

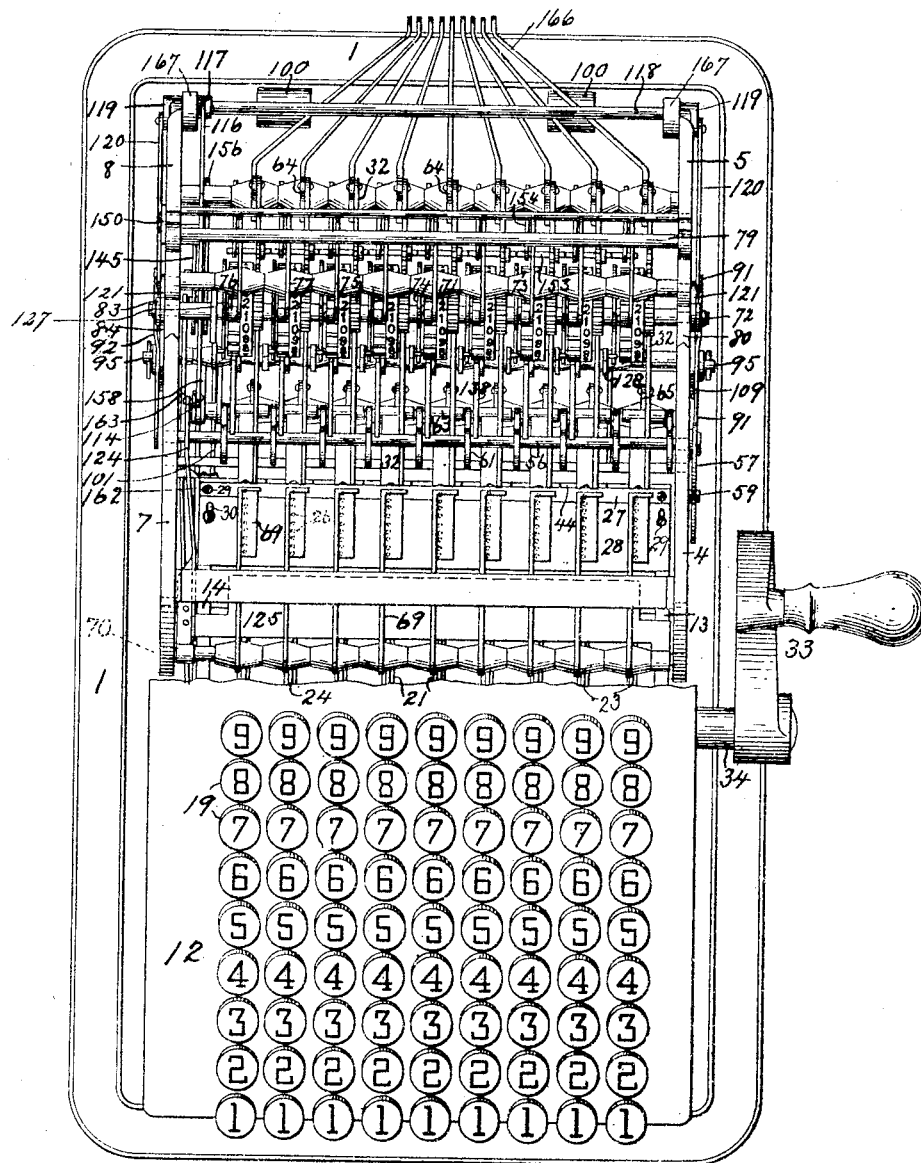
C. WALES.

ADDING AND PRINTING MACHINE.

APPLICATION FILED SEPT. 15, 1903. RENEWED MAR. 11, 1905.

15 SHEETS—SHEET 1.

Fig. 1.



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No. 797,032

PATENTED AUG. 15, 1905.

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APPLICATION FILED SEPT. 15, 1903. RENEWED MAR. 11, 1905.

15 SHEETS—SHEET 2.

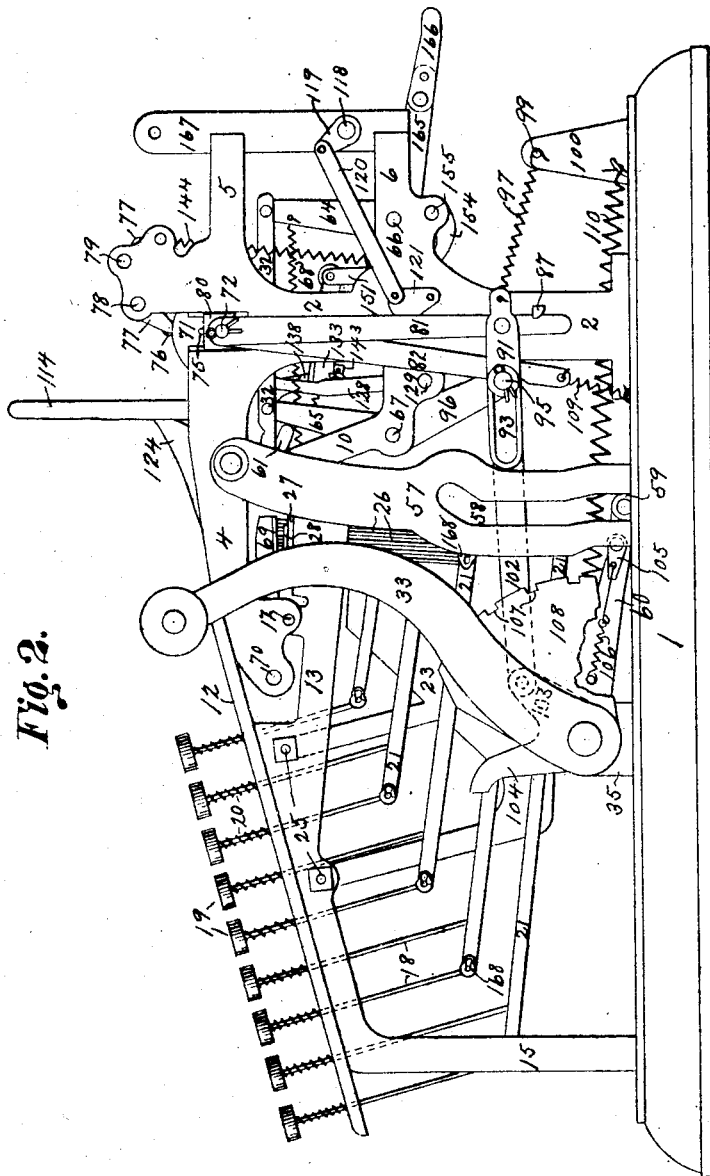


Fig. 2.

WITNESSES:

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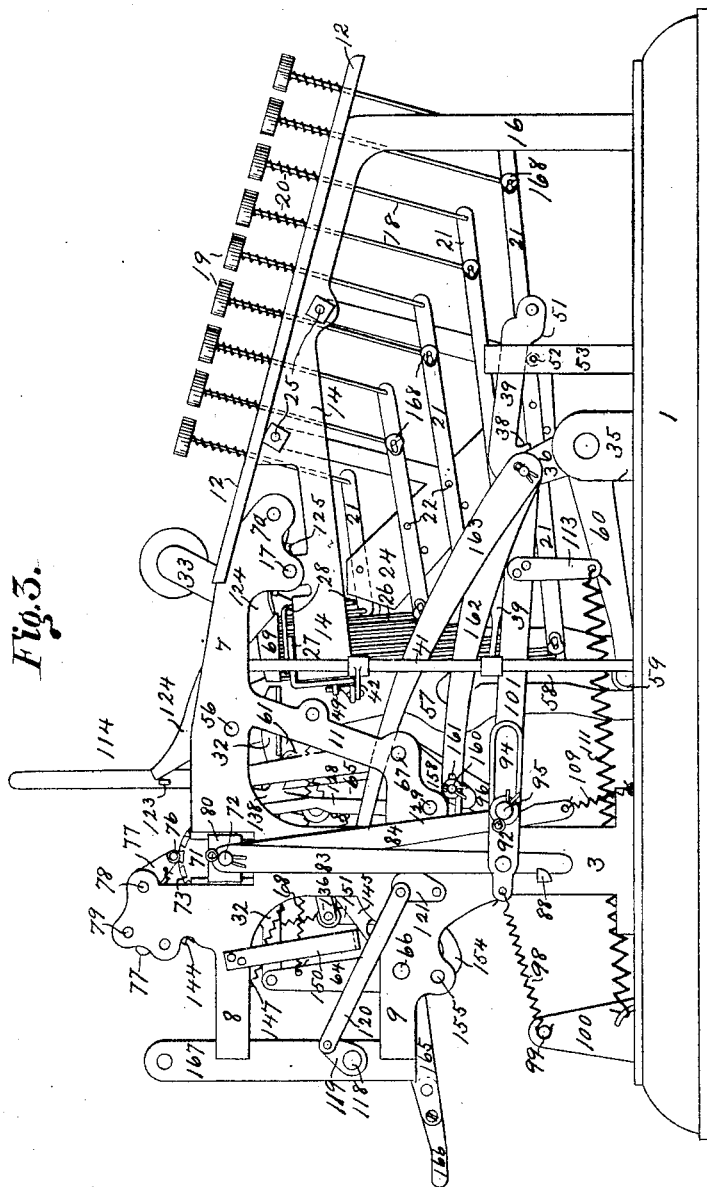
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15 SHEETS—SHEET 3.



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15 SHEETS—SHEET 4.

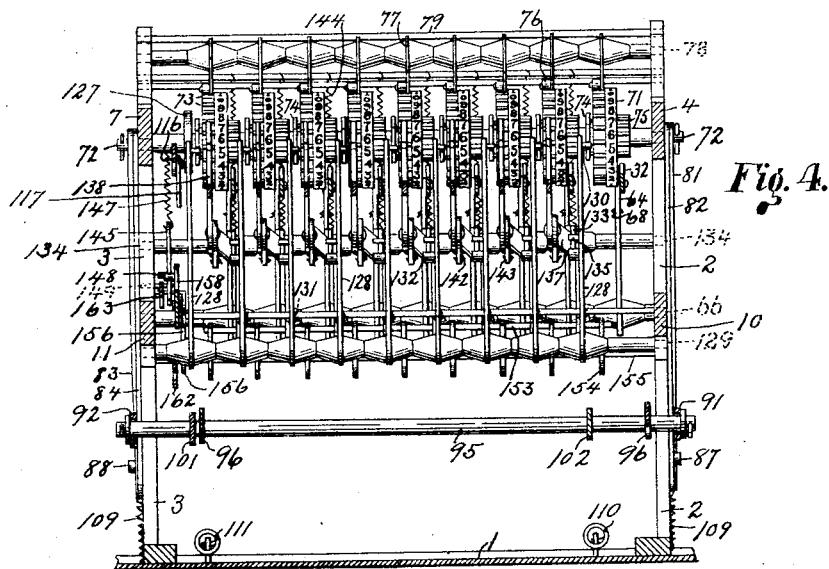


Fig. 27.

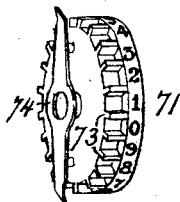


Fig. 28.

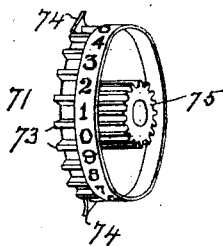


Fig. 29.

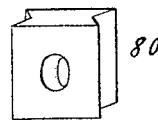


Fig. 30.

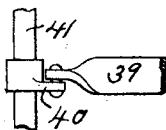
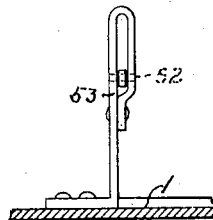


Fig. 32.



Fig. 31.



WITNESSES:

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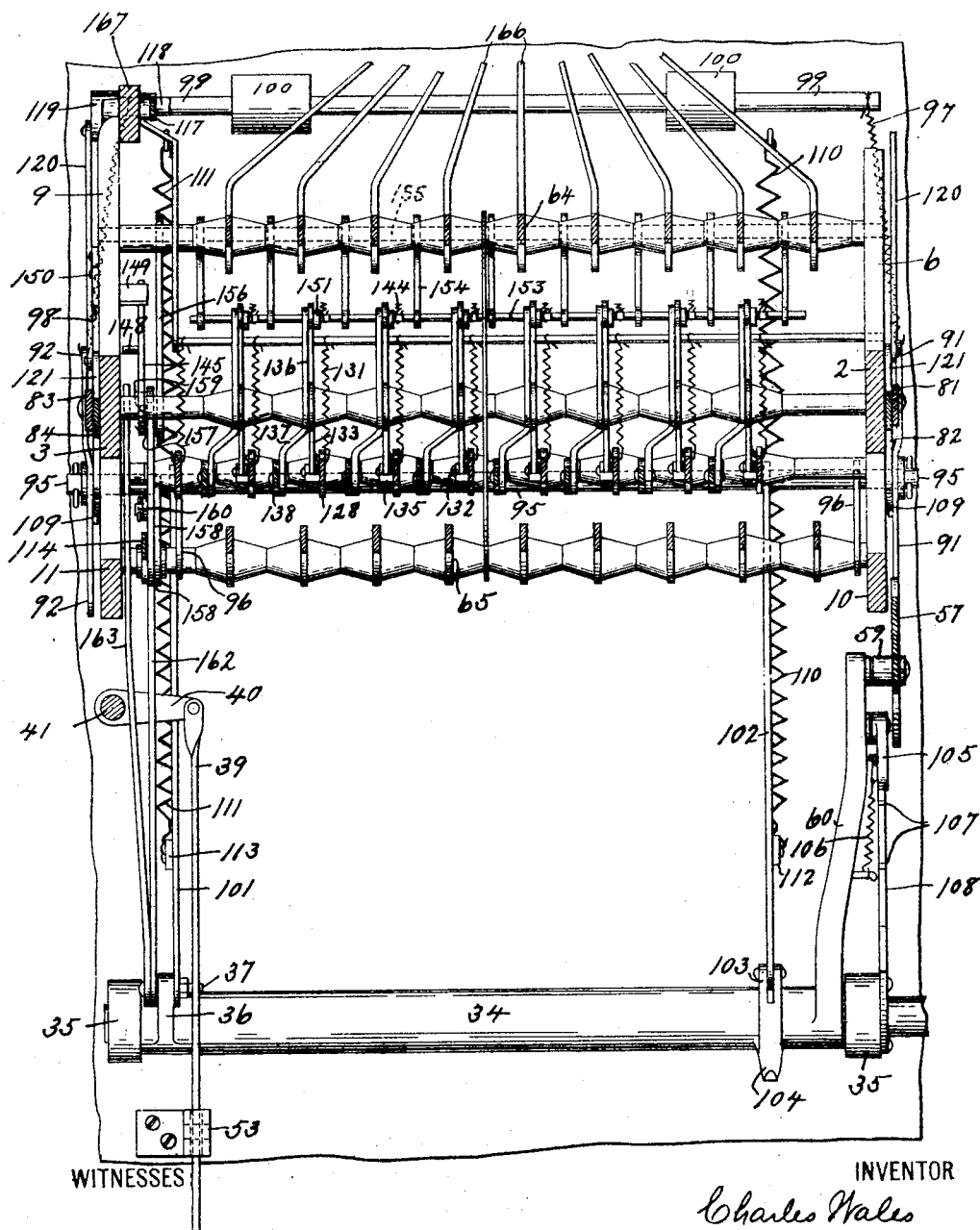
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ADDING AND PRINTING MACHINE.

APPLICATION FILED SEPT. 15, 1903. RENEWED MAR. 11, 1905.

15 SHEETS—SHEET 5.

Fig. 5.



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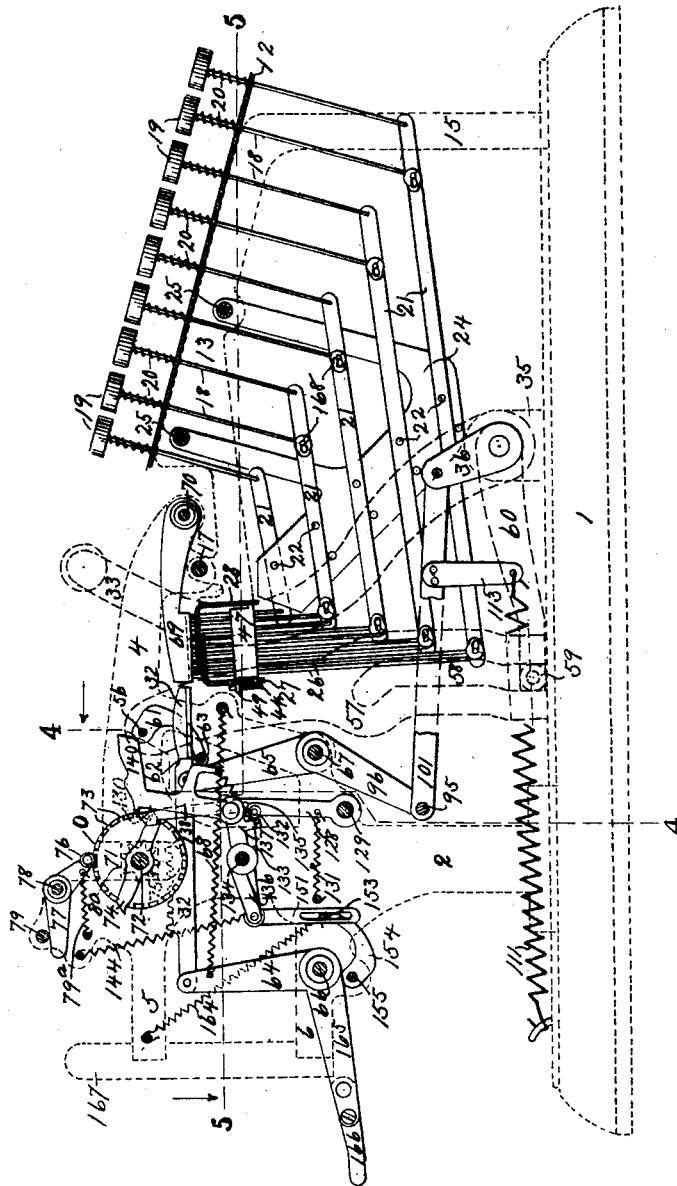
C. WALES.

ADDING AND PRINTING MACHINE.

APPLICATION FILED SEPT. 15, 1903. RENEWED MAR. 11, 1905.

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Fig. 6.



WITNESSES:

C. H. Beutholf
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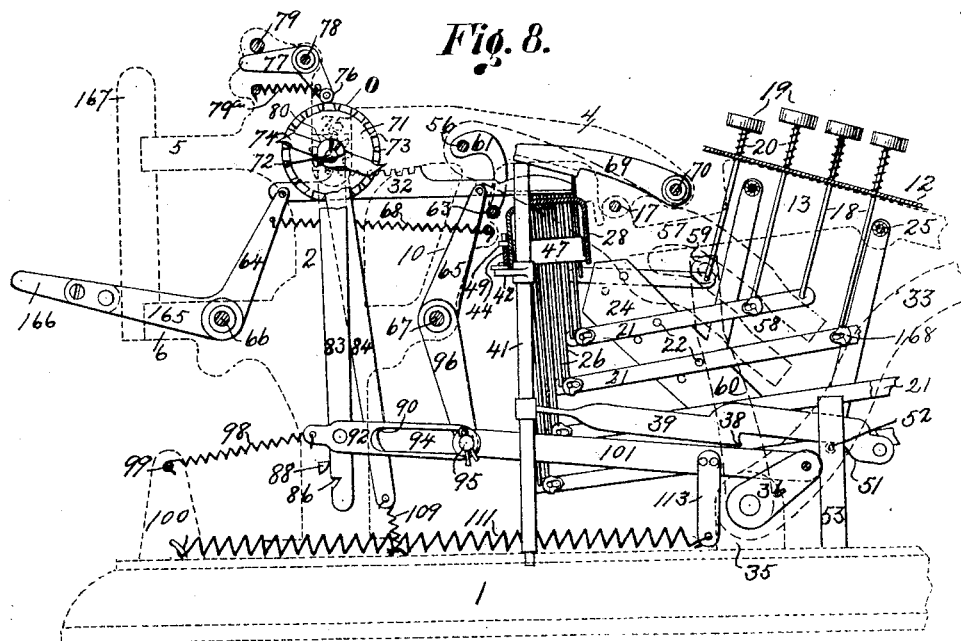
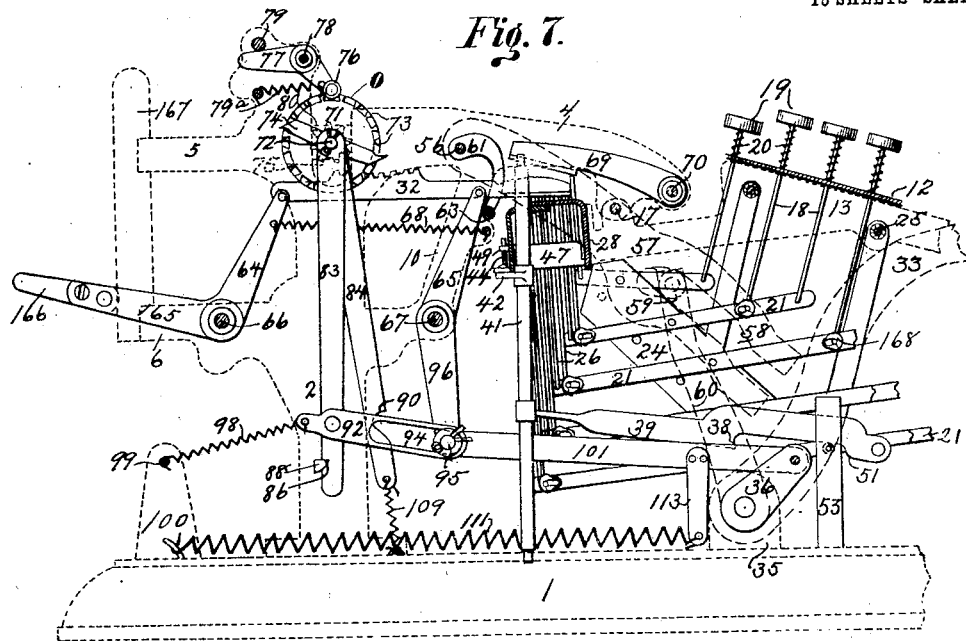
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15 SHEETS—SHEET 7.



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ADDING AND PRINTING MACHINE.

APPLICATION FILED SEPT. 15, 1903. RENEWED MAR. 11, 1905.

15 SHEETS—SHEET 8.

Fig. 9.

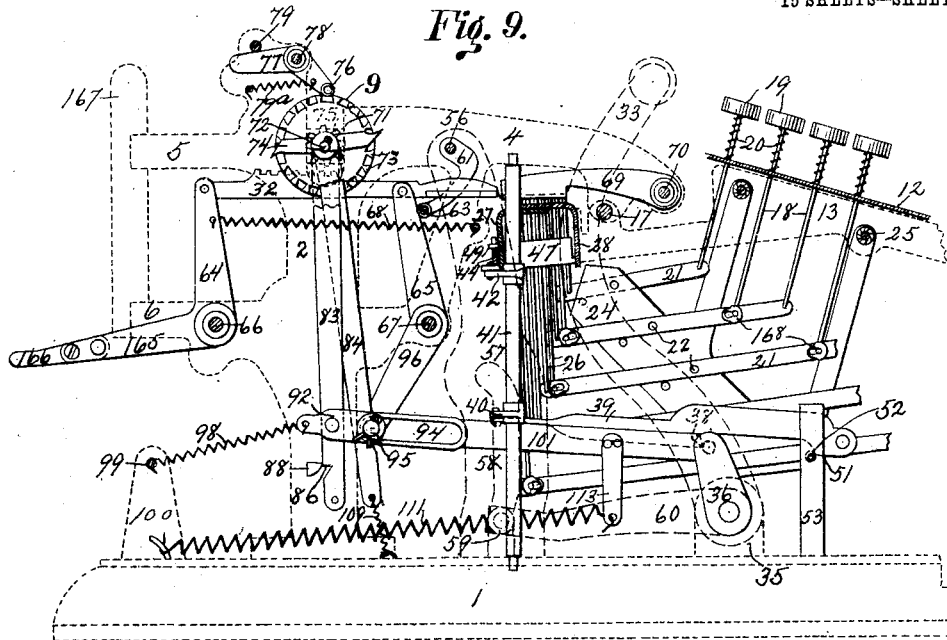
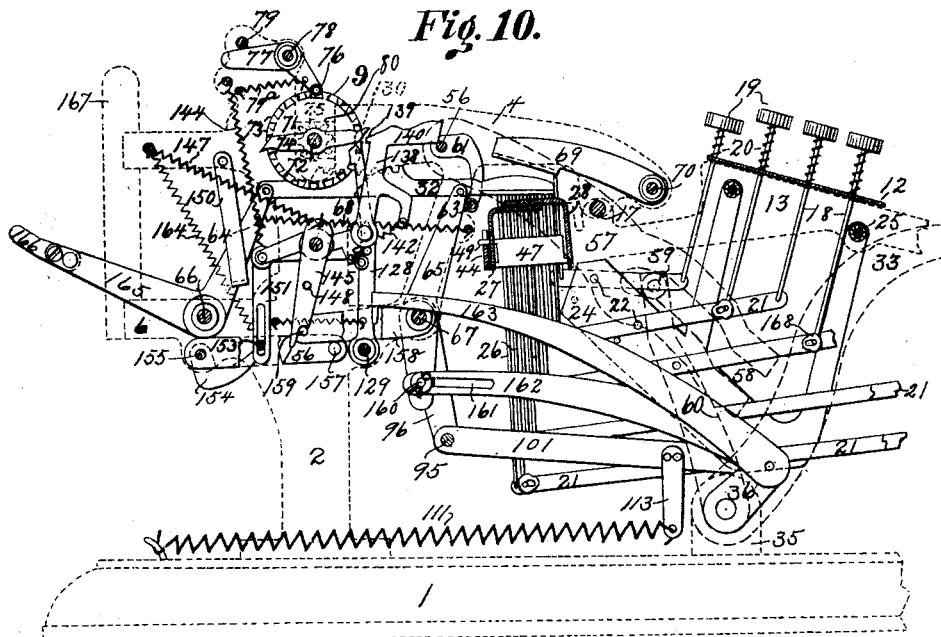


Fig. 10.



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15 SHEETS—SHEET 9.

Fig. 11.

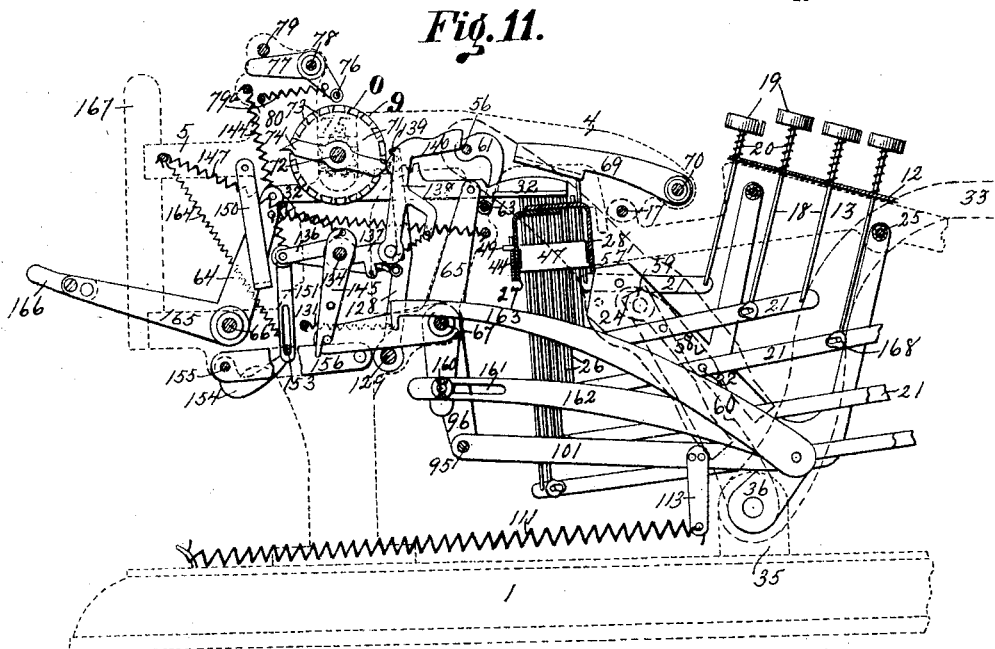
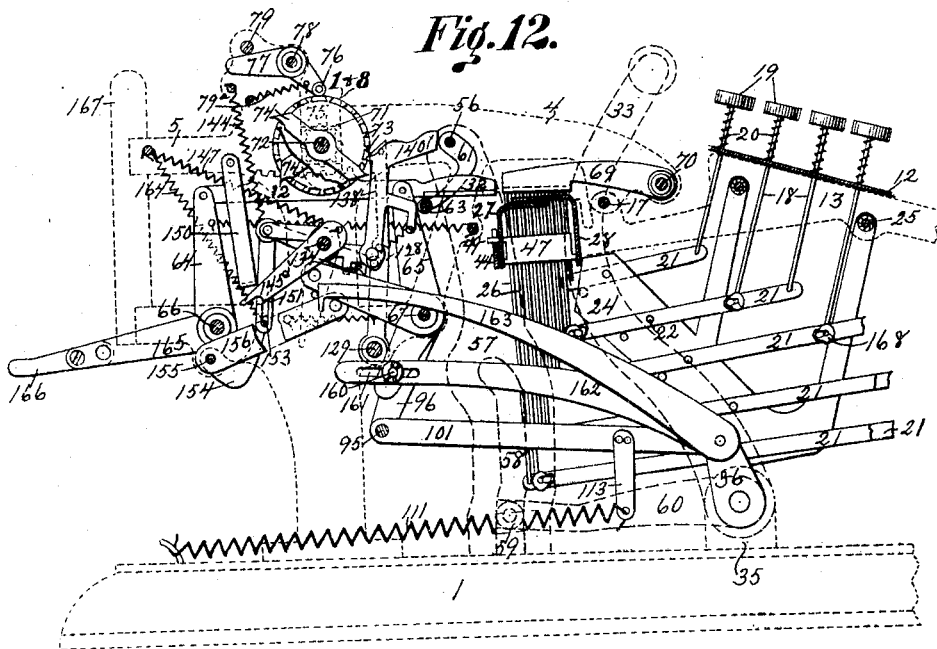


Fig. 12.



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ADDING AND PRINTING MACHINE.

APPLICATION FILED SEPT. 15, 1903. RENEWED MAR. 11, 1905.

15 SHEETS—SHEET 10.

Fig. 13.

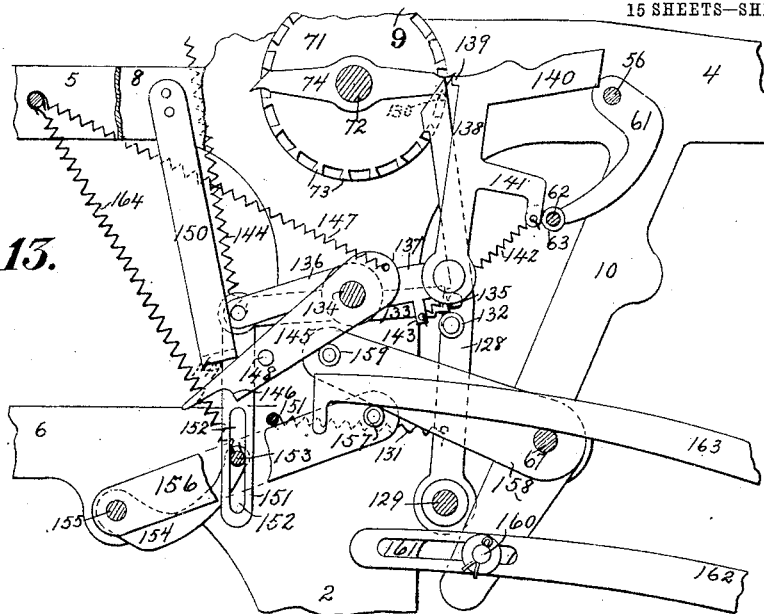
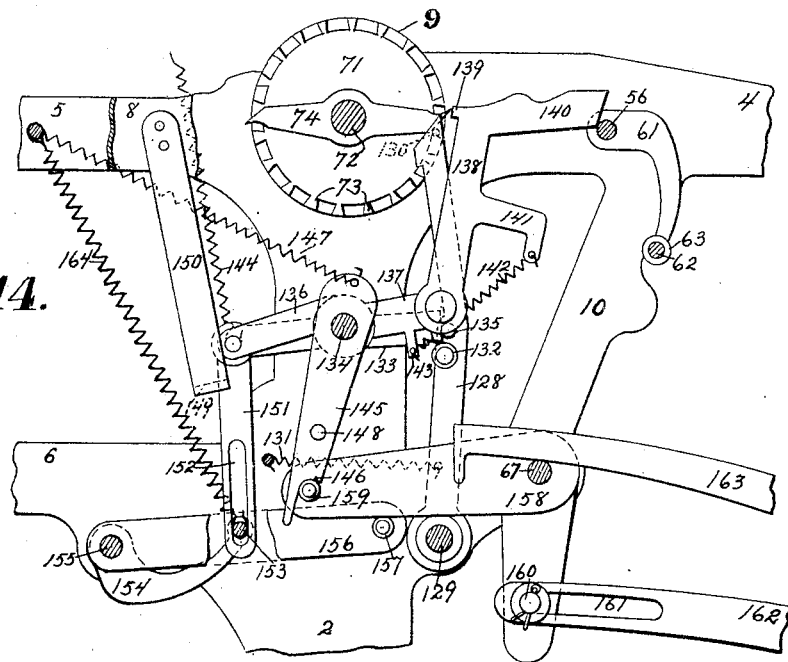


Fig. 14.



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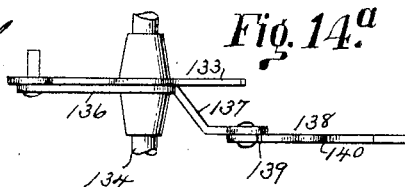


Fig. 14^a.

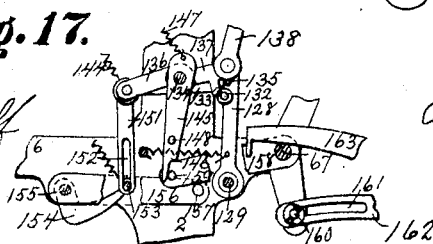
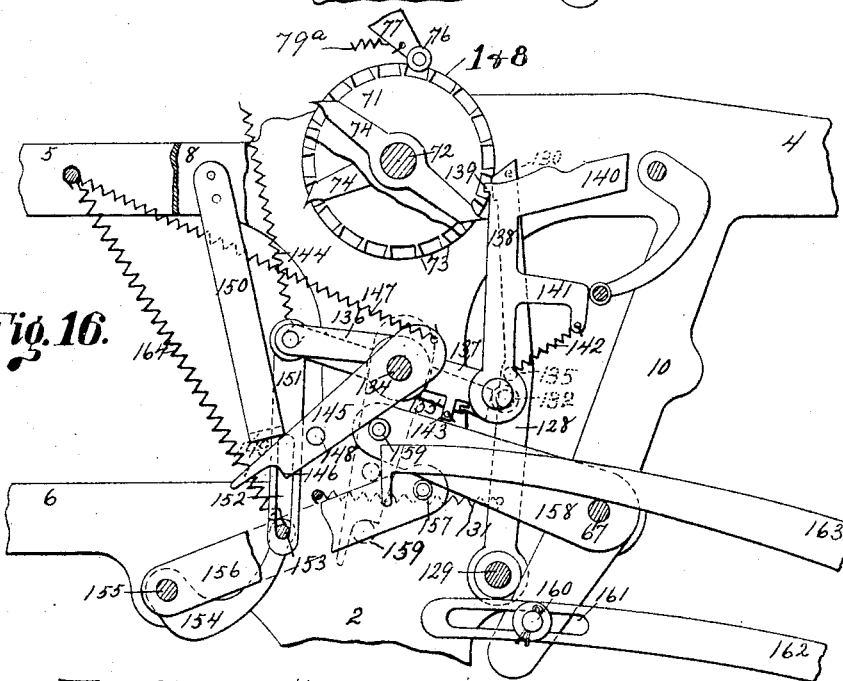
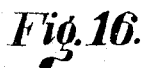
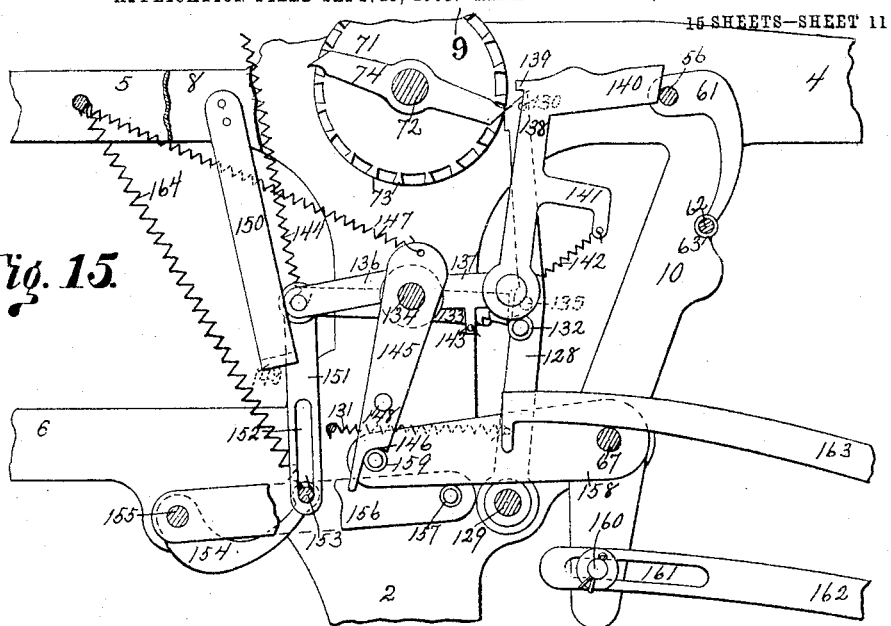
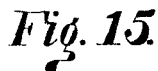
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~~16 SHEETS—SHEET 11.~~



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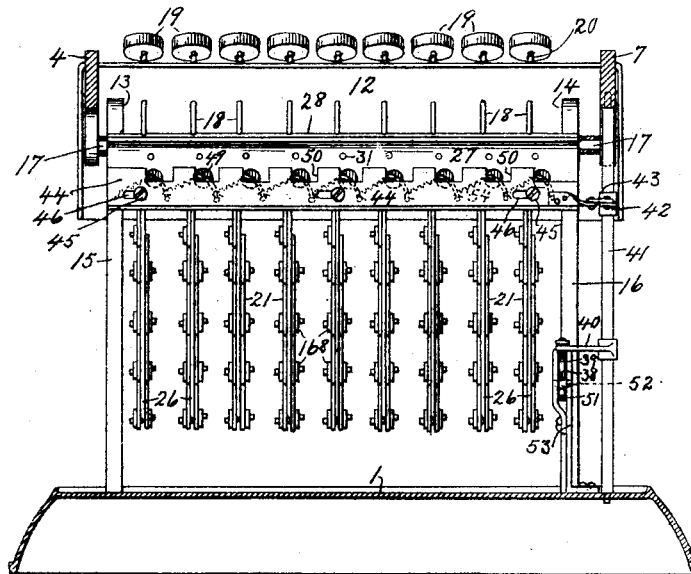
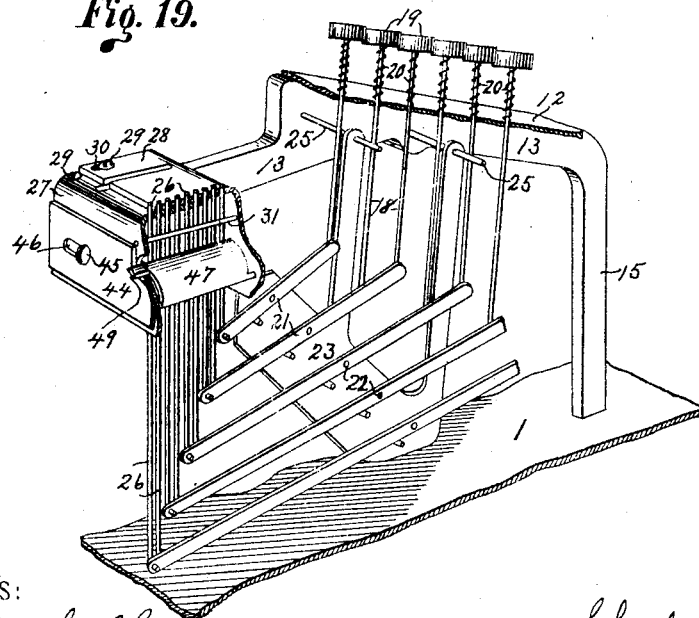
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APPLICATION FILED SEPT. 15, 1903. RENEWED MAR. 11, 1905.

15 SHEETS—SHEET 12.

Fig. 18.*Fig. 19.*

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APPLICATION FILED SEPT. 15, 1903. RENEWED MAR. 11, 1905.

15 SHEETS—SHEET 13.

Fig. 20.

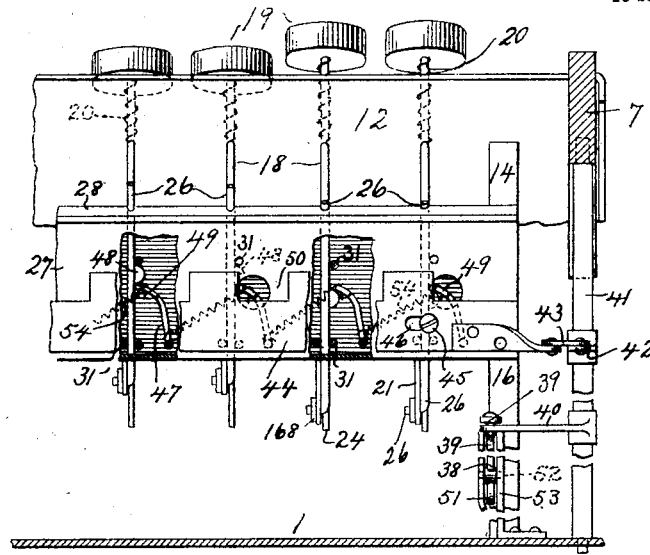
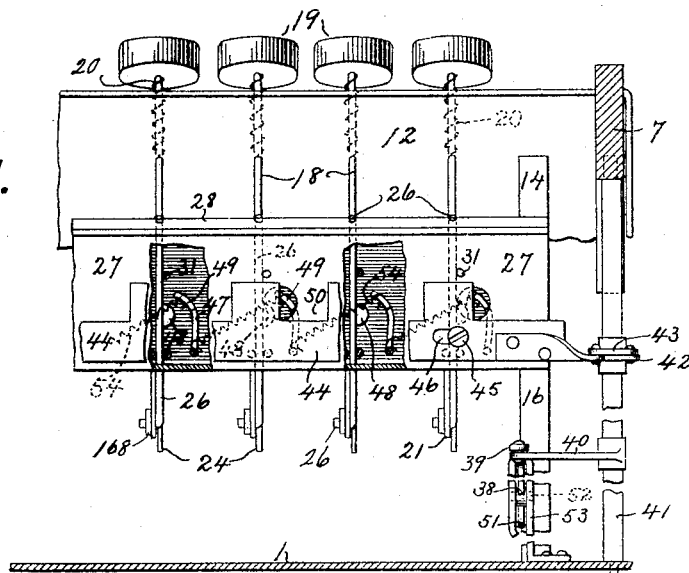


Fig. 21.



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APPLICATION FILED SEPT. 15, 1903. RENEWED MAR. 11, 1905.

15 SHEETS—SHEET 14.

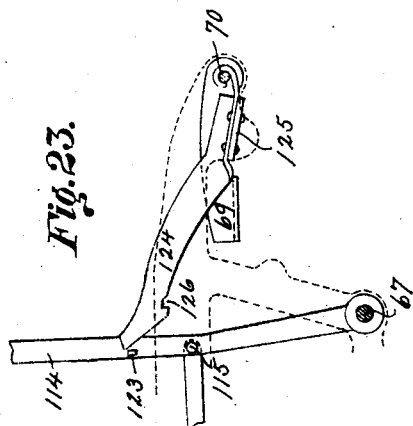


Fig. 23.

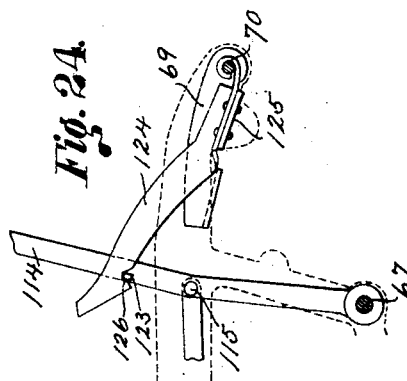


Fig. 24.

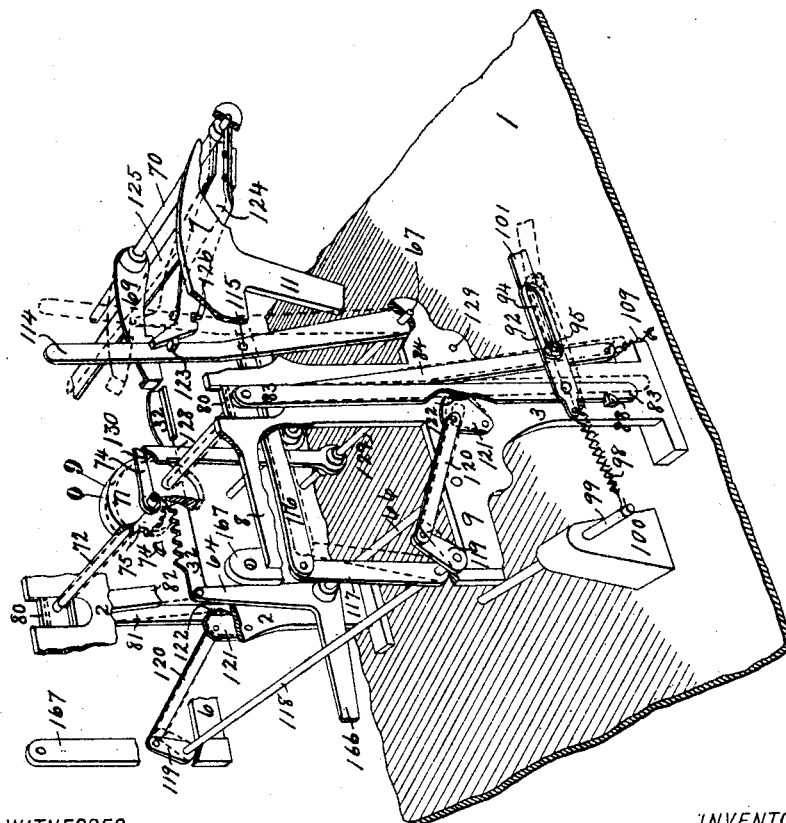


Fig. 22.

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APPLICATION FILED SEPT. 15, 1903. RENEWED MAR. 11, 1905.

15 SHEETS—SHEET 15.

Fig. 26.

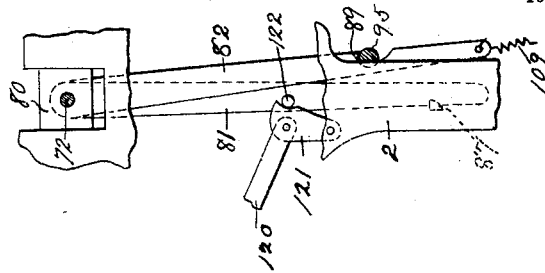
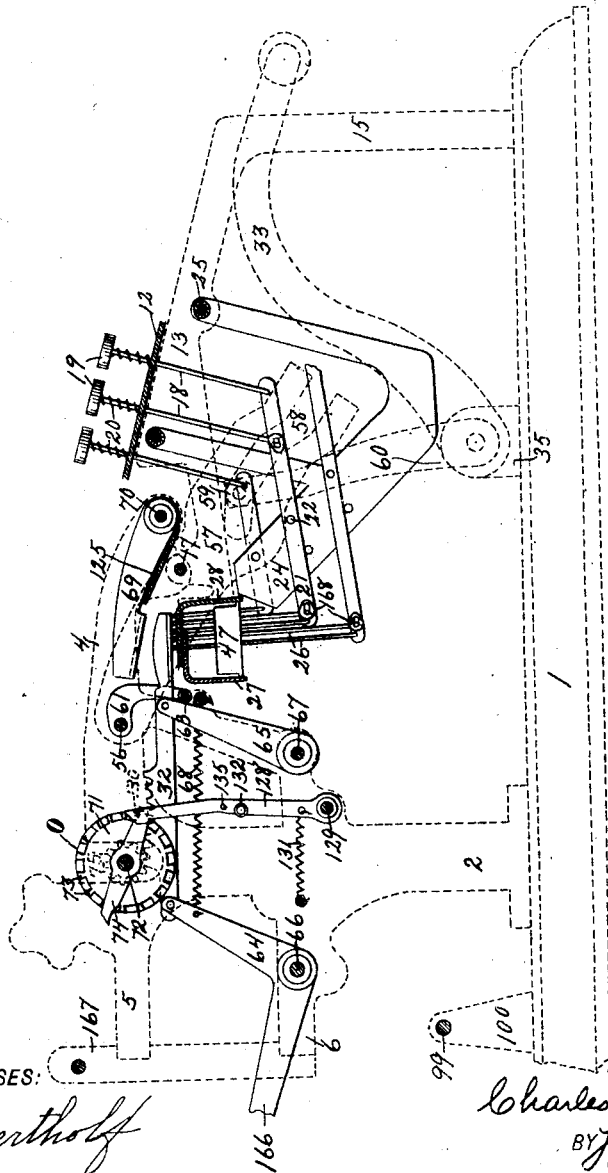


Fig. 25.



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His ATTORNEY

UNITED STATES PATENT OFFICE.

CHARLES WALES, OF DETROIT, MICHIGAN, ASSIGNOR TO THE ADDER MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

ADDING AND PRINTING MACHINE.

No. 797,032.

Specification of Letters Patent.

Patented Aug. 15, 1905.

Application filed September 15, 1903. Renewed March 11, 1905. Serial No. 249,554.

To all whom it may concern:

Be it known that I, CHARLES WALES, a citizen of the United States, and a resident of Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Adding and Printing Machines, of which the following is a specification.

This invention relates generally to machines for adding and registering, recording, or printing the results of the additions; but the present application is restricted to the means for adding and registering, the mechanism for recording or printing the results forming the subject-matter of another application filed simultaneously herewith, to which reference is made.

The machine subject of this application is operated by depressing keys arranged in series in a keyboard to set corresponding stops in the path of racks which by the operation of a main operating lever or handle are brought into mesh with pinions mounted on corresponding registering-wheels, one for each set of keys and bearing corresponding numerals, whereby the wheels are actuated to display numerals similar to those keys which have been depressed.

In order that the invention may be readily comprehended, I have illustrated an embodiment thereof in the accompanying drawings, in which—

Figure 1 represents a plan view of the machine, part of the key-apron being broken away and part of the printing or recording mechanism being omitted. Fig. 2 represents a side elevation of substantially the same parts illustrated in Fig. 1 looking at the right-hand side of the machine, the casing of the machine being removed. Fig. 3 represents a similar view looking at the left-hand side of the machine. Fig. 4 represents a vertical transverse sectional view of the machine, taken on the broken line 4 4 of Fig. 6. Fig. 5 represents a horizontal longitudinal sectional view taken on the broken line 5 5 of Fig. 6, the keyboard-section of the machine being omitted. Fig. 6 represents in side elevation one of the trains of mechanism in its normal position or state of rest, parts being shown in section, parts in dotted lines, and parts broken away. Fig. 7 represents in side elevation substantially the parts shown in Fig. 6 in the positions they assume when the forward stroke of the oper-

ating lever or handle is nearly but not quite completed with the No. 9 key of the train or series depressed. Fig. 8 represents in side elevation substantially the parts shown in Figs. 6 and 7 in the positions they assume at the end of the forward stroke of the operating-handle. Fig. 9 represents in side elevation substantially the parts shown in Figs. 6, 7, and 8 in the positions they assume when the return stroke of the operating-handle is nearly but not quite completed, the registering numeral-wheel, as in Figs. 7 and 8, being set to display the numeral "9." Fig. 10 represents in side elevation substantially the same parts as in the four preceding figures in the positions they assume when a second forward stroke of the operating-handle is nearly but not quite completed, such stroke from the No. 9 position, before illustrated, bringing the carrying mechanism into operation. Fig. 11 represents in side elevation substantially the same parts in positions they assume during a return stroke, which operates the carrying mechanism at what I denominate the "first release" of the jack. Fig. 12 represents in side elevation substantially the same parts in the positions they assume when the operating-lever has nearly but not quite reached the end of the second return stroke, the jack being sprung and the carrying operation being completed. Fig. 13 represents, on an enlarged scale, in side elevation, the carrying mechanism in its normal position or state of rest. Fig. 14 represents in side elevation, on the same scale as Fig. 13, the same parts in the positions they assume when the forward stroke of the handle is nearly but not quite completed, showing the parts locked to hold the jack. Fig. 14^a is a detail plan view of some of the parts shown in Fig. 14. Fig. 15 represents in similar view and on the same scale as Fig. 14 the same parts in positions assumed during return stroke at the first release of the jack. Fig. 16 represents in similar view and on same scale the same parts in positions assumed during return stroke when the jack is released and the carrying operation completed. Fig. 17 represents the mechanism comprising the jack in plan view. Fig. 18 represents in rear elevation the keyboard-section of the machine detached, illustrating the key-release slide-bar and its vertical operating-shaft supported in

the main frame of the machine. Fig. 19 represents in perspective view what I denominate the "shutter mechanism" for holding up and releasing the rack-stops on the inner ends of the key-levers. Fig. 20 represents the same mechanism in rear elevation, partly broken away, showing two keys depressed and the corresponding stops raised and two other keys raised and their stops lowered. Fig. 21 represents the same mechanism, showing the keys released and their stops in lowered positions. Fig. 22 represents in perspective view the "zero-resetting mechanism," the full lines showing the parts in the normal position of rest and the dotted lines in the positions to which they are moved by the operation of the vertical lever throwing the rack into mesh with the numeral-wheel pinion. Fig. 23 represents in side elevation parts of the mechanism of Fig. 22 in their normal position of rest. Fig. 24 represents similarly the same parts after the vertical lever has been pulled or operated. Fig. 25 represents the zero-resetting mechanism in side elevation in the positions assumed when the resetting operation has been completed, other adjacent parts being shown in dotted lines. Fig. 26 represents in enlarged detail view the elevating-arms attached to the registering-wheel shafts. Fig. 27 represents in perspective view one of the registering-wheels looking at the "pawl" side thereof. Fig. 28 represents a similar view looking at the opposition side or pinion thereof. Fig. 29 represents in enlarged perspective detail view the sliding bearing-block for the registering-wheel shafts. Fig. 30 represents in enlarged detail view the connection of its actuating-arm with the vertical shaft of the key-resetting mechanism. Fig. 31 represents in enlarged perspective detail view the guide for the actuating-arm of Fig. 30. Fig. 32 represents in enlarged view the key-system guide mechanism.

Like reference characters will be used to designate the same parts where they appear in one or more of the figures of the drawings.

Before entering upon a particular description of the parts of the machine illustrated in the drawings I will outline its general characteristics in order that the relation of the parts to each other and to the whole may be clearly understood as the specification proceeds.

The machine has a keyboard and key-levers, which will remain in either one of their two positions until moved therefrom by an impulse received from the operator through the keys or other parts of the machine. These levers operate a series of stops and interpose them into the path of the racks, which determine the relation of the numeral-wheels, the position of the particular stop thus interposed determining the extent of the wheel's rotation, and consequently the particular numeral on the periphery of the wheel in view when

the rotation is checked. The racks are normally out of mesh with pinions on the registering-wheels and are brought into mesh prior to the rack being moved in the direction to rotate the wheels. The numeral on the key corresponds to the number displayed on the wheel when the wheel comes to a standstill. Stop and release mechanism is employed which holds the racks until the number desired to be added is written on the keyboard by the depression of the keys. The racks are brought into mesh with the wheels by the action of the main operating lever or handle, which upon its return stroke returns the racks to their normal positions, simultaneously rotating the wheels in mesh (through their pinions) with the racks which have been displaced. The wheels are returned to their zero or normal positions by mechanism operating upon pawls secured to wheels, the latter being mounted on the shafts. Suitable mechanism is also provided for returning the keys to their normal raised positions at the end of an operation or at any time for correcting a mistake by depressing the wrong key. Most of the parts are held in normal positions or actuated in one direction by springs.

Referring particularly to the drawings by reference characters, the base-frame, which is preferably rectangular, is indicated by the numeral 1, which is properly shaped to support the main frame, which carries all of the actuating mechanism. The main frame comprises on each side of the machine an upright, as at 2 in Fig. 2 and 3 in Fig. 3, from which project forward and rearward arms, as at 4, 5, and 6 in Fig. 2 and 7, 8, and 9 in Fig. 3, the forward arms 4 and 7 being connected with the uprights 2 and 3 by brackets or braces 10 and 11, respectively.

12 indicates the keyboard, which supports the forward portion of the machine, which I have denominated the "keyboard-section," a frame-piece, as at 13 and 14, being secured to the under side of the keyboard at each side, said frame-pieces terminating at their forward ends in depending uprights 15 and 16, which rest upon the base-piece 1 and being connected at their rear ends to the arms 4 and 7 of the main frame by means of a cross-rod 17.

The whole mechanism will be inclosed in a suitable casing, which I have not illustrated and which may be of any suitable material and ornamented in any desired manner.

Through the keyboard are suitable perforations to admit of the passage therethrough of key-rods 18, upon the tops of which are secured keys 19, held normally in their raised positions by springs 20, coiled around the key-rods between the keys and the keyboard. The keys and the trains of mechanism connected therewith are arranged in series, as clearly shown in Fig. 1, each series comprising keys bearing numerals from "1" to "9," inclusive, the series extending longitudinally of

the machine side by side, that series on the right being intended to be operated to add units, the next series to the left tens, and so on, the capacity of the machine illustrated in Fig. 1 being to add sums up to nine million nine hundred and ninety-nine thousand nine hundred and ninety-nine dollars and ninety-nine cents, the capacity of each machine, governed by the number of series of keys and connected mechanisms, being regulated as may be desired to suit the use to which the machine is to be put. In the several views illustrating the machine only one series is generally used, inasmuch as they are all constructed and operate alike, and the general mechanism, such as the main operating-handle, the resetting devices, &c., are connected to all the series in the same manner. In each series the key-rods 18 are pivotally connected at their lower ends to key-levers 21, pivoted intermediate their ends, as at 22 in Figs. 3, 6, and others, to frame-pieces 23 24, rigidly secured to the frame-pieces 13 and 14, respectively, by cross rods or bolts 25, the pivotal points being located with relation to the length of the key-levers to give each lever the proper length forward and aft of the pivot to move a stop-bar, as at 26, upward when the key is depressed to bring said stop-bar into its proper operative position, said stop-bars being pivotally connected to the rear ends of the key-levers and passing upward in series through slots in angle-plates 27 28, secured to the frame-pieces 13 and 14 by bolts 29, (see Fig. 19,) the slots being made adjustable in length to properly accommodate the series of stops by passing the bolts 29 through slots 30 in either of the plates 27 or 28. Each series of stops is also further guided and kept in alinement by cross-pins 31, connecting the plates 27 and 28, Fig. 19.

The parts hereinbefore described constitute all of the removable keyboard-section of the machine except parts of the stop supporting and releasing or key-resetting mechanism, which I shall next proceed to describe.

When a key is depressed, the corresponding stop-bar is raised, as shown in Figs. 7, 8, and 10, and as each series of stops is in the path of movement of a rack, as at 32 in said figures, the movement of the rack forward is limited by said stop. After the rack is moved (by means of its spring against the stop) the rack is moved rearward to actuate the corresponding registering-wheel by the operation of a main lever or handle 33 through the medium of connections to be hereinafter described, the wheel being actuated during the rearward or return stroke of the handle. This handle 33 is rigidly secured to the main rock-shaft 34, which is journaled in lugs 35, erected on the base 1, which shaft also carries a crank-arm 36, (see Figs. 5, 7, 8, and 9,) to which are connected several arms or links, to be later described, by means of a bolt or pin 37, which

projects inwardly beyond the crank-arm and in the rearward rocking of the main shaft engages a shoulder 38 of a link 39 and presses the said link rearwardly. At its rear end this link is pivotally connected with a longitudinal crank-arm 40 (see Fig. 30) on a vertical shaft 41, journaled in the base and frame of the machine and provided nearer to its upper end with another crank-arm 42, connected by a link 55 to a bar 43, rigidly secured to a horizontal transverse bar 44, mounted slidably upon the angle-plate 27 of the keyboard-section by means of bolts or screws 45 passing through slots 46 in said bar 44 (see Figs. 19, 20, and 21) and into said angle-plate. Adjacent to each series of stops a shutter or broad pawl 47 is journaled in the angle-plates 27 and 28 in such a position as to rest normally against the sides of all of the stops of each respective series. Upon each stop on the side with which the shutter engages is a lobe or projection 48, the lobes of each series being in line with each other when all of the stops of the series are either raised or lowered. When a stop is raised by the depression of a key, as hereinbefore described, the lobe passes above the engaging edge of the shutter and rests upon the edge thereof, whereby as long as the shutter remains in its normal position the stop will be held up or locked in its raised position by the engagement of the shutter with its lobe. During the raising of a stop the passage of its lobe under the shutter will force the edge of the shutter far enough away from the other stops to permit the lobes of any stops which might be already raised to pass down under the force of the key-raising springs, and thus leave only the last-actuated stop in the raised position. This function makes a correcting device of this mechanism as well as a stop-releasing and key-resetting device. When the operating-handle is moved rearwardly, the main shaft is rocked, and through the connections described the vertical shaft is also rocked, thus sliding the transverse horizontal bar 44 to the right, as seen in Figs. 20 and 21, when by virtue of the engagement of the projecting end 49 of each shutter in a corresponding notch 50 in the upper edge of bar 44 all of the shutters will be pushed away from their respective series of stops, thus permitting all of the raised stops in all of the series to be lowered into their normal positions by the raising of the corresponding keys by means of their raising-springs. Near its forward end the link 39 is formed with a cam-surface 51 which at the end of the operating movement of said link rides over roller on a pin 52, which is mounted in a short standard 53, erected on the base 1, (see Fig. 31,) thereby raising the link, disengaging the shoulder 38 from the pin 37 of crank-arm 36, and permitting the springs 54 to draw the shutters to the left against the stops and the bar 44 to the right (from the position of Fig. 21 to that

of Fig. 20) and rock the vertical shaft, thus throwing the link 39 forward to its normal position. As the main operating-lever makes its next forward movement, rocking the main shaft and carrying the crank-arm 36 forward with it, the pin 37 rides under the link 39 and again takes position in front of the shoulder 38, ready for the next movement rearward, as before described.

As hereinbefore noted, each train of mechanism, beginning with the series of keys, is provided with a rack 32, which actuates a numeral or registering wheel by means of the mechanism now to be described, the operation of which will be best understood by reference to Figs. 2, 7, 8, 9, 10, 25, &c. In Fig. 7 the parts are shown in the positions they assume when the forward stroke of the operating-lever has been nearly but not quite completed.

Journalled in the arms 4 and 7 of the main frame is a transverse rock-shaft 56, to which is secured an arm or lever 57, Fig. 2, provided in its free end with an open-ended cam-slot 58, in which works a roller 59 on a pin projecting laterally from the free end of an arm 60, secured to the main rock-shaft 34. On the rock-shaft 56 are secured a number of curved arms 61, corresponding to the number of trains of mechanism, and in the free ends of these arms is secured a cross-rod 62, extending from the first to the last of these arms, (see Fig. 1,) which rod carries a roller 63 for each train or series. Each rack is mounted on the upper ends of arms 64 and 65, pivoted on cross-rods 66 and 67, mounted in the side frames, and is normally drawn forward by a spring 68, secured at its respective ends to arm 64 and to the frame. As the main lever is moved forward the roller 59 throws the lower end of arm 57 forward, rocking the shaft 56 and throwing the cross-rod 62, with the rollers 63, forward and permitting springs 68 to carry forward against the stops all racks corresponding with the depressed keys. The rest of the racks are retained in their normal positions by means of a series of retaining-stops 69, pivoted on a cross-rod 70, secured in the frame, which stops rests normally on top of the stop-rods of each series and are raised out of the way of the racks by the raised stop-rods. When the forward stroke of the operating-lever is nearly completed, as illustrated in Fig. 7, the rack is in contact with the raised stop, in this instance the stop corresponding with key No. 9, which is shown depressed, and the completion of the stroke to the position of Fig. 8 has no further effect upon the longitudinal movement of the rack, which up to this time has been unconnected in any way with the registering-wheel, which is normally set to expose "0". In order to connect the rack with the registering-wheel, it is necessary to either lower the wheel or raise the rack, and in this machine I have

provided means for lowering the wheel, which I will now describe.

There is a registering-wheel 71 for each rack, each wheel constructed as shown in detail in Figs. 27 and 28, said wheels being loosely mounted on a shaft 72, journaled in the side frames (see Figs. 1 and 4) and having two series of numerals "1," "2," "3," "4," "5," "6," "9," and "0" on its periphery, a series of cogs or teeth 73 at the left side of the periphery, a double pawl 74, and a pinion 75 on its right-hand side, all of these parts being rigidly secured or formed together. The teeth 73 are engaged by rollers 76, journaled on pins in the forward arms of elbow-levers 77, mounted on a cross-rod 78, secured in the frame, the rear arms of said elbow-levers being normally held against a cross-rod 79 by springs 79^a secured in the frame, in which normal positions the rollers are yieldingly held in engagement with the teeth of the wheel when the wheel is in its raised position to prevent displacement of the wheels by accidental turning. The shaft 72 is mounted at each end in a bearing-block 80, (see Figs. 2, 3, 22, 26, and 29,) and on the ends of the shaft beyond the bearing-block are suspended four bars, which I denominate "latch-bars," two of such bars (numbered 81 and 82) being on the right-hand end (see Fig. 2) and two (numbered 83 and 84) on the left-hand end. (See Figs. 3 and 7 to 9.) The bars 81 and 83 are of like construction and are provided with notches 85 and 86 to engage catches 87 and 88, projecting from the frame, while the bars 82 and 84 are alike in construction, being provided with shoulders 89 and 90 for purposes later described. Pivottally connected with the latch-bars 81 and 83 are bars 91 and 92, provided with slots 93 and 94, which engage over a cross-rod 95, secured in the lower ends of arms 96, secured to the cross-rod 67, said bars 91 and 92 being normally drawn rearward by springs 97 98, connecting them with a cross-rod 99, mounted on lugs 100 on the base 1 of the frame. Connected to the cross-rod 95 (on the left-hand side of the machine, as seen in Figs. 3 and 7 to 9) is a link or bar 101, which is connected at its forward end to the bolt or pin 37 of the crank-arm 36 on the main rocking shaft 34. Connected to the cross-rod 95 on the right-hand side of the machine (as seen in Figs. 2 and 5) is another link 102, the forward end of which is connected to a crank-arm 103, rigidly secured to the main rock-shaft 34. From this crank-arm projects a stop-arm 104, which by striking the base of the machine limits the forward stroke of the main operating-lever. On the crank-arm 60 is a pivoted pawl 105, normally but yieldingly held with its point toward the main shaft by a spring 106. If at any time during a stroke of the operating-lever it slips from the operator's hand or it is desired to stop it, this pawl 105 will engage one of a number of notches 107 in the

periphery of a fixed sector-shaped plate 108 and hold the lever stationary. At either end of the stroke of the operating-lever the pawl passes beyond the sector ready to act in either direction. While that part of the forward stroke of the operating-lever which ends in the position shown in Fig. 7 is made the latch-bars 81 and 83 remain in their normal positions engaging their catches and holding the shaft of the registering-wheels in its upper position with the wheels out of mesh with the racks, the cross-rod 95 moving to the forward end of slot 94. The continuation of the stroke brings the parts to the position of Fig. 8, drawing the bars 91 92 forward, releasing the latch-bars 81 and 83 from their catches 87 and 88, and permitting the registering-wheels and shaft to drop and bring the pinions 75 to engage with the racks held in position against their raised stops, the dropping of the registering-wheel shafts being assured by the action of springs 109, connecting latch-bars 82 and 84 with the base of the frame. With the parts thus positioned, as in Fig. 8, the return or rearward stroke of the operating-lever is made, which is assisted by springs 110 and 111, connecting arms 112 and 113 on the links 101 and 102 with the base of the frame. During this stroke the racks are forced rearward by the reversal of the movements before described, causing the registering-wheels to be rotated a number of steps corresponding to the keys depressed (being in the instance illustrated nine steps) and to expose at the proper place of observation the numeral added, (being "9" in this instance,) as indicated in Fig. 9. This movement is accomplished before the return stroke is quite completed, and during this part of the stroke the cross-rod 95 has traveled to the rear end of slot 94. In the latter part of this stroke the cross-rod pressing against the rear wall of the slot pushes the bar 92 rearward and by pressing against shoulders 89 and 90 of latch-bars 83 and 84 pushes these latch-bars upward, restoring the registering-wheels to their normal positions out of engagement with the racks. The latches 81 and 82 are also raised at the same time, causing their notches 85 and 86 to engage the catches 87 and 88 and retain the registering-wheels in their normal raised positions until the operation is repeated. At any time during the operation of the machine the registering-wheels may be reset or returned to their normal positions to expose zero at the point of observation by means of the mechanism which I shall now describe and which is specially illustrated in Figs. 22 to 26.

Pivoted on cross-rod 67 is a handle-lever 114, projecting above the top of the machine to an intermediate part of which, at 115, is pivotally connected a link 116, extending rearwardly and pivotally connected at its rear end to a crank-arm 117, secured on a rock-shaft 118, which also carries a crank-arm near

each end, as at 119, from which latter crank-arms extend links 120, connecting them with plates 121, pivoted to the side pieces of the frame and adapted to engage pins 122, projecting from latch-bars 81 and 83. By pulling the handle-lever 114 forward the plates 121 are forced forward against pins 122, thus also forcing latch-bars 81 and 83 forward, disengaging their notches 85 and 86 from the catches 87 and 88 and permitting the registering-wheel shaft to drop, thus bringing the pinions 75 into mesh with the racks 32, so that the wheels may be turned in reverse direction by moving the main lever, bringing the wheels to position to expose zero, the wheels being stopped in their normal or zero position by the double pawl 74, contacting with a pin on a trigger 128, (see Fig. 25,) further functions of which trigger will be disclosed in the description of the carrying mechanism hereinafter. It being necessary in order to accomplish this reverse rotation of the wheels in resetting them to zero that the racks 32 be moved in a forward direction and this movement being ordinarily prevented by the retaining-stops 69 until they are raised by the key-stops, mechanism must be provided for raising these retaining-stops by the movement of the handle-lever 114. For this purpose I provide a laterally-projecting pin 123 on the handle-lever wheel, which in the forward movement of said lever rides under a latch-lever 124, secured to a cross-plate 125, extending under all of the retaining-stops, (see Figs. 22 to 24,) whereby the latch-lever moves, thus raising all of the retaining-stops out of the paths of the racks. A notch 126 in the latch-lever engages over the pin 123 at the end of the movement, holding the latch-lever, cross-plates, and retaining-stops in their raised positions as long as desired.

The sum of nine being registered by the operations before described, the next operation will require that at least the sum of one be carried from the wheel showing "9" to the next wheel to the left—in this instance from the units-wheel to the tens-wheel—and I will now proceed to describe the mechanism which I have provided for accomplishing this carrying operation, which is specially illustrated in Figs. 13 to 16 and parts of it incidentally in other figures.

The trigger 128 is pivotally mounted substantially in the plane of the units-wheel upon a cross-rod 129 and is provided with a laterally-projecting pin 130 near its upper end on the plane of rotation of the double pawl 74 of the units-wheel, a spring 131 serving to normally but yieldingly draw the trigger toward the double pawl. A second pin projects laterally from the trigger at about its mid-length, which carries a roller 132 in the plane of a lever 133, pivoted on a cross-rod 134, there being another pin 135 projecting from the trigger above the roller, also in the plane of lever

133. A second lever 136 is pivoted on the cross-rod 134 alongside of lever 133 and is either formed with the lever 133 or rigidly secured thereto and has its forward end, as at 137, in substantially the plane of the tens-wheel, being laterally bent for this purpose. Upon the end 137 is pivotally mounted a metal piece 138, which I denominate the "jack," which is substantially of the shape of the letter F, its pivotal connection being at the bottom of the stem. The jack has a tooth 139 at the top of the stem on its rear edge, a forward projection 140 at the top of the stem, and a forward projection 141 at the middle of its stem. A spring 142 connects projection 141 with a lug 143, projecting downward from the lever 136, and tends to draw the jack downward and forward. A spring 144 tends to draw the rear ends of levers 136 upward. On the cross-rod 134 is also pivoted a locking-lever 145, whose lower end is cut away on one side to provide a shoulder 146, said lower end being normally forced downward and forward by a spring 147, connecting its upper end with the frame of the machine. A pin 148 projects laterally from locking-lever 145 above the shoulder, and the lower end of said lever 145 is limited in moving rearward by a flange 149 at the lower end of an arm 150, riveted to the frame. Pivotally suspended from the rear ends of levers 133 and 136 is a link 151, provided with a slot 152, in which works a cross-rod 153, secured in the ends of curved arms 154, rigidly secured to a rock-shaft 155, which also carries an arm 156, provided on a laterally-projecting pin with a roller 157. On the cross-rod 67 is pivotally mounted a bell-crank or elbow-lever 158, on the rearward arm of which is a roller 159 on a laterally-projecting pin, while on the vertical arm is a laterally-projecting pin 160, working in a shaft 161 in a link 162, connected with pin 37 on crank-arm 36 of the main rock-shaft 34. (See Figs. 11 and 13.) A link 163, which rests on the cross-rod 67 and is supported thereby, is also connected to pin 37 of crank-arm 36. The cross-rod 153 is connected with the frame of the machine by a spring 164, which normally but yieldingly draws the cross-rod with the curved arms 154 and arm 156 upward. These parts are shown in Fig. 13 with the point of lever 133 resting on roller 132, holding the jack up while the end of the same lever is against pin 135, holding the trigger from movement to the rear. The middle forward projection 141 of the jack is held by spring 142 against roller 63 of rod 62 while the tooth 139 is free of the wheel. The locking-lever 145 is supported on roller 159 of elbow-lever 158, and the elbow-lever is supported on roller 157 of arm 156, the locking-lever being stopped from further rearward movement by flange 149 of stop-arm 150. The forward projections of the jack are so positioned with relation to

rock-shaft 56 and rollers 63 that one of said projections will always be in contact with either the rock-shaft or rollers, thereby always holding the jack against falling forward. When the forward stroke of the operating-lever is made in the operation of adding nine to the nine already registered on the units-wheel, the link 162 draws the vertical arm of the elbow-lever forward and its horizontal arm downward, permitting the locking-arm 145 to be drawn by spring 147 to the position of Fig. 14, the roller 159 sliding along its edge until it drops below the shoulder 146, the elbow-lever being held in this position by the upward pressure of roller 157 on arm due to the pull of spring 164 through the medium of cross-rod 153, curved arms 154, and arm 156, thus locking the jack in inoperative position until tripped during the return or wheel-rotating stroke of the main operating-lever. During the forward stroke the movement of curved arms 61 has moved the roller 63 out of contact with projection 141 of the jack and the projection 140 has come into contact with the rock-shaft 56. The first part of the return stroke of the main lever produces no effect on this mechanism except through the rotation of the units-registering wheel, the links 162 and 163 moving forward without effect. As the units-wheel is rotated from the nines position and brings the zero into view the pawl 74 presses against pin 130 of trigger 128 and moves the trigger forward slightly, permitting the spring 144 to force the point of lever 133, with a cam-like action, down on roller 132 of the trigger, moving the trigger a little farther forward to the position of Figs. 15 and 16, this movement of the lever 133 downward being stopped when the end wall of slot 152 reaches the cross-rod 153, which is still held locked by arm 145. As the forward stroke further progresses the link 163 strikes pin 148 of the locking-lever 145 and trips it by pushing the shoulder 146 off the roller 159. In the meantime the action of curved arms 61 has pushed roller 63 against projection 141 of the jack 138 and projected tooth 139 of the jack between two of the teeth 73 of the tens-wheel. The tripping of the locking-lever 145 permits spring 164 to act, drawing up cross-rod 153 and curved arm 154, rocking the shaft 155, carrying up arm 156, causing roller 157 to raise the horizontal arm of the bell-crank lever 158 and pressing the roller 159 against stop-flange 149, as shown in Fig. 16. The tooth 139 of jack 138 being in engagement with teeth 73 of the tens-wheel and the locking mechanism being tripped, as described, the spring 144 now acts, drawing up the rear end of arm 136 and pulling down its forward end, carrying down the jack with it, and moving the tens-wheel one step, so that the number exposed on the two wheels is "18," the sum of nine and nine. The movement of

the wheel is limited to one step by the lower end wall of slot 152 reaching the cross-rod 153, which is itself held against rising by reason of the trigger 145 resting against stop-flange 149. The last trigger 128 on the left of the machine is held from too great movement inward under stress of its spring by a disk 127 on the numeral-wheel shaft, which takes the place of the lever 133 in this respect. The operation of carrying, as described, takes the mechanism from the position shown in Fig. 13, which is usually the position in which the parts are set when the machine leaves the factory, and the completion of the carrying operation leaves the parts in the positions shown in Fig. 16. It is necessary that the parts be again raised to the positions of Fig. 13 during each carrying operation, and this is accomplished at the end of each forward stroke just beyond that part of the stroke which brings the parts to the positions shown in Fig. 14. In this latter part of the forward stroke the curved arm is carried downward by the rocking of shaft 155 through the medium of the action of elbow crank-lever 158 on roller 157 of arm 158, thus pulling down the link 151 and the rear ends of levers 133 and 136 and raising their forward ends, carrying up the jack 138 and permitting spring 131 to draw trigger 128 rearward, causing the point of lever 133 to rest on roller 132 and hold the jack up and the end of said lever 133 to rest against pin 135 and limit the movement of the trigger rearward. After each rotation of a registering-wheel the wheel, as before stated, is held yieldingly against accidental displacement, backlash, or overmovement by the engagement of the rollers 76 of elbow-lever pawls 77 between the teeth 73 of the wheels by spring-pressure, as shown clearly in Fig. 16.

From the foregoing description the construction and operation will be readily understood by those skilled in the art, and it will be obvious to them that the parts as shown and described are simple in construction and economical to manufacture, the arms, levers, and many other parts being readily and cheaply stamped up from sheet metal, thus dispensing to a large extent with skilled labor and its accompanying expenditure of time and money.

I propose to attach to the machine improved mechanism for printing or recording the results of its operation, which mechanism is made the subject-matter of another application of even date herewith, and I have deemed it necessary in properly illustrating the present invention to illustrate some of the parts connecting the described mechanism with the said printing, but which form no part of the present invention. Such parts occur in Figs. 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, and 12 and are indicated by the numerals 165, 166, and 167, no description of their construction or operation being deemed necessary herein.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an adding-machine, the combination of keys, key-levers pivoted thereto, stops pivoted to the key-levers and operated thereby, numeral-wheels carrying pinions, racks normally spring-pressed forward toward the stops, an operating-lever, and means operated by the lever for permitting and regulating the forward movement of the racks.

2. In an adding-machine, the combination of keys, key-levers pivoted thereto, stops pivoted to the key-levers and operated thereby, numeral-wheels carrying pinions, racks normally spring-pressed forward toward the stops, an operating-lever, and means for permitting and regulating the forward movement, and positively effecting the backward movement of the racks.

3. In an adding-machine, the combination of keys, key-levers pivoted thereto, stops pivoted to the key-levers and operated thereby, racks normally spring-pressed forward toward the stops, an operating-lever, curved arms carrying rollers normally in contact with the rack-supports, and means operated by the main lever for withdrawing the curved arms as the racks advance forward.

4. In an adding-machine, the combination of keys, key-levers pivoted thereto, stops pivoted to the key-levers and operated thereby, racks normally spring-pressed forward toward the stops, curved arms carrying rollers normally in contact with the racks, an operating-lever, and means operated by the lever for pressing the curved arms against the rack-supports to effect their rearward movement.

5. In an adding-machine, the combination of keys, stops operated thereby, racks normally spring-pressed forward toward the stops, curved arms carrying rollers normally in contact with the rack-supports, a rock-shaft carrying said arms, a second arm carried by said rock-shaft, an operating-lever, and connections between the operating-lever and said second arm for oscillating it and rocking the shaft carrying the curved arms.

6. In an adding-machine, the combination of keys, stops operated thereby, racks normally spring-pressed forward toward the stops, curved arms carrying rollers normally in contact with the rack-supports, a rock-shaft carrying said arms, a second arm carried by said rock-shaft, a main shaft, a crank-arm thereon engaging the second arm, and an operating-lever for rocking the main shaft.

7. In an adding-machine, the combination of keys, key-levers pivoted thereto, stops pivoted to the key-levers and operated thereby, racks normally spring-pressed forward toward the stops, a rock-shaft, curved arms carried thereby normally in the path of the forward movement of the racks, an operating-lever, and connections between said lever and

the rock-shaft to rock the shaft and move the curved arms forward with the racks.

8. In an adding-machine, the combination of racks normally spring-pressed forward, a rock-shaft, curved arms secured thereto carrying rollers normally in contact with the racks, slotted arms secured to the shaft, a main shaft, a crank-arm secured to the main shaft carrying rollers engaging in the slot of the arm, and an operating-lever for rocking the main shaft.

9. In an adding-machine, the combination of swinging arms, racks supported thereby and normally spring-pressed forward, a rock-shaft, curved arms secured thereto and carrying rollers normally in contact with the forward swinging arm, an operating-lever, and means operated by the lever for rocking the shaft carrying the curved arms to permit of the forward movement of the swinging arms and racks.

10. In an adding-machine, the combination of keys, key-levers pivoted thereto, stops pivoted to the key-levers and operated thereby, numeral-wheels carrying pinions, racks normally out of mesh with the pinions, means for impelling the racks toward the stops, and means for moving the pinions into mesh with the racks.

11. In an adding-machine, the combination of keys, key-levers pivoted thereto, stops pivoted to the key-levers and operated thereby, numeral-wheels carrying pinions, racks normally out of mesh with pinions during their forward movement, and means for moving the pinions into mesh with the racks at the end of said forward movement.

12. In an adding-machine, the combination of keys, key-levers pivoted thereto, stops pivoted to the key-levers and operated thereby, racks normally spring-pressed forward toward the stops, numeral-wheels normally elevated above the racks, and means for dropping them into mesh with the racks.

13. In an adding-machine, the combination of keys, key-levers pivoted thereto, stops pivoted to the key-levers and operated thereby, racks normally spring-pressed forward toward the stops, numeral-wheels normally elevated above the racks, and means for dropping them into mesh with the racks at the end of said forward movement.

14. In an adding-machine, the combination of keys, stops operated thereby, racks normally spring-pressed forward toward the stops, a shaft, numeral-wheels on said shaft carrying pinions, a latch upon said shaft, and a catch engaging and normally holding said latch raised to support the numeral-wheel, shaft and pinions above the racks.

15. In an adding-machine, the combination of keys, stops operated thereby, racks normally spring-pressed forward toward the stops, a shaft, numeral-wheels on said shaft carrying pinions, a latch upon said shaft, a

catch engaging and normally holding said latch raised to support the numeral-wheel shaft and pinions above the racks, and means for drawing the numeral-wheel shaft down when the latch is released from the catch.

16. In an adding-machine, the combination of keys, stops operated thereby, racks normally spring-pressed forward toward the stops, a shaft, numeral-wheels on said shaft carrying pinions, a latch upon said shaft, a catch engaging and normally holding said latch raised to support the numeral-wheel shaft and pinions above the racks, and a second latch on the numeral-wheel shaft normally spring-impelled downward to lower the shaft to bring the pinions into mesh with the racks when the first latch is released.

17. In an adding-machine, the combination of keys, stops operated thereby, racks normally spring-pressed forward toward the stops, a shaft, numeral-wheels on said shaft carrying pinions, a latch upon said shaft, a catch engaging and normally holding said latch raised to support the numeral-wheel shaft and pinions above the racks, an operating-lever, and connections therefrom for tripping the latch at the end of the forward stroke of the racks to lower the pinions into mesh with the racks.

18. In an adding-machine, the combination of racks, a shaft, numeral-wheels thereon carrying pinions normally raised out of mesh with the racks, a latch depending from the shaft, a stationary catch adapted to engage and hold the shaft raised, an operating-lever, a main shaft carrying the operating-lever, a crank-arm on the main shaft, and connections between the latch and crank-arm to disengage the latch from the catch at the end of the forward movement of the operating-lever.

19. In an adding-machine, the combination with racks, numeral-wheels carrying pinions, a latch normally holding the pinions raised above the racks, a slotted link pivoted to the latch, a spring drawing the link rearward, a cross-rod in the slot of the link, a main shaft, an operating-lever thereon, a crank-arm on the main shaft, and a link connecting the crank-arm with the cross-rod.

20. In an adding-machine, the combination of racks, a shaft, numeral-wheels on said shaft carrying pinions, a latch depending from the shaft, a rigid stop engaging the latch in raised position to keep the pinions out of mesh with the racks, a slotted link pivoted to the latch, a spring drawing the link rearward, a second latch depending from the shaft having a shoulder, a cross-rod in the slot of the link and adapted to engage the shoulder and raise the latch at the end of the rearward movement of the cross-rod, and means operated by a main operating-lever to move the cross-rod rearward and forward.

21. In an adding-machine, the combination of keys, key-levers pivoted thereto, stops

pivoted to the key-levers and operatively connected thereto, racks, means for impelling them in the direction of said stops, a pawl in the path of each rack and in the path of its stop for holding the rack out of operative position until the stop is interposed in its path, numeral-wheels, and means for causing the rotation of the same through the movement of the racks in one direction.

22. In an adding-machine, the combination of keys arranged in series, stops separate from the keys correspondingly arranged in series connected to and operated by the keys, a lobe on each stop, a broad pawl, or shutter, yieldingly pressed against all of the stops in each series and adapted to engage under the lobes, a main operating-lever, and connections therefrom operating to simultaneously withdraw all of the shutters.

23. In an adding-machine, the combination of keys arranged in series, stops correspondingly arranged and operated by the keys, a lobe on each stop, a shutter for each series yieldingly pressed against all of the stops thereof and adapted to engage under the lobes thereof to hold the stops raised, a transverse sliding plate arranged to engage all of the shutters simultaneously, a main operating-lever, and connections therefrom for sliding the transverse plate and simultaneously releasing all of the shutters from the stops.

24. In an adding-machine, the combination of keys arranged in series, stops correspondingly arranged and operated by the keys, a lobe on each stop, a shutter for each series yieldingly pressed against all of the stops thereof and adapted to engage under the lobes thereof to hold the stops raised, a transverse sliding plate arranged to engage all of the shutters simultaneously, a vertical rock-shaft, a crank-arm thereon, a link connecting the crank-arm and transverse sliding plate, a main operating-lever, and connections therefrom for rocking the vertical shaft to simultaneously release all of the stops.

25. In an adding-machine, the combination of keys arranged in series, stops correspondingly arranged and operated by the keys, a lobe on each stop, a shutter for each series yieldingly pressed against all of the stops thereof and adapted to engage under the lobes thereof to hold the stops raised, a transverse sliding plate arranged to engage all of the shutters simultaneously, a vertical rock-shaft, a crank-arm thereon, a link connecting the crank-arm and transverse sliding plate, a second crank-arm thereon, a main shaft, an operating-lever thereon, a crank-arm on the main shaft, and connections therefrom to rock the vertical shaft.

26. In an adding-machine, the combination of a plurality of series of stops, means on each series for holding the stops thereon in raised position, a transverse plate engaging the holding means of all the series, a vertical shaft

carrying two crank-arms, a main operating-lever, connections between the one crank-arm and the transverse plate, and connections between the other crank-arm and the main operating-lever for rocking the vertical shaft to simultaneously release all of the stop-holding devices.

27. In an adding-machine, the combination of a plurality of series of stops, means for holding each series raised, a transverse plate engaging all of said holding means simultaneously, a main operating-lever, a main shaft carrying said lever, a crank-arm on the main shaft, having a laterally-projecting pin, a vertical rock-shaft, two crank-arms thereon, one connected to the sliding plate, and a link connected to the other crank-arm of the vertical shaft and pin of the crank-arm of the main shaft during a portion of the forward movement.

28. In an adding-machine, the combination of stops, releasing means therefor, a vertical shaft having a crank-arm connected with said releasing means, a second crank-arm on the vertical shaft, a crank-arm on the main shaft, a pin projecting laterally therefrom, and a link connected to the second crank-arm of the vertical shaft and provided with a shoulder to engage the pin of the main-shaft crank-arm during part of its forward movement.

29. In an adding-machine, the combination of stops, releasing means therefor, a vertical shaft having a crank-arm connected with said releasing means, a second crank-arm on the vertical shaft, a crank-arm on the main shaft, a pin projecting laterally therefrom, a fixed pin, and a link connected to the second crank-arm of the vertical shaft and provided with a shoulder to engage the pin on the main-shaft crank-arm during part of its forward movement and with an incline to ride over the fixed pin to disengage the shoulder from the crank-arm pin.

30. In an adding-machine, the combination of a main shaft, an operating-lever thereon, a spring for retracting it, a fixed sector concentric with the main shaft, an arm projecting from the main shaft, and a pawl pivoted to said arm and arranged to slide over the periphery of the sector in the forward movement of the main operating-lever and to engage the periphery when the lever is released before its forward movement is completed.

31. In an adding-machine, the combination of a main shaft, an operating-lever thereon, means for moving the lever forward and retracting it, a fixed sector concentric with the main shaft, and a pawl engaging the periphery of the sector and arranged to move with the arm and prevent reverse movement thereof except after the first movement has been completed.

32. In an adding-machine, the combination of a main shaft, an operating-lever thereon, a fixed sector concentric with the shaft and

notched in its periphery, a crank-arm on the shaft projecting beyond the periphery of the sector, a pawl pivoted at the end of the arm in the plane of the sector, and a spring normally holding the pawl with its end toward the main shaft.

33. In an adding-machine, the combination of a shaft, numeral-wheels thereon carrying pinions, latches supporting the shaft normally in its raised position, racks below the pinions and out of mesh therewith when the pinions are in normal raised position, an operating-lever, and connections between the operating-lever and the latches for releasing the latter and dropping the shaft to bring the pinions into mesh with the racks.

34. In an adding-machine, the combination of a shaft, numeral-wheels thereon carrying pinions, latches supporting the shaft normally in its raised position, racks below the pinions and out of mesh therewith during the forward movement of the racks when the pinions are in normal raised position, an operating-lever, and connections between the operating-lever and the latches for releasing the latter and dropping the shaft to bring the pinions into mesh with the racks at the beginning of said forward movement.

35. In an adding-machine, the combination of a shaft, numeral-wheels thereon carrying pinions, latches supporting the shaft normally in its raised position, racks below the pinions and out of mesh therewith during the forward movement of the racks when the pinions are in normal raised position, an operating-lever, and connections between the operating-lever and the latches for releasing the latter and dropping the shaft to bring the pinions into mesh with the racks at the beginning of the rearward movement, and independent means for dropping the pinions into mesh with the racks at any time desired.

36. In an adding-machine, the combination of a shaft, numeral-wheels thereon carrying pinions, latches supporting the shaft normally in its raised position, racks below the pinions and out of mesh therewith during the forward movement of the racks when the pinions are in normal raised position, an operating-lever, connections between the operating-lever and the latches for releasing the latter and dropping the shaft to bring the pinions into mesh with the racks at the end of said forward movement, and independent means for bringing the racks into mesh with the pinions at any time.

37. In an adding-machine, the combination of racks normally spring-pressed forward, a shaft, numeral-wheels on said shaft carrying pinions, a latch upon said shaft, a catch engaging and normally holding said latch raised to support the numeral-wheel shaft and pinions above the racks, and manually-operated means for tripping the latch to drop the pinions into mesh with the racks.

38. In an adding-machine, the combination of a numeral-wheel shaft mounted in vertically-adjustable bearings, a latch depending from the shaft, a catch for engaging the latch in its raised position, a pivoted cam-piece adjacent to the catch, and means for operating the cam-piece to push the latch off the catch.

39. In an adding-machine, the combination of a numeral-wheel shaft mounted in vertically-adjustable bearings, a latch depending from the shaft, a catch for engaging the latch in its raised position, a pivoted cam-piece adjacent to the catch, a pivoted hand-lever, and connections from the hand-lever to operate the cam-piece to release the latch from the catch.

40. In an adding-machine, the combination of a numeral-wheel shaft mounted in vertically-adjustable bearings, a latch depending from the shaft, a catch for engaging the latch in its raised position, a pivoted cam-piece adjacent to the catch, a rock-shaft, a crank-arm thereon, a link connecting the cam-piece and cam-lever, and means for rocking the shaft to operate the cam-piece against the latch.

41. In an adding-machine, the combination of a numeral-wheel shaft mounted in vertically-adjustable bearings, a latch depending from the shaft, a catch for engaging the latch in its raised position, a pivoted cam-piece adjacent to the catch, a rock-shaft, a crank-arm thereon, a link connecting the cam-piece and cam-lever, a second crank-arm on the rock-shaft, a pivoted hand-lever, and a link connecting it with the second crank-arm.

42. In an adding-machine, the combination of keys, key-levers pivoted thereto, stops pivoted to the key-levers, racks normally spring-pressed forward toward the stops, pawls in the paths of the racks and stops to hold the racks against this normal tendency, means for causing the stops to release the pawls, and independent manually-operated means for releasing the pawls.

43. In an adding-machine, the combination of racks normally spring-pressed forward, pawls in the paths of the racks to hold them against this normal tendency, latch-levers rigidly secured to the pawls, a pivoted hand-lever, and pins thereon engaging under the latch-levers to raise them and the pawls.

44. In an adding-machine, the combination of keys, key-levers pivoted thereto, stops pivoted to the key-levers, racks normally spring-pressed forward toward the stops, pawls in the paths of the racks and stops to normally prevent this forward movement, numeral-wheels carrying pinions normally out of mesh with the racks, a main operating-lever, an independent hand-lever, and connections with the main operating-lever and with the hand-lever to bring the pinions into mesh with the racks and raise the pawls out of the paths of the racks either by the operation of the main operating-lever or of the hand-lever.

45. In an adding-machine, the combination of two numeral-wheels side by side, a radial pawl on each wheel, a trigger in the plane of the pawl, two pivoted levers side by side secured together, one in the plane of the right-hand wheel and the other bent to the plane of the left-hand wheel, a jack pivoted to the second lever to actuate the left-hand wheel, a locking-arm depending from the two levers, a main operating-lever, and means operated thereby to lock said arm and release it to permit the jack to drop.

46. In an adding-machine, the combination of a numeral-wheel, a jack for moving it one step, a spring-impelled pivoted lever to the free end of which the jack is pivoted, a numeral-wheel to the right, a trigger operated thereby, an arm depending from the jack-supporting lever, a main operating-lever, connections therefrom to lock the depending arm, and separate connections from the main lever for releasing said depending arm.

47. In an adding-machine, the combination of the jack, its spring-impelled pivoted sup-

porting-lever, its locking-arm having a shoulder, an elbow-lever having horizontal and vertical arms, a roller on the horizontal arm engaging the locking-arm, a main operating-lever, a link connected to the horizontal arm, means for holding the locking-arm in locked position, a link for tripping said arm, and connections between the two links and the operating-lever.

48. In an adding-machine, the combination of racks, curved arms for governing their action, numeral-wheels, jacks adjacent thereto, spring-impelled away from the wheels, and means for operating the jacks and curved arms in unison whereby the jacks are prevented from moving too far under the action of their springs.

Witness my hand, this 10th day of September, 1903, at the city of New York, in the county and State of New York.

CHARLES WALES.

Witnesses:

HERMAN MEYER,
S. BRASHEARS.