

No. 649,522.

Patented May 15, 1900.

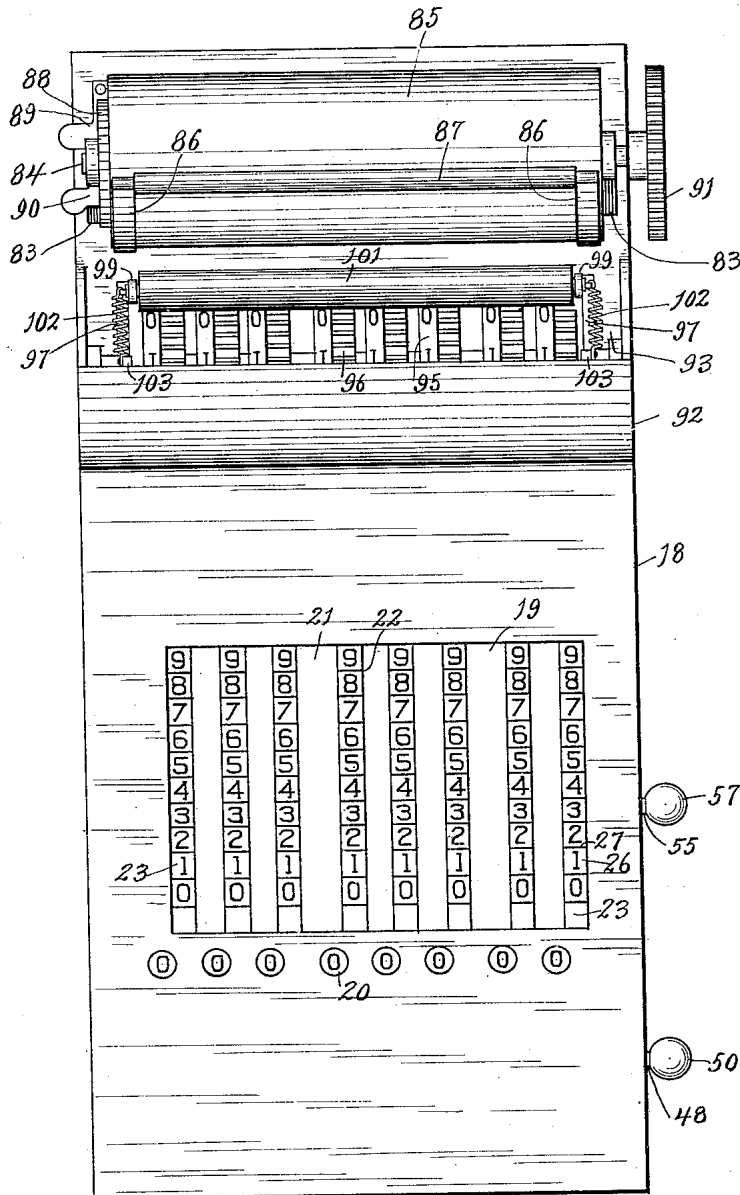
J. MALLMANN.
CALCULATING MACHINE.

(Application filed Feb. 13, 1899.)

(No Model.)

5 Sheets—Sheet 1.

Fig. 1.



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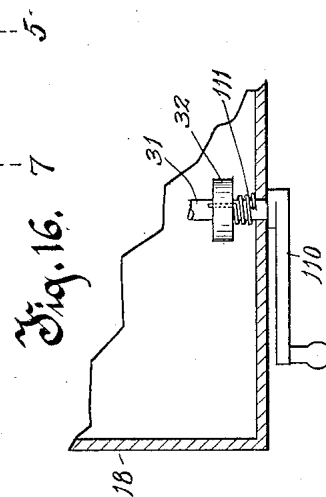
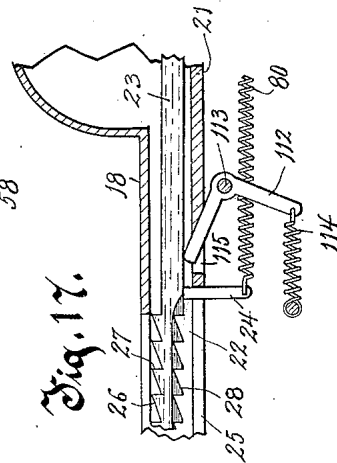
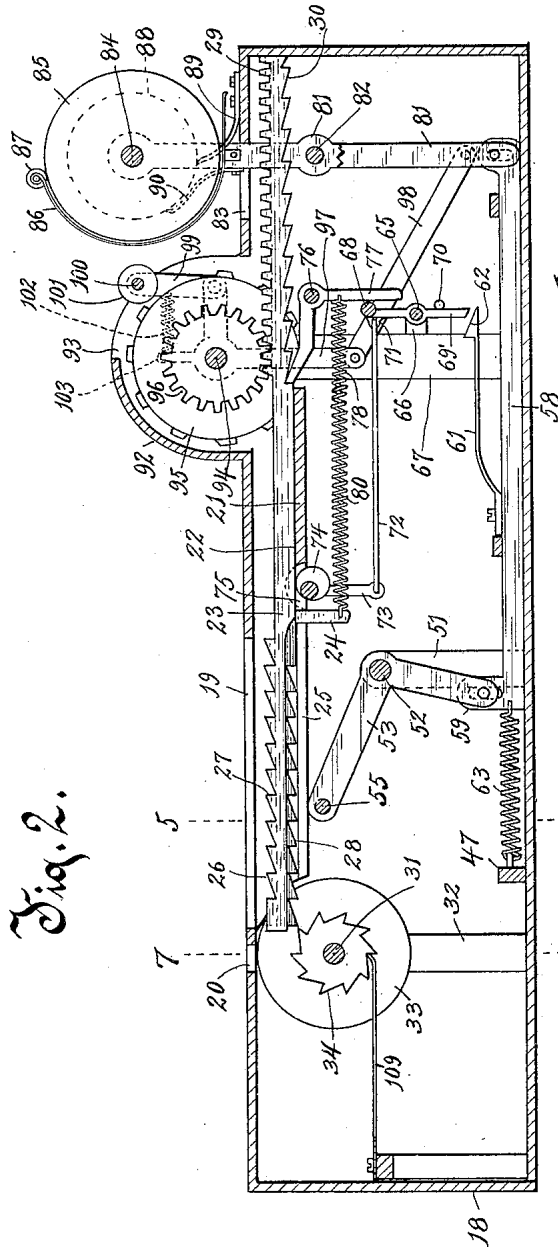
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5 Sheets—Sheet 2.



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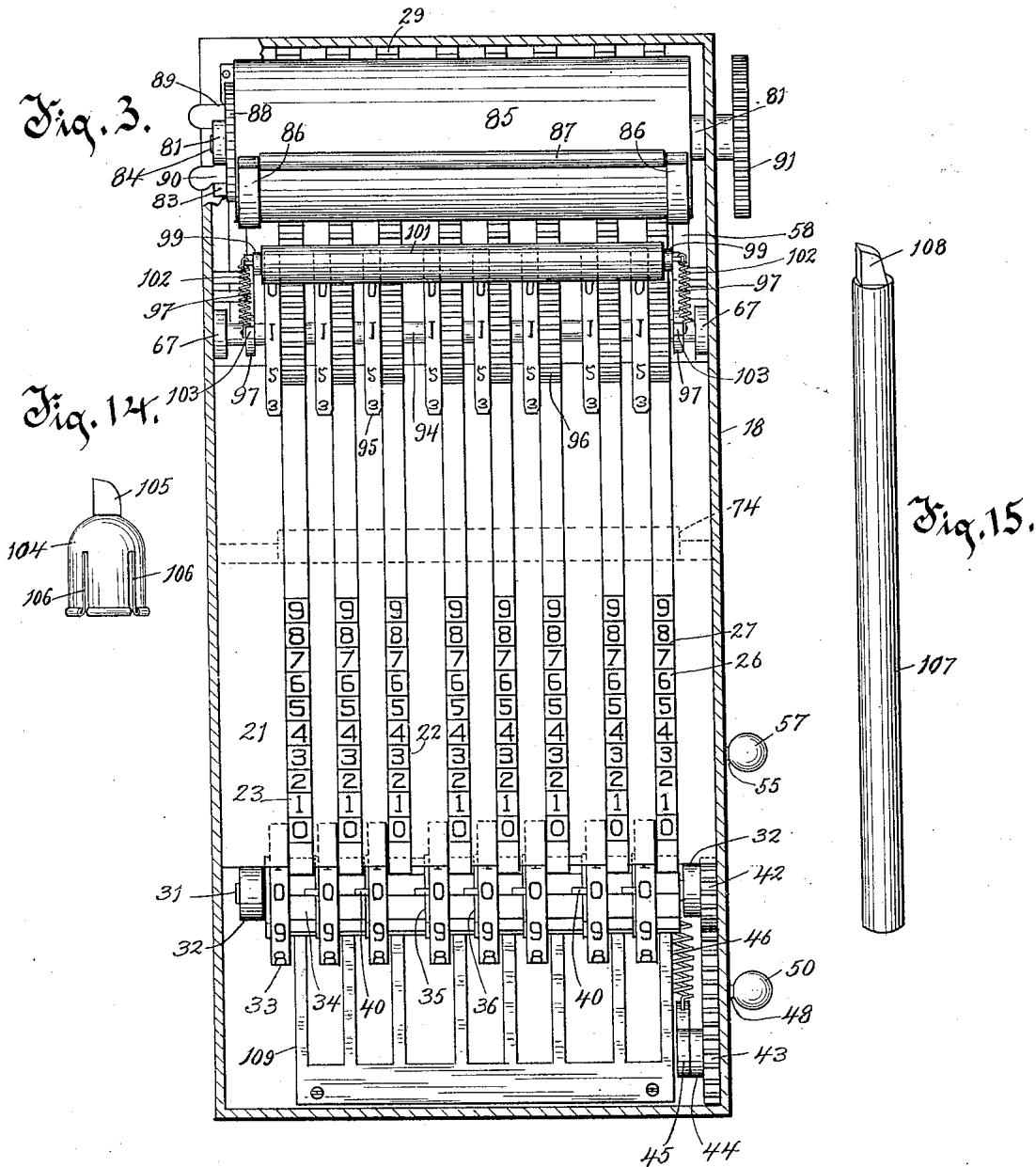
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5 Sheets—Sheet 3.



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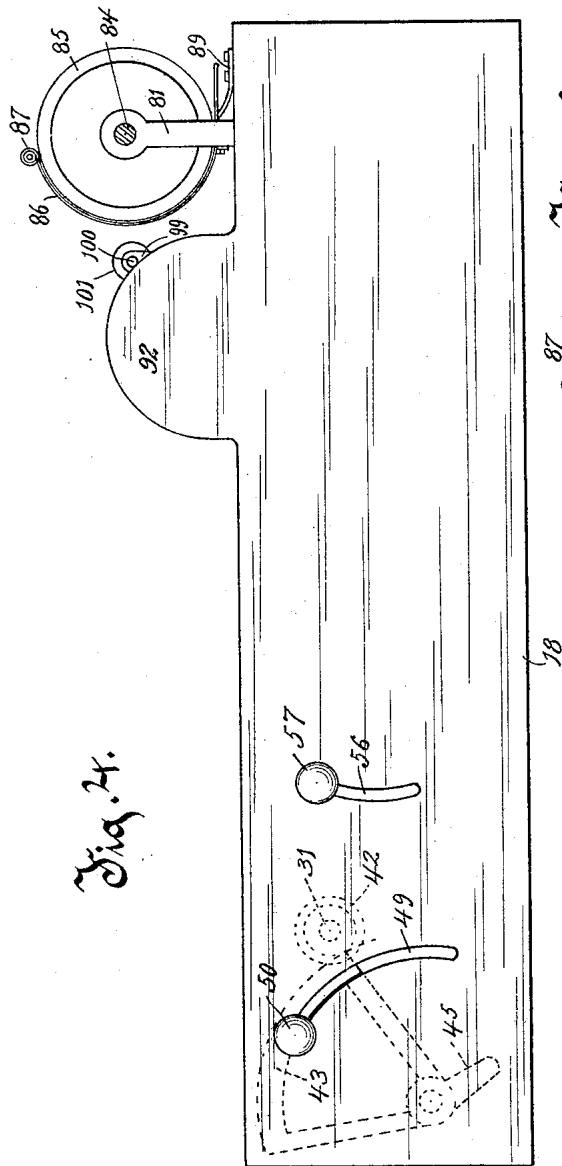


Fig. 4.

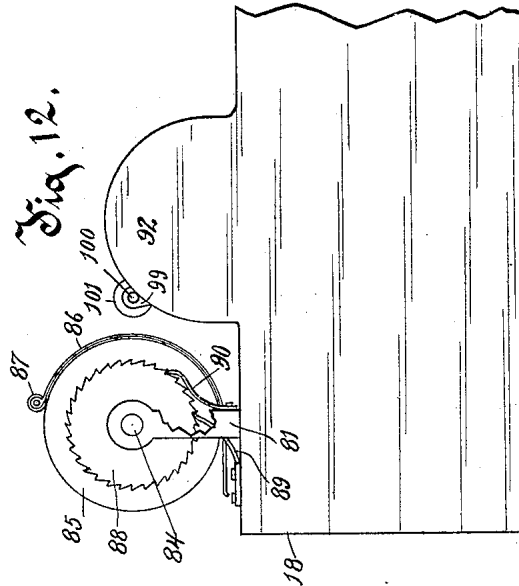
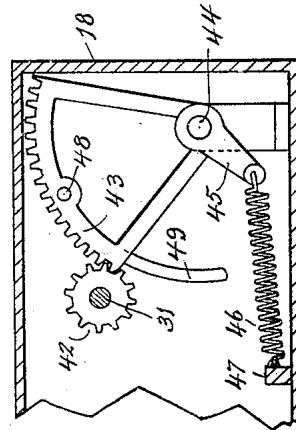


Fig. 12.

Fig. 13.



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Fig. 5.

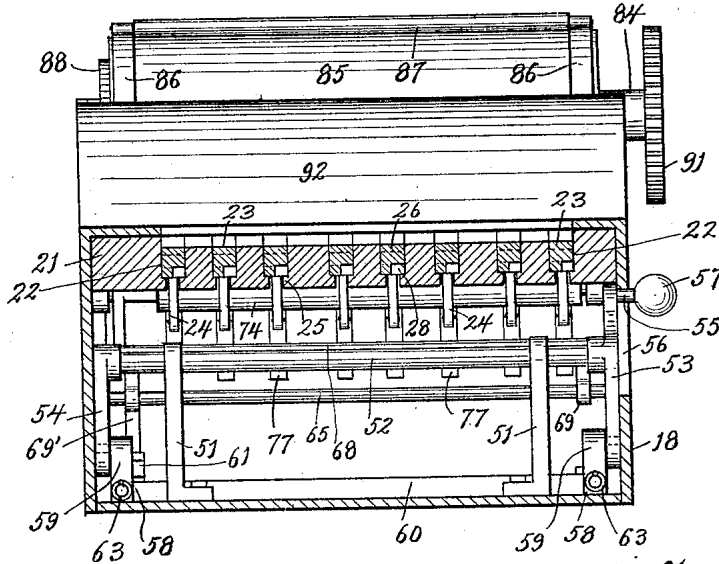


Fig. 6.

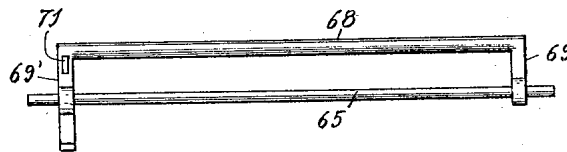


Fig. 7.

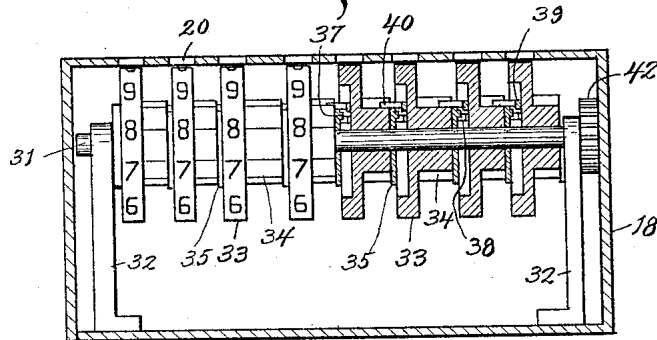


Fig. 8.

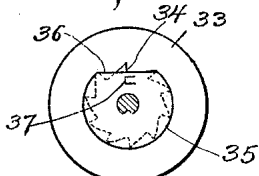


Fig. 9.

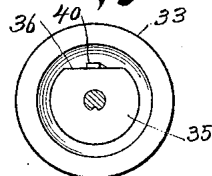


Fig. 10.

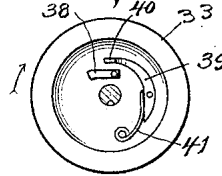
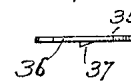


Fig. 11.



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UNITED STATES PATENT OFFICE.

JAMES MALLMANN, OF SHEBOYGAN, WISCONSIN.

CALCULATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 649,522, dated May 15, 1900.

Application filed February 13, 1899. Serial No. 705,366. (No model.)

To all whom it may concern:

Be it known that I, JAMES MALLMANN, of Sheboygan, in the county of Sheboygan and State of Wisconsin, have invented a new and useful Improvement in Calculating-Machines, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

My invention has relation to improvements in calculating-machines.

The primary object had in view is to provide an improved construction of calculating-machine which has in view simplicity of construction and operation and inexpensiveness in production.

A further object contemplated is to provide an improved construction of such character as to adapt the machine to be used in connection with type-writing mechanism, the arrangement being such that the calculating mechanism displays the proper numbers through suitable sight-openings, while the type-writing mechanism is adapted to print the proper numbers in columns and the correct answer to the calculation also printed after the figures to be calculated are first printed.

With the above primary and other incidental objects in view the invention consists of the devices and parts or their equivalents, as hereinafter more fully pointed out.

In the accompanying drawings, Figure 1 is a plan view of the complete machine. Fig. 2 is a longitudinal vertical sectional view. Fig. 3 is a plan view with the top of the casing broken away. Fig. 4 is an elevation of one side of the machine. Fig. 5 is a cross-section on the line 5 5 of Fig. 2. Fig. 6 is a detail view of the mechanism for lifting the longitudinal actuating-bars off the ratchet-wheels. Fig. 7 is a cross-section on the line 7 7 of Fig. 2. Fig. 8 is a detail view of one of the calculating-wheels, showing the carrying-over disk adjacent thereto. Fig. 9 is a detail view of the opposite side of the calculating-wheel to that shown in Fig. 8, also showing the opposite side of the carrying-over disk. Fig. 10 is a view similar to Fig. 9 with the carrying-over disk removed. Fig. 11 is an edge view of the carrying-over disk. Fig. 12 is a side elevation of a fragment of the opposite side of the machine to that shown in

Fig. 4. Fig. 13 is a sectional fragmentary view showing the mechanism for turning the calculating-wheel back to "0." Fig. 14 is a view of a finger-piece or thimble conveniently used for operating the machine. Fig. 15 is a view of an operating-bar which may be employed in lieu of the finger-piece or thimble. Fig. 16 is a detail fragmentary view of a modified form of mechanism for turning the calculating-wheels back to "0," and Fig. 17 is a detail sectional fragmentary view showing a modified form of mechanism for raising the longitudinal actuating-bars from the ratchet-wheels.

Referring to the drawings, the numeral 18 indicates the casing of the machine. In the top of this casing is a rectangular opening 19, and just in front of the rectangular opening is a series of small openings 20, preferably circular in form. Arranged within the casing and just below the top thereof and extending for a desired distance longitudinally of the casing and also extending across the casing is a horizontal supporting-partition 21. This partition is provided in its top surface with a series of longitudinal recesses 22, in each of which recesses is seated a longitudinal actuating-bar 23. Each bar 23 is provided with a depending finger 24, which finger extends through an elongated slot 25, extending downwardly from each recess 22, and through the partition 21. These slots are not coextensive in length with the length of the recesses, but only extend from the front end of the partition to a point some distance in advance of the rear ends of the recesses 22, as clearly shown. The upper surface of the front portion of each longitudinal actuating-bar is provided with a series of projections 26, there being ten of such projections shown. Each projection is preferably formed with a rearwardly and upwardly inclined face, terminating at its rear end in an abrupt shoulder 27. The inclined faces of these projections are numbered, as clearly shown in Figs. 1 and 3, so as to be clearly visible through the large rectangular opening 19, the first tooth at the front end of each bar being numbered "0" and each succeeding tooth being numbered with the digits "1," "2," "3," "4," "5," "6," "7," "8," "9," respectively. Each bar is also provided on its

under surface immediately below the projections 26 with a series of teeth 28, said teeth also having inclined faces, said faces, however, inclined downwardly and forwardly, with abrupt shoulders at their forward terminal ends. The upper edge of the rear portion of each longitudinal actuating-bar is formed or provided with a series of teeth 29, forming a rack. Each bar is also provided on its lower edge, at the rear portion thereof and beneath the teeth 29, with inclined teeth 30, the inclined face of each tooth terminating at a rear abrupt shoulder.

Arranged within the casing and extending across the front portion thereof is a shaft 31, said shaft being mounted in bearings 32 32. Mounted loosely on this shaft is a series of calculating-wheels 33, eight of said wheels being shown in the accompanying illustration of my invention to correspond to the number of sight-openings 20 in the top of the casing and to also correspond to the number of longitudinal actuating-bars 23. It is obvious, however, that any desired number of calculating-wheels, bars 23, and openings 20 may be employed. Each calculating-wheel has arranged around its periphery a series of numbers running from "0" to "9." Each calculating-wheel has also projecting from one side thereof and integral with or fast to said side a ratchet-wheel 34. A series of disks 33 are mounted fast on the shaft 31, and each one of these disks is adjacent to the face or end of one of the ratchet-wheels. A portion of the periphery of each disk is cut off or squared, as indicated at 36, and one side of each disk is provided with a lug 37. To the side of each calculating-wheel opposite to the side from which projects the ratchet-wheel 34 is secured a spring-arm 38, the free end of said arm outstanding from the wheel. Also pivotally secured to this side of each calculating-wheel is an arm 39, the pivot of said arm being preferably between the ends thereof. One end of each arm is formed or provided with a laterally-extending finger 40, said finger normally bearing upon the curved periphery of the adjacent disk 35. The free end of a spring 41 acts on the arm 39 in order to hold the laterally-extending finger in engagement with the periphery of the disk. The spring-arm 38, the arm 39, and the spring 41 are preferably arranged within a recess cut out in this side of each calculating-wheel in order to decrease the width required in order to accommodate the parts. On one end of shaft 31, preferably between the bearing 32 at that end and the inner side of the casing, is a gear-wheel 42. This gear-wheel is engaged by a segmental rack 43, said segmental rack mounted upon a short stud or shaft 44. This short stud or shaft has also extending therefrom a crank-arm 45, and to the end of this crank-arm is connected one end of a coiled spring 46, the opposite end of said coiled spring being fixed to a fixed point, such as a lug 47, projecting upwardly from

the bottom of the casing. The upper curved or segmental portion of the rack 43 has projecting therefrom a stud 48, which stud extends through a curved slot 49 in the side of the casing. The outer end of the stud is formed with a suitable handle or hand-grasp 50.

Mounted in suitable bearings 51 51, extending upwardly from the bottom of the casing, is a transverse shaft 52. This shaft has mounted on one end thereof a bell-crank lever 53. On the opposite end of said shaft is mounted a depending crank-arm 54. From the upper arm of the bell-crank lever 53 projects outwardly a stud 55, said stud extending through a curved slot 56 in the side of the casing. On its outer extremity this stud is formed or provided with a handle or hand-grasp 57. The lower member of the bell-crank lever 53 and the lower end of the crank-arm 54 are pivotally connected to a frame 58, the pivots extending into longitudinal slots in lugs 59 59, projecting upwardly from the forward end of said frame, so as to provide for a slight lost motion. This frame may be of any desirable form; but I prefer to provide a frame consisting of two longitudinal bars connected together by cross-bar 60. To one of the longitudinal bars of this frame is secured a spring-arm 61, said arm being curved upwardly and extended rearwardly, so that throughout the greater portion of its length it is raised a slight distance above the frame. The extremity of this arm terminates in a beveled lug 62. The frame 58 is normally held to the position shown in Fig. 2 by means of coiled springs 63 63, said springs being secured at their rear ends to the frame and at their forward ends to the lug 47.

The numeral 65 indicates a transverse rod which is journaled in lugs 66, extending rearwardly from standards 67 67. Loosely mounted on this rod is a frame consisting of a transverse bar 68 and depending arms 69 69', said arms being mounted loosely on the rod 65. The arm 69' is extended downwardly below the rod 65, and the lower extremity of this extension is beveled slightly and is located immediately above the beveled lug 62 of the spring-arm 61. A pin 70 bears against the rear edge of the downwardly-extending portion of this arm 69'. The upper portion of arm 69' is formed with a forwardly-projecting lug 71, to which lug is pivotally connected the rear end of a link 72. The forward end of this link is pivotally connected to the lower end of a crank-arm 73, said crank-arm depending from an eccentric shaft 74, which eccentric shaft extends transversely across the casing just beneath the longitudinal actuating-bars and in register with recesses 75 on the under edges of said bars.

On a transverse rod 76 is mounted a series of bell-crank levers 77. The upper members of these bell-crank levers at their ends are bent upwardly slightly in order to engage with the teeth 30 on the under edges of the rear portions of the bars 23. It will be un-

derstood that there is one of these bell-crank levers for each longitudinal bar 23. The lower arm or member of each bell-crank lever extends downwardly just to the rear of the transverse bar 68 of the pivoted frame hereinbefore referred to. Said lower member of each bell-crank lever has connected thereto the rear end of a coiled spring 78, the opposite ends of said springs being connected to the fingers 24 of the longitudinal bars 23.

To the rear extremities of the longitudinal bars forming part of the frame 58 are pivotally connected levers 81 81. The connecting pivot-pins pass into elongated slots in these levers, so as to provide for a slight lost motion. The levers are mounted at points between their ends on a transverse rod 82. The upper ends of the levers extend through elongated slots 83 in the top of the casing and project a desired distance above the top of said casing. The upper ends of these levers form bearings for the ends of a shaft 84, said shaft having mounted thereon the paper-cylinder 85 of the type-writing mechanism. This cylinder has adjacent thereto the usual curved paper-clips 86 for holding the paper to the cylinder, said curved clips being connected by the usual roller 87. The shaft 84 has also mounted thereon adjacent to one end of the paper-cylinder a ratchet-wheel 88, which ratchet-wheel is engaged by two spring-pawls 89 and 90, respectively. One end of the shaft 84 is extended laterally through the side of the casing, and on the extremity thereof is mounted a hand-wheel 91, the periphery of which is milled for convenience in turning.

The top of the casing, near the rear portion thereof, is provided with an upwardly-extending curved portion or chamber 92. The rear side of this curved portion is provided with an opening 93. Within this upwardly-extending portion or chamber and mounted fixedly in the upper ends of the standards 67 is a transverse shaft 94. Upon this shaft are loosely mounted type-wheels 95, there being one of said wheels for each longitudinal bar 23. Secured to or integral with one side of each of the type-wheels is a gear-wheel 96, each gear-wheel being so positioned that the teeth thereof are in engagement with the teeth 29 of the respective longitudinal bars 23. Each type-wheel has arranged peripherally therearound a series of numbers running from "0" to "9." Also mounted loosely on the shaft 94 are bell-crank levers 97 97. To the lower end of the lower members of these bell-crank levers are connected one end of links 98, the rear ends of said links being pivotally connected to the levers 81. To the outer ends of the upper rearwardly-extending arms of these bell-crank levers are pivotally connected arms 99 99. The upper ends of these arms form bearings for the axis 100 of an inking-roller 101, said roller being normally held in the position to contact with the type of the type-wheels as said wheels are revolved by

means of coiled springs 102 102; the rear ends of said coiled springs being connected to the arms 99 and the forward ends of said springs being connected to lugs 103 103, extending upwardly from the bell-crank levers.

For conveniently operating my machine I employ either the device shown in Fig. 14 or the device illustrated in Fig. 15.

The device shown in Fig. 14 consists of a thimble or cup-shaped portion 104, having a stud 105 projecting from its closed end, the end of the stud being preferably rounded and beveled off, as clearly shown. The thimble portion is advisably split at different points, as indicated by the numeral 106, so that said thimble may fit different sizes of fingers. This thimble portion of the device is adjusted to any finger of the hand and the stud 105 passed into the opening 19 of the casing and made to engage any particular shoulder 27 of the projections 26 of an actuating-bar. By now pushing forward, the particular bar 23 which is thus engaged will be moved forward the required distance, the limit of the forward movement of the bar being regulated by contact of the stud 105 with the forward bordering edge of the opening 19.

The device shown in Fig. 15 consists of a long handle portion 107, which is adapted to be grasped by the hand, and a reduced stud portion 108 at the end of the handle portion, the extremity of said stud being also preferably rounded and beveled. This device is used in the same manner as the device shown in Fig. 14—that is to say, the stud 108 is made to engage any particular shoulder of a bar 23, and by pushing forward said bar is moved forwardly until the device contacts with the forward bordering edge of the opening 19.

In the operation of my invention it will be supposed that it is desired to add together two hundred and fifty, or no units, five tens, and two hundreds, and three hundred and fifty, or no units, five tens, and three hundreds. In the first place either of the devices shown in Figs. 14 or 15 is employed, and the stud thereof is made to engage the shoulder 27 immediately in advance of the digit "2" of the third bar 23 from the right of Fig. 1. By now moving this bar to the limit permitted by the contact of the hand actuating device with the forward edge of the opening 19 the digit "2" will be brought to view in the space of the opening 19 just in advance of the forward bordering edge of said opening. This movement of the bar 23 also causes the teeth 28 on the under side thereof to engage the appropriate ratchet-wheel 34 and rotate said wheel a sufficient distance to bring the digit "2" on the circumference of the wheel 23 to view through the third sight-opening 20 from the right of Fig. 1. The hand device is next made to engage the shoulder 27 just in advance of the digit "5" of the second bar from the right of Fig. 1. This bar is now moved in the same manner as explained in regard to the previously-referred-

to bar and the digit "5" brought to view. The hand device is next made to engage the shoulder 27 immediately in front of "0" on the first bar at the right hand of Fig. 1, and this bar in like manner is moved to the limit. This movement, however, is not sufficient to cause an engagement of the teeth 28 on the under side of the forward portion of the bar with the ratchet-wheel 34, so that the calculating-wheel for this bar is unaffected, and said calculating-wheel therefore still displays "0" through the sight-opening 20 at the right of Fig. 1. The "0" character on the bar, however, has been moved to the space just to the rear of the front bordering edge of the opening 19. This space therefore discloses the numbers "250," while the same number is disclosed in the three sight-openings 20 referred to. It will be understood that the calculating-wheels which have been operated remain at the position to which they have been adjusted by means of the engagement of a spring-pawl 109 with each ratchet-wheel 34, and that the bars 23 remain temporarily to the forward positions to which they have been adjusted by the engagement of the upper members of the bell-crank levers 77 with the teeth 30 of said bars. It will be further understood that with the forward movement of the bars, as explained, the teeth 29 on the upper portion of the rear edges of said bars engage with the teeth of the gear-wheels 96 of the respective type-wheels 95. For instance, the first bar 23 which was actuated will act on its type-wheel, so as to bring the digit "2" of said wheel into printing position. The second bar which was actuated will bring the digit "5" of its type-wheel into position for printing, while the third bar which was actuated will bring "0" of its type-wheel to printing position. The next operation is to grasp the knob or handle 57 and cause a down movement of the stud 55 in the curved slot 56 to the limit permitted by said slot. This will cause a turning of the bell-crank lever 53 and a consequent turning of the shaft 52, the lower member of the bell-crank lever being thrown rearwardly and the crank-arm 54 in the same direction. As this member of the bell-crank lever and said crank-arm are pivotally connected to the frame 58, said frame is also necessarily moved rearwardly. With this rearward movement of the frame the lug 62 at the rear end of the spring-arm 61 is caused to move past the lower end of the arm 69' of the frame for actuating the mechanism for raising the bars 23 out of engagement with the ratchet-wheels 34 and the shoulder of the lug 62 to be brought to the rear of the lower extremity of said arm 69'. This rearward movement of the frame 58 causes a turning of the levers 81 on their pivots, so as to throw the paper-roller 85 toward the type-wheels 95. Before the paper-roller contacts with the type which have been brought to printing position, however, the links 98 will have been drawn rearwardly, so

as to act upon the bell-crank levers 97, and thereby turn the lower depending arms of said bell-crank levers rearwardly, while the upper arms of said levers are thrown forwardly and upwardly, producing an upward movement of the arms 99, in which the axis of the inking-roller 101 is carried, thereby throwing said inking-roller upwardly and forwardly to a position where it will be out of the way of the paper-cylinder, and thereby permit said paper-cylinder to contact with the type which have been brought to printing position and cause the numbers "250" to be printed on the paper carried by the cylinder. The normal position of the inking-roll (shown in Fig. 2) is such that as the type-wheels are revolved the type thereof will contact with the inking-roll, said roll being held yieldingly thereto by means of the springs 102. The next step is to release the handle or knob 57. The moment this is released the recoil of the springs 63 will draw the frame 58 forwardly to normal position. With this forward movement of the frame the levers 81 are turned so as to bring the paper-cylinder back to normal position. As this cylinder is returned to normal position, a tooth of the ratchet-wheel 88 at one end of the cylinder is engaged by the spring-pawl 89, fixed to the casing, and said ratchet-wheel and paper-cylinder are thereby turned, the turning of the paper-cylinder causing a shifting of the paper, so that a clear space is afforded for the printing of the next number. The spring-pawl 90, which is carried by one of the levers 81, prevents the ratchet-wheel from rotating reversely after having been rotated in the manner described by the spring-pawl 89. The forward return movement of the frame 58 also causes the shoulder of the lug 62 of the spring-arm 61 to act against the lower end of the long arm 69' of the frame for actuating the mechanism for raising the bars 23. This turning of the arm 69' will cause a rearward pull on the link 72, which in turn will cause a rearward movement of the crank-arm 73 and a consequent turning of the eccentric shaft 74, the eccentric portion of said shaft being turned upwardly into the recesses 75 in the under edges of the bars 23, thereby causing a raising of all of said bars and the teeth 28 on the under edges of the bars which have been adjusted forwardly far enough to engage the teeth of the ratchet-wheels 34 to be disengaged from the teeth of said ratchet-wheel. This turning of the arm 69' also causes the rod 68 to act on the depending arm of the bell-crank levers 77, thereby causing a down movement of the upper arms of said bell-crank levers and the disengagement of said arms with the under teeth 30 of all the bars 23. As these bars 23 are now free, those which have been adjusted forwardly will be immediately returned to their normal position (shown in Fig. 2) by the recoil of the coiled springs 78, and said recoil of the springs will also return the bell-

crank levers 77 to their normal position, and the depending arms of said bell-crank levers, in turn acting on the rod 68, will cause said rod and its arms 69 69' to be returned to a normal position, and hence the links 72 thrust forwardly and the crank-arm 73 turned forwardly, so as to return the eccentric shaft 74 to a normal position out of engagement with the recesses on the under edges of the bars 23.

After the display of the numbers "250" in the sight-openings 20, as explained, and the printing of said numbers "250" the shoulder immediately in front of "3" on the third bar from the right of Fig. 1 is engaged and said bar moved forwardly to the limit permitted. This will cause the number "3" to be brought to the space immediately to the rear of the front bordering edge of the opening 19 and will cause an actuation of the ratchet-wheel 34 relating to this particular bar. As the calculating-wheel for this bar already discloses "2" through its sight-opening 20 and as said calculating-wheel by the movement just described is rotated the distance of three more numbers, the number "5" of said calculating-wheel will be displayed through its sight-opening 20. The next operation is to engage the shoulder immediately in advance of the digit "5" of the second bar from the right of Fig. 1 and move said bar to the limit of its movement. This will cause the digit "5" to be brought to view in the space immediately to the rear of the front bordering edge of the opening 19 and will also cause a movement of the calculating-wheel relating to this bar the distance of five more numbers. As the calculating-wheel of this bar already discloses "5" through its opening 20 and as said calculating-wheel by the movement just described is rotated the distance of five more numbers and as the numbers of said wheel only run from "0" to "9," said calculating-wheel will be rotated one number past the digit "9," with the result that "0" is brought to view through the sight-opening 20 of this wheel. Each time a calculating-wheel is thus made to make a complete revolution the projecting lateral finger 40 thereof will at the final movement of said wheel ride off the curved periphery of the disk 35 onto the squared or cut-off portion 36 of said periphery, and thus extend into position to be in engagement with and to actuate the next succeeding ratchet-wheel 34 the distance of one number, as most clearly illustrated in Fig. 7. As the calculating-wheel for the third bar from the right of Fig. 1 already discloses "5" through its appropriate sight-opening, this movement of the ratchet-wheel by the finger 40 of the preceding ratchet-wheel will turn this third calculating-wheel a distance of one number, and consequently now disclose the number "6" of said third calculating-wheel to view through its appropriate sight-opening 20. The next operation is to engage the shoulder immediately in front of "0" on the first bar at the right

hand of Fig. 1 and move said bar to the limit permitted. This forward movement will disclose "0" in the space immediately to the rear of the front bordering edge of the opening 19; but this limited movement of the bar will not cause an engagement of the teeth 28 on the under edge of said bar with the ratchet-wheel 34, with the result that the calculating-wheel at the right hand of Fig. 1 will still disclose "0" through its sight-opening 20. With the movements of the bars just described the printing of the numbers "350" on the paper immediately below the numbers "250" is also effected in exactly the same manner as described in relation to the printing of the numbers "250." After all the bars 23 are returned to their normal position and it is desired to print the total below the numbers which have been printed the shoulder immediately in front of the digit "6" of the third bar to the right of Fig. 1 is engaged and said bar moved to the limit permitted, and in like manner the shoulders immediately in advance of "0" on the second bar from the right of Fig. 1 and of "0" on the first bar at the right of Fig. 1 are successively engaged and the bars moved, whereby the types on three of the type-wheels for "600" are brought to printing position. The frame 58 is now actuated rearwardly and the printing effected in the manner hereinbefore fully pointed out.

After the calculating-wheels have been operated and it is desired to return all of said wheels back to "0" before commencing a new operation this is effected by grasping the handle 50, and thereby turning the segmental rack 43. The turning of the segmental rack causes a turning of the gear-wheel 42 and a consequent turning of the shaft 31. With the turning of said shaft 31 the disks 35, which are fast thereon, are turned therewith and the lugs 37 on said disks are brought into engagement with the ends of the fingers 38. When all the fingers 38 are thus engaged by the lugs 37 of the several disks, the continued rotation of the shaft 31 will of course carry the calculating-wheels back to a normal position, wherein "0" on each wheel is in line immediately below a sight-opening 20. When this is accomplished, the hand is removed from the handle 50 and the coiled spring 46 returns the segmental rack to a normal position, said segmental rack in so returning rotating the gear-wheel 42, and consequently the shaft 31, in an opposite direction, thereby bringing all of the disks 35 back to a normal position.

In Fig. 16 I show a slightly-modified form of construction for turning the shaft 31 in order to bring all the calculating-wheels back to "0." This consists in merely extending the end of the shaft 31 outwardly through one side of the casing and securing to said extended end of the shaft a crank-handle 110. The shaft 31 is surrounded by a coiled spring 111, disposed between the bearing 32 and the inner side of the casing 18. One end of this

spring is secured to the shaft and the other end to the bearing 32. In order to turn the shaft and the disks 35 carried thereby, the crank-handle 110 is turned in one direction.

5 After all the calculating-wheels have thus been turned back to "0" the hand is removed from the handle 110 and the recoil of the spring 111 will return the shaft 31 and the disks 35 back to normal position.

10 In Fig. 17 is shown a modified form of construction for disengaging the teeth on the under edges of the forward portions of the bars 23 from the ratchet-wheels 34. This construction contemplates that the bars 23

15 shall be normally raised, so that the teeth 28 thereof are not in alinement to engage the teeth of the ratchet-wheels 34. In this construction I employ a series of bell-crank levers 112, mounted on a shaft 113. The lower

20 arm of each bell-crank lever has connected thereto a coiled spring 114, which normally holds the upper arms of said bell-crank levers upwardly in engagement with the under edges of the bars 23, consequently holding

25 said bars 23 in a raised position, so that the teeth 28 on the under edges of said bars are not in line to engage the teeth of the ratchet-wheels 34. The upper arms of these bell-crank levers work through slots 115 in the

30 casing 18. In this modified form of construction when any one of the bars 23 is engaged by either of the devices shown in Figs. 14 and 15 a pressure is first exerted downwardly, so as to overcome the upward pressure of the

35 upper arm of the bell-crank lever and to bring the bar 23 into line so that the teeth 28 thereof will engage the teeth of the ratchet-wheel 34. The bar 23 is then moved forwardly, as in the other form of construction, and when the hand device for actuating the

40 bar is removed and down pressure thereon thereby ceases the recoil of the spring 114 will return the bell-crank lever 112 to a normal position, and hence again raise the bar

45 23 out of engaging position.

While I preferably employ a hand device, such as those shown in Figs. 14 and 15, for actuating the bars 23, yet it is obvious that any other suitable device may be employed

50 for the purpose—such, for instance, as an ordinary lead-pencil or penholder—or, in fact, the bars 23 may be actuated by the finger of the operator.

While I have herein shown and described

55 specific details of construction, yet I do not wish to be understood as restricting myself thereto, inasmuch as mechanical changes or variations thereof capable of performing the same function are deemed to be within the

60 spirit and scope of my invention. As one instance of such modification or variation I would state that it is not absolutely necessary that the upper edges of the bars 23 should be constructed in the identical manner shown—*i. e.*, with the projections having

65 inclined faces terminating in abrupt shoulders.

An important feature of my invention resides in the provision of improved means for verification as the operator proceeds with the work. This consists in providing the bell-crank levers 77 for holding the bars 23 which have been actuated at the position to which they have been actuated in order to display a number to be mathematically considered in the opening 19 of the casing, just back of the bordering edge of said opening, until the calculating mechanism is ready to be again operated for the next succeeding number to be mathematically considered, whereby as each bar is actuated to the extent permitted by the contact of the operating device with a bordering edge of the opening in the casing the several bars are thereby held in position to display the proper characters for verification in said opening of the casing just back of the bordering edge of said opening and said bars are then released by the engagement of mechanism with the bell-crank levers and returned to their normal position before any of the bars are again actuated in a direction to operate the calculating mechanism. It is evident that after the first number to be mathematically considered is operated upon and the calculating mechanism is then again operated the number first mathematically considered no longer appears on the calculating-wheels, but the result of the two numbers mathematically considered is shown on said wheels. By holding the numbers temporarily to the position to which they have been actuated, however, the operator can, each time after the machine has been operated for each number to be mathematically considered, glance at the space just back of the bordering edge of the opening in the casing and plainly see the number which has been mathematically considered on the portion of the bars just back of said bordering edge and can then compare the number so shown with the number on the slip of paper containing the numbers to be mathematically considered or operated upon, whereby he is enabled to verify his work as the work progresses.

What I claim as my invention is—

1. In a calculating-machine, the combination, of a casing having an opening therein, a series of longitudinal bars beneath the opening, the exposed edge of each bar having a series of characters thereon running in regular sequence, and each of said bars also provided with a series of teeth, means for actuating each bar, said means contacting with a bordering edge of the opening in the casing in order to limit the movement of each bar, calculating mechanism adapted to be actuated by the longitudinal bars on the movement of said bars in one direction, a series of levers, each lever adapted to engage the teeth of a bar in order to hold the bars which have been actuated to thereby display a number to be mathematically considered in the opening of the casing just back of the bordering edge

of said opening, until the calculating mechanism is ready to be again operated for the next number to be mathematically considered, whereby as each bar is actuated to the extent permitted by contact of the actuating mechanism with a bordering edge of the opening in the casing, the several bars are held in position to display the proper characters for verification in said opening of the casing just back of the bordering edge of said opening, means for simultaneously turning the levers for the purpose of releasing them from engagement with the teeth of the bars, and means for acting on the bars to simultaneously return such bars as have been actuated to normal position, after the levers are so released from the bars.

2. The combination, of a casing, a longitudinal bar within the casing, said bar provided with a series of teeth, means for actuating the bar, said means adapted to be inserted through an opening in the casing in order to engage the bar, a stop with which the actuating means contacts, in order to limit the movement of the bar, mechanism adapted to be actuated by the longitudinal bar on the movement of said bar, a bell-crank lever engaging a tooth of the bar to hold said bar to adjusted position, a frame carrying an arm, and means for causing a movement of said frame, whereby the arm carried thereby is caused to turn the bell-crank lever, and thereby release said bell-crank lever from engagement with a tooth of the bar.

3. The combination, of a casing, a longitudinal bar within the casing, said bar provided with a series of teeth, means for actuating the bar, said means adapted to be inserted through an opening or openings in the casing, in order to engage the bar, a stop with which the actuating means contacts in order to limit the movement of the bar, mechanism adapted to be actuated by the longitudinal bar on the movement of said bar, a bell-crank lever engaging a tooth of the bar to hold said bar to adjusted position, a rod provided with a projecting arm, a frame carrying an arm, and means for causing a movement of said frame, whereby the arm carried thereby is caused to act on the arm of the rod to cause said rod to contact with the bell-crank lever, and thereby turn said lever in order to release it from engagement with a tooth of the bar.

4. The combination, of a casing, a longitudinal bar within the casing, said bar provided with a series of teeth, means for actuating the bar, said means adapted to be inserted through an opening in the casing in order to engage the bar, a stop with which the actuating means contacts, in order to limit the movement of the bar, mechanism adapted to be actuated by the longitudinal bar, on the movement of said bar in one direction, a bell-crank lever engaging a tooth of the bar to hold said bar to adjusted position, a spring engaging the bell-crank lever to normally hold said lever in engagement with a tooth of the bar, a frame

carrying an arm, and means for causing a movement of said frame, whereby the arm carried thereby is caused to turn the bell-crank lever, and thereby release said lever from engagement with a tooth of the bar.

5. In a calculating-machine, the combination, of a casing having an opening therein, a series of longitudinal bars beneath the opening, the exposed edge of each bar having a series of characters thereon running in regular sequence, and each of said bars also provided with two series of teeth, means for actuating each bar, said means contacting with a bordering edge of the opening in the casing, in order to limit the movement of the bar, calculating mechanisms, each provided with a ratchet-wheel adapted to be engaged by one of the series of teeth of each bar, whereby the calculating mechanism is actuated, a series of bell-crank levers, each lever adapted to engage the other series of teeth of each bar, in order to hold the bar in the position to which it has been actuated, whereby as each bar is actuated to the extent permitted by the contact of the actuating mechanism with a bordering edge of the opening, the several bars are held in position to display the proper characters through the opening in the casing and just back of a bordering edge of said opening, means for simultaneously releasing all of the bell-crank levers from engagement with the series of teeth of the bars, and means for returning the bars which have been actuated to normal position upon the release of the bell-crank levers.

6. The combination of a casing, a series of longitudinal bars within the casing, said bars having a series of teeth, means for actuating the bars, said means adapted to be inserted through an opening in the casing in order to engage the bars, a stop with which the actuating means contacts, in order to limit the movement of the bars, mechanisms adapted to be actuated by the longitudinal bars on the movement of any of said bars in one direction, bell-crank levers adapted to engage the teeth of the bars in order to hold said bars to adjusted position, a rod arranged adjacent to the bell-crank levers, and means for turning said rod, to cause it to engage the bell-crank levers and thereby release said levers from engagement with the teeth of the bars, in order to permit the return of said bars to normal position.

7. In a calculating-machine, the combination, of a casing, a longitudinal bar within the casing, means for actuating said bar, said means adapted to be inserted through an opening in the casing, in order to engage the bar, a stop with which the actuating means contacts for limiting the movement of the bar, calculating mechanism adapted to be actuated by the longitudinal bar on the movement of said bar in one direction, means for holding the calculating mechanism to adjusted position, an eccentric shaft normally out of engagement with the bar, means for

turning said shaft so as to act on the bar and raise the same out of engaging position with the calculating mechanism, after said bar has actuated the calculating mechanism, and means for returning the bar to normal position, after being so raised.

8. In a calculating-machine, the combination, of a casing, a longitudinal bar within the casing, means for actuating the bar, said means adapted to be inserted through an opening in the casing, in order to engage the bar, a stop with which the actuating means contacts for limiting the movement of the bar, calculating mechanism adapted to be actuated by the longitudinal bar on the movement of said bar in one direction, means for holding the calculating mechanism to adjusted position, an eccentric shaft normally out of engagement with the bar, an arm depending from the eccentric shaft, a link connected at one end to said arm, mechanism to which the opposite end of the link is connected, means for actuating said mechanism, whereby the shaft is turned and the eccentric portion thereof brought into contact with the bar in order to raise said bar out of engaging position with the calculating mechanism, after the bar has actuated said calculating mechanism, and means for returning the bar to normal position, after being so raised.

9. The combination, of a casing, a shaft, a type-wheel mounted thereon, a gear-wheel mounted on the axis of the type-wheel, and rotatable with said type-wheel, a longitudinal bar provided with a series of teeth, said teeth adapted to engage directly with the teeth of the gear-wheel, means for actuating the bar to bring different characters on the type-wheel to printing position, a paper-carrying cylinder, and means for bringing said paper-carrying cylinder into contact with the type on the type-wheel which have been brought to printing position.

10. In a calculating and printing machine, the combination, of a casing, a longitudinal bar within the casing, said bar provided with a series of teeth, means for actuating the bar, means for limiting the movement of the bar, calculating mechanism adapted to be actuated by the bar, a shaft, a type-wheel mounted thereon, a gear-wheel mounted on the axis of the type-wheel, and rotatable with said type-wheel, said gear-wheel engaged directly by the teeth of the bar, and adapted to be turned by the bar as said bar is actuated, in order to bring different characters on the type-wheel to printing position, a paper-carrying cylinder, and means for bringing said paper-carrying cylinder into contact with the type on the type-wheel which have been brought to printing position.

11. The combination, of a casing, a longitudinal bar within the casing, said bar provided with a series of teeth, means for actuating the bar, means for limiting the movement of the bar, a rotatable type-wheel, a gear-wheel adapt-

ed to rotate the type-wheel, said gear-wheel engaged by the teeth of the bar and adapted to be turned thereby, as said bar is actuated, in order to bring different characters on the type-wheel to printing position, an inking-roll adapted normally to be held in position to contact with the type on the type-wheel, a paper-carrying cylinder, means for bringing said cylinder into contact with the type on the type-wheel which have been brought to printing position, means for throwing the inking-roll out of the path of movement of the paper-cylinder, when said paper-cylinder is thus thrown into contact with the type-wheel, and means for returning said inking-roll to normal position, after the paper-cylinder has been returned to normal position.

12. The combination, of a casing, a longitudinal bar within the casing, said bar provided with a series of teeth, means for actuating the bar, means for limiting the movement of the bar, a rotatable type-wheel, a gear-wheel adapted to rotate the type-wheel, said gear-wheel engaged by the teeth of the bar, and adapted to be turned thereby, as said bar is actuated, in order to bring different characters on the type-wheel to printing position, a bell-crank lever on the shaft, a spring-controlled bearing carried by said bell-crank lever, an inking-roll mounted in the bearing, the spring of the bearing normally holding the inking-roll in position to engage the characters on the type-wheel, a paper-carrying cylinder, means for bringing said cylinder into contact with the type on the type-wheel which have been brought to printing position, means acting on the bell-crank lever to thereby throw the inking-roll out of the path of movement of the paper-cylinder, when said paper-cylinder is thus thrown into contact with the type-wheel, and means for returning said inking-roll to normal position, after the paper-cylinder has been returned to normal position.

13. The combination, of a type-wheel, means for rotating said wheel to bring different characters thereof to printing position, a frame, levers pivotally connected to the frame, a paper-carrying cylinder having its axis journaled in the levers, a ratchet-wheel rotatable with the paper-carrying cylinder, a pawl fastened to the frame and having its free end engaging the ratchet-wheel, another pawl connected to one of the levers and having its free end engaging the ratchet-wheel, and means for actuating the frame, whereby on one actuation thereof the paper-carrying cylinder is thrown to a position to contact with the type on the type-wheel which have been brought to printing position, and on the reverse actuation of said frame, the paper-carrying cylinder is returned to normal position.

14. The combination, of a shaft, a series of type-wheels, bell-crank levers mounted on the shaft, spring-controlled bearings pivotally connected to said bell-crank levers, an inking-roll having its journals mounted in the bearings, said inking-roll being normally held

by the springs in position to engage the characters on the printing-wheel, a frame, levers pivotally connected to the frame, a paper-carrying cylinder having its axis journaled in the levers, links connecting the levers with the bell-crank levers, and means for actuating the frame.

15. The combination, of a casing, a longitudinal bar provided with a series of teeth, means for actuating the bar, mechanism operated by the bar, a bell-crank lever normally engaging a tooth of the bar to hold said bar in adjusted position, a frame, an arm carried by the frame, mechanism between said arm and the bell-crank which engages a tooth of the bar, another bell-crank lever engaging the frame and having an operating-handle connected to one arm thereof for causing a movement of the frame in one direction, and means for causing a movement of the frame in the opposite direction, whereby the arm carried by the frame is caused to contact with the mechanism which operates the bell-crank lever which engages a tooth of the bar, thereby causing a disengagement of said bell-crank lever and a release of the bar, to adapt said bar to return to normal position.

16. The combination, of a casing, a longitudinal bar provided with a series of teeth, means for actuating the bar, mechanism operated by the bar, a bell-crank lever normally engaging a tooth of the bar to hold said bar in adjusted position, a frame, an arm carried by the frame, a spring-controlled rod provided with a depending arm, said rod being in position to engage the bell-crank lever, means for causing a movement of the frame in one direction, and means for causing a movement of the frame in the opposite direction, whereby the arm carried by the frame is caused to contact with the depending arm of the rod, whereby the rod is swung in a direction to act on the bell-crank lever, thereby causing a disengagement of said bell-crank lever and a release of the bar, to adapt said bar to return to normal position.

17. The combination, of a type-wheel, means for rotating said wheel to bring the different characters thereon to printing position, a longitudinal bar provided with a series of teeth, means for actuating the bar, mechanism operated by the bar, a bell-crank lever normally engaging a tooth of the bar to hold said bar in adjusted position, a frame, an arm carried by the frame, levers pivotally connected to the frame, a paper-carrying cylinder having its journals mounted in the levers, a spring-controlled rod provided with a depending arm, said rod being in position to engage the bell-crank lever, means for causing a movement

of the frame in one direction, whereby the levers are rocked and the paper-carrying cylinder thrown into engagement with the characters on the type-wheel which have been brought to printing position, and means for causing a movement of the frame in the opposite direction, whereby the arm carried by the frame is caused to contact with the depending arm of the rod, whereby said rod is swung in an opposite direction to act on the bell-crank lever, thereby causing a disengagement of the bell-crank lever and a release of the bar, to adapt said bar to return to normal position.

18. The combination, of a longitudinal bar provided with a series of teeth, means for actuating the bar, mechanism operated by the bar, a bell-crank lever normally engaging a tooth of the bar to hold said bar in adjusted position, a spring-controlled rod provided with a depending arm, an eccentric shaft having a crank-arm extending therefrom, a link connecting said crank-arm with the rod, a frame, an arm carried thereby, and means for causing a movement of the frame, whereby the arm carried by said frame is adapted to contact with the depending arm of the rod to cause a swing of said rod and a contact of the rod with the bell-crank lever, in order to release said lever from engagement with the teeth of the bar, and said swing of the rod also causing a pull on the link and a consequent turning of the eccentric shaft, and an engagement of said shaft with the bar, in order to raise said bar from working engagement with the mechanism which it operates.

19. In a calculating-machine, the combination, of a casing, a longitudinal bar within the casing, said bar provided with a series of teeth, means for actuating the bar, means for limiting the movement of the bar, calculating mechanism adapted to be actuated by the bar, a rotatable type-wheel, a gear-wheel adapted to rotate the type-wheel, said gear-wheel engaged directly by the teeth of the bar, and adapted to be turned by the bar as said bar is actuated, in order to bring different characters on the type-wheel to printing position, paper-carrying mechanism, and means for bringing the paper-carrying mechanism and the type-wheel into contact, whereby the type on the type-wheel which have been brought to printing position are printed on the paper.

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

JAMES MALLMANN.

Witnesses:

A. L. MORSELL,
ANNA V. FAUST.