No. 825,469. PATENTED JULY 10, 1906.

C. F. LAGANKE & J. A. SMITH.

COMPUTING MECHANISM FOR TYPE WRITING MACHINES.

APPLICATION FILED AUG. 23, 1904.

6 SHEETS—SHEET 1.

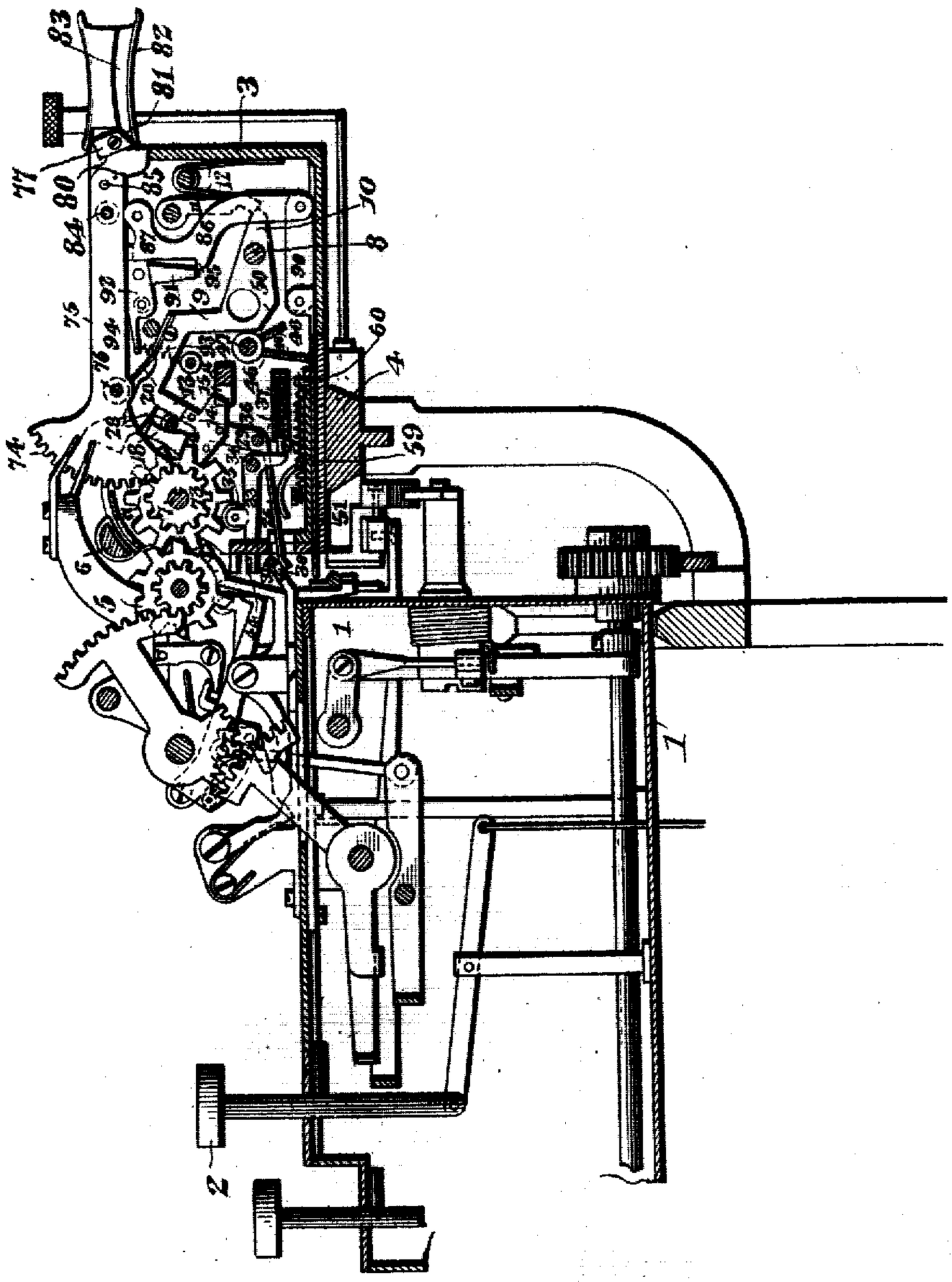

Fig. 1.

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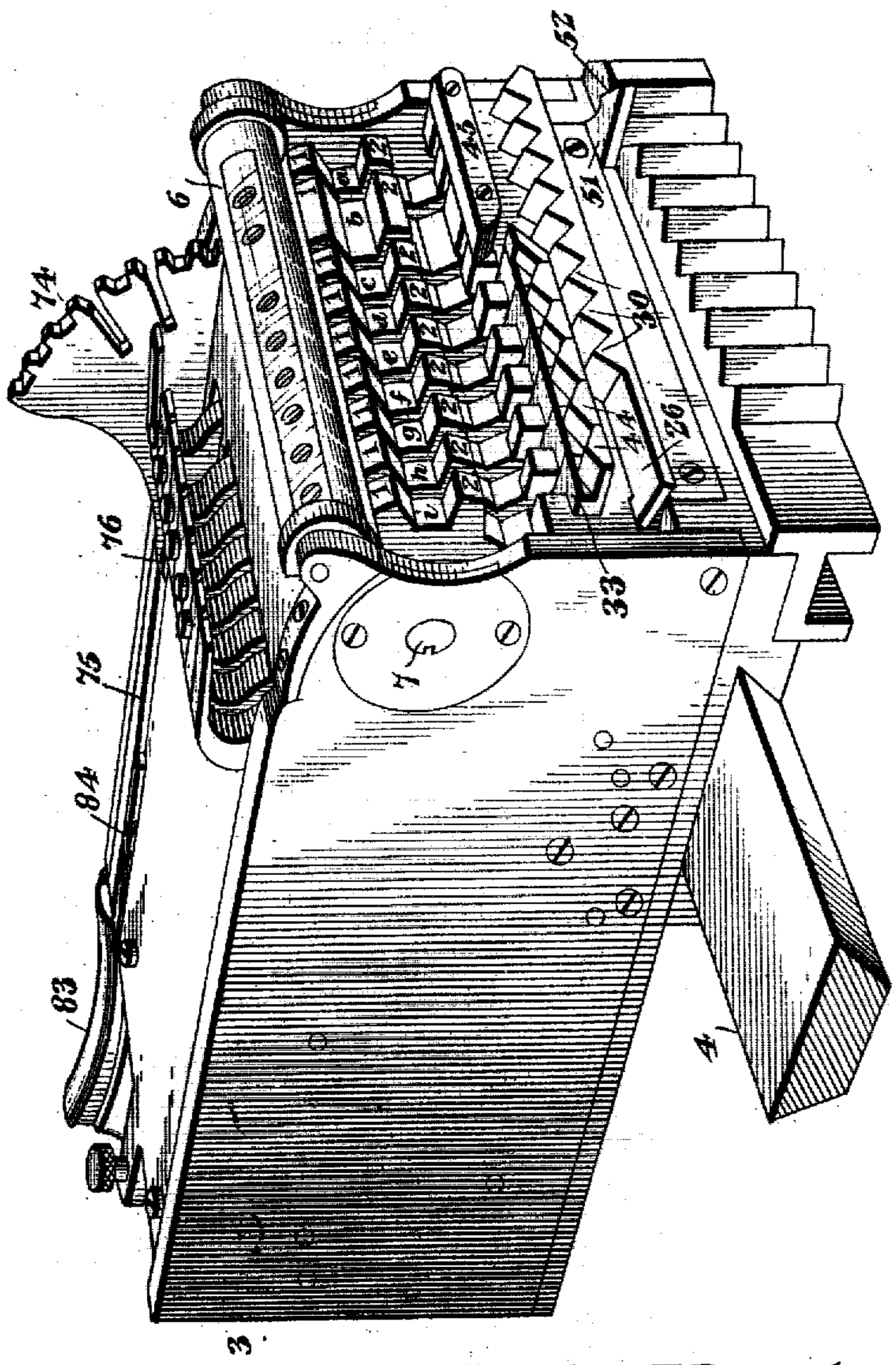
8 SHEETS—SHEET 2.

Fig. 2.



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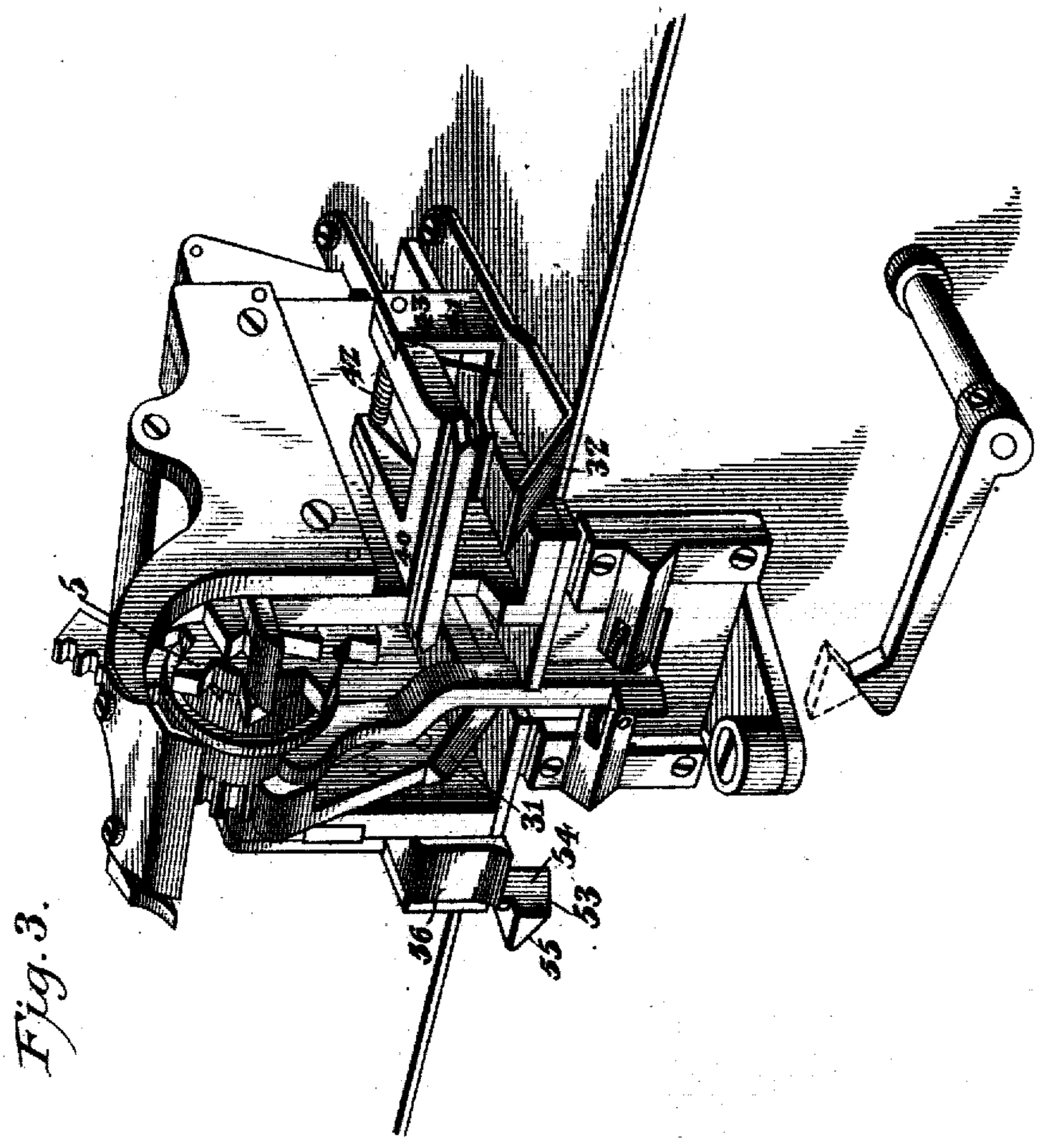

Fig. 3.

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Fig. 4.

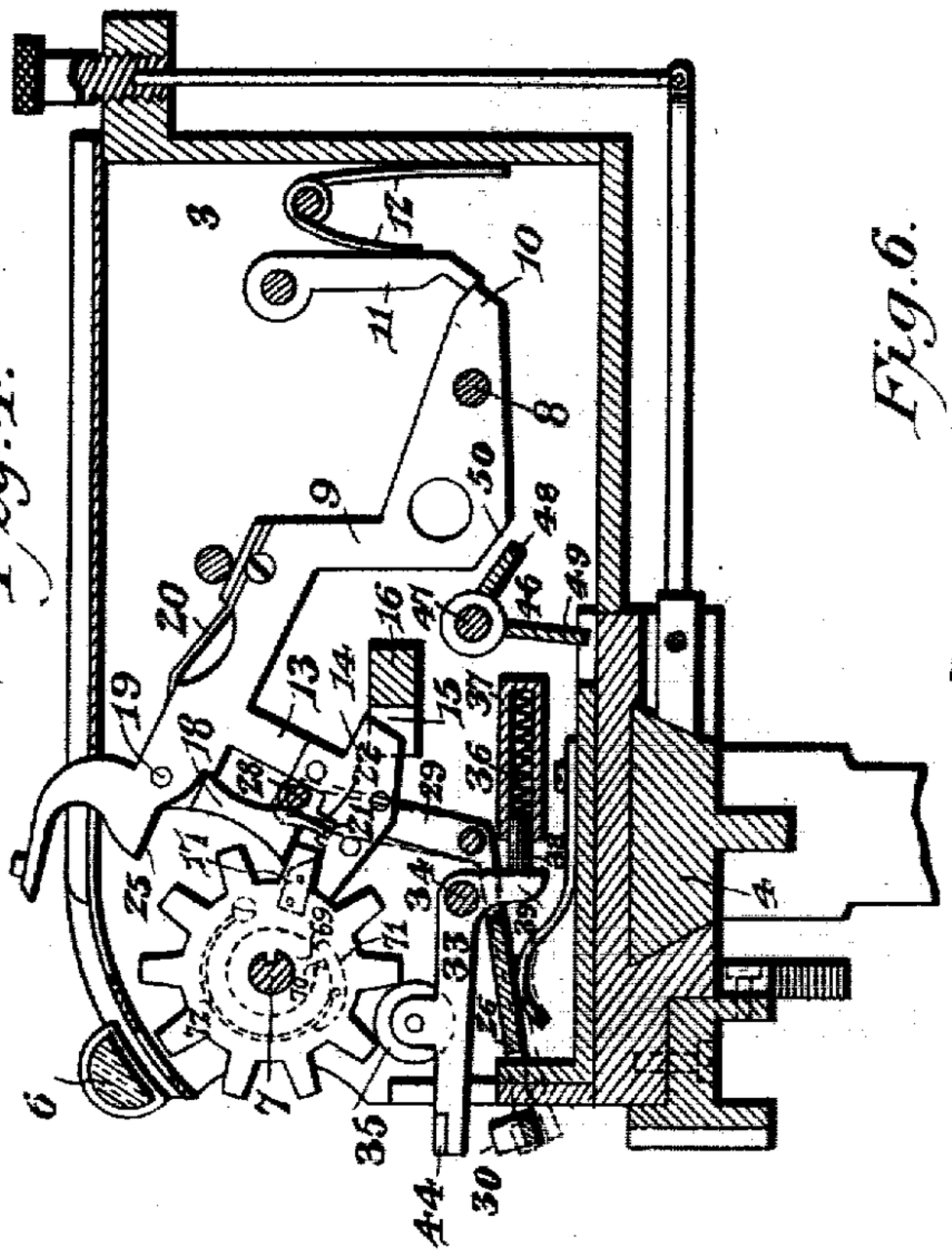

Fig. 6.

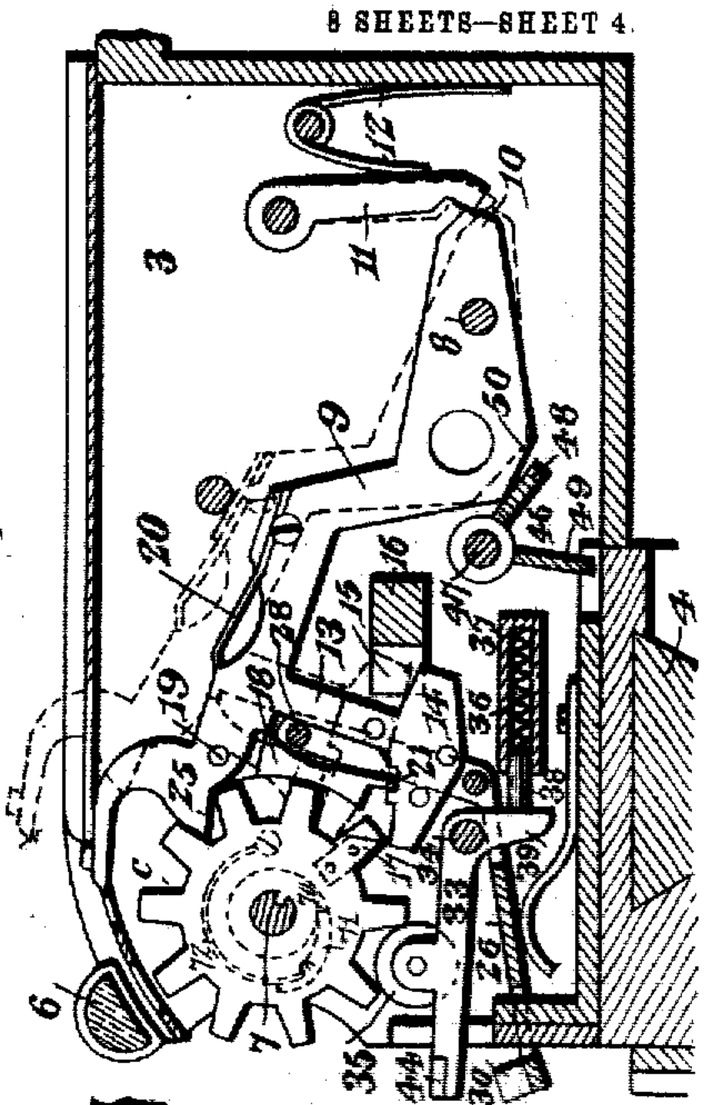

Fig. 7.

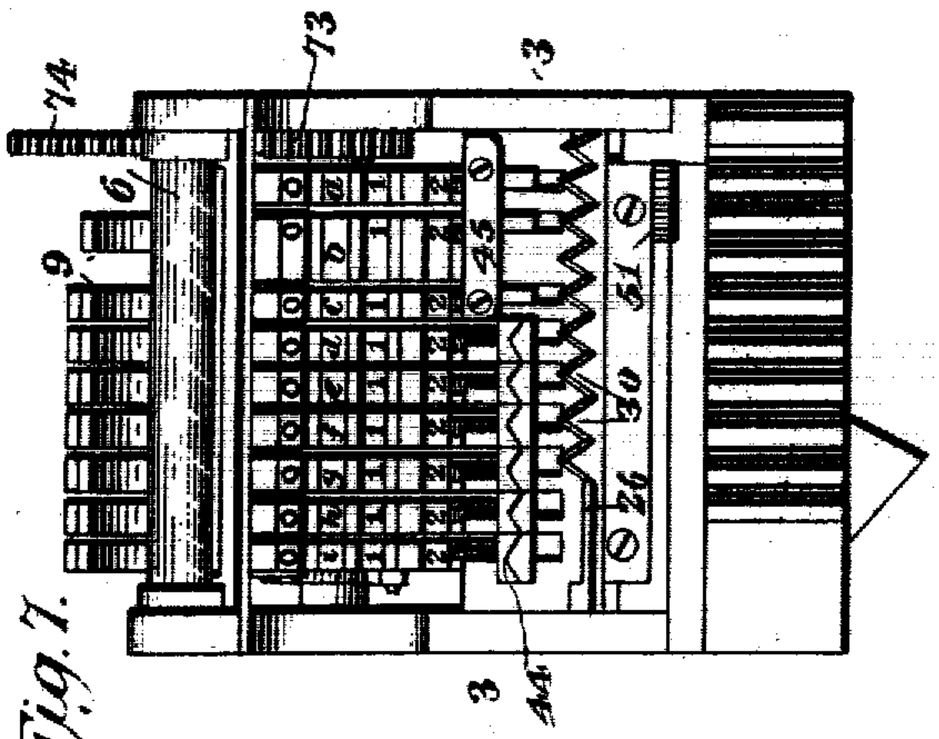

Fig. 5.

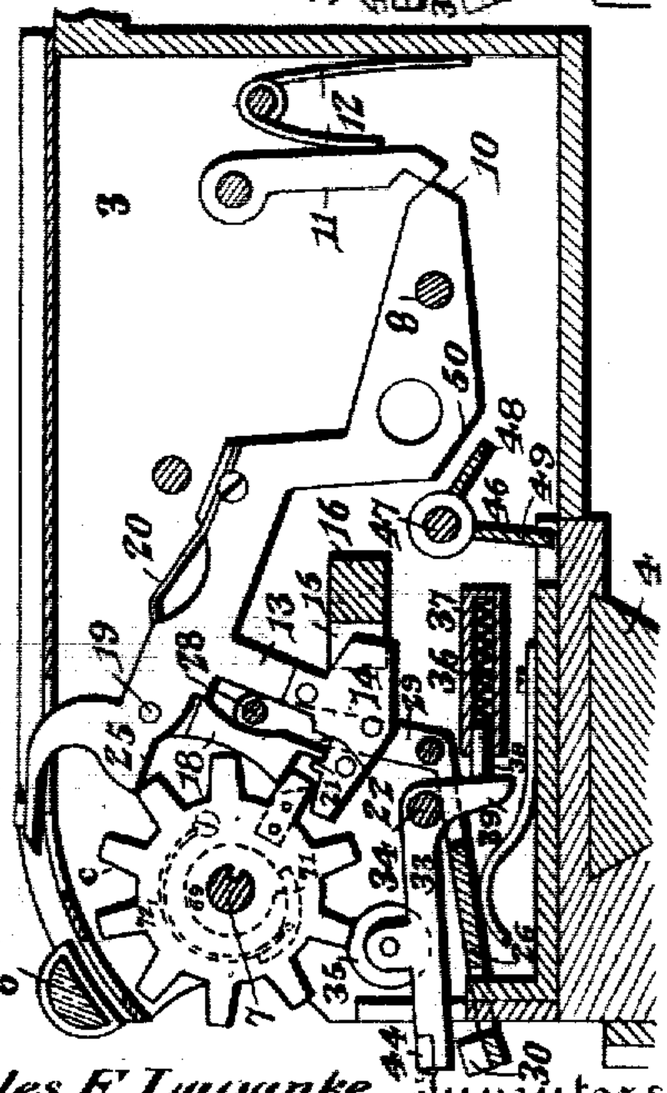

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Fig. 9.

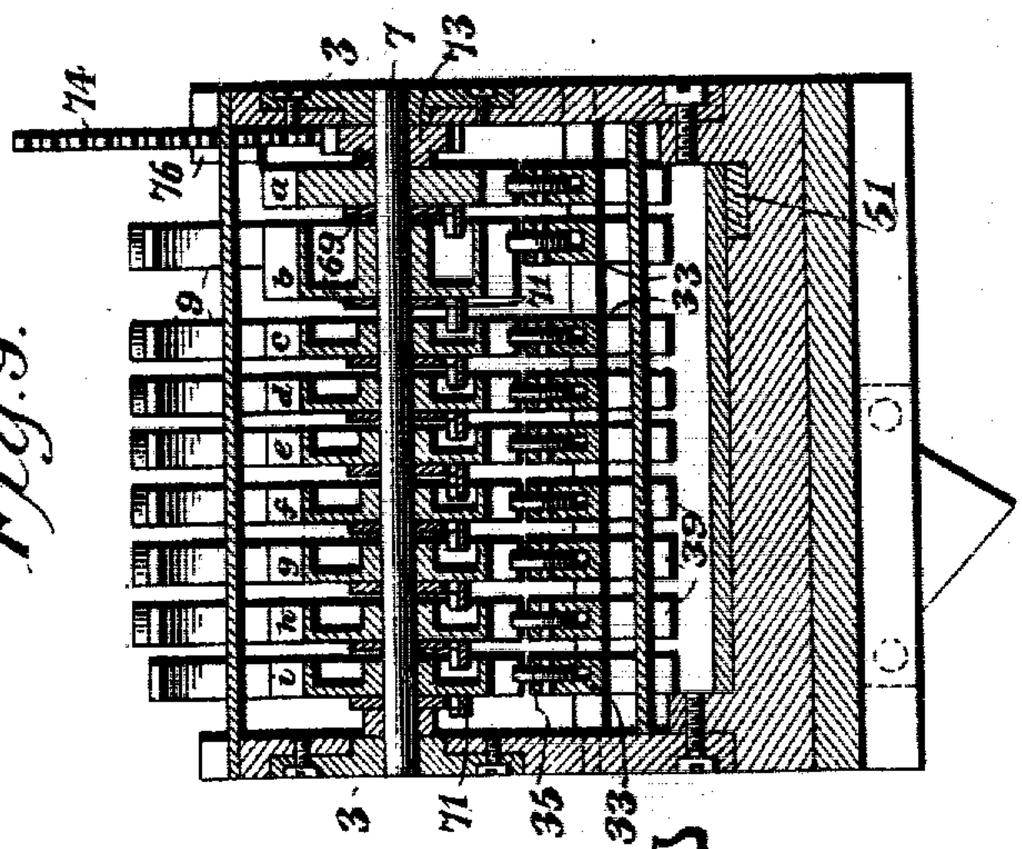

Fig. 14.

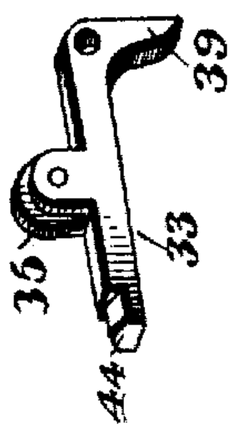

Fig. 8.

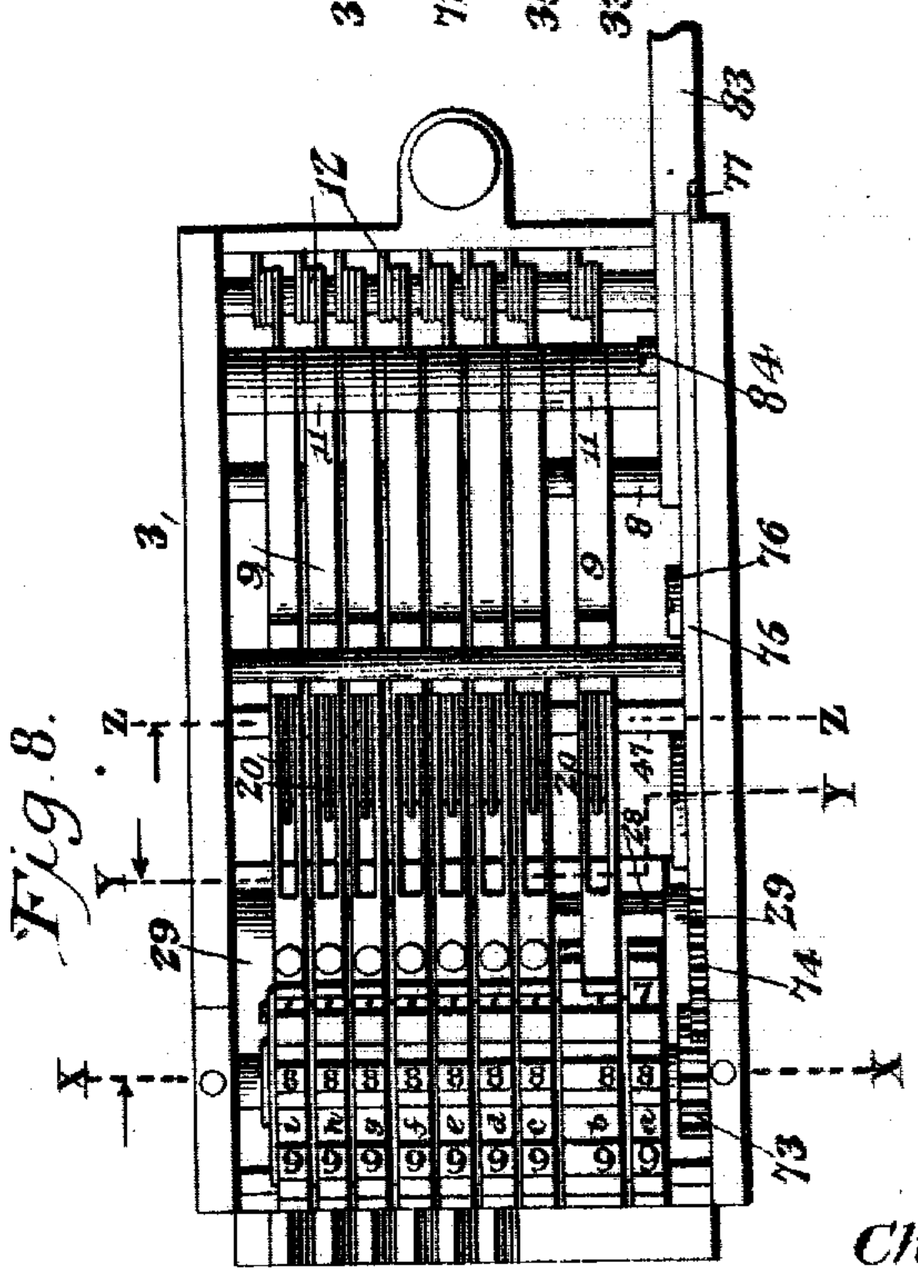

Fig. 13.

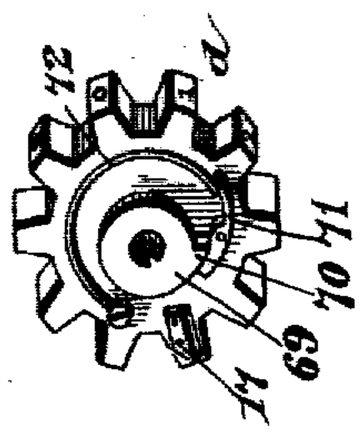

Fig. 12.

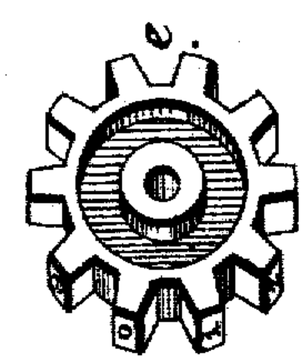

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Fig. 11.

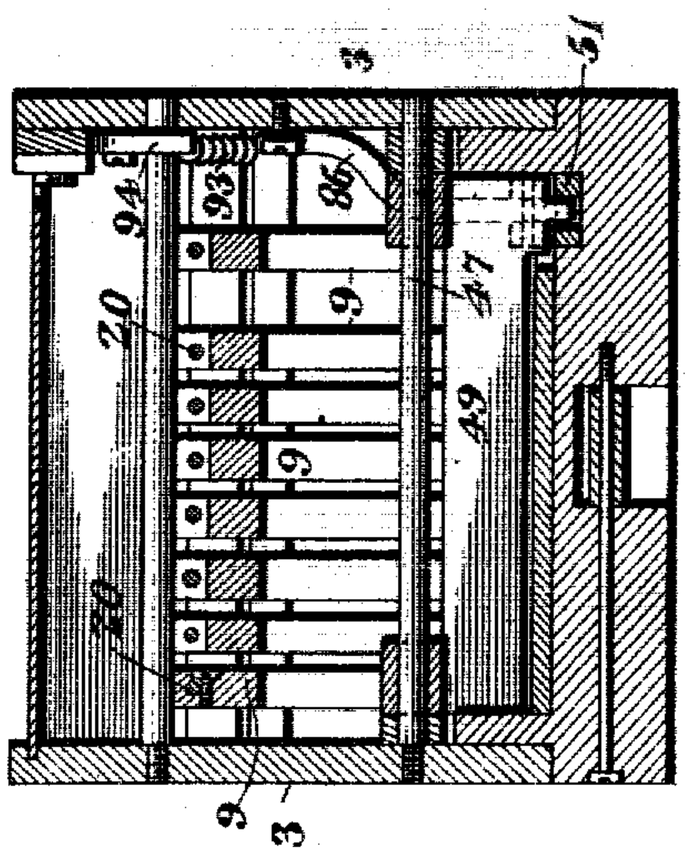
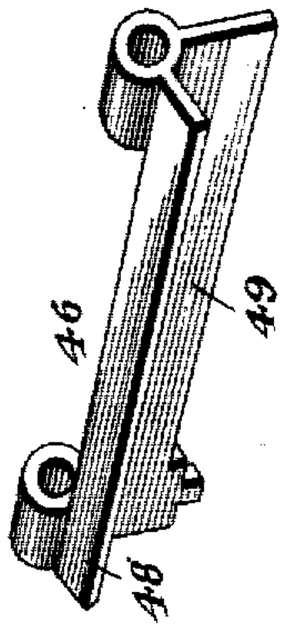


Fig. 16.



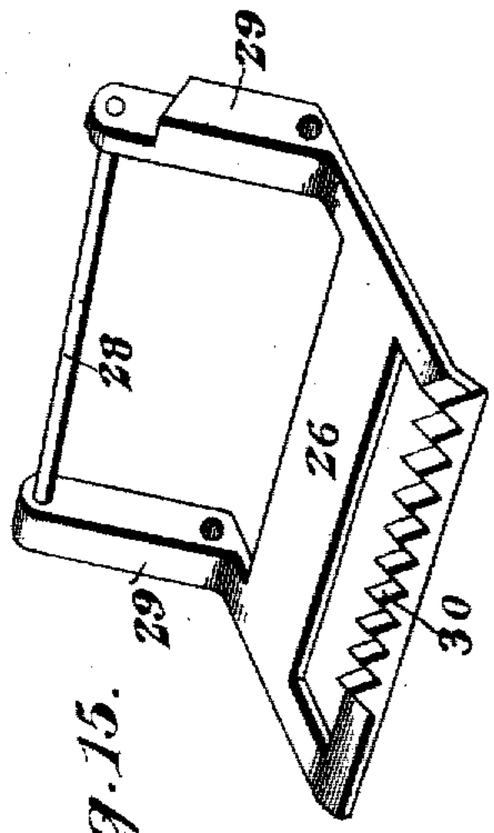


Fig. 15.

Fig. 10.

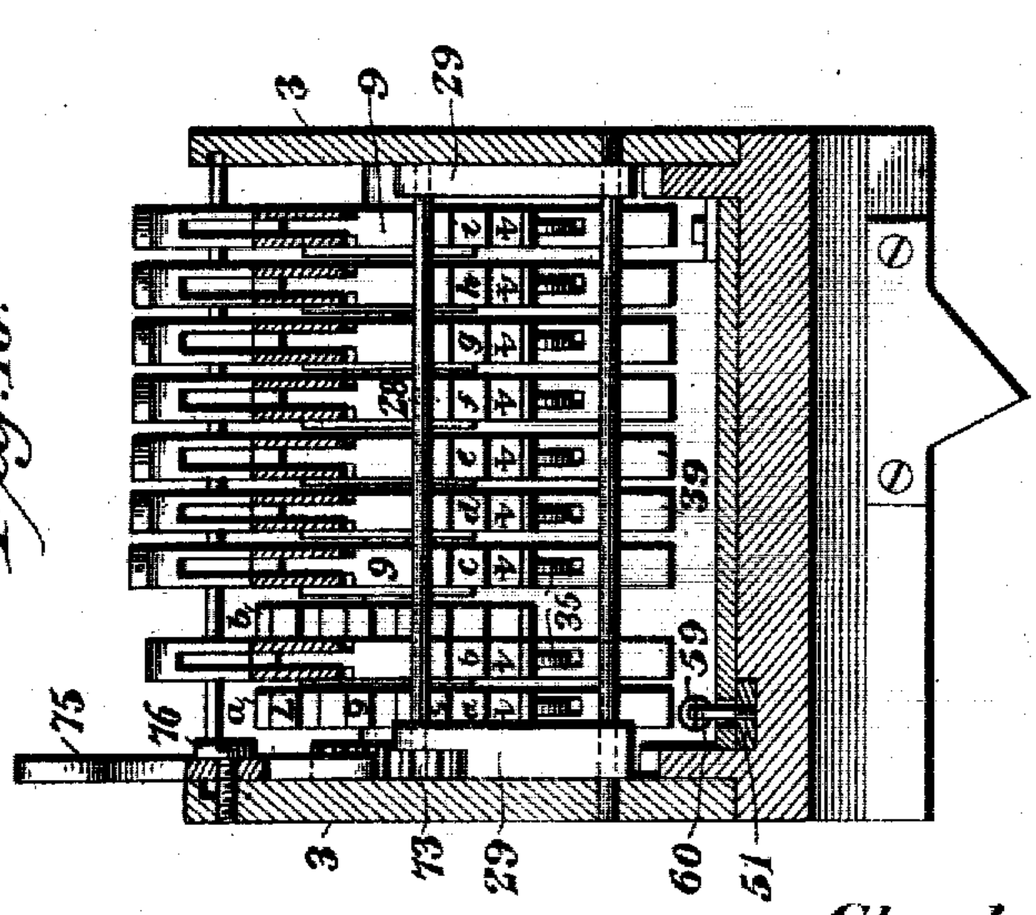


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Fig. 18.

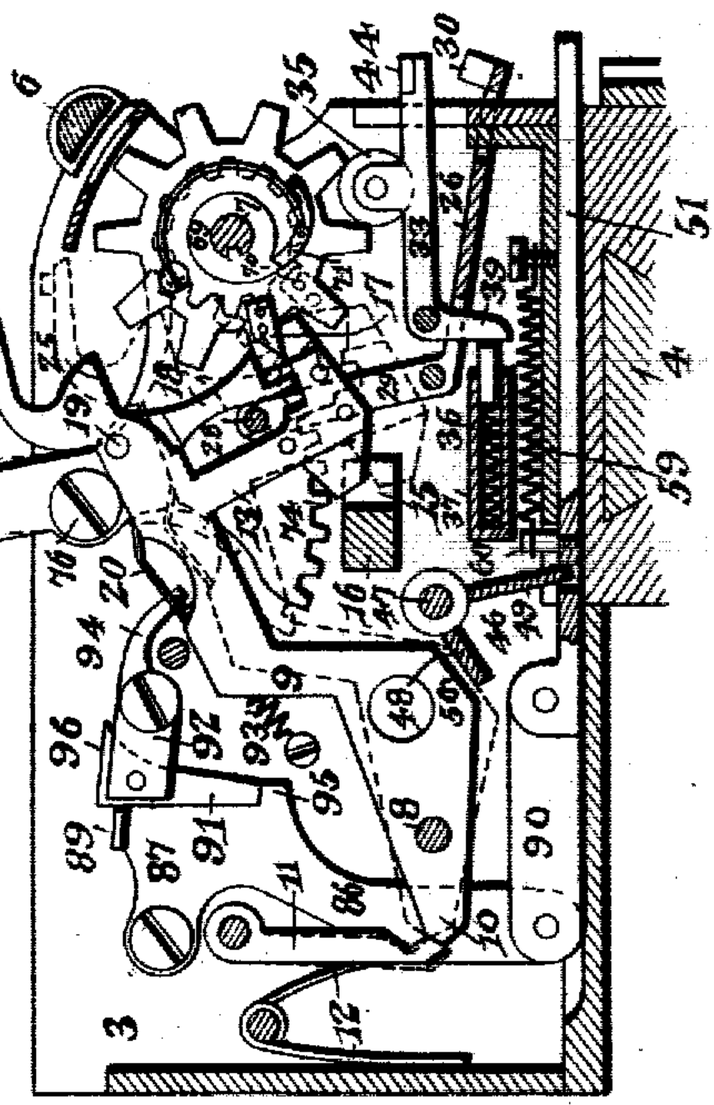


Fig. 19.

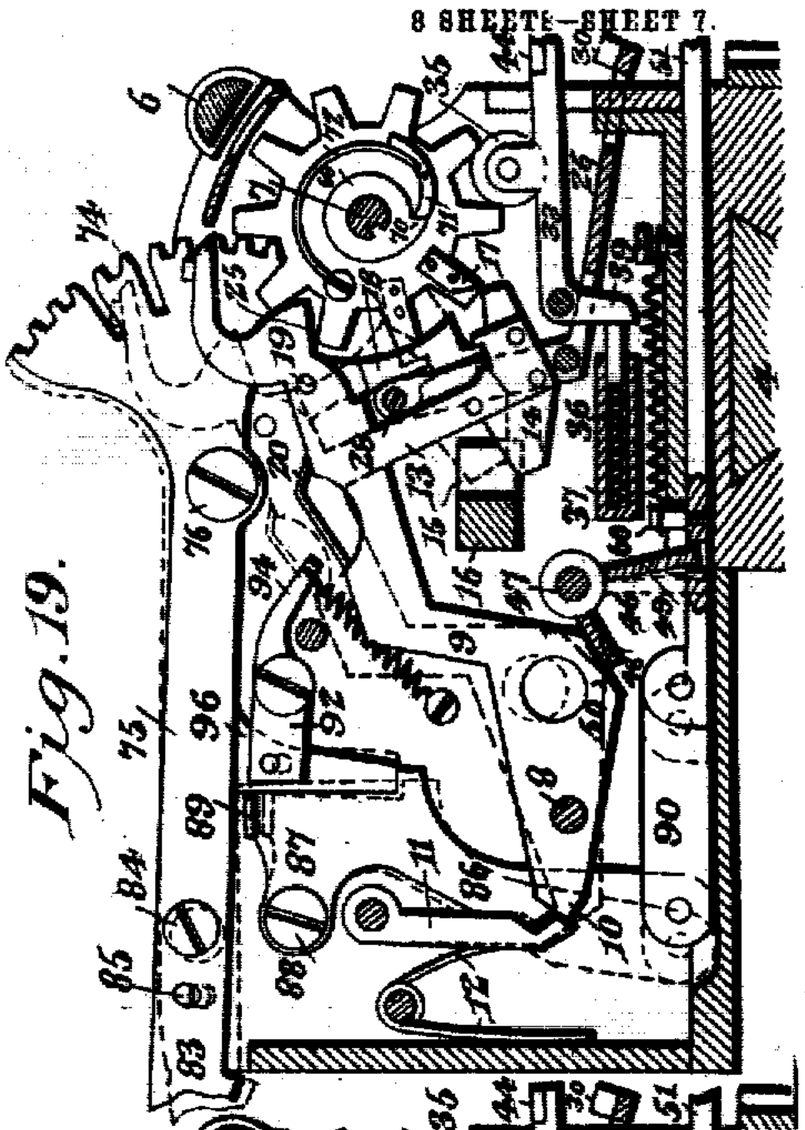


Fig. 17.

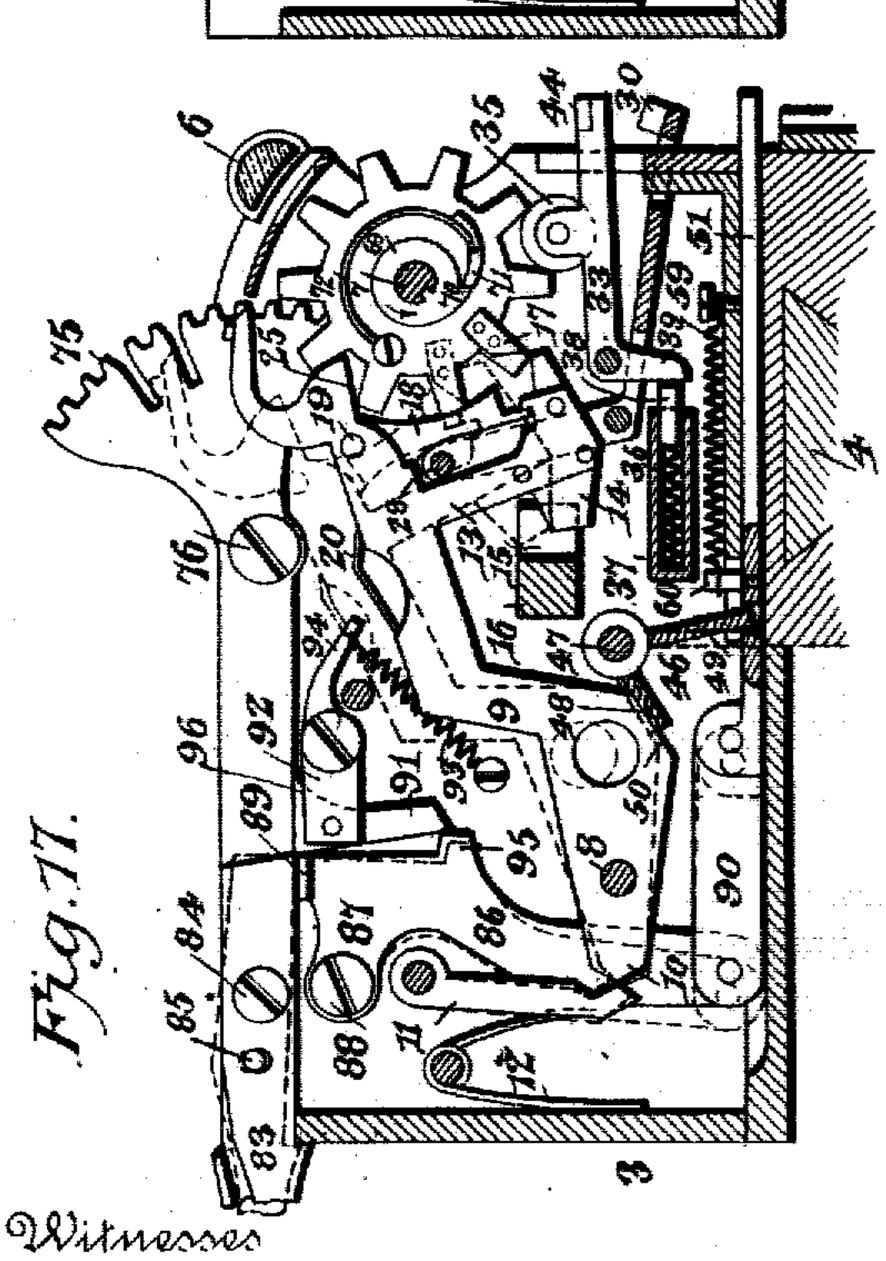
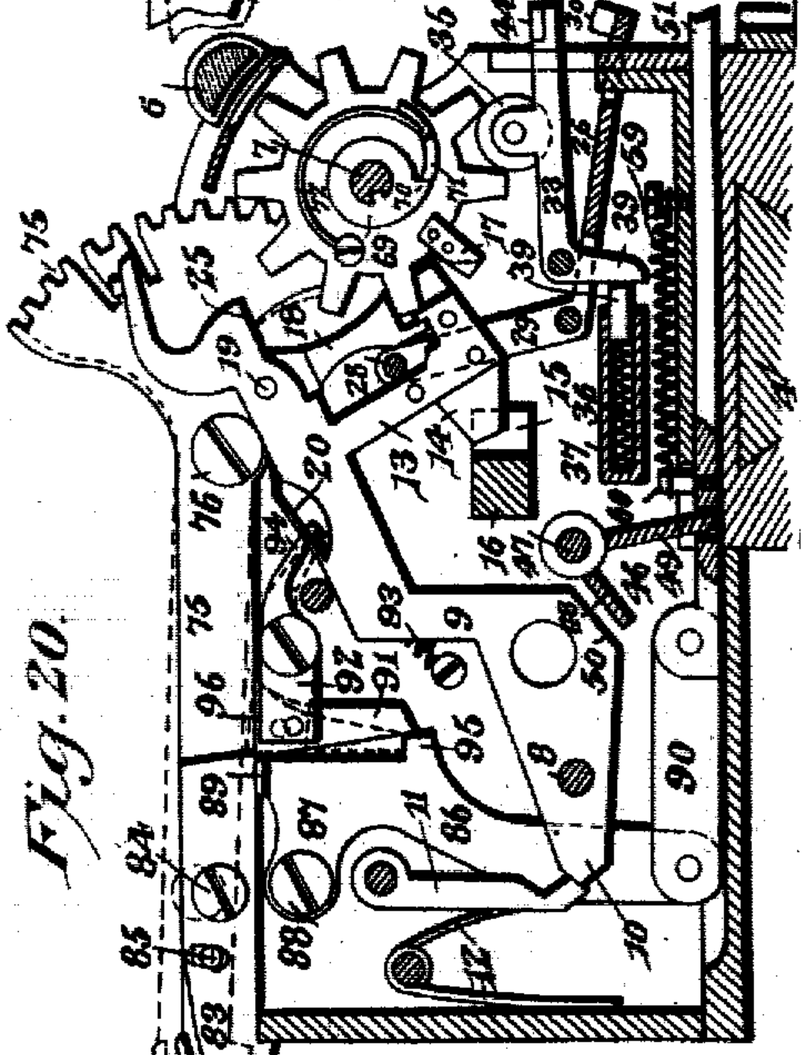


Fig. 20.



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APPLICATION FILED AUG. 23, 1904.

8 SHEETS—SHEET 8.

Fig. 22.

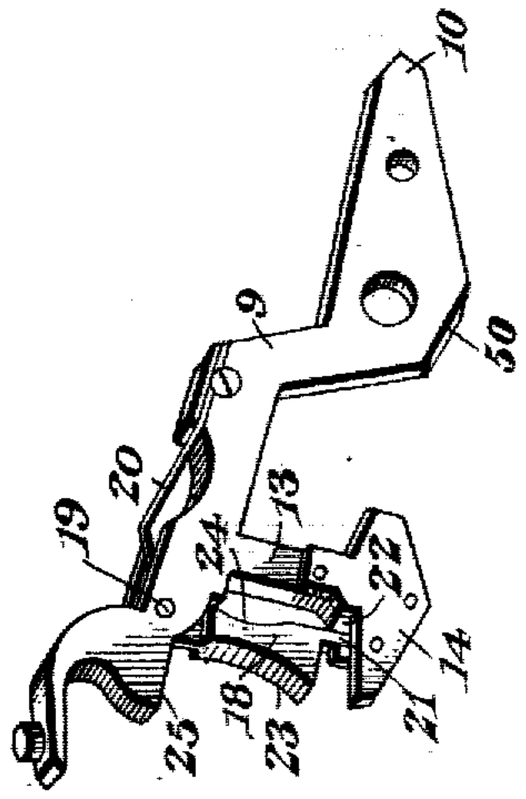


Fig. 23.

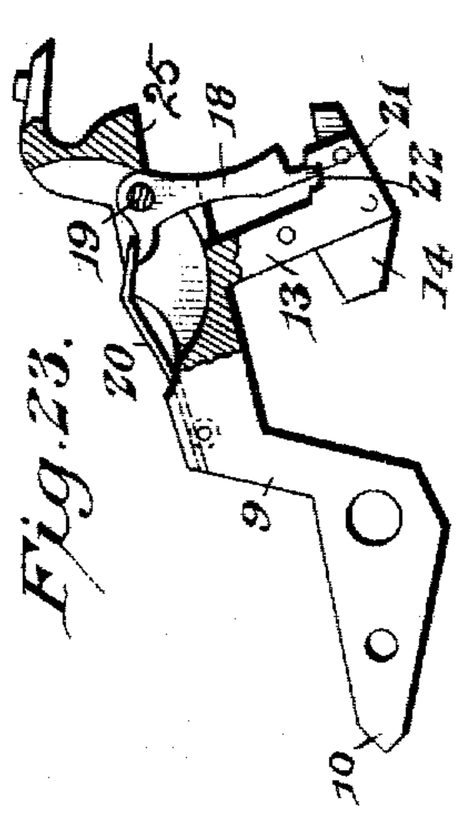
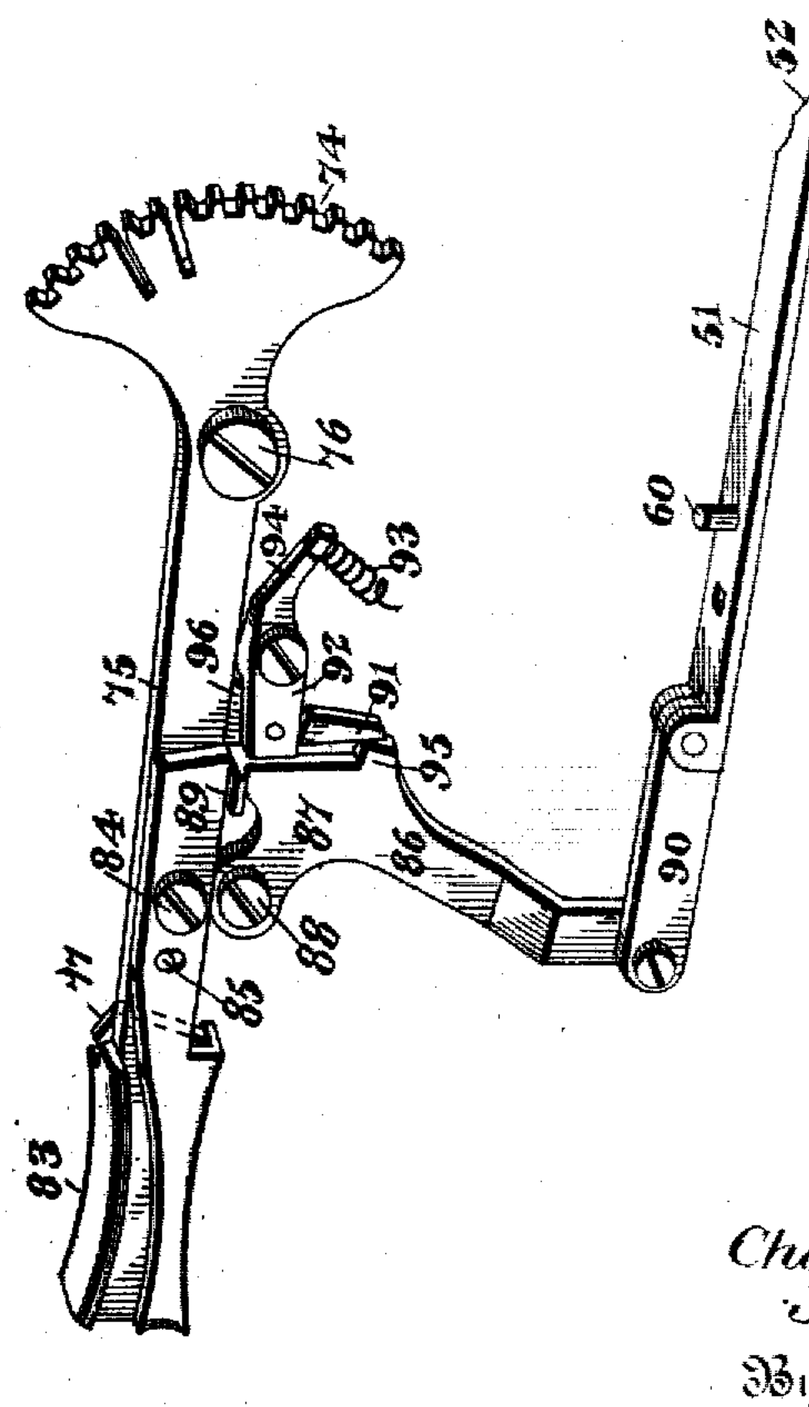


Fig. 21.



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UNITED STATES PATENT OFFICE.

CHARLES F. LAGANKE AND JOHN A. SMITH, OF CLEVELAND, OHIO, ASSIGNORS TO ELLIOTT-FISHER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

COMPUTING MECHANISM FOR TYPE-WRITING MACHINES.

No. 825,469. Specification of Letters Patent. Patented July 10, 1906.

Application filed August 23, 1904. Serial No. 221,856.

To all whom it may concern:

Be it known that we, CHARLES F. LAGANKE and JOHN A. SMITH, citizens of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a new and useful Computing Mechanism for Type-Writing Machines, of which the following is a specification.

This invention relates to a computing device designed with special reference to its employment in a combined calculating and type-writing machine of that type disclosed in our copending application, Serial No. 173,614, for Letters Patent, but capable of independent use.

The object of the invention is to simplify the construction and arrangement of parts and to provide for every contingency which could by any possibility result in erroneous computations. Subordinate to this general object are various others, which are principally as follows: First, to provide durable and positively-operating transfer or carrying mechanism which when any one of a series of digit-carriers or number-wheels has completed nine increments of movement, or nine-tenths of a complete rotation, will with certainty transmit during the next or final increment a single corresponding increment of movement to the next adjacent carrier or wheel of higher order; second, to provide for by the automatic locking of the digit-carriers the transfer mechanism; third, to provide means for positively moving the transfer-dogs into engagement with the number-wheels; fourth, to associate with the number-wheels locating devices which will insure proper movement of the wheels to present the digits thereof in accurate alinement and which will constitute retaining means serving to hold the wheels against accidental displacement from their proper positions, and, fifth, to provide novel and highly efficient means for resetting the number-wheels to zero. Subordinate to these several objects are others which will hereinafter more fully appear.

In the accompanying drawings, wherein one embodiment of our invention is shown, Figure 1 is a sectional view of a combined type-writing and calculating machine, including a computing device constructed in accordance with our invention. Fig. 2 is a perspective view of the computing device. Fig. 3 is a perspective view, on a large scale, showing a portion of the type-writing-machine carriage and various parts mounted thereon and arranged to coöperate with the elements of the computing device. Figs. 4, 5, and 6 are longitudinal sectional views through the computing device, but showing the transfer mechanism in progressively different positions. Fig. 7 is a front elevation of the computing device complete. Fig. 8 is a top plan view of the same with the top wall of the casing removed. Fig. 9 is a transverse sectional view on the line *x x* of Fig. 8. Fig. 10 is a transverse section on the line *y y* of Fig. 8. Fig. 11 is a similar view on the line *z z* of Fig. 8. Figs. 12 and 13 are detail perspective views of the number-wheels or digit-carriers. Fig. 14 is a similar view of one of the wheel-locators. Fig. 15 is a detail perspective view of the vibrator for positively moving the transfer-dogs into engagement with the wheels. Fig. 16 is a similar view of the rocker for elevating or retracting the transfer-levers. Figs. 17, 18, 19, and 20 are longitudinal sectional views through the computing device, showing the resetting mechanism in progressive positions. Fig. 21 is a detail perspective view of the resetting-lever and the mechanism associated therewith for operating the rocker which retracts the transfer-levers. Fig. 22 is a detail perspective view of one of the transfer-levers; and Fig. 23 is a side elevation of one of the levers, partly in section, to show the mounting of the transfer-dog.

Before proceeding to describe the invention it may be stated that the computing device has been specially devised for use in connection with a type-writing machine equipped with operating mechanism including the numeral-keys of the type-writer and presentable in succession to the number-wheels or digit-carriers of the computing device. It is therefore most convenient to illustrate and describe the computing device as an adjunct of a combined type-writing and calculating machine; but it is to be understood that this application is designed to embrace a computing device without regard to its particular environment or to any particular form of mechanism for operating its digit-carriers.

Referring more particularly to Fig. 1 of the

drawings, 1 indicates the laterally-movable carriage of a Fisher type-writer, 2 the numeral-keys thereof, and 3 the casing of our computing device, which is shown mounted in rear of the carriage upon a bar 4. The carriage 1 moves relative to the computing device for the purpose of presenting a master-wheel 5 to the several number-wheels of the computing device in succession. The master-wheel is operatively related to each of the numeral-keys, and upon the depression of a key to print a numeral said master-wheel is rotated a distance corresponding to the value of the key depressed—that is to say, the depression of the "1" key will effect a rotation of the master-wheel the distance of one unit or increment, while the depression of the "9" key rotates the master-wheel nine units or increments. Consequently the depression of any numeral-key will effect a corresponding advance of the number-wheel with which the master-wheel is engaged. The computing device includes, as usual, a series of denominational numbers, digit-carriers, or number-wheels *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, and *i*, designed to register hundredths, tenths, units, tens, hundreds, thousands, ten thousands, hundred thousands, and millions, the tenths-wheel being of double width to accommodate the decimal-space. Each of these wheels is provided upon its periphery with the digits "0" to "9," inclusive, preferably formed in or upon the end faces of the peripheral teeth, one digit of each wheel being observable through a magnifying sight-glass 6, extending across the casing 3 at its upper front corner. (See Fig. 2.) Each carrier or wheel is arranged to make nine-tenths of a complete revolution independently of the other wheels of the series to present its digits successively before the sight-glass and during its last increment of movement engages the wheel to the left and moves it a single increment or step, after which the first-named wheel may again rotate independently for nine-tenths of a complete rotation before again advancing the adjacent wheel at the left a single step. Since the wheels of the entire series are related to one another in the manner stated, it follows that mechanical computations in addition may be effected by moving the wheels corresponding in order to the order of the digits composing the numbers to be added a number of increments corresponding to the unitary values of such digits. Thus suppose it is desired to add four hundred and thirty-two and two hundred and thirty-four. The ciphers of all of the wheels being disposed opposite the sight-glass, the wheel of the third order—to wit, the hundreds-wheel *e*—will be rotated four increments, presenting the digit "4" opposite the sight-glass, the tens-wheel *d* of the second order will be rotated three increments, and the units-wheel *c* of the first order two increments or steps. The numerals observable through the glass will now read "432," corresponding to the first number. The second number, two hundred and thirty-four, will now be added by imparting to the third-order wheel *e* two additional increments of movement, to the second-order wheel *d* three increments, and to the first-order wheel *c* four increments, thus causing the numerals presented before the sight-glass to read "666," the sum of the two numbers. Since the numerical value of each order is ten and since each wheel during its last increment of movement will, as heretofore explained, impart a single increment of movement to the next adjacent wheel to the left, it follows that when the number registered reaches the limit of the numerical value of a given order the rotation of the adjacent wheel to the left will effect the registration of a digit of the next higher order. Thus assuming the first-order or units wheel *c* to be given nine increments of movement, causing the presentation of the digit "9" opposite the sight-glass, the next or tenth increment of movement will present the "0" on said wheel before the sight-opening, and by the automatic engagement of the wheel *c* with the wheel *d* of the next higher or second order the latter wheel will be moved a single increment to present the digit "1" of the second order before the glass, the presentation of the two digits "0" and "1" in the first and second orders effecting the registration of the number 10.

The transfer or carrying mechanism.—Adjacent to the rear end of the casing 3 is disposed a transverse supporting-rod 8, upon which are independently mounted a series of transfer members or levers 9, one of these levers being arranged opposite each of the number-wheels with the exception of wheel *a*, for which no lever is provided. These levers are arranged to swing from the rod 8 in a manner to be described and each is formed with a pointed tailpiece 10, engaged by a swinging detent 11, urged to its engaging position by a spring 12 and arranged to yieldingly retain the lever at either limit of its movement. The levers 9 are of irregular form and each is provided in rear of its front end with a pendent arm 13, to which is attached in a laterally offset position (see Figs. 22 and 23) a contact-plate 14, having its front end extended between a pair of digit-carriers and its rear end located in one of a series of guide-openings or notches 15 in a guide-bar 16, extending across the casing. (See Fig. 4.) The front end of each contact-plate 14 is arranged to be engaged by a lug or projection 17, preferably having the form of a small plate secured to the left-hand side face of each digit-carrier except the carrier *i*. (See Figs. 4 and 13.) This engagement of the projection 17 with the contact-plate 14 does not occur, however, until the digit-carrier has

moved nine increments, the purpose of the engagement being to cause the carrier or wheel when moved the final or tenth increment to swing down a transfer-lever for the purpose of effecting a single increment of movement of the adjacent wheel to the left. The connection between each transfer-lever and the wheel served by it is established through the medium of what may be termed a "transfer-dog" 18, (see Figs. 4, 22, and 23,) pendent from the transfer-lever in advance of the arm 13 and having a flat lower end designed to extend over and engage one of the teeth of the adjacent number-wheel. The dog is pivotally mounted at its upper end in the transfer-lever, as indicated at 19, and is yieldingly urged toward its engaging position by a spring 20, the swinging movement of the dog relative to the lever being limited by a stop 21, extending from the lower end of the dog and engaging a recess 22 in the arm 13. (See particularly Fig. 23.) The front face 23 of the dog is concaved from end to end thereof and its rear face is formed with a concavity 24 for a reason which will be made apparent.

Assuming that the number-wheel shown in Fig. 4 is wheel *d* and that the projection 17 shown in said figure in dotted lines is carried by the wheel *c*, it will be observed that the wheel *c* has been rotated nine increments—to wit, from "0" to "9"—by the master-wheel. As the wheel *c* completes its ninth increment of movement the projection 17 carried thereby is brought into engagement with the contact-plate 14 of the transfer-lever 9, which serves or communicates movement to the next higher wheel *d*. The parts being positioned as shown in Fig. 4 and the wheels *c* and *d* registering "9" and "0," respectively, before the sight-glass, another or tenth increment of movement imparted to the wheel *c* will cause the transfer-lever to be thrown down. As the transfer-dog 18 is in engagement with the upper side of one of the teeth of the wheel *d*, this downward movement of the lever will be communicated to said wheel, the rotation of which will bring the tooth next in rear of the one engaged by the dog into contact with the front face of said dog and will move the latter out of engagement with the wheel. Before this disengagement is effected, however, the front end 25 of the transfer-lever 9 will engage the upper corner of a tooth of the wheel *d*, (see Fig. 5,) so that notwithstanding the disengagement of the transfer-dog 18 the operative connection between the wheel *d* and the transfer-lever will be maintained, thus insuring the transfer of a complete increment of movement to said wheel. At the completion of this movement of the wheels *c* and *d* in unison the side face of one of the teeth of the wheel *d* will be brought into engagement with the end 25 of the transfer-lever, and the projection 17 of the wheel *c* will have moved out of engagement with the contact-plate of said lever. In this position of the parts (see Fig. 6) the wheel *d* will be locked by the transfer-lever, and the wheel *c* will be capable of continued movement independently of the wheel *d*.

It will be observed that when the transfer-lever moves down the point of its tailpiece will swing relative to the point of the detent 11, and by reference to Fig. 5 it will be seen that the point of the tailpiece passes the point of the detent just as the front end of the transfer-lever is brought into engagement with a tooth of the wheel *d*. As the detent will now engage the under side of the point of the tailpiece 10, the spring 12 will exert some force, tending to swing the front end of the lever downward, this arrangement serving to insure a complete movement of the lever and the wheel *d* in the event of slightly premature disengagement of the projection 17 and the contact-plate 14.

The means for positively moving the dogs into engagement with the number-wheels.—While the springs 20 are ordinarily effective to move the transfer-dogs 18 into engagement with the number-wheels, such engagement is absolutely insured by the provision of a vibrator 26. (See Figs. 4 and 15.) This vibrator is in the form of an angular frame fulcrumed upon a supporting-bar 27, disposed transversely of the casing and having at its upper end a bar 28, extending between side arms 29 of the frame, and disposed when the vibrator is rocked to the position indicated in dotted lines in Fig. 4 to engage all the dogs and move them positively into engagement with the number-wheels. The front end of the vibrator 26 is extended beyond the front of the casing 3 and is provided with a series of pointed projections or teeth 30. These teeth are so related that as the carriage moves for the purpose of advancing the actuator or master wheel to each succeeding number-wheel a vibrator-actuator 31, mounted on the carriage, will engage the teeth to rock the vibrator forward during each advance movement of the carriage. The actuator 31 (see Fig. 3) is in the form of a small inclined bar of triangular cross-section, preferably extended from the carriage. By reason of its triangular form the inclined side face of the bar or actuator will readily ride over the inclined faces of the teeth 30 of the vibrator. Also mounted on the carriage, but at some distance to the left of the actuator 31, is a vibrator depressing-plate 32, which engages the teeth of the vibrator and depresses the latter as the master-wheel is moving away from the digit-carrier of lowest order. This final movement of the vibrator insures the engagement of the dogs with the wheels, so that upon the return of the carriage the teeth of the master-wheel will register accurately with the spaces between the

teeth of the digit-carriers, and thus be permitted to move back freely when the carriage is retracted to begin a new line of writing. Neither the actuator 31 nor the depressing-plate 32 are elements of the present invention. They are shown and described to emphasize the utility of the vibrator when the computing device is used as a part of the type-writer equipment; but it will be understood that the vibrator may be operated by other actuating means or manually.

The locating mechanism for the number-wheels.—For the purpose of locating the number-wheels with accuracy, so that the digits will always be disposed in exact alinement before the sight-glass and for the further purpose of preventing reverse rotation of the wheels by frictional contact with the transfer-dogs during the elevation of the transfer-levers, we provide what may be termed "wheel-locators" 33. These locators are in the form of swinging arms mounted upon a transverse rod 34. Each locator is provided with a roller 35, urged upwardly into engagement with the adjacent number-wheel by a spring 36, located in a spring-casing 37 and bearing against a plunger 38, which in turn bears against a depending angular extremity 39 of the locator. The roller 35 is of such diameter that when disposed opposite an interval between two teeth of the adjacent number-wheel its periphery will be engaged by the contiguous outer corners of the teeth. Obviously the rotation of the digit-carrier in either direction will necessarily be accompanied by the depression of the locator, and as this depression is resisted by the spring 36 it will be apparent that the number-wheel cannot be moved except by the application of sufficient force to overcome the spring. These locators therefore serve to hold the number-wheels in their accurately-alined positions. Aside from this retention of the wheels, however, these locators actually serve to locate the wheels. By reference to Fig. 5 it will be seen that when a wheel is rotated the adjacent locator is depressed to permit the teeth of the wheel to ride over the roller. As soon, therefore, as the tooth has passed beyond a plane intersecting the axes of the wheel and roller the tendency of the locator to move back to its elevated position will serve to complete the movement of the number-wheel, which, however, will be arrested and located by the engagement of the next succeeding tooth with the roller.

The locators obviously present more or less resistance to the rotation of the number-wheels, and the illustrated construction therefor comprehends means for easing the number-wheels to decrease the burden imposed upon a key when a series of wheels are moved in unison—as, for instance, in adding "1" to "99,999." This easing means or locator-depressing mechanism constitutes no part of the present invention, but may be briefly described as follows: A locator-depressing plate 40 is hinged upon a support 41, mounted on the carriage. This plate is urged upwardly to its horizontal position by a spring 42, where it is retained by shoulders 43, bearing against the support 41.

The front ends of the locators 32 are extended beyond the front of the casing 3, where they are provided with teeth 44—that is to say, the locators, with the exception of those provided for the three wheels of lowest order, are so extended, these three wheels being excepted, for the reason that, as heretofore stated, it is impracticable to depress the locators of the two wheels next adjacent to the one being actuated, and as the necessity for depressing any of the locators ceases when the master-wheel moves out of engagement with the wheel *a* of lowest order no provision need be made for depressing the locators of the wheels *b* and *c*.

As the carriage moves to the right the locator-depressing plate 40, the ends of which are beveled, as shown, rides over the toothed ends of the locators, beginning with the locator of the wheel *i*, when the master-wheel is in engagement with the wheel *f* and successively depresses the locators sufficiently to ease the wheels for the purpose stated. The depression is not sufficient, however, to absolutely prevent the locators from performing their functions as such—that is to say, while the rollers 35 are drawn back slightly their retraction is not such as will permit the jarring of the number-wheels to effect their dislocation.

When the master-wheel moves into engagement with the number-wheel of lowest order, it is practicable to entirely depress such of the locators as are extended beyond the front of the casing in order to still further decrease the resistance opposed to the key when an extended series of number-wheels are moved in unison. We therefore mount upon the front of the casing a rigid trip-bar 45, having its under corners beveled, as shown, and so located that as the master-wheel advances from the wheel *b* to the wheel *a* the locator-depressing plate 40 will ride under the trip-bar, and thus be swung down or depressed sufficiently to entirely retract the locators associated with the wheels *d* to *i*, inclusive. As a result of this arrangement the almost-prohibitive resistance, which has heretofore been opposed to a key by an extended series of wheels, is minimized, and the touch is made comparatively light.

The means for restoring the transfer-levers to their normal positions.—When the master-wheel moves beyond the number-wheel of lowest order, the transfer-levers will still remain in their depressed or locked positions, and it is obvious that some means must be provided for returning these levers to their

normal positions before the master-wheel again traverses the computing device, as otherwise the number-wheels would remain locked. The present embodiment of this lever-retracting mechanism includes a rocker 46, (see Fig. 4,) mounted to swing from a transverse bar 47 and comprising a pair of angularly-related leaves or plates 48 and 49. The leaf 48 of the rocker is disposed opposite a cam-face 50, formed on each of the transfer-levers 9 at a point in advance of its axis. When the transfer-levers, or any of them, are drawn down to their depressed positions, as shown in Fig. 6, their cam-faces 50 are moved close to or in contact with the leaf 48 of the rocker, so that when the latter is rocked back the transfer-levers will be raised or retracted to their normal positions. It has been pointed out that the springs 12 exert some force to assist in the downward movement of the levers, and it will now appear that these springs similarly assist in the elevation of the levers as soon as the detents 11 are brought into engagement with the upper sides of the tail-pieces 10 of the levers. The rocker 46 is connected to a slide 51, (see Figs. 17 to 21, inclusive,) which extends beyond the front of the casing (see Fig. 2) to facilitate its actuation. In the illustrated use of the totalizer the slide 51 has a beveled extremity 52 disposed for engagement by what may be termed a "rocker-slide actuator" 53. (See Fig. 3.) This actuator is formed with an inclined side face 54 and an inclined bottom face 55 and is carried at the end of an angular arm 56, pivotally mounted on the carriage. Assuming the transfer-levers, the rocker, and the rocker-slide to be in the positions indicated in Figs. 2 and 6, the retraction of the carriage to the left will present the inclined side face 54 of the actuator 53 to the inclined end 52 of the slide 51. As the movement of the carriage continues, the slide will be forced back, thus swinging the rocker 46 to the dotted-line position in Fig. 6 for the purpose of effecting the elevation or retraction of the transfer-lever. As soon as the actuator 53 has passed beyond the end of the slide the latter and the rocker will be restored to their normal positions by a retracting-spring 59, (see Fig. 18,) secured at one end to a fixed part and at its opposite end to a pin 60, projecting from the slide. When the carriage again advances to the right, the actuator 53 will not move the slide 51; but, on the contrary, its inclined bottom or under face 55 will contact with the slide, thus causing the actuator to ride over the latter.

The number-wheel-resetting mechanism.—Fixed upon the shaft 7 and alternating with the number-wheels are a series of resetting-cams 69, each of which is formed with a shoulder 70, these shoulders being normally alined and occupying the position shown in Fig. 17. Mounted to travel upon each of these cams is a resetting-pawl 71, pivoted upon the adjacent number-wheel and having its beak urged toward the periphery of the cam by a spring 72. When the number-wheels are registering "0" before the sight-glass, the beaks of the pawls 71, carried thereby, will be in engagement with the shoulders of the cams, this position of the pawls being indicated in Fig. 17. As the number-wheels are advanced one or more increments the pawls move away from the shoulders 70 of the cams, and when a given computation has been completed the pawls on the several wheels will occupy various positions with relation to the resetting-cams. It is obvious, therefore, that if the shaft 7 is rotated in the direction of the arrow in the above-mentioned figure the shoulders of the cams will engage the pawls of the wheels, and when said shoulders have reached their normal positions after one complete rotation all of the wheels will be reset at zero.

For the purpose of imparting the necessary movement to the shaft the latter is provided adjacent to one end with a pinion 73, engaged by a toothed segment 74 upon the rear end of a resetting-lever 75, fulcrumed upon a bearing-screw 76, projecting inwardly from one side wall of the casing 3. The throw of this lever is just sufficient to effect one complete rotation of the shaft 7, and it therefore follows that by swinging the lever from the full-line position in Fig. 17 to the dotted-line position in Fig. 18 the number-wheels will be reset. The resetting-lever is retained in its normal position by a latch 77 in the form of a small block pivoted upon the lever and engaging a notch 80 in the casing 3. The latch 77 is provided at its lower end (see Fig. 1) with a cam-face 81, engaged by a flange 82, extending from a latch-lever 83, pivotally mounted upon the resetting-lever, as indicated at 84, and limited in its independent movement by a stop-pin 85 engaging a slot in the latch-lever.

We have seen that the transfer-levers when in their depressed positions lock the number-wheels and that the wheels are unlocked automatically by the elevation of the transfer-levers upon the retraction of the carriage. It sometimes happens, however, that it is desired to reset the number-wheels before the carriage has been retracted, and, in fact, when the computing device is used in other relations and the resetting mechanism therefore includes means whereby such of the transfer-levers as are depressed will be elevated to unlock the number-wheels before the resetting-lever begins its movement. In the present embodiment of the invention this means includes a swinging arm 86, having an angular upper end 87, pivotally mounted upon a bearing-screw 88, projecting from a side wall of the casing 3. At its upper end the arm 86 is provided at a point in advance of its axis

with a lug 89, disposed to be engaged by the inner or front end of the latch-lever 83, the lower end of the arm being connected, as by a link 90, with the inner or rear end of the rocker-slide 51. (See Fig. 21.) Assuming that the parts are now in the positions indicated in full lines in Fig. 17 and that it is desired to reset the computing device, the end of the resetting-lever is grasped. This action serves to swing the latch-lever from the full-line position in Fig. 17 to the dotted-line position therein indicated, thus causing the flange 82 on the latch-lever to swing the latch 77 out of engagement with the casing and depressing the front end of the latch-lever, which, by reason of its engagement with the lug 89 on the arm 86, swings the latter for the purpose of retracting the rocker-slide 51 and operating the rocker 46, which in turn effects the elevation of the transfer-levers 9 to release the number-wheels. The parts will now be in the positions indicated in dotted lines in Fig. 17, and the resetting-lever and number-wheels having been released the lever may be swung up for the purpose of resetting the wheels. Of course as soon as the latch-lever is moved out of engagement with the arm 86 by the elevation of the resetting-lever 75 the spring 59 will restore the slide 51 and the arm 86 to their normal positions.

When the resetting-lever reaches the position indicated in full lines in Fig. 18, the resetting-cams will have moved around nine increments, the shoulders 70 of said cams being within one increment of their normal position. As the beaks of the several pawls 71 are in engagement with these shoulders, it follows that the wheels will all be registering "9" before the sight-glass, and the projections 17 on the wheels will therefore be in engagement with the contact-plates 14 of the transfer-levers. Therefore during the final movement of the resetting-lever before restoring the cams to their normal positions the wheels will all be moved from "9" to "0" and the transfer-levers will be carried down and the number-wheels locked, the final positions assumed by the parts being indicated by dotted lines in Fig. 18. Before the computing device can be again operated it is necessary to unlock the number-wheels, and while this may be done by retracting the carriage in the manner already explained it is desired to have the computing device complete within itself, so that it may be reset and the parts restored to their normal positions without reference to the mechanism mounted on the carriage. The resetting mechanism, therefore, includes in addition to the means for unlocking the wheels preparatory to the resetting thereof other mechanism for unlocking the wheels after the latter have been reset. This latter mechanism includes a block 91, pivotally mounted at the rear ends of a swinging support 92, constantly urged upwardly by a spring 93, connected at one end to a fixed part and at its opposite end to a tailpiece 94, extended from the support 92. The block 91 is normally retained by the resetting-lever in the position shown in Fig. 17; but when said lever is swung up the support 92 is swung by its spring 93 and the block 91 is moved into engagement with a projection 95 on the arm 86. When in this position, (see Figs. 18 and 19,) the upper end of the block 91 is disposed somewhat above the plane of the lug 89. If now the resetting-lever, having reset and locked the wheels, is swung back to the position indicated in full lines in Fig. 19, it will contact with the upper end of the block 91 and during its final movement to its resetting positions will force down the block, thus moving the arm 86, the slide 51, and the rocker 46, and the transfer-levers 9 to the position shown in dotted lines in Fig. 19. Thus the retraction of the resetting-lever effects the unlocking of the number-wheels by restoring the transfer-levers to their normal positions. As the block moves down, however, with the resetting-lever to effect the described movements of the arm 86 and connected parts it will be swung slightly on its individual axis by reason of the fact that its upper face 96, with which the resetting-lever contacts, is slightly inclined, and this individual movement of the block and the swinging movement of the arm 86 will effect the disengagement of the block from the projection 95. (See Fig. 21.) By reason of this disengagement the arm 86, having performed its function, may swing back to its normal position, thus presenting the lug 89 to the inner end of the latch-lever 83 and restoring the slide and rocker to their normal positions preparatory to the inauguration of another computation.

In the present embodiment of the invention the wheels which coöperate with the carrying, locking, locating, and resetting mechanisms actually carry and exhibit the digits; but it will of course be understood that so far as the invention is concerned it is immaterial whether the digits are carried by these wheels or not, since the digits may be carried by other members geared to these wheels in a manner common in the art. Furthermore, in certain aspects of the invention these wheels are to be regarded as members occupying different denominational positions, irrespective of their form, and for this reason have been designated, broadly, in the specification as "denominational" members.

What we claim is—

1. In a computing device, and in combination, two denominational members one of which is driven by the other, and a locking device for the driven member, said locking device being positively moved toward its locking position by the driving member during the movement of the driven member, to

lock the latter immediately upon the completion of its movement, and to hold the driven member locked during subsequent movement of the driving member.

2. In a computing device, two denominational members one of which is driven by the other, a locking member for the driven member, means carried by the driving member and directly engaging the locking member to move the same toward the driven member during the movement of the latter, said means being movable out of engagement with the locking member to permit the same to remain in its locking position during subsequent movement of the driving member.

3. The combination with a series of wheels, and locking members therefor, of means for positively moving the members to engage the wheels, and separate means for holding the members in their engaged positions.

4. The combination with a series of wheels, and locking members therefor, of means for positively moving the members to engage the wheels, and independent retaining devices for retaining the members in their engaged positions.

5. The combination with a series of wheels, and locking members therefor, of means for moving the members into engagement with the wheels, and detents for retaining the members in their engaging positions.

6. The combination with a series of wheels, of locking means operated by the wheels to lock the same, and unlocking means independent of the wheels.

7. In a computing device, the combination with a denominational member, of a transfer member carrying a transfer-dog arranged to engage the denominational member to move the same, another denominational member controlling the movement of the transfer member to cause the transfer-dog to advance the denominational member first named and to present the transfer member in locking engagement with the denominational member advanced thereby and means for holding the transfer member in its locking position during subsequent movement of a transfer member other than the one thus locked.

8. The combination with a plurality of denominational members, of an independently-mounted transfer-lever, a transfer-dog mounted on the lever and disposed to engage and operate another denominational member, said transfer-lever being arranged to engage and lock the denominational member thus advanced and to hold the same locked during the subsequent operation of another denominational member.

9. The combination with a plurality of digit-carriers, of a transfer-lever disposed for actuation by one carrier, and a transfer-dog pivotally mounted upon said lever to engage and operate another carrier, said lever being provided with a locking portion arranged to engage the last-named carrier, to lock the same after it has been operated and to hold it locked during the operation of another denominational member.

10. The combination with a pair of denominational members, of a transfer-lever arranged to transmit movement from one member to the other, and a detent for yieldingly retaining said lever at either limit of its movement.

11. The combination with a pair of denominational members, of a transfer-lever for transmitting movement from one member to the other, of a pointed tailpiece extending from the lever, and a pointed detent disposed to engage said tailpiece to yieldingly retain the lever at either limit of its movement.

12. The combination with a computing device including a series of denominational members and transfer mechanism arranged to be moved by one member to advance or carry another member, of means independent of the denominational members for positively returning said transfer mechanism to its normal position.

13. The combination with a series of denominational members and combined transfer and locking members arranged to move and lock the denominational members and to hold them locked during the actuation of members of lower order, of means for restoring the transfer members to their normal position.

14. The combination with a series of denominational members and transfer-levers mounted independently of the members and each arranged to be moved by one member to advance or carry another, of means common to the several levers and independent of the denominational members for positively returning said transfer-levers to their normal positions.

15. The combination with a series of denominational members and a series of transfer-levers each arranged to be moved by one member to advance or carry another, of a rocker disposed to positively return the levers to their normal positions.

16. The combination with a series of denominational members and locking means therefor, of resetting mechanism including a resetting-lever, a latch-lever associated with the resetting-lever, and means operated by the latch-lever for unlocking the denominational members prior to the resetting thereof.

17. The combination with a series of denominational members and locking means therefor, of member-resetting mechanism including a resetting-lever, a latch retaining said lever, and a latch-lever arranged to unlock the members and to release the latch prior to the resetting of the members.

18. The combination with a series of de-

nominational members and combined transfer and locking levers therefor, of resetting mechanism including a resetting-lever, a latch-lever carried by the resetting-lever, and means operated by the latch-lever to move the combined transfer and locking levers for the purpose of unlocking the denominational members prior to the resetting thereof.

19. The combination with a series of denominational members and locking means therefor, of resetting mechanism including means for unlocking the members both before and after the resetting thereof.

20. The combination with a series of denominational members and locking means therefor, of resetting mechanism including a resetting-lever, a latch-lever, means operated by the latch-lever to unlock the members prior to the resetting thereof, and means operated by the resetting-lever to unlock the members after the latter have been reset.

21. The combination with a series of denominational members and combined transfer and locking levers therefor, of resetting mechanism including a resetting-lever, a latch-lever carried thereby, means operated by the latch-lever to release the resetting-lever and to retract the combined locking and transfer levers, means operated by the resetting-lever for resetting the denominational members and for moving the combined locking and transfer levers to their locking position, and means operated by the retractile movement of the resetting-lever to again retract the combined locking and transfer levers after the members have been reset.

22. In a computing device, the combination with a series of wheels occupying different denominational positions and carrying means, of means positively operated to lock each wheel against further movement when carried and to hold said wheel locked during the operation of one or more wheels of lower order.

23. In a computing device, the combination with a series of coaxial wheels occupying different denominational positions, and carrying means, of a series of locking-levers, and means whereby, upon the transmission of movement from one wheel to another of higher order, a locking-lever will be positively operated to lock the wheel carried and to hold it locked during the subsequent operation of another wheel.

24. The combination with a computing device including a series of coaxial wheels, and locking devices for said wheels, each locking device being positively moved to its locking position by one of said wheels other than the one locked by it and retained in such position during the operation of one or more wheels of lower order.

25. In a computing device, the combination with a series of coaxial wheels occupying different denominational positions and having peripheral teeth, of a locking device, operated by one wheel to engage adjacent peripheral teeth of another wheel and lock the latter against movement in either direction.

26. In a computing device, the combination with a series of coaxial wheels occupying different denominational positions and each having peripheral teeth and a projection on one side face, of locking-levers each arranged to be engaged by a projection on one wheel and to be moved by said wheel into locking engagement with adjacent peripheral teeth of another wheel to lock the same against movement in either direction.

27. The combination with a computing device including a series of wheels occupying different denominational positions, transfer-dogs for transmitting motion from one wheel to another and movable out of engagement with the advanced wheel at the completion of its function, and means for subsequently moving the dog into engagement with said wheel to permit another advance thereof, said means being exposed upon the exterior of the computing device for actuation.

28. In a computing device, the combination with a series of wheels occupying different denominational positions, of a series of transfer-dogs arranged to transmit motion from one wheel to another and to move out of engagement with the advanced wheel at the completion of its function, and a pivoted vibrator for positively moving the dog back into engagement with said wheel.

29. In a computing device, the combination with a series of wheels occupying different denominational positions, of a series of transfer-levers, a dog carried by each lever and disposed to engage a wheel, means for positively moving the dogs into engagement with the wheels, and separate means for moving the levers.

30. In a computing device, the combination with a casing and a series of wheels located therein and occupying different denominational positions, of a series of locators for the wheels, and means whereby said locators will be guided by the front wall of the casing.

31. In a computing device, the combination with a casing and a series of wheels located therein and occupying different denominational positions, of locating devices for said wheels, said locating devices being extended through the front wall of the casing to facilitate the actuation thereof.

32. In a computing device, the combination with a casing, of a series of peripherally-toothed wheels located therein and occupying different denominational positions, locating-levers of bell-crank form mounted in the casing and extended through a wall thereof, and rotary members carried by said levers and engaging the teeth of the wheels.

33. The combination with a series of wheels

occupying different denominational positions, of locking devices for the wheels, means whereby one wheel will advance another and move a locking device into engagement with the advanced wheel, and resetting mechanism including means for moving the locking devices out of engagement with the wheels and for subsequently resetting said wheels.

34. The combination with a series of wheels occupying different denominational positions, and a locking device disposed opposite each wheel, of means whereby each wheel will transmit movement to an adjacent wheel of higher order and will simultaneously move a locking device into engagement with the wheel to which motion is transmitted, and resetting mechanism including a resetting-lever and means whereby the locking devices will be moved out of engagement with the wheels before the resetting-lever operates to reset the wheels.

35. In a computing device, the combination with a plurality of coaxial denominational members, of locking members each movable to engage and lock a denominational member and arranged to hold the same locked during subsequent movement of another denominational member, a pivoted transfer-dog mounted on each locking member and arranged to advance or carry a denominational member immediately prior to the locking thereof, retracting means common to the several locking members, and a resetting member arranged to operate the retracting means and to reset the denominational members to zero.

36. In a computing device, the combination with a series of coaxial denominational members, of a transfer member, a swinging transfer-dog carried thereby, a rocker for moving the transfer member in one direction, and a separate rocker for moving the transfer-dog to engage a denominational member.

37. In a computing device, the combination with a plurality of coaxial denominational members, locking members each movable to engage and lock a denominational member and arranged to hold the same locked during the movement of another denominational member, a pivoted transfer-dog carried by each locking member, and a dog-vibrator extended to the exterior of the computing device for actuation.

38. In a computing device, the combination with a plurality of coaxial denominational members, locking members each movable to engage and lock a denominational member and arranged to hold the same locked during the movement of another denominational member, a pivoted transfer-dog carried by each locking member, a dog-vibrator extended to the exterior of the computing device for actuation, and retracting means common to the several locking members.

39. In a computing device, the combination with a series of coaxial denominational members, of a series of transfer-levers each having a locking portion arranged to engage and lock a member, a pivoted transfer-dog carried by each lever, means exposed upon the exterior of the computing device for moving the dogs into engagement with the denominational members, and mechanism also exposed upon the exterior of the computing device for retracting the transfer-levers

40. In a computing device, the combination with a series of denominational members and transfer mechanism therefor, of a rocker for retracting the transfer mechanism, a slide for operating the rocker, and a resetting-lever arranged to move the slide and to effect the resetting of the denominational members to zero.

41. In a computing device, the combination with a series of coaxial denominational members, of transfer mechanism therefor, retracting means including a rocker, a slide connected to the rocker, and a swinging member connected to the slide to operate the same, and a resetting-lever coöperatively related to the swinging member and movable to effect the resetting of the denominational members to zero.

42. In a computing device, the combination with a casing, of a series of coaxial denominational members mounted therein, transfer mechanism therefor, including means for locking the denominational members when carried, means extended beyond the front of the casing to facilitate the operation of said means to unlock the denominational members, and resetting mechanism operable to unlock and reset the denominational members.

43. In a computing device, the combination with a casing, of a series of coaxial denominational members therein, a series of levers each arranged to engage and lock a denominational member, a transfer-dog carried by each of said levers, a rocker for retracting the levers, a slide connected to the rocker and extended beyond a wall of the casing, a resetting-lever movable to effect the resetting of the denominational members, and means establishing a coöperative relation between the resetting-lever and the slide.

44. In a computing device, the combination with the casing, of a series of denominational members therein, a series of levers each arranged to engage and lock a denominational member, transfer-dogs carried by the levers, means exposed upon the exterior of the casing for moving the dogs into engagement with the denominational members, means exposed upon the exterior of the casing for retracting the levers, and a resetting-lever arranged to reset the denominational members to zero and coöperatively related to the lever-retracting means.

45. In a computing device, the combination with a casing, of a series of denominational members therein, a series of levers each arranged to engage and lock a denominational member, transfer-dogs carried by the levers, a retracting-rocker for the levers, a slide connected to the rocker and extended to the exterior of the casing for actuation, means exposed upon the exterior of the casing for moving the transfer-dogs into engagement with the denominational members, a resetting-lever movable to reset the denominational members to zero, and means operated by the lever for moving the slide to effect the retraction of the levers.

46. In a computing device, the combination with a series of denominational wheels and a series of transfer members, of a transfer-resetting member common to the several transfer members, a wheel-resetting member, means carried in part by the wheel-resetting member for operating the transfer-resetting member, and means for operating the transfer-resetting member independently of the wheel-resetting member to reset the transfer mechanism.

47. In a computing device, the combination with a casing, a series of denominational members therein, and transfer mechanism, of a transfer-resetting member common to the several transfer members, means arranged to operate said resetting member and extended beyond the front of the casing for actuation, a resetting member for the denominational members, and means carried in part by said resetting member for operating the transfer-resetting member.

48. In a computing device, the combination with a casing, a series of denominational members therein, and transfer mechanism, of transfer-resetting mechanism including a slide extended to the exterior of the casing for actuation, a resetting member for the denominational members, and means carried in part by said resetting member for operating the slide.

49. The combination with a casing, a series of denominational wheels, and transfer mechanism, of a wheel-resetting lever, a transfer-resetting member, a slide connected to the resetting member and extended to the exterior of the casing, a slide-operating member, and means carried by the resetting-lever for operating the slide through the medium of said operating member.

50. In a computing device, the combination with a series of denominational wheels, of a series of locking members each arranged to engage and lock a wheel against movement in either direction, a carrying-dog mounted on each locking member and operated thereby to carry a wheel during the movement of the locking member into engagement with the wheel, and resetting mechanism arranged to first unlock the wheels and to then reset the same.

51. The combination with a casing and a series of wheels occupying different denominational positions therein, of a series of locking members each arranged to lock a wheel against movement in either direction, means whereby the locking members may be moved one at a time to their locking positions, wheel-resetting mechanism including means for simultaneously moving the several locking members out of engagement with the wheels prior to the resetting of the latter, and means exposed upon the exterior of the casing for unlocking the wheels without resetting the latter.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in the presence of two witnesses

CHARLES F. LAGANKE.
JOHN A. SMITH.

Witnesses:
W. T. McElroy,
J. A. Ziegler.