F. A. HART.

COMBINED TYPE WRITING AND COMPUTING MACHINE.

APPLICATION FILED AUG. 6, 1913.

1,287,301.

Patented Dec. 10, 1918.

2 SHEETS—SHEET 1.

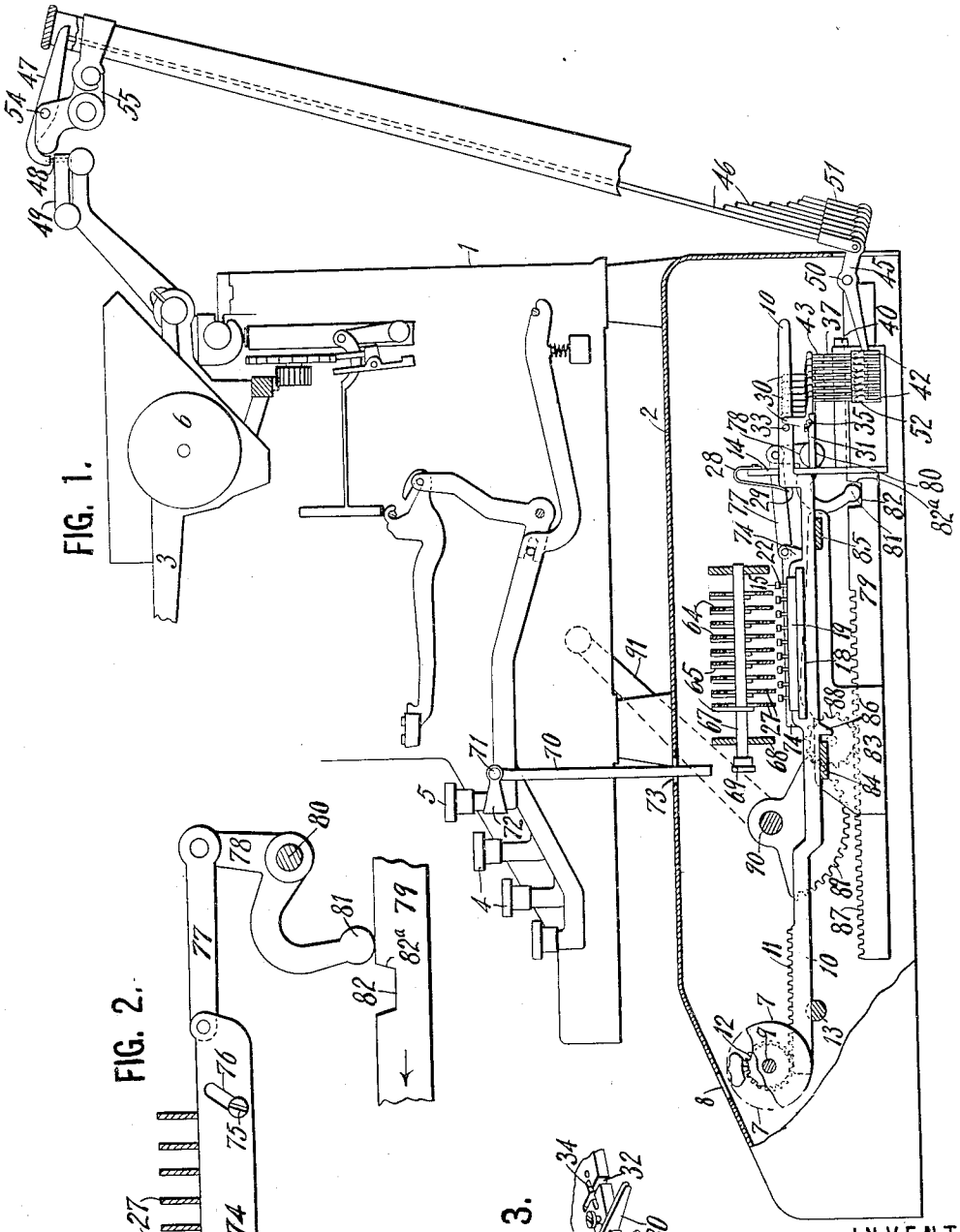

FIG. 1.

FIG. 2.

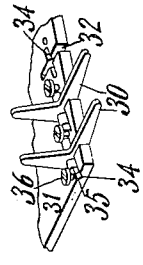

FIG. 3.

WITNESSES:

INVENTOR:

Frederick A Hart

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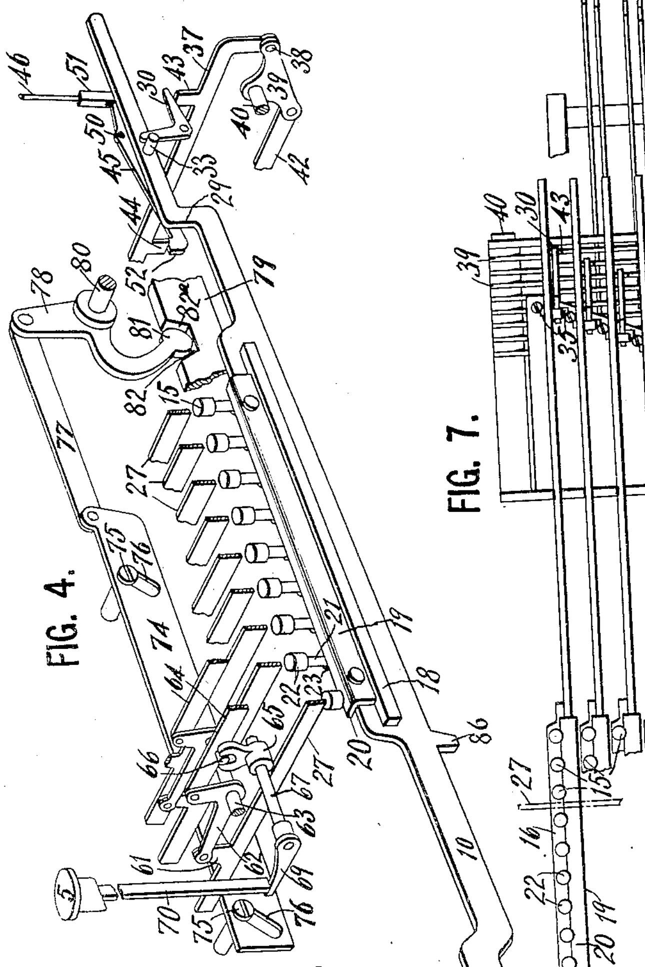

FIG. 4.

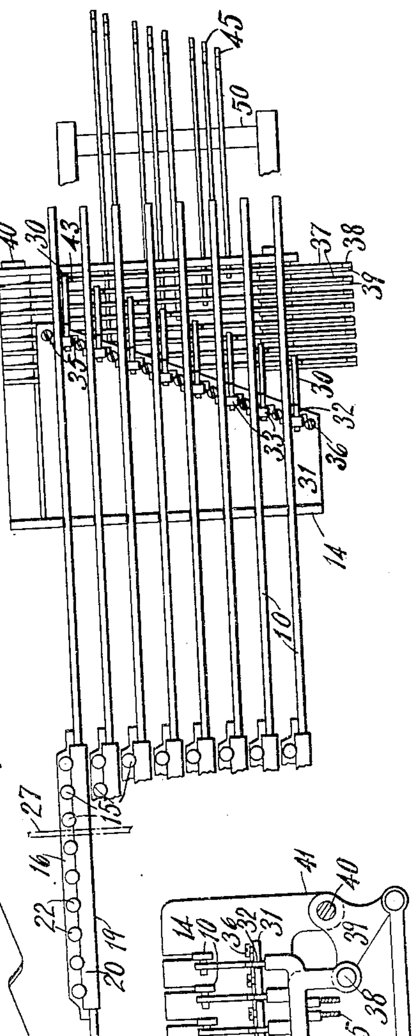

FIG. 7.

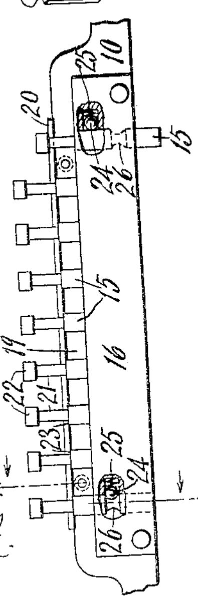

FIG. 5.

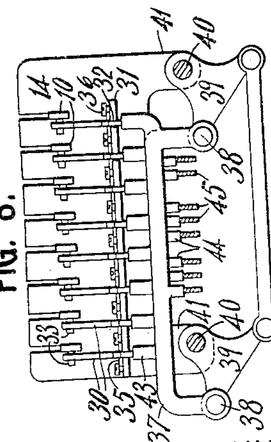

FIG. 8.

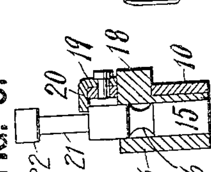

FIG. 6.

WITNESSES:

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UNITED STATES PATENT OFFICE.

FREDERICK A. HART, OF NEWARK, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO UNDERWOOD COMPUTING MACHINE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

COMBINED TYPE-WRITING AND COMPUTING MACHINE.

1,287,301. Specification of Letters Patent. Patented Dec. 10, 1918.

Application filed August 6, 1913. Serial No. 733,258.

To all whom it may concern:

Be it known that I, FREDERICK A. HART, a citizen of the United States, residing in Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Combined Type-Writing and Computing Machines, of which the following is a specification.

The present invention has reference to an improved computing and typewriting mechanism of the kind disclosed in United States Patent No. 816,319 to Hans Hanson.

In this class of machines, the numeral keys of the typewriter not only operate the type-bars and carriage-feeding mechanism, but also set up index-pins, so that at the completion of the writing of a number, a corresponding array of index-pins is set up. These setup pins are then used to control the extent of rotation of their associated number-wheels; the latter being moved by a general operator, which is set in motion after the writing of the number on the work-sheet is completed. The present invention relates generally to the index-pin mechanism, and particularly to means for setting them at the operation of the keys. Of these pins there are usually provided nine for each of the number-wheels; and the pins are usually mounted on parallel computation or decimal bars, which in the Underwood-Hanson machine are provided also with rack teeth, to engage pinions to drive or impel the number-wheels.

One of the main objects of the invention is to adapt these index-pin bars to be displaced endwise, to bring the pins within reach of the key-operated pin-setting devices, by means of a simple and inexpensive device requiring but trifling change in the manufacture of the machine, and moreover readily applicable to existing machines. Usually a dog on the typewriter carriage depresses one after another a series of denomination-selecting jacks, and these are usually connected to the index-pin bars by means of a transposition device, the order of the number-wheels being the reverse of the order of the jacks; and according to the present improvements, simple devices are arranged between the transposition device and the index-pin bars, to displace them endwise to pin-setting position instead of lifting them to such position as heretofore.

In the preferred form of the invention, bell-cranks are interposed between the index-pin bars or number-wheel actuators and the transposition device or transposers before mentioned, all so mounted that they can be inserted, removed, and replaced individually. The bell-cranks are herein shown as mounted on a plate provided with open-ended slots wherein the several bell-cranks are respectively adapted to oscillate, surface grooves bisecting these slots and affording seats for separate pivot-pins on which the bell-cranks are supported independently of one another, and screws whose heads bear upon the extended ends of the pivot-pins.

The effect accomplished is to simplify the mounting of the various mechanical elements, to reduce the labor in fitting of same, to localize such repairs as might eventually be needed, and to insure a safe and efficient construction.

The index-pins are mounted on their bars or wheel actuators by means of detachable socket-pieces in which they are yieldingly retained by spring-pressed devices, and through engagement with side flanges on these bars, a single flange serving to limit the reciprocal movements of an entire row of pins across the corresponding bar, though they may rotate harmlessly on their axes, within the mounting.

Other features and advantages will hereinafter appear.

In the accompanying drawings,

Figure 1 is a sectional side elevation of the combined typewriting and computing machine, some parts being broken and others removed.

Fig. 2 is a fragmentary side view showing part of a general operator, and a lock for the setting device.

Fig. 3 is a broken perspective view to illustrate the method of mounting the bell-cranks.

Fig. 4 is a detail diagrammatic view illustrating, in perspective, a setting operation.

Fig. 5 is a broken side view of one bar and its index-pins, showing how the latter are mounted and set for action.

Fig. 6 is a vertical cross section on the line A—A of Fig. 5.

Figs. 7 and 8 represent in top plan and rear end views, respectively, the particular arrangement and relative positions of the transposers, bell-cranks, and index-pin bars or register actuators.

The typewriter frame 1 is mounted upon a computing case 2. The typewriter carriage 3 is controlled by an escapement 3^a subject to the key action. Ordinary character keys 4 and numeral keys 5 operate the type-bars to strike the platen 6, and as they approach the platen the type-bars 3^a actuate the universal bar 3^b by their heels, 3^c, as in the ordinary Underwood typewriting machine. Number-wheels 7 visible through an aperture 8 are mounted on a shaft 9 singly or conjointly. The same key 5 that drives the type-bar to the printing point on the platen also regulates the extent to which each wheel of the register is to be actuated.

For each number wheel 7 there is an actuator which consists of a bar 10 having a rack 11 in mesh with a pinion 12 adjacent to wheel 7. These bars 10 extend from front to rear of the machine, and are mounted for reciprocation longitudinally. They rest at their forward ends upon a transverse rod 13 which is notched crosswise, Fig. 1, to hold them properly spaced, and at their rear ends, they are likewise supported and spaced apart by a guide-comb 14.

There are nine index-pins 15 on each bar. These pins are fitted for up and down movements through vertical sockets formed in plates 16 which are fastened at their ends to said bars. The plates 16 are disposed against the left-hand sides of the bars, and each has a flange 18 at its upper edge projecting laterally through a longitudinal slot in the bar. An angular strip 19, Fig. 4, is attached to the bar 10 on the right-hand side, and is so positioned as to bear at its lower edge upon the flange 18 projected therethrough, while its upper edge forms a flange 20 overlying the bar and extending beyond it on the side opposite.

The circumference of each pin 15 is uniformly reduced at 21 toward the upper end thereof, to produce a head 22 and a shoulder 23, affording means for limiting the pin's movements up and down, by engagement with said flange 20. As Figs. 4 to 6, indicate, the flange 20 enters the circumferential depressions at the upper ends of all the pins, and acts as a retainer for them in both directions, the heads 22 bearing upon the flange 20 when the pins are driven downwardly, and the shoulders 23 similarly encountering the flange at the time the pins are pushed upwardly. The pins are idle while in the latter-named state in which they are normally maintained, each by a spring-pressed ball 24 in a recess 25 in said socket plate, to engage a circumferential groove 26 in the lower portion of the pin. Any pin may be forced down past the ball 24, and when so depressed, its lower end protrudes below the contiguous lower edge of the rack bar 10, as shown in Fig. 5. The pins are depressed by transversely-disposed links or members 27 of a setting device, which, however, is normally inoperative with relation to said pins, since the index-pin bars or rack bars are normally far enough back to keep all their pins out of range of the links 27. A downwardly-curved spring 28, secured to the guide-comb 14 and arranged to press in a rearward direction against a shoulder 29 formed on the rack bar 10, assists in holding the latter retracted. It will be observed that any pin can be easily removed from its mounting, for the purpose of substitution or any other reason, simply by detaching the angle strip 19 and forcing the pin out past the spring-pressed ball 24.

Bell-cranks 30 are used for individually advancing the rack bars 10, each to a slight extent, and bringing their index-pins 15 forwardly into the working zone of the setting device, so that the pins stand directly beneath its links 27. A special mounting is provided for these bell-cranks, Figs. 1, 3, 4, 7 and 8. A supporting plate 31 is placed transversely of the computer case 2, in a horizontal plane parallel to and underlying the rear ends of the series of rack bars, rearwardly of the guide-comb 14. This plate is cut on an oblique line at the end remote from the guide-comb, and is formed with open-ended longitudinal slots 32 at the same end, wherein the elbows of the bell-cranks are inserted, with one arm of each bell-crank projecting out rearwardly, and the other arm reaching up to the corresponding rack bar, so as to bear against a stud 33 located forwardly thereof on one side of the bar. Grooves 34 are also formed in the surface of the plate 31 transversely of its longitudinal slots, and separate pivot-pins 35 on which the bell-cranks are loosely mounted independent of one another, are received in these grooves where they are held fast by the impinging heads of screws 36, as shown in Fig. 3. Thus mounted, the bell-cranks are severally adapted to impart the desired rectilinear motion to their respective rack bars which is effected merely by raising their lower arms and thereby bringing their upper arms into forcible engagement with the studs 33. This is preferably accomplished by subjecting the lower arms of the bell-cranks to the immediate action of the transposers to which reference has already been made, and which in turn are acted upon by the thereto connected levers, links, jacks, and selecting dog on the typewriter carriage, all likewise hereinbefore mentioned.

The transposers, Figs. 1, 4, 7 and 8, estab-

lish a cross-connection between the bell-cranks 30 and the aforesaid lines of mechanical connections, whereby the latter transmit to the former the right-to-left movement of the typewriter carriage after converting it into a left-to-right motion. They consist mainly of bars 37, one for each bell-crank 30. These bars 37 are placed transversely under the rear ends of the actuators 10 and so that they will underlie successively the horizontal extremities of the bell-cranks 30, one to each. As shown more clearly in Fig. 7, the horizontally-disposed lower arms of the bell-cranks project consecutively at uniform distances from the obliquely-cut plate 31, thus terminating all on a line slanting in the same direction.

The several bars 37, as seen in Figs. 4 and 8, have both their ends turned downwardly by means of which they are adapted for vertical movements, through pivotal connections 38 with pairs of bell-cranks 39 fulcrumed on rods 40 which extend horizontally and rearwardly from depending lugs 41 on opposite sides of the guide-comb 14, at its lower edge. A transverse link 42 parallel to the bar 37 pivotally interconnects the bell-cranks in each pair. Two projections 43 and 44 are formed respectively on the top and bottom of each bar 37, on opposite sides of the center thereof, and these afford connecting means whereby the bar can be raised from one end, and itself in turn will become adapted for raising at the other end. The under projections 44, wherewith the bars 37 move upwardly, are located diagonally with relation to the series of these bars, so that the latter may be reached in consecutive order from the rearmost to the foremost, starting from the right-hand side of the machine, and thence proceeding in regular succession toward the left-hand side. Contrariwise, the upper projections 43, intended to transmit the movement of the bars 37 from the opposite ends thereof, are made to run in a reverse diagonal direction, in order that they may be brought successively under the horizontally-pointed extremities of the lower arms of the bell-cranks 30, to raise them progressively in advance of one another from the left toward the right of the machine.

The connections between the transposers and the typewriter carriage include levers 45, links 46, and jacks 47, operated by a selecting dog 48 mounted in a block 49 on the carriage. The levers 45 are pivoted on a rod 50 and connect the lower ends 51 of the links 46. The inner ends of the several levers 45 are turned upwardly as at 52, Fig. 4, and made to engage the under projections 44 of the transposer bars 37 which they reach consecutively. As Figs. 1 and 7 show, these levers are of progressively-increasing lengths so that they may be hinged for uniform action on both sides of their pivot and brought into contact with their respective transposer bars, through the upturned ends 52 and downwardly-directed projections 44 in sequence from the right-hand side of the machine toward the left-hand side thereof, beginning with the connection of the shortest lever with the rearmost bar, thence advancing inwardly consecutively by connecting levers of proportionate dimensions to the other bars forwardly located. The jacks 47 are fulcrumed on a transverse rod 54 in a bracket 55.

When the selecting dog 48 is brought into engagement with the jacks 47 by the travel of the typewriter carriage, it oscillates them *seriatim*. As each jack 47 is swung upwardly at its inner end, it depresses by its lowered outer end the link 46 thereunder, which in turn oscillates the thereto coupled lever 45, and raises the transposing bar 37 that is cross-connected with its bell-crank 30 and so shifts forwardly or advances the rack bar 10 of corresponding decimal order, thus bringing its index-pins 15 directly under the transverse links or setting members 27 of the setting device, as shown in Fig. 4. Any pin 15 in the advanced row can at that time be acted upon by the overlying member 27. The pin is set or pushed down into its operative position by lowering the corresponding member 27 and causing it to press squarely upon the pin's head 22 straight underneath.

To move the setting members 27 downwardly in this manner, they are pivotally suspended by lugs 61, each from the lower arms of a pair of bell-cranks 62, fulcrumed on rods 63 that are suitably spaced apart and disposed longitudinally within the case 2. By preference, the upper arms of the pairs of bell-cranks 62 are pivotally interlinked by tie-bars 64. The several tie-bars are moved endwise to swing the bell-cranks 62 on their supporting rods 63 and thereby impart to the lower members 27 a downward movement in the opposite direction, this being effected by providing each tie-bar with a stud 66 which is engaged by a forked arm 65 rigidly secured to a rock shaft 67 journaled in a frame 68 in the upper part of the computer case and having another arm 69 placed in the path of a stem or plunger 70 depending from a numeral key 5 thereabove (see Fig. 1). This stem is pivoted at 71 to a bracket 72 on the numeral key, and enters the case 2 through a slot 73. Each numeral key, it is understood, operates a separate rock shaft and corresponding link-actuated transverse member of the setting device, through the connections described.

The above-named general operator of the computing mechanism comprises a pair of laterally-spaced bars 79 each of which has an arm 83 secured thereto, the two arms 83

being connected by rear and front cross-bars 85 and 84, respectively adapted, one to propel the actuators 10 of the register-wheels by engaging the pins 15 depressed by the members 27 of the setting device, and the other to withdraw the actuators subsequently, by engagement with lugs 86 thereunder. The general operator is reciprocated by gearing, which includes a rack 87 on the forward end of each bar 79, a pinion 88 in mesh therewith, and a segment gear 89 also engaging this pinion. The gear 89 is rigidly secured to a transverse rock shaft 90, and the movements thereof are con trolled by an oscillatory handle 91, located on the left-hand side of the machine. As the general operator is moved forwardly by oscillating the handle 91 in the same direction, the rear cross bar 85 of the rack bar 79 encounters the set pins 15 on the actuators 10, and these pins drive the actuators onwardly, thereby causing the appropriate register wheels to rotate, each a variable amount corresponding to the digit which it is meant to display. On the reverse movement of the general operator, the register-wheel actuators that have thus been propelled are pushed back by its forwardly-located cross bar 84, engaging the lugs 86, the wheels not turning on the reverse stroke, owing to pawl and ratchet connections shown in the aforesaid Hanson patent. Other parts of the mechanism, not bearing directly on the present invention, are similarly returned to idle positions by the general operator.

For preventing the operation of any numeral key during the action of the general operator, the latter is provided with means to elevate a locking bar 74 beneath the index-pin setting members 27 which are connected to the keys as aforesaid. This bar 74 has diagonal slots 76 whereby it is mounted upon screw-studs 75 fixed upon the framework. A link 77 connects the bar 74 to a bell-crank 78 pivotally mounted at 80; and one end 81 of the bell-crank normally rests in a notch 82 provided in one of the bars 79 of the general operator.

Normally the bar 74 is depressed as at Figs. 1 and 4, the end 81 occupying the notch 82; but at the first part of the advance of the general operator, the arm 81 is swung by engagement of the edge 82^a of the notch 82, and thereby the bell-crank 78 is caused to pull the link 77 and draw the bar 74 to effective locking position, as at Fig. 2. The parts remain in this position, the end 81 riding on the upper edge of the bar 79, until the general operator completes its forward movement and nearly finishes its return movement, during which time no numeral key can be operated. At the completion of the return movement of the general operator, the arm 81 again falls into the notch 82. During the upward movement of the bar 74, produced as above described, by the action of the bell-crank 78 and the link 77, said bar 74 will operate to positively return to normal position any of the setting members 27 which have failed to rise concomitantly with the corresponding numeral key.

Variations may be resorted to within the scope of the invention, and portions of the improvements may be used without others.

Having thus described my invention, I claim:

1. In a computing machine, the combination with a register, a series of actuating devices therefor, and denominational members for said actuating devices of operating connections between said actuating devices and said denominational members for transmitting the movement of the former to the latter, said connections including a series of bell-cranks; and a grooved plate on which said bell-cranks are journaled.

2. In a computing machine, the combination with computing mechanism, and two corresponding series of movable members representing similar decimal values, of means for transmitting motion from one to another of said series of members, said means including a series of bell-cranks, a support for said bell-cranks, and separate pivots for said bell-cranks demountably journaled in said support.

3. In a computing machine, the combination with a register, a series of longitudinally-slidable actuators therefor, of a corresponding series of bell-cranks adapted to move said actuators a predetermined extent, and a plate having open-ended slots parallel to the lines of reciprocation of the several actuators in which the bell-cranks are journaled for oscillation.

4. In a computing machine, the combination with computing mechanism, of two series of members having corresponding decimal values, bell-cranks interposed therebetween to operate the one from the other, and a slotted plate wherein said bell-cranks are respectively lodged and oscillated, said plate being transversely grooved at the surface to permit open journaling thereon of the series of bell-cranks.

5. In a computing machine, the combination with computing mechanism, and a series of actuators therefor arranged for reciprocation, of operative connections for denominationally selecting said actuators including an intermediate series of bell-cranks, and a plate having slots wherein the series is journaled and guided, each bell-crank having one arm intermittingly impinging against its respective actuator, and the other arm alternately engaged by one of said connections.

6. In a computing machine, the combination with computing mechanism, of a series

of actuators therefor, operative connections for said actuators, intermediate bell-cranks, and an obliquely-cut supporting plate for said bell-cranks formed with slots opening through the oblique edge thereof, the several bell-cranks having arms extended outwardly from said slots at working distances from said edge, and the thereto appertaining operative connections advancing successively toward said arms.

7. In a computing machine, the combination with computing mechanism, of a series of actuators for said computing mechanism arranged so as to be advanced in succession from the left toward the right in accordance with the normal reading of decimal orders, bell-cranks respectively adapted to slide the same, an obliquely-cut supporting plate formed with slots opening through the oblique edge thereof from which said bell-cranks consecutively project rearwardly, a series of operative connections, a key-actuated transversely-moving carriage, a selecting dog on said carriage encountering said operative connections successively as it moves from the right toward the left, and transposers diagonally cross-connected with the operative connections and the arms of the bell-cranks projecting out of said slots.

8. In a computing machine, the combination with a register, of an actuator therefor, a flange projecting laterally from said actuator, and a row of transversely movable impellers carried by said actuator and located partly to one side of said flange, said impellers consisting of cylindrical pins having each a reduced stem portion in engagement with the flange and a head extending laterally thereabove.

9. In a computing machine, the combination with a register, of an actuator therefor, a transversely-movable impeller for said actuator having a head and a shoulder separated by a reduced stem portion, and a lateral flange on said actuator entering said reduced portion for permanent engagement therewith, so that the said head and shoulder will be retained on opposite sides of said flange.

10. In a computing machine, the combination with a register, of an actuator therefor, a transversely-movable impeller for said actuator consisting of a cylindrical pin held loose circumferentially, said pin having its stem partly reduced to form a head and shoulder thereon, and a lateral flange on the actuator substantially perpendicular to the reduced portion of said stem permanently engaging it between said head and said shoulder.

11. In a computing machine, the combination with a register, of an actuator, a row of impellers individually movable across said actuator, said impellers consisting of cylindrical pins loosely socketed by one side of said actuator, each pin having its stem partly reduced to form a head and a shoulder thereon, and a flange projected laterally from the actuator and entering the reduced portions of the several stems for permanent engagement with the row of impellers.

12. In a computing machine, the combination with computing mechanism, of a duplicate series of members for selecting decimal orders in said computing mechanism, a bell-crank adapted to transmit motion from one of said members to a corresponding member, a surface-grooved plate affording a support to said bell-crank, a pivot for the latter partly embedded in the groove of said plate, and a retaining screw bearing on the exposed side of said pivot.

13. In a computing machine, the combination with computing mechanism, of a duplicate series of members for selecting decimal orders in said computing mechanism, a series of bell-cranks intervening between said series of members to transmit motion from one series to the other, a plate for said bell-cranks formed with surface grooves, separate pivot-pins on which the several bell-cranks are journaled in the grooves of said plate, and retaining screws with heads impinging on said pivot-pins.

14. In a computing machine, the combination with computing mechanism, of a series of numeral keys, a system of indexing devices, members operated by said keys for setting said indexing devices to control the amount of movement of said computing mechanism, a bar moving to position to lock said setting members against actuation, a general operator to coöperate with said indexing devices to register the corresponding number, said general operator having a bar provided with a notch, and a tumbler connected to said locking bar and normally resting in said notch but movable out of the notch by the movement of the general operator, said tumbler mounted to rest on the edge of the notch during the completion of the forward stroke of the general operator, and to fall into said notch again upon the return of the general operator to normal position.

15. In a computing machine, the combination with denominational members, of bell-cranks for making them effective, shafts whereon said bell-cranks are mounted, a support for said bell-cranks arranged diagonally of said members, said support having slots in which said bell-cranks swing and also having grooves adapted to carry said shafts, and headed members entered into said support and overlying said grooves to hold said bell-cranks in their journals.

16. In a computing machine, the combination with computing mechanism, and a series of denominational members therefor, of a series of bell-cranks set along a diagonal line, one bell-crank for each denominational

member, and a series of selector linkages set at right angles to said denominational members and effective thereon through said bell-cranks.

17. In a computing machine, the combination with computing mechanism, of a series of key-operated linkages for controlling said computing mechanism, a holding bar effective on said linkages, denominational members on which said linkages are effective, a general operator for said denominational members, and means positively moved by said operator to force said holding bar to effective position and positively restore said linkages to normal position whenever the operator is actuated to carry it out of its normal position.

18. In a computing machine, the combination with computing mechanism, of a series of key-operated linkages for controlling said computing mechanism, a holding bar effective on said linkages, denominational members on which said linkages are effective, a general operator for said denominational members, means positively moved by said operator to force said holding bar to effective position and positively restore said linkages to normal position whenever the operator is actuated to carry it out of its normal position, and a series of bell-cranks for moving said denominational members to operable position with relation to said linkages.

19. In a computing machine, the combination with computing mechanism, and a series of denominational members therefor; of a corresponding series of actuating devices arranged beneath and at right angles to said denominational members; and a corresponding series of bell-cranks intermediate said denominational members and said actuating devices, for transmitting the movement of the former to the latter, each bell-crank comprising a horizontal arm projecting across its associated actuating device and a vertical arm engaging the associated denominational member.

20. In a computing machine, the combination with computing mechanism, and a series of denominational members therefor; of a corresponding series of vertically-movable linkages for actuating said denominational members arranged beneath and at right angles to the same; and a corresponding series of bell-cranks intermediate said denominational members and said linkages, for transmitting the movement of the former to the latter, each bell-crank having one arm projecting across its associated linkage, and the other arm engaging the associated denominational member.

21. In a computing machine, the combination with computing mechanism, and a series of key-operated linkages therefor; of a locking bar for said linkages having diagonal slots therein, and guides projecting into said slots; denominational members having devices thereon settable by said linkages; a general operator engageable with the set devices on said denominational members, to actuate the latter; and a rocker positively operated by said general operator and connected to shift said bar endwise, whereby said bar is simultaneously moved vertically by the co-action of said slots and guides.

22. In a computing machine, the combination with computing mechanism, and a series of key-operated linkages therefor; of a locking bar for said linkages having diagonal slots therein, and guides projecting into said slots; denominational members having devices thereon settable by said linkages; a general operator engageable with the set devices on said denominational members, to actuate the latter, said general operator comprising a bar provided with a cam; and a rocker engageable by said cam during the forward movement of said general operator and connected to shift said bar endwise, whereby said bar is simultaneously moved vertically by the co-action of said slots and guides.

FREDERICK A. HART.

Witnesses:
GEO. W. NAYLOR,
F. E. ALEXANDER.