D. W. SHIEK.

CARRYING MECHANISM FOR CALCULATING MACHINES AND THE LIKE.

APPLICATION FILED JULY 13, 1906.

948,188. Patented Feb. 1, 1910.

8 SHEETS—SHEET 1.

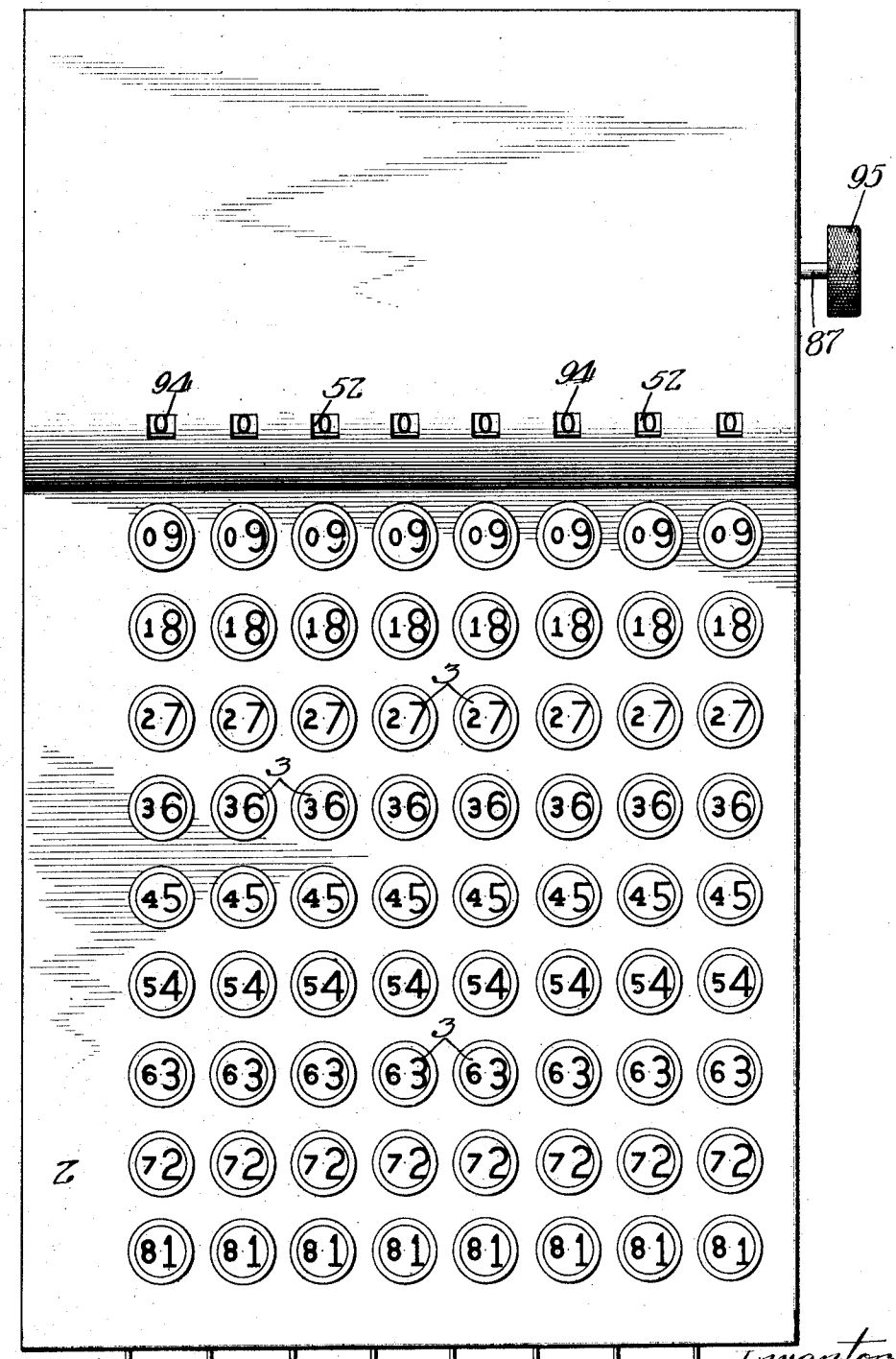

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Fig. 1.

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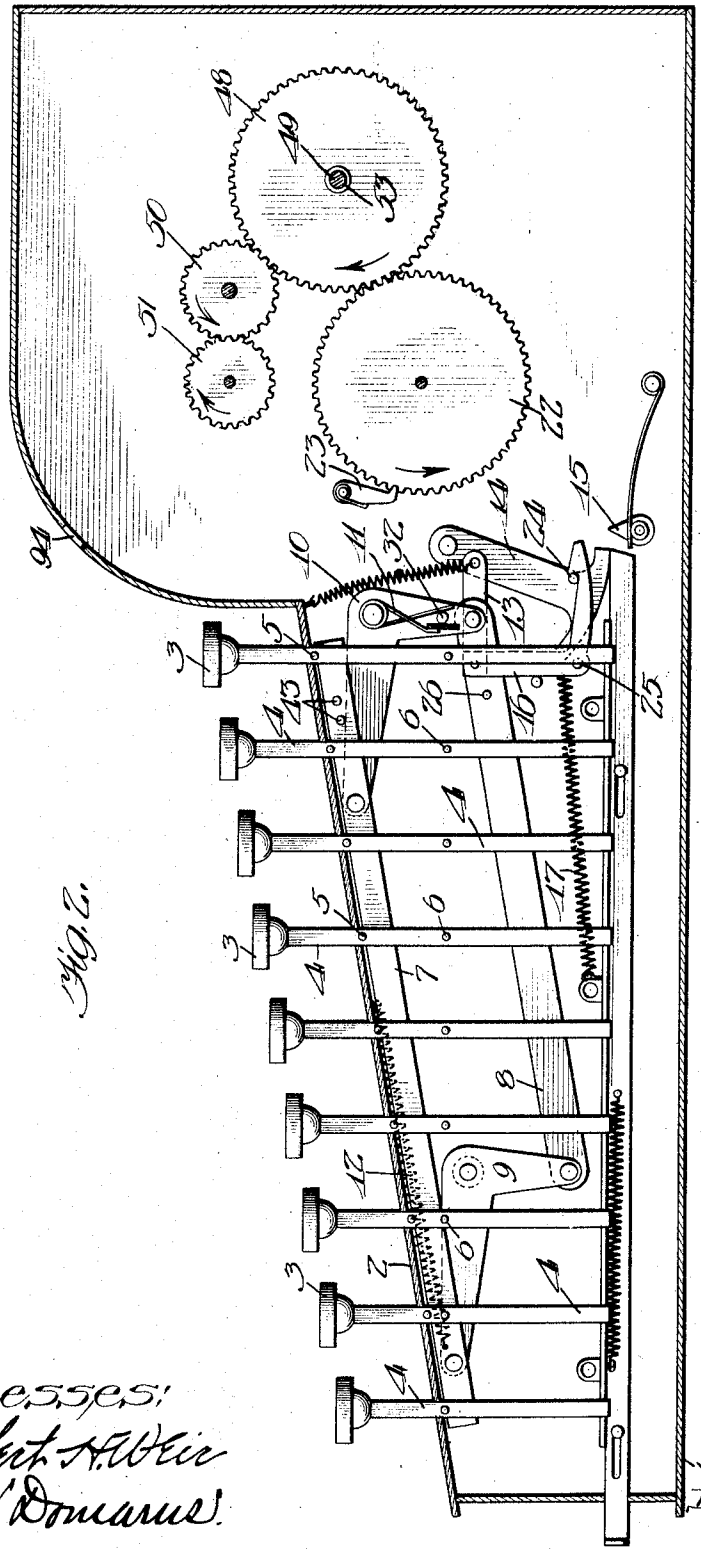

Fig. 2.

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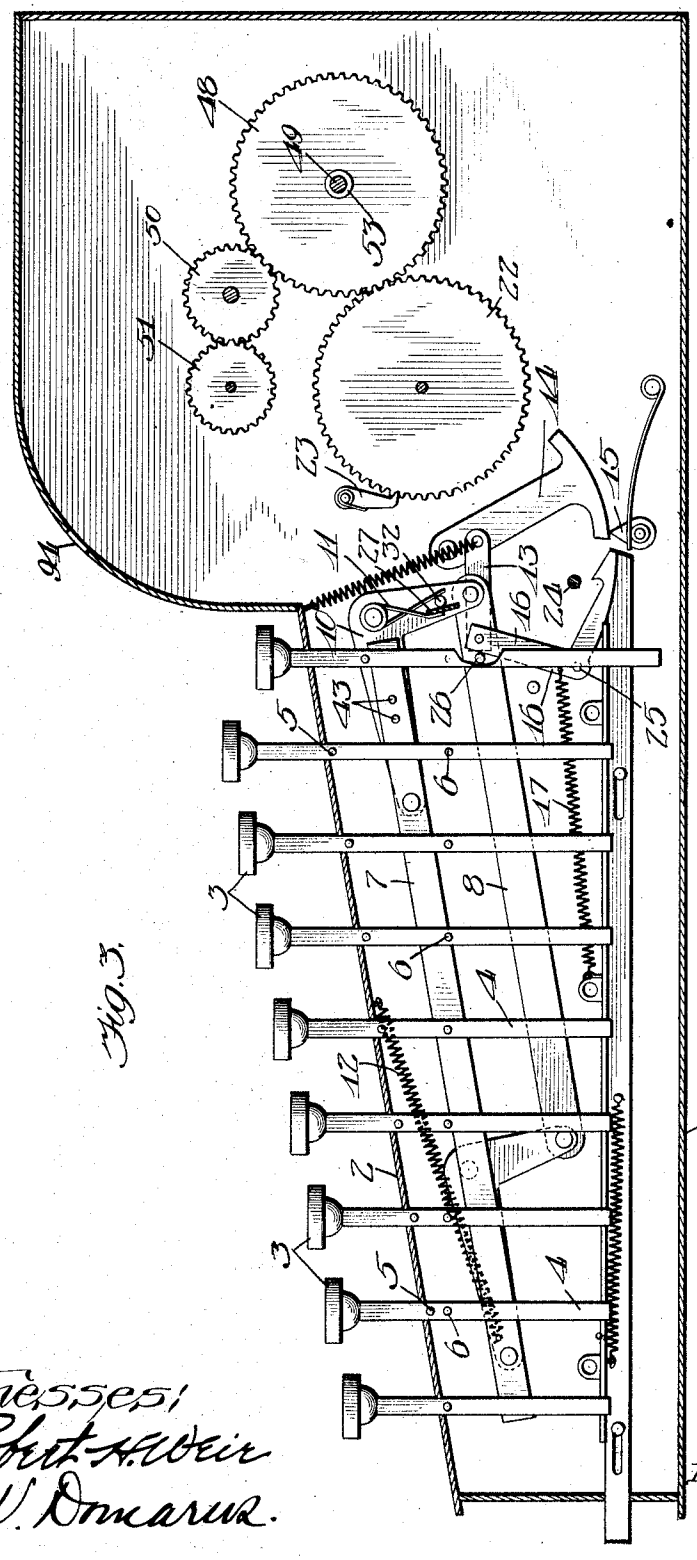

Fig. 3.

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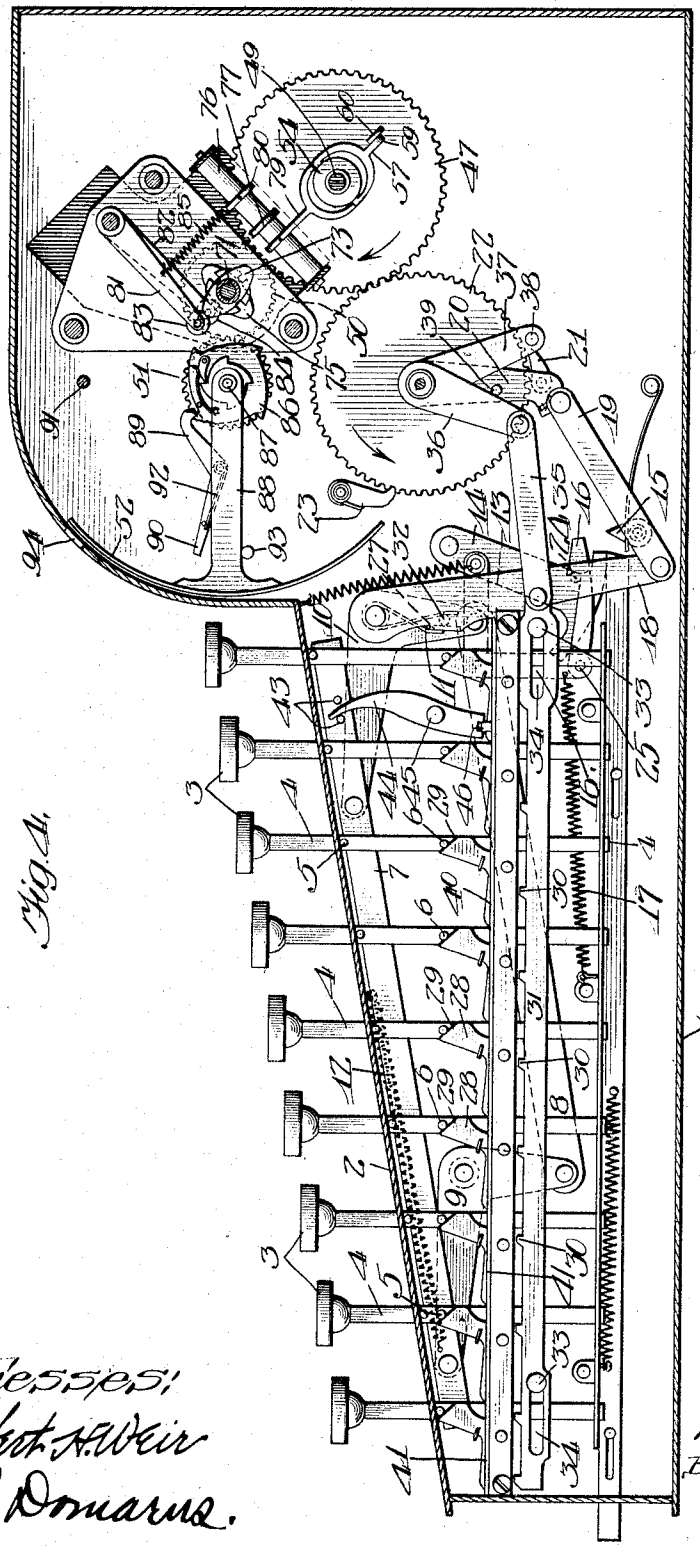

Fig. 4.

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Fig. 5.

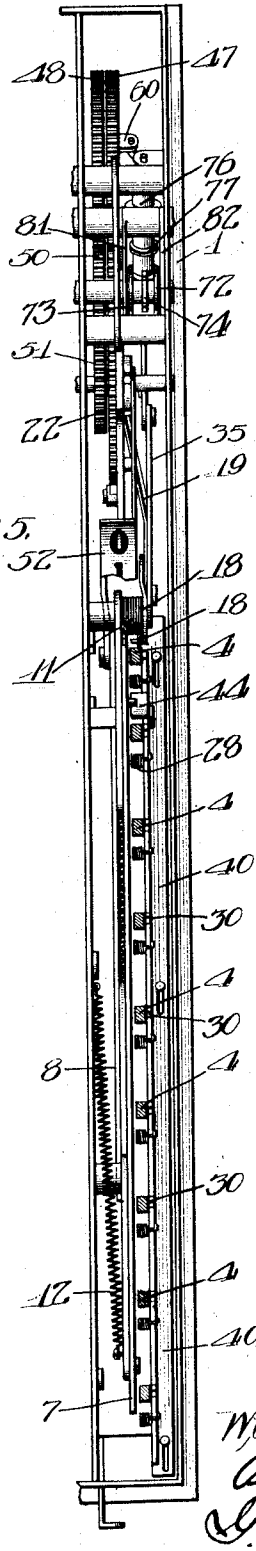

Fig. 6.

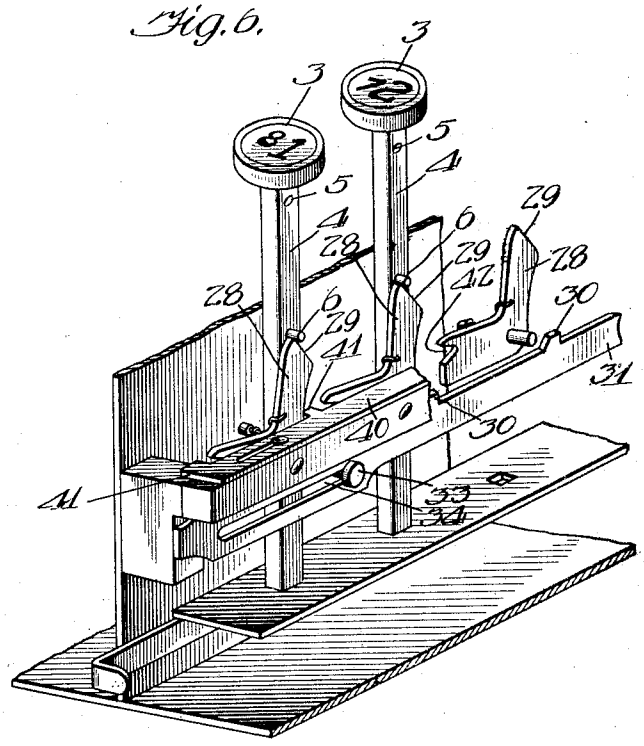

Fig. 7.

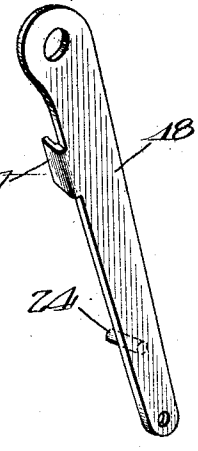

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Fig. 9.

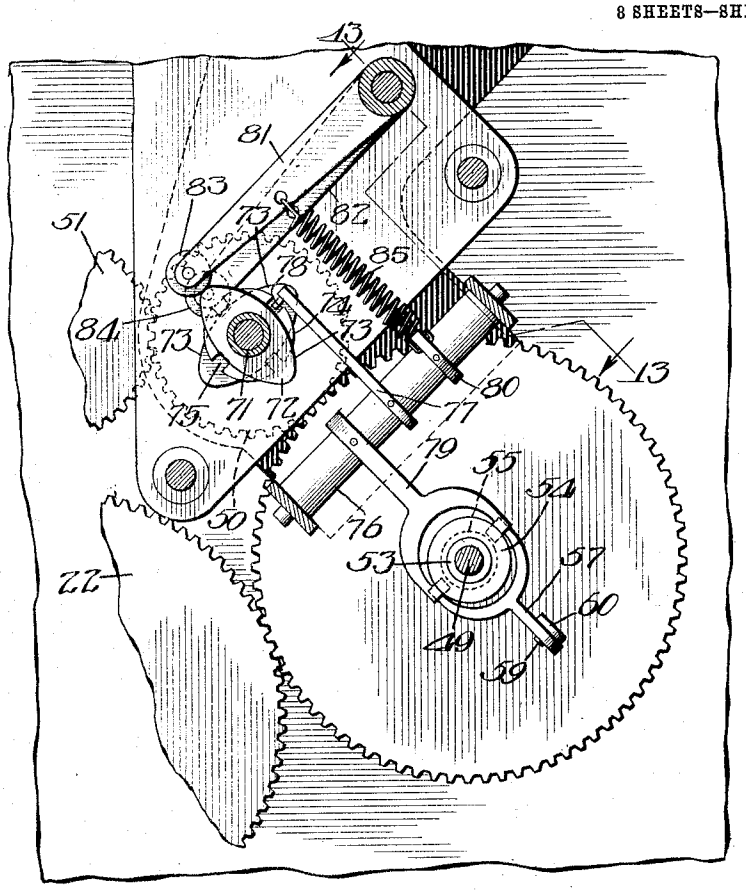
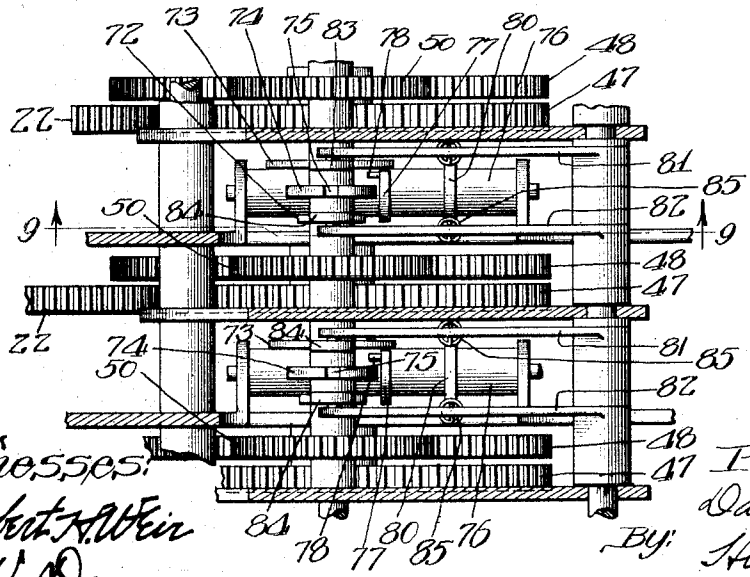


Fig. 8.



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8 SHEETS—SHEET 7.

Fig. 11.

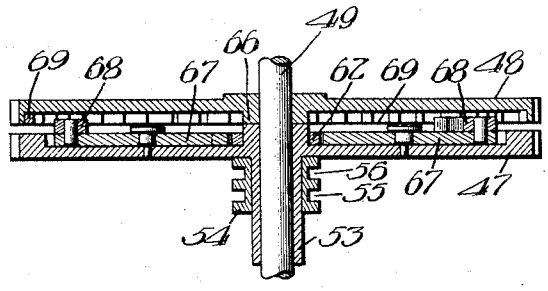


Fig. 11.

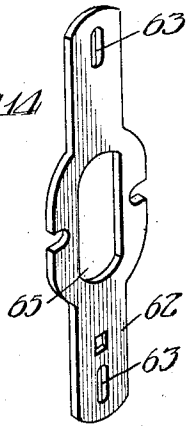


Fig. 10.

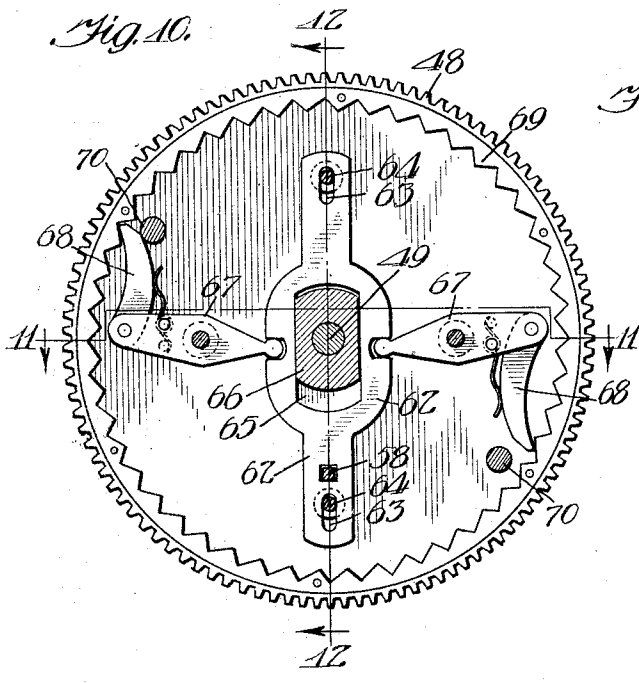
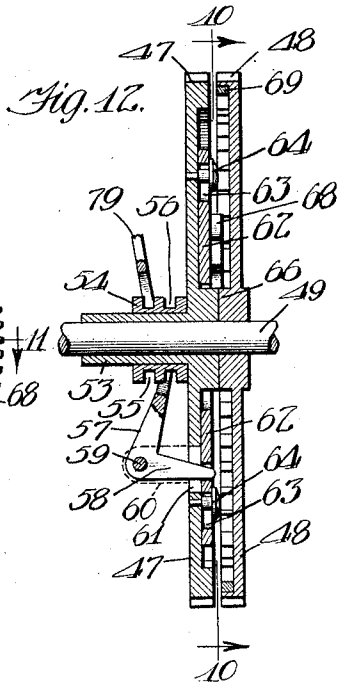


Fig. 12.



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APPLICATION FILED JULY 13, 1906.

948,188. Patented Feb. 1, 1910.

8 SHEETS—SHEET 8.

Fig. 13.

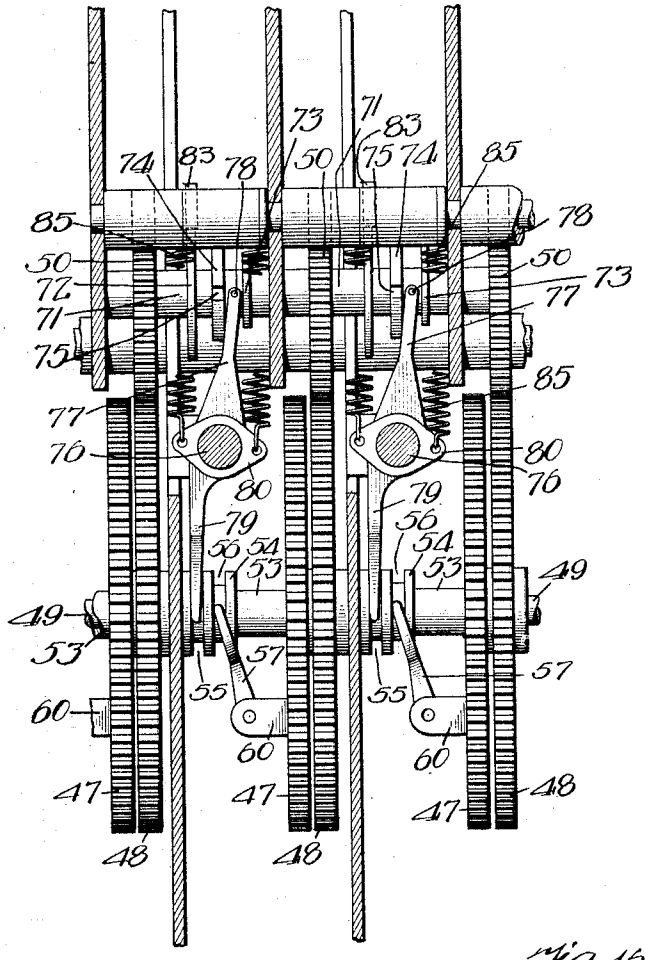


Fig. 15.

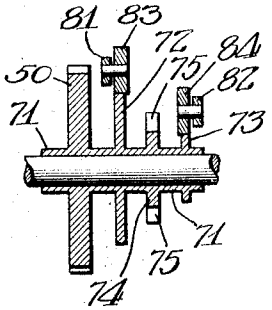
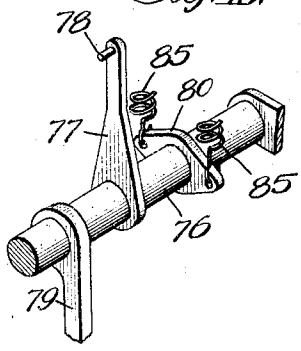


Fig. 16.



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UNITED STATES PATENT OFFICE.

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CARRYING MECHANISM FOR CALCULATING-MACHINES AND THE LIKE.

948,188. Specification of Letters Patent. **Patented Feb. 1, 1910.**

Application filed July 13, 1906. Serial No. 326,108.

To all whom it may concern:

Be it known that I, DANIEL W. SHIEK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Carrying Mechanism for Calculating-Machines and the Like, of which the following is a description.

My invention relates to improvements in calculating or equivalent machines, in which a plurality of numerical orders are employed, with suitable indicators, and in which as the indicator of a lower order reaches its limit of operation, a suitable amount is carried to the next higher order and is there indicated. For example as the indicator of the lower order reaches a total of ten, in decimal notations, one is carried to the next higher order and there indicated.

The object of my invention is to produce effective and accurate means for the purpose stated.

To this end my invention consists of the novel construction, arrangement and combination of parts shown and described and more particularly pointed out in the claims.

In the drawings, wherein like reference characters indicate like or corresponding parts; Figure 1 is a plan view of a calculating or adding machine containing my invention. Fig. 2 is a side elevation of the same with the side plate and a part of the operating mechanism removed, showing a part of the mechanism of the lowest numerical order. Fig. 3 is a similar view showing the relative position of the parts when a key of the order is depressed. Fig. 4 is a similar view of one of the higher orders, with the key controlled mechanism and connections therewith, and also my improved carrying mechanism. Fig. 5 is a substantially horizontal section inclined to correspond to the inclination of the key board, showing the mechanism of one order. Fig. 6 is a partial perspective view showing the key locking mechanism and limiting bar. Fig. 7 is a perspective view of the operating arm. Fig. 8 is a partial top plan of the carrying mechanism of two adjacent numerical orders, showing the relative position of the cooperating parts. Fig. 9 is a partial section on line 9—9 of Fig. 8. Fig. 10 is a face view of one of the parts of the transmitting member with its operating pawls, taken substantially on line 10—10 of Fig. 12. Fig. 11 is a section on line 11—11 of Fig. 10, showing also the companion or coöperating part of the transmitting member. Fig. 12 is a similar view on line 12—12 of Fig. 10. Fig. 13 is a view taken substantially on line 13—13 of Fig. 9; and Figs. 14, 15 and 16 are detail views.

The first seven figures of the drawings illustrate the key mechanism and associated parts of an accounting machine substantially the same as that shown in an application filed by me on January 11th, 1906, for improvements in computing machines, Serial No. 295,670.

As shown, 1 is the frame of the machine, 2 the key board provided with a section of keys 3—3 for each numerical order. The stems 4 of the keys extend through the key board and down into the machine and are provided with stops 5, and 6, for a purpose hereafter described. Beneath the key board is a pair of substantially parallel bars 7, and 8, connected by bell crank levers 9, and 10, tending to keep the bars parallel to one another during their operation and to give the lower bar 8 a forward swing. Resilient means such for example as the springs 11, are provided to return the bars together with the key operated and their associated parts to their normal positions. This may be aided also by any other suitable means, for example by one or more springs 12, secured to one of the bell crank levers and to the frame of the machine. A link 13 connects the bar 8 with a spring latch 14 which coacting with a resilient pivotal detent 15 prevents the restoration of the parts to their normal positions until the key has completed the limit of movement allowed in its stroke. A latch 16 is also operated by the movement of the bar 8 for a purpose hereafter described. A spring 17 is provided to restore the latch 16 to its original or normal position. A pivotally supported bar 18 (Figs. 4 and 7) is operated by the forward movement of the bar 8 and is connected by a link 19 with an arm or lever 20 carrying a pawl 21 arranged to engage the periphery of the gear-wheel 22. A pawl 23 operating in the opposite direction engages the gear-wheel 22 and prevents any back movement. The bar 18 is provided with a stop 24 arranged to coöperate with the latch 16 to retain the bar in its normal position until the spring 11 is properly tensioned and the op-

erated key has reached the proper point to permit the disengagement of the bar and allow the operation of the device. The latch 16 before referred to is pivotally connected in any suitable manner as at 25 and it is substantially in the form of a bell crank lever, with one end extended in line with a stop 26 carried on the bar 8, clearly illustrated in Figs. 2, 3 and 4. The swinging arm or bar 18 is also provided with an offset part 27 (see Fig. 7) which extends between the ends of the spring 11 as shown in Figs. 2, 3 and 4, thus as the free arm of the bar 18 is held against movement by the engagement of the latch 16, with the stop 24, the depressing of the key swings forward the bell crank lever 10 when the engagement of the pin 32 with the other leg of the spring 11 tensions the said spring storing sufficient energy to operate the bar 18 and its connected parts when the key reaches the proper point to cause the release of the arm 18 from the latch 16.

A series of bell crank levers 28 are provided for the keys each provided with a cam face 29 by means of which the bell crank will be operated by the contact of the stop 6 of the particular key depressed. By this operation the other arm of the bell crank lever will be swung out of its normal position and in line with a stop 30 on the longitudinally movable bar 31, which is supported by slot and pin connection 33, 34.

A link 35 connects the end of the bar 31 with a bell crank lever 36, 37, pivotally supported upon the same center as the gear-wheel 22 with the arm 20. The latter arm 37 carries a stop 38 arranged to co-act with the pawl 21 in operating the gear-wheel 22. The arm 20 is provided with a projecting pin 39 positioned between the arms 36, 37, of the bell crank for a reason which will be hereafter stated. In the operation of the mechanism just described, the swinging forward of the arm 18 brings the pawl 21 into engagement with the gear-wheel wedging the same between the stop 38 and said wheel. The continued forward movement of the arm 18 thus rotates the gear-wheel 22 a distance permitted by the movement of the bar 31 which again is regulated by the stop constituted by the bell crank 28 of the particular key operated. When the parts reach their limit of movement and the key is released the various resilient connections restore the several parts except the gear-wheel 22 to their original positions during which the stop 39 on the arm 20 engages the arm 36 of the bell crank thus forcing the longitudinally movable bar 31 back into its normal position.

A longitudinally movable bar 40 (Fig. 6) is provided with extensions 41 in line with the bell crank stops 28, arranged to engage the notches 42 in the end of said stops. The bar 7 (Figs. 2, 3 and 4) is provided with two projections 43—43 spaced from one another to engage the opposite sides of the cam lever 44 which is pivotally supported between its ends at 45 with its opposite end loosely engaging a part 46 on the bar 40. As a key is depressed, therefore, its initial movement causes one of the pins 5 to depress the bar 7 and one of the extensions 6 on the key stem to engage with the cam 29 on its bell crank lever 28 thus depressing the opposite end of the bell crank lever below the level of the stop 41. The continued movement of the key causes the extensions 43 to operate the cam lever 44 longitudinally moving the bar 40 causing the extensions 41 thereon to engage the notches in all of the other stops 28 so that until the operated key reaches its limit of movement and is released, no other key in that section can be operated inasmuch as they are all locked by the mechanism described. The reverse movement reverses the action of the cam lever 44 and restores the movable bar 40 to its normal position.

As before stated the parts heretofore described are included in the above mentioned pending application and are not claimed herein except in claims in which they may be included as elements of the combination with the parts hereafter described.

The novel means for transmitting the movement of the driving member or wheel 22 to the indicator, and of the carrying from a lower to a higher order are substantially as follows. As clearly shown in Figs. 10, 11 and 12 two gear wheels 47 and 48 are placed in proximity to one another on a shaft 49 and are so engaged as to normally operate in unison as a single transmitting member. Their engagement however, is adjustable and is such that as a lower order completes its cycle of movement one of said wheels is automatically moved forward in relation to the other to properly carry the necessary numerical amount to the next higher order. As shown the pinion 47 meshes with the driving pinion 22 and by its engagement with its companion member 48 transmits the movement to an idler 50 and thence to a pinion 51 actuating an indicator 52. In the first or lowest order it is obvious that an ordinary pinion may be employed to transmit the movement of the driving pinion to the idler 50, since nothing is carried to it from a lower order. All others, however are provided with the double transmitting member and the carrying mechanism therewith. The pinion or member 47 is preferably provided with a sleeve 53, secured thereto or integral therewith and a collar 54 slidably mounted on said sleeve. The collar 54 is constructed with two circumferential grooves 55, 56. A bell crank lever 57—58 is pivotally supported at 59 on a lug 60 formed on the

pinion 47 with one arm 57 bifurcated and positioned in the groove 56 and the other arm 58 extended through a slot 61 in the pinion and engaging a sliding reciprocating yoke 62 carried on the opposite face of the pinion. As shown (Fig. 10) the yoke 62 is provided with slots 63—63 within which pins 64—64 on the pinion are positioned. In the preferred construction the yoke is also constructed with an enlarged central slot 65 loosely embracing a guiding extension 66. Obviously the parts may be reversed if preferred and the functions mentioned retained. A lever 67 is pivotally supported between its ends on each side of the yoke with one end extended to and pivotally engaging the adjacent side of the yoke and the other end provided with a spring pawl 68 off-set to engage an internal ratchet ring 69 or equivalent part carried on the companion member 48, of the transmitting device. The pawls extend in opposite directions and the reciprocation of the yoke thus causes the pawls to alternately engage the ratchet ring and thus periodically move the part 48 in one direction in relation to the part 47. Stop pins 70 or equivalent devices are suitably positioned upon the member 47 to limit the advance movement of the pawls and thus measure with exactness the movement of the part 48, in relation to the part 47, at each movement of the yoke. They also serve to prevent overthrow of the two parts and to positively lock the parts 47 and 48 together at measured points to operate as a unit until the reverse movement of the yoke, when the part 48 is again advanced in relation to the part 47 and they are again locked together to operate as a unit. Obviously the advance movement of the part 48 will be transmitted at once to the idler 50 and thence to the indicator, the operation being regulated to advance the indicator a sufficient distance to register the amount carried from the lower order.

The idler 50 of all the orders except the last or highest is constructed with a sleeve 71 having fixed thereon two substantially elliptical cams 72—73 arranged to extend at right angles to each other, with a disk 74 positioned between them. The said disk has formed in its periphery four transverse slots 75, positioned to register with the longest diameter of the two cams 72—73. A rock shaft 76 is located beneath each disk 74 (Figs. 4, 8, 9, 13, 15, 16) provided with an oscillating arm 77 having at its free end a transversely projecting pin or finger 78 adapted to readily pass through the several slots 75 in the disk 74. The rock-shaft 76 is also provided with an oppositely extending arm 79 which at its free end is bifurcated and positioned in the slot 55 of the collar 54 heretofore described. (Figs. 11, 12 and 13). A cross piece or arm 80 is also carried by the rock shaft extending at right angles to the arms 77 and 79, with its opposite ends resiliently connected to levers 81 and 82 pivotally connected to a fixed part of the device with the free ends extended to the cams 72—73 and arranged to ride thereon. As shown the ends of the said levers or arms are provided with anti-friction rollers 83—84 riding upon said cams, while coiled springs 85—85 serve to connect the said levers to the cross arm 80.

It will be apparent that the gradual rotation of the idler 50 and the connected cams 72—73 will alternately oscillate the levers 81—82 in opposite directions to one another and that the tensioning and release of the springs 85—85 will also be alternate and in opposition to one another thus actuating the rock shaft 80 and tending to oscillate the arm 77. The pin 78, however, rides upon the side of the disk until a slot 75 registers therewith at which moment the maximum tension is on the spring actuating the rock shaft. The pin being unobstructed readily passes through the slot thus allowing the rock shaft to operate the actuating lever 79, thus moving the collar 54 longitudinally on the shaft 49, operating the bell crank lever 57—58, the sliding yoke 62, the proper pawl 68 and moving the part 48 forward in relation to the part 47. This train of operations is timed to take place at the moment the next lower order has reached the point when the carrying is to be done, for example when a ten is to be carried to the proper order.

It is clear that the operation described will take place with substantially the same exactness and accuracy whether the transmitting members 47—48 be then moving in response to the actuation of a key, or whether it be at rest, no key in that order being depressed. In other words it is not necessary to retard the operation of the mechanism of the higher orders until the carrying operation is completed below, as in all machines now in general use, for the reason that the carrying operation in my invention cannot be absorbed in the simultaneous movement of the mechanism of the higher orders. It is obvious therefore, that keys in several orders may be simultaneously operated, thus greatly increasing the speed at which the machine may be manipulated.

The indicating mechanism may be as preferred. As shown in Fig. 4, the indicator is the same as that shown and described in said prior application for Letters Patent. As thus arranged the indicator pinion 51 has secured thereto or made integral therewith a ratchet wheel 86, the two being loosely mounted on a shaft 87. An oscillating arm 88 carrying upon its free end an indicator segment 52, is provided with a bell crank hooked pawl 89 for the ratchet wheel 86 pivotally supported between its ends with the free end 90 extended to contact with a stop 91 to release

the pawl as the arm reaches its limit of movement in that direction. A suitable spring 92 resiliently holds the pawl in suitable position, and a stop 93 or other suitable means limits the return of the indicator to its normal position. The indicating characters on the part 52 are shown through a sight opening 94 in the case. The shaft 87 extends from the casing (Fig. 1) and is provided with a suitable knob or button 95 by means of which it may be rotated in re-setting the device. The shaft also has fixed thereto for each wheel 51 a ratchet wheel 96 co-acting with a spring pawl 97 on the ratchet wheel 86, by means of which upon rotating the shaft the ratchet wheels 86 and the associated wheels 51 are engaged carrying the several indicators up in unison to the point where they are simultaneously released resetting them all at the zero point, the several associated parts being capable of such movement for the purpose stated.

It is obvious that after describing my improvement, various immaterial modifications may be made without departing from the spirit of my invention. Hence I do not wish to be understood as limiting myself to the exact form and construction shown.

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

1. In a device of the kind described provided with mechanism for a plurality of numerical orders, a transmitting mechanism for each order comprising two coöperating members independently rotatable on a common center, and means pivotally mounted upon one of said members and operated by the mechanism of the next lower order for moving one of said members forward in relation to the other.

2. In a computing machine or the like, mechanism for a plurality of numerical orders each comprising a driving member, an indicator, and intermediate mechanism between the two provided with two parts independently rotatable on a common center and temporarily engaged to transmit movement to the indicator, in combination with means pivotally mounted upon one of said members for moving one part forward in relation to the other, and means periodically operated by the mechanism of the next lower order for actuating the same, whereby as the lower order reaches the carrying point one of said members is moved forward in relation to the other to indicate the same in the next higher order.

3. In a device of the kind described, two rotatable members permanently fixed in close proximity to one another and normally engaged to operate together as a unit, one of said members carrying a ratchet part and the other coöperating pawl mechanism therefor, in combination with means for periodically operating the pawl mechanism, whereby one of said members is advanced in relation to the other.

4. In a device of the kind described provided with mechanism for a plurality of numerical orders, a transmitting member comprising two pinions placed side by side, and independently rotatable on a common center, one of said pinions being provided with a ratchet ring, and the other with a pair of coöperating pawls, in combination with means controlled by the mechanism of the next lower order for periodically operating said pawls, whereby one of said members is advanced in relation to the other.

5. In a device of the kind described, provided with mechanism for a plurality of numerical orders, transmitting mechanism comprising a pair of pinions placed side by side and independently rotatable on a common center, one of said pinions being provided with an internal ratchet ring, the other with a reciprocating yoke, and a pair of coöperating pawls operated by said yoke, in combination with means controlled by the next lower order for periodically operating said yoke.

6. A transmitting member for adding machines and the like, comprising two pinions placed side by side and independently rotatable upon a common center, one of said members being provided with a ratchet ring and the other with a pair of coöperating pawls therefor, and a reciprocating yoke engaging said pawls and arranged to operate the same by its movement, in combination with a bell crank lever carried by the second pinion with one end engaging said yoke, and the other end spanning a groove in a movable collar, and means controlled by the next lower order for periodically reciprocating said collar and operating said bell crank lever, whereby one of said members is advanced in relation to the other.

7. Transmitting mechanism comprising two rotatable members placed in proximity to one another and normally engaged to operate together as a unit, in combination with means pivotally mounted upon one of the members for periodically advancing one member in relation to the other and again normally engaging them.

8. In a device of the kind described provided with mechanism for a plurality of numerical orders, a transmitting member for each order, comprising two coöperating rotatable members placed in proximity to one another and normally connected to operate as a unit, in combination with means pivotally mounted upon one of the members and controlled by the mechanism of the next lower order for periodically advancing one of said members in relation to the other, and means for again normally engaging said members in such position.

9. In a device of the kind described provided with mechanism for a plurality of numerical orders, transmitting mechanism for the several orders comprising two rotatable members placed in proximity to one another and normally engaged to operate together as a unit, in combination with a rock-shaft, means for operating said rock-shaft as the mechanism of an order completes its cycle of movement, and means for transmitting the movement of the rock-shaft to the transmitting mechanism of the next higher order to periodically advance one of the transmitting members in relation to the other and means for again normally engaging said members.

10. In a device of the kind described provided with mechanism for a plurality of numerical orders, transmitting mechanism comprising two rotatable members placed in proximity to one another and normally engaged to operate together as a unit, an idler driven by one of said members, and a rock-shaft periodically operated by said idler, in combination with means for transmitting the movement of said rock-shaft to one of said members of the next higher order advancing the same in relation to the other, and means for again normally engaging said members.

11. In a device of the kind described provided with mechanism for a plurality of numerical orders, transmitting mechanism for the several orders comprising two rotatable members placed in proximity to one another and normally engaged to operate together as a unit, an idler driven by one of said members provided with cam members arranged at substantially right angles to one another, and a rock-shaft periodically operated by said cam members, in combination with means for transmitting the movements of the rock-shaft to the transmitting mechanism of the next higher order to advance one of said members in relation to the other and means for again normally engaging said members.

12. Intermittent actuating mechanism comprising two levers, a rock-shaft connected to said levers on opposite sides of its center of movement, and means for normally restraining the operation of the rock-shaft, in combination with cam mechanism arranged to alternately reciprocate the said levers, and means for periodically releasing said rock-shaft in relation to the reciprocation of the levers.

13. Intermittent actuating mechanism comprising two elliptical cams arranged to extend at substantially right angles to each other and rotating on a common center, and means for rotating said cams, in combination with two pivotally supported levers with their free ends riding on said cams, a rock-shaft having its opposite sides connected to said levers, means for restraining the operation of the rock-shaft, and means for periodically releasing the rock-shaft in relation to the rotation of the cams.

14. Intermittent actuating mechanism comprising two elliptical cams arranged to extend at substantially right angles to each other and rotating on a common center, with a disk between them having its perimeter transversely slotted in line with the longest diameters of said cams, and means for rotating said cams and disk in unison, in combination with two pivotally supported levers with their free ends riding on said cams, a rock-shaft connected on opposite sides of its center of movement to the levers, and an oscillating lever carried by the rock-shaft with its free end extended to the disk and constructed to pass by the same as the slot registers therewith.

15. In a computing machine or the like, two rotatable members placed in proximity to one another and means for engaging the two at a plurality of points to rotate together as a unit, in combination with intermittent actuating mechanism comprising two levers, a rock-shaft connected to said levers on opposite sides of its center of movement, means for temporarily restraining the operation of the rock-shaft, cam mechanism arranged to alternately reciprocate said levers, means for periodically releasing said rock-shaft in relation to the reciprocation of the levers, and means for transmitting the operation of the rock-shaft to one of said rotatable members to advance it in relation to the other to a point where they are again engaged to operate as a unit.

16. In a device of the kind described, provided with mechanism for a plurality of numerical orders, transmitting mechanism for the several orders comprising two rotatable members placed in proximity to one another and normally engaged to operate together as a unit, an idler driven by one of said members provided with cam members arranged at substantially right angles to one another, two pivotally supported levers arranged with their free ends to ride upon said cam members, a rock-shaft periodically operated by said cam members, means for temporarily restraining the operation of the rock-shaft, means for periodically releasing the rock-shaft in relation to the reciprocation of the levers, a lever operated by said rock-shaft, and means for transmitting the movement of said lever to the transmitting mechanism of the next higher order to advance one of said members in relation to the other, and means for again normally engaging said members.

17. In a device of the kind described, provided with mechanism for a plurality of numerical orders, transmitting mechanism comprising a pair of pinions placed side by side and independently rotatable on a com-

mon center, one of said members being provided with an internal ratchet ring, and the other with a reciprocating yoke and a pair of coöperating pawls operated by said yoke, in combination with intermittent actuating mechanism arranged in the next lower order comprising two levers, a rock-shaft connected to said levers on opposite sides of its center of movement, means for temporarily restraining the operating of the rock-shaft, cam mechanism arranged to alternately reciprocate said levers, means for periodically releasing said rock-shaft in relation to the reciprocation of the levers, and means for transmitting the action of the rock-shaft to the reciprocating yoke whereby one of said pinions is advanced in relation to the other and again normally engaged therewith to operate together as a unit.

18. In a computing machine or the like, mechanism for a plurality of numerical orders each provided with a plurality of actuating keys, a driving member for each numerical order, and means for transmitting the movement of any key in the numerical order to its driving member, an indicator for each order, and intermediate transmitting mechanism between the driving member and its indicator, in combination with carrying mechanism carried by the said intermediate mechanism and controlled by the operation of the next lower order.

19. In a device of the kind described provided with mechanism for a plurality of numerical orders, a plurality of actuating keys for each order, a transmitting member for each order actuated by the several keys of that order, comprising two coöperating members independently rotatable on a common center, and means for adjustably engaging the two members to operate together as a unit, in combination with means pivotally mounted upon one of said members and controlled by the mechanism of the next lower order for moving one member forward in relation to the other to a point where they are again engaged to operate as a unit.

20. In a device of the kind described provided with mechanism for a plurality of numerical orders, a plurality of actuating keys for each order, a driving member, and means for transmitting the action of any key in an order to its particular driving member, a transmitting member for each order comprising two coöperating rotatable members placed in proximity to one another and normally engaged to operate together as a unit, in combination with means pivotally mounted upon one member and controlled by the mechanism of the next lower order for periodically advancing one of said members in relation to the other, means for again normally engaging said members in such position, and means for transmitting the action of the transmitting member to an indicator.

21. A device of the kind described, comprising a driving mechanism, an indicator, and intermediate transmitting mechanism for each of a plurality of numerical orders, in combination with carrying mechanism for each order, mounted upon said transmitting mechanism and means controlled by the mechanism of the next lower order for operating said carrying mechanism.

22. A device of the kind described, comprising a driving mechanism, an indicator, and intermediate transmitting mechanism for each of a plurality of numerical orders carrying means for each order forming a part of said transmitting mechanism and adapted to be controlled by the mechanism of the next lower order.

23. A device of the kind described, comprising a driving mechanism, an indicator, and intermediate driving mechanism for each of a plurality of numerical orders carrying means for each order forming a part of said transmitting mechanism and adapted to be controlled by the transmitting mechanism of the next lower order.

In testimony whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

DANIEL W. SHEEK.

Witnesses:
GEO. H. MORSE,
CHARLES I. COBB.