact with the pin on the transfer lever on one side only and the two parts may be held in contact by a spring or by suitably arranging for example the spring 31 (Figure 6) so that it exerts its force in the appropriate direction.

The invention has been described above as applied to calculating machines operating on the decimal system of notation but it must be understood that the invention is not to be limited thereto as other systems of notation may be employed for

example the English monetary system.

In connection with the partial key board machines referred to above it is only feasible to employ these machines for adding, but in the full key board machines not only additions but also multiplications and other calculations may be effected.

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

1. A calculating or adding machine of the type referred to having transfer mechanism comprising a cam rotated from one bank or column, a transfer element actuated by said cam and associated with a pinion in an adjacent column of higher order and normally lying in the path of the pinion teeth and means for moving said transfer element out of the path of the teeth of its associated pinion for a predetermined period until the moment at which transfer is due to take place.

2. A calculating or adding machine as in claim 1, wherein the transfer element comprises a spring controlled pawl having a transfer finger thereon.

3. A calculating or adding machine as in claim 2, wherein the cam has a part which co-operates with the pawl to move a transfer finger on the pawl out of the path of the teeth of its associated pinion.

4. A calculating or adding machine as in claim 2 or 3, wherein the pawl is pivoted on a lever having a connection with a transfer lever actuated by said cam.

5. A calculating or adding machine as in claim 4, wherein the cam is so shaped that it does not commence to actuate the transfer lever until after a predetermined period for the purpose specified.

6. A calculating or adding machine as in claim 4, wherein the cam is arranged to actuate the transfer lever immediately after the 0 reading has been registered.

7. A calculating or adding machine as in claim 6, wherein the cam is driven by

its associated pinion through the medium of a spring drive and means are provided for arresting the movement of the cam during the transfer operation for a predetermined period.

8. A calculating or adding machine as in claim 7, wherein the means comprise a spring controlled catch having a part projecting into the path of a projection on the cam, means being provided for moving the catch out of the path of said projection at the appropriate time.

9. A calculating or adding machine as in claim 1, wherein the transfer element is mounted upon or made in one piece with a spring controlled pinion lever which is mounted by means of a slot on the shaft carrying the pinions.

10. A calculating or adding machine as in claim 9, wherein the pinion lever is provided with an inclined ledge or other projecting part with which a lug or finger on an associated cam is adapted to engage for the purpose specified.

11. A calculating or adding machine as in claim 2 or 3, wherein the transfer pawl is directly mounted on a transfer lever and has a part which is engaged by a lug or projection on the cam for the purpose specified.

12. A calculating or adding machine as in claim 2 or 3, wherein the pawl is mounted directly on the transfer lever and another lever is interposed between a part of the pawl and a lug or finger on its associated cam for the purpose specified.

13. A calculating or adding machine constructed, arranged and adapted to operate substantially as hereinbefore described with reference to the accompanying drawings.

Dated this 21st day of April, 1931.

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

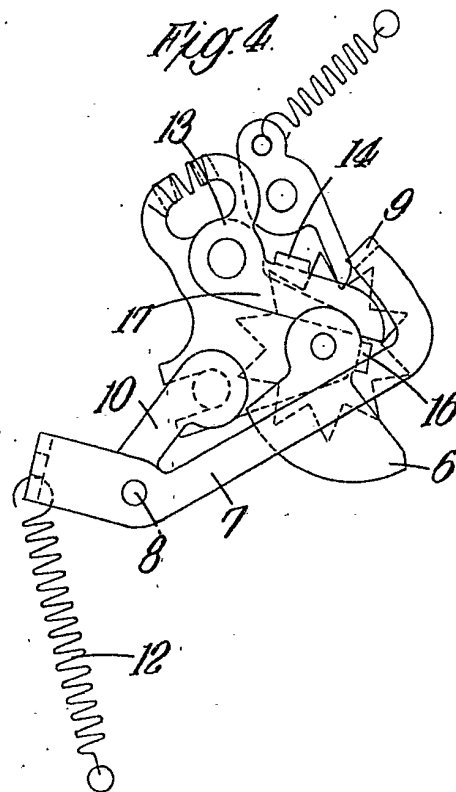
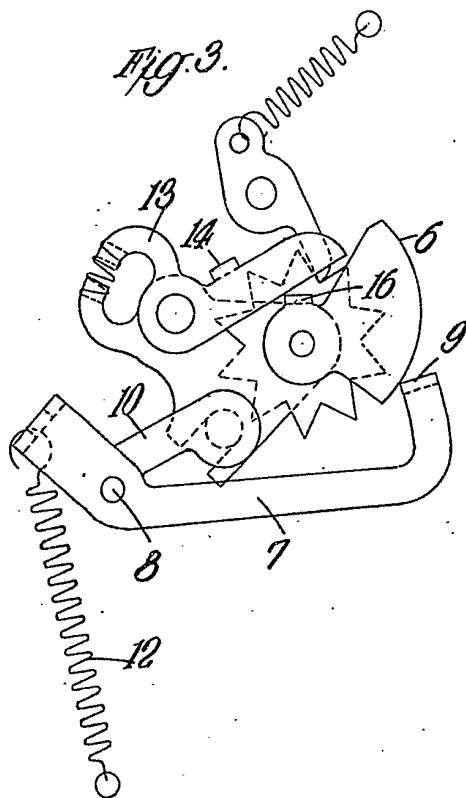
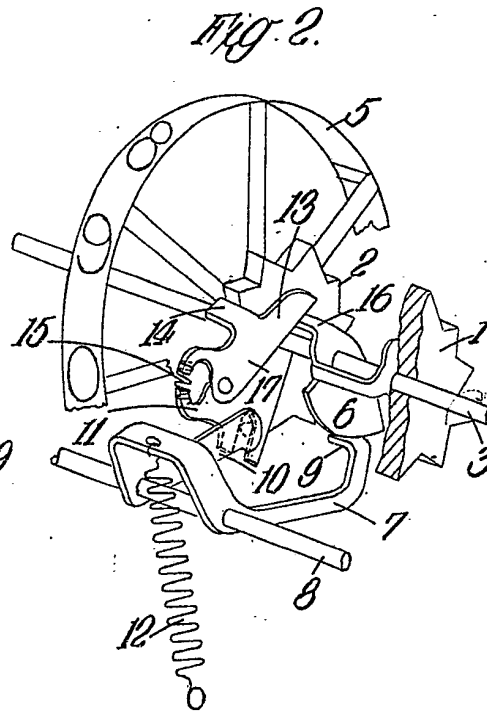
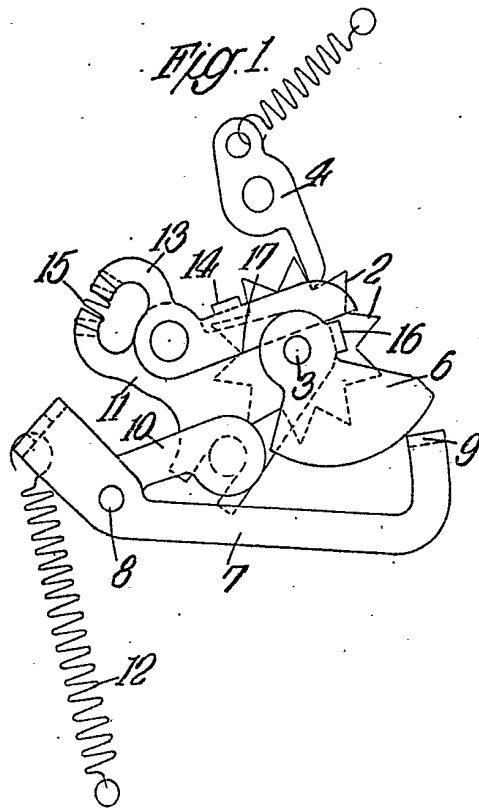
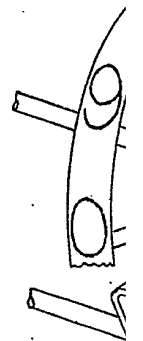
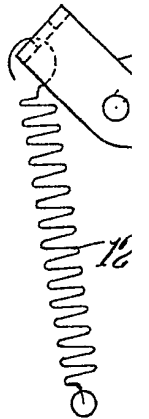
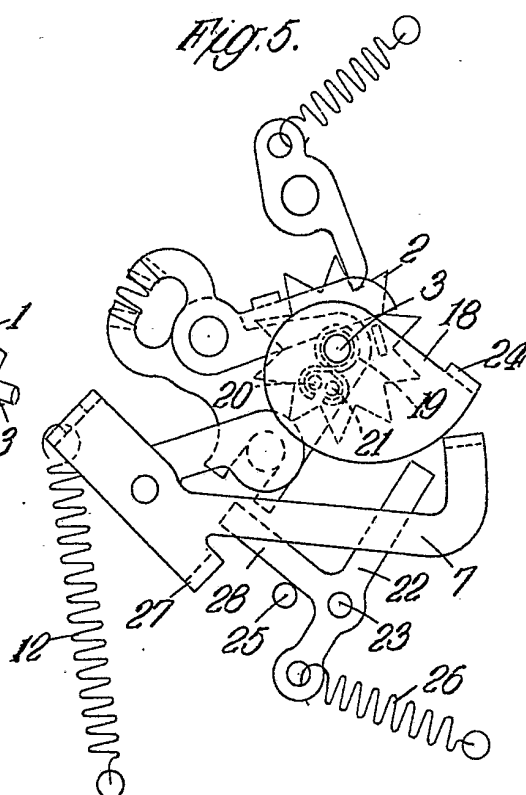
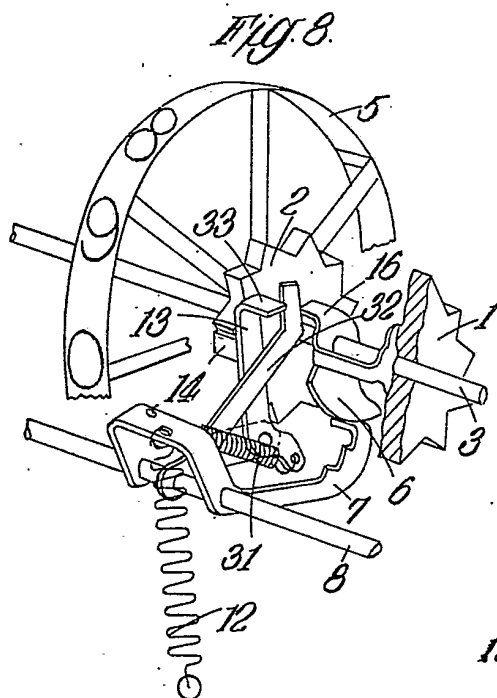
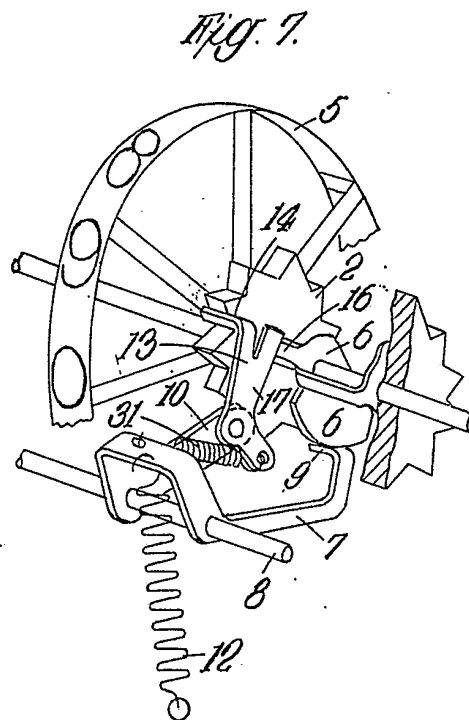
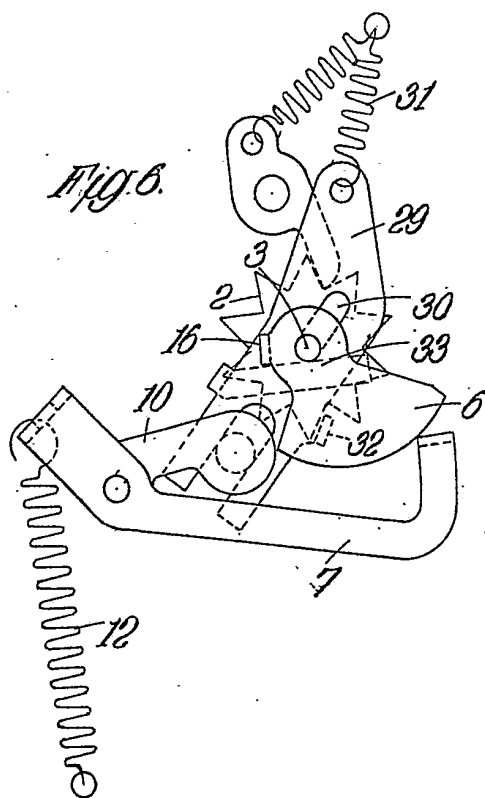
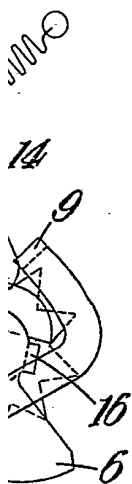
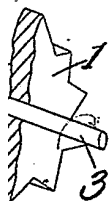
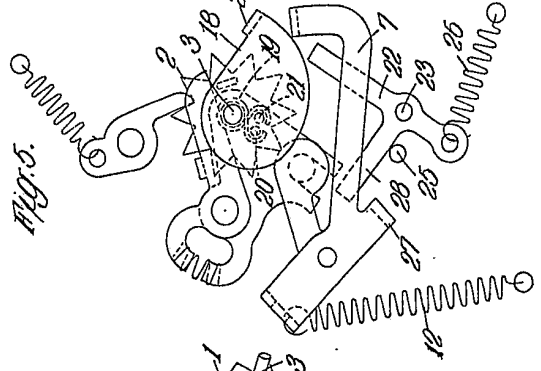
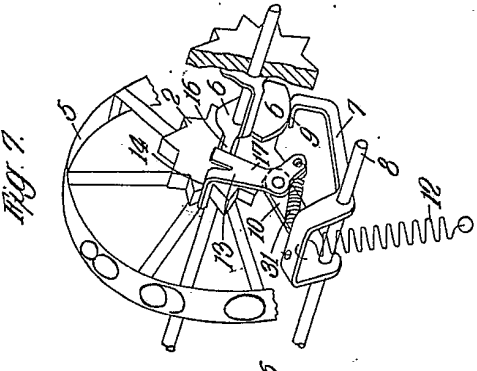
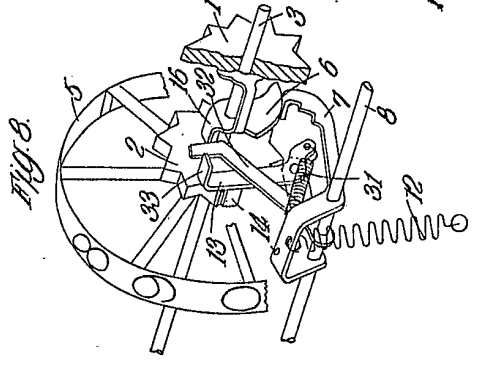
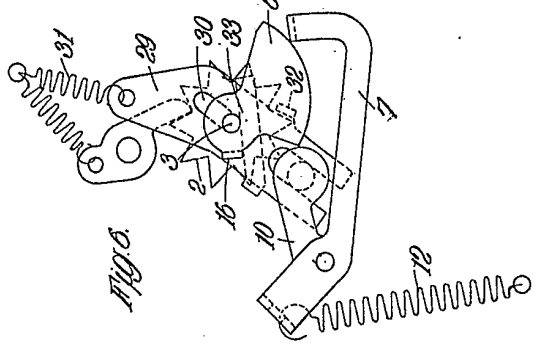
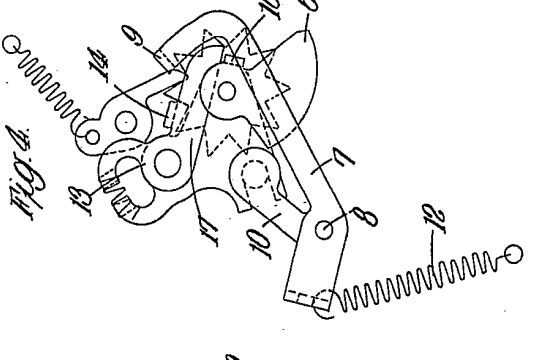
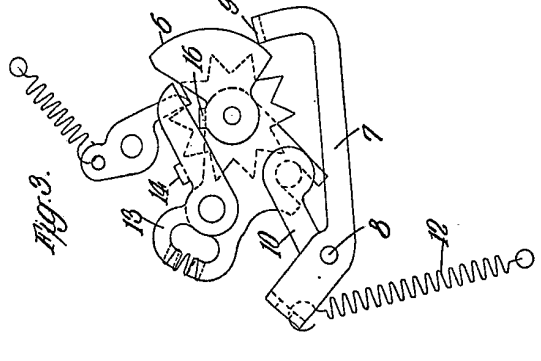
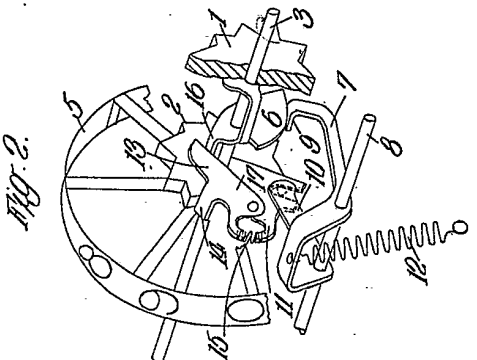
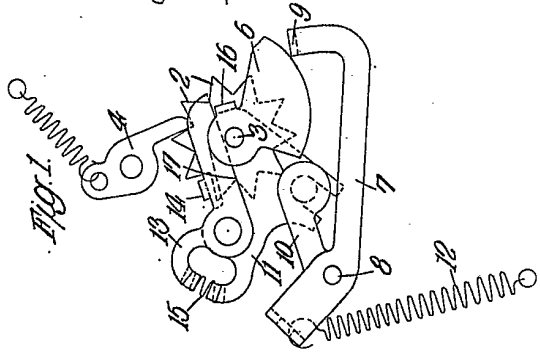


Fig.







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