

C. WALES.
PRINTING MECHANISM FOR ADDING MACHINES.
APPLICATION FILED SEPT. 15, 1903.

14 SHEETS—SHEET 1.

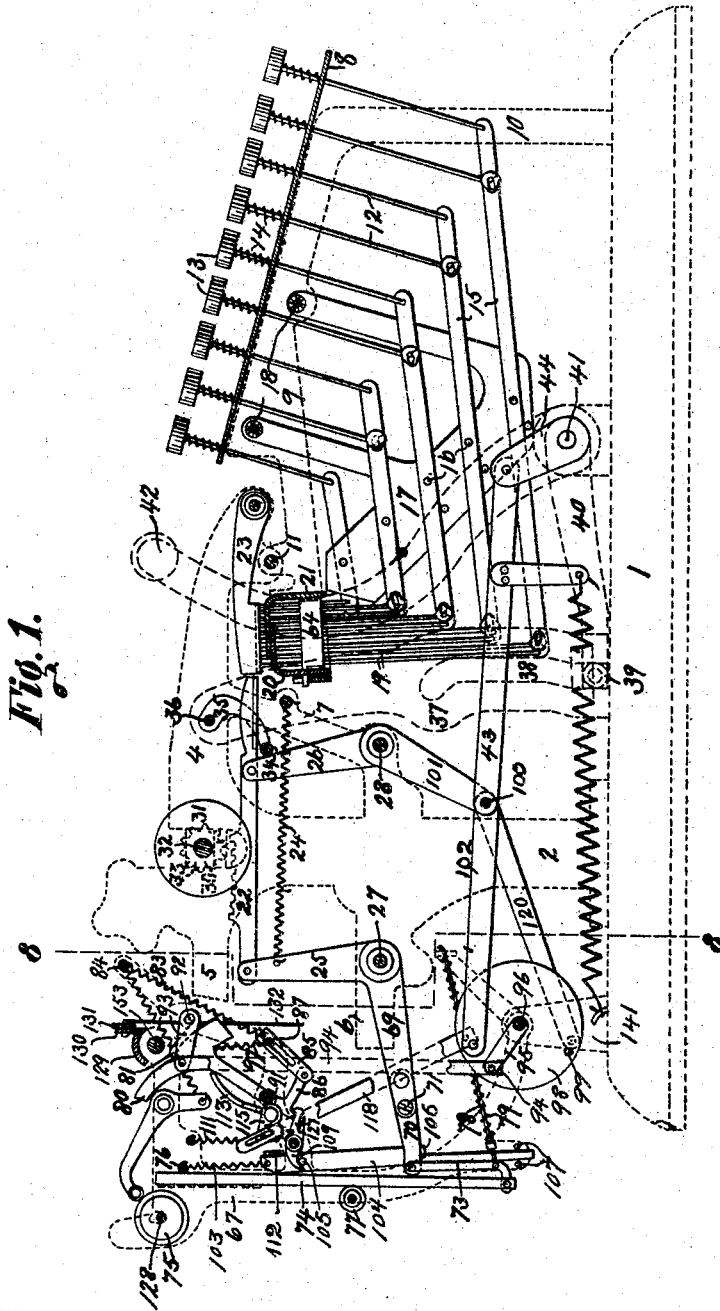


Fig. 1.

WITNESSES:

C. H. Berthoff
Clare Force.

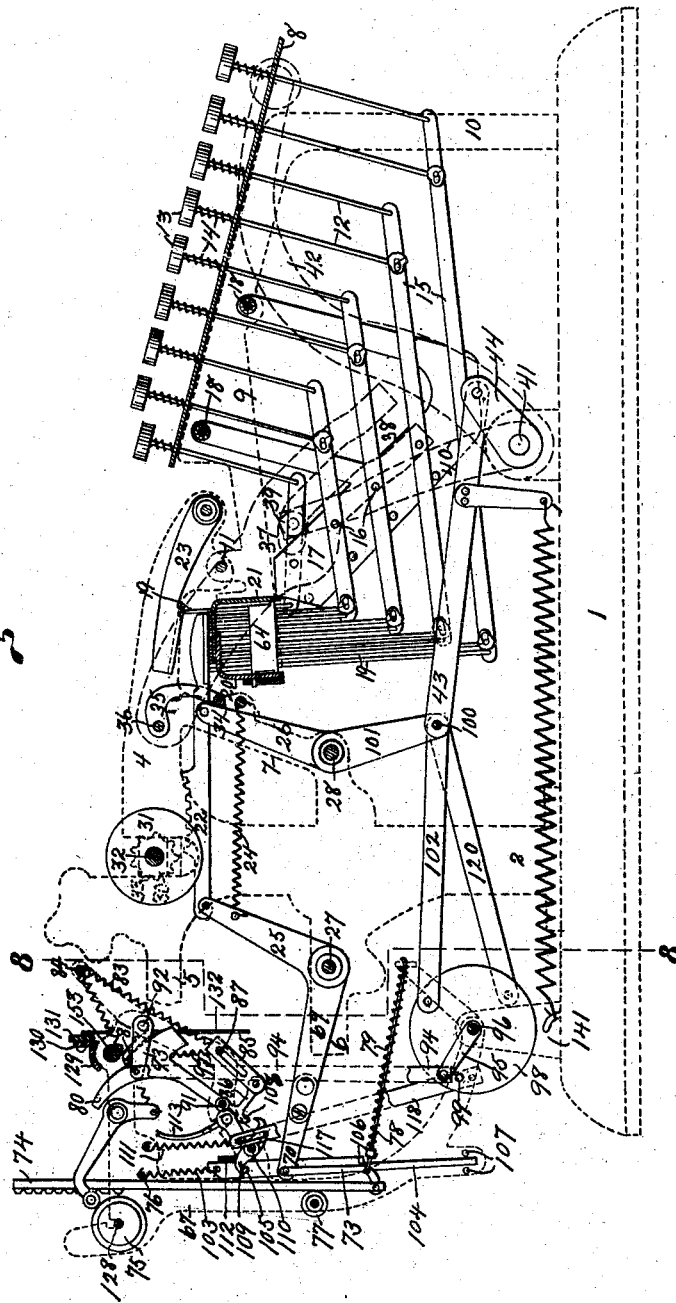
INVENTOR.

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14 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:

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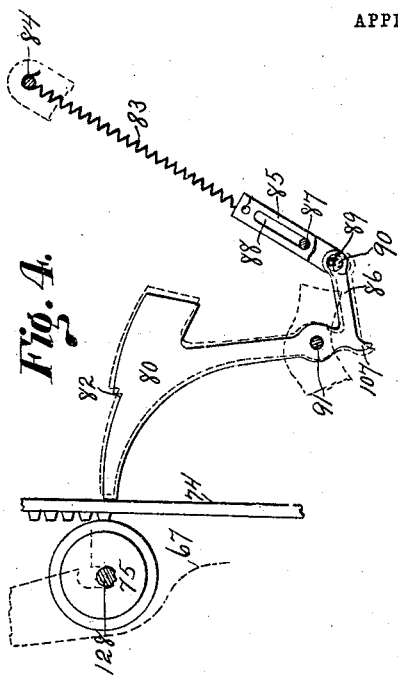
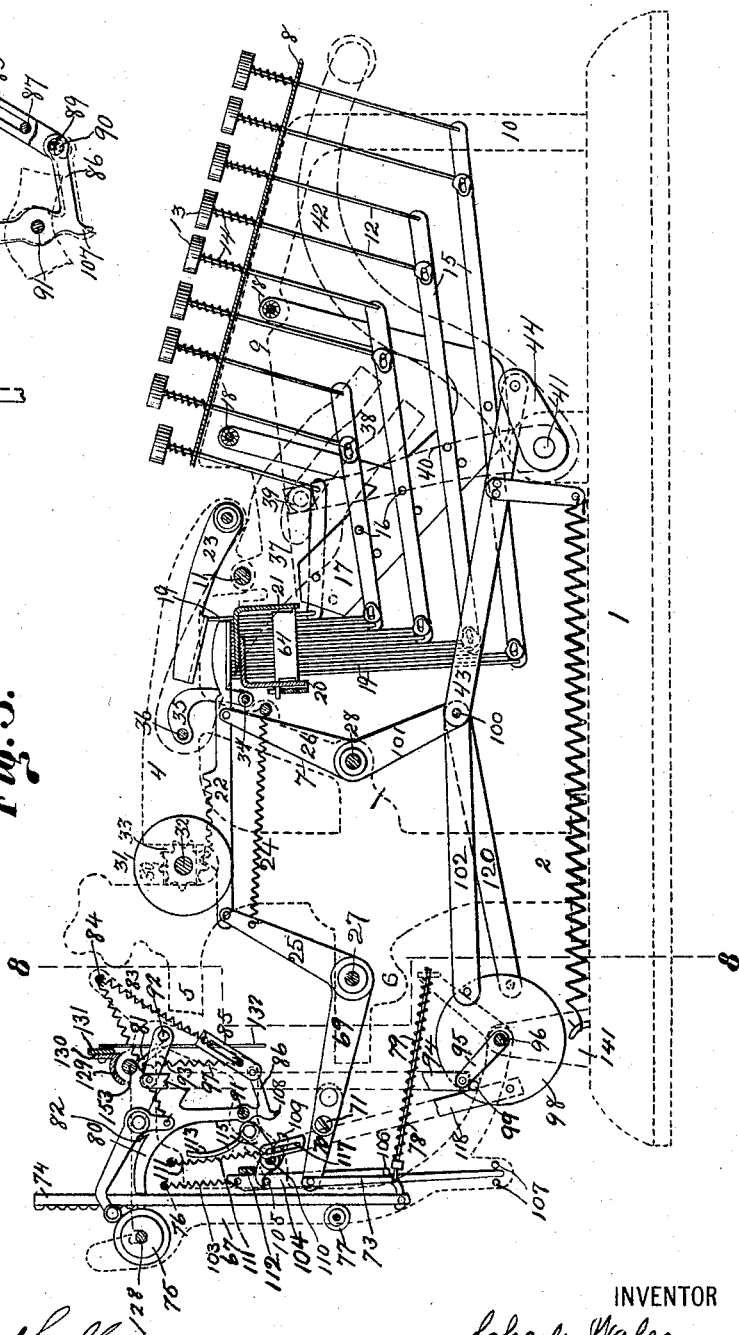
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14 SHEETS—SHEET 3.

**Fig. 3.**

WITNESSES:

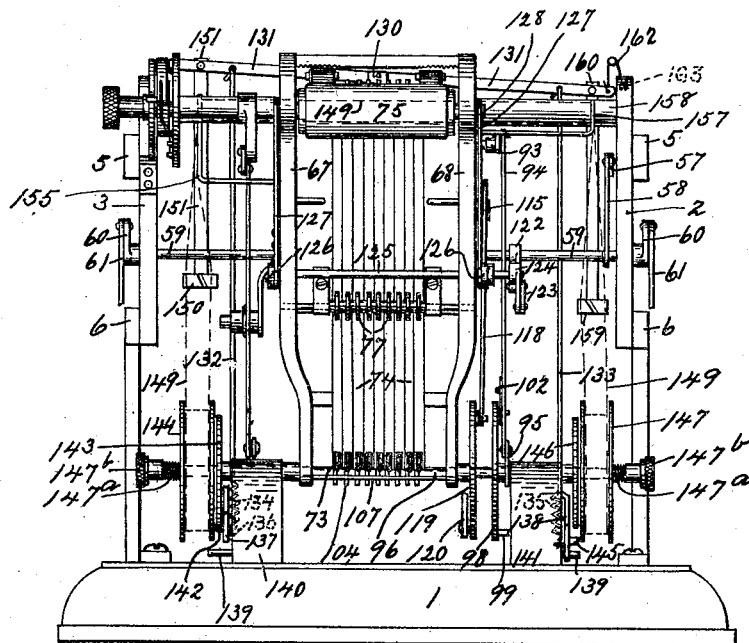
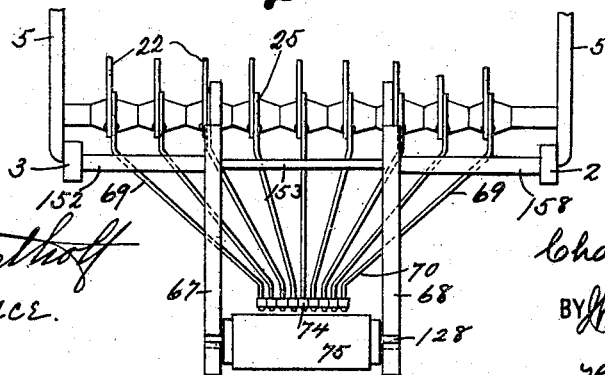
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14 SHEETS—SHEET 4.

Fig. 5.*Fig. 10.*

WITNESSES:

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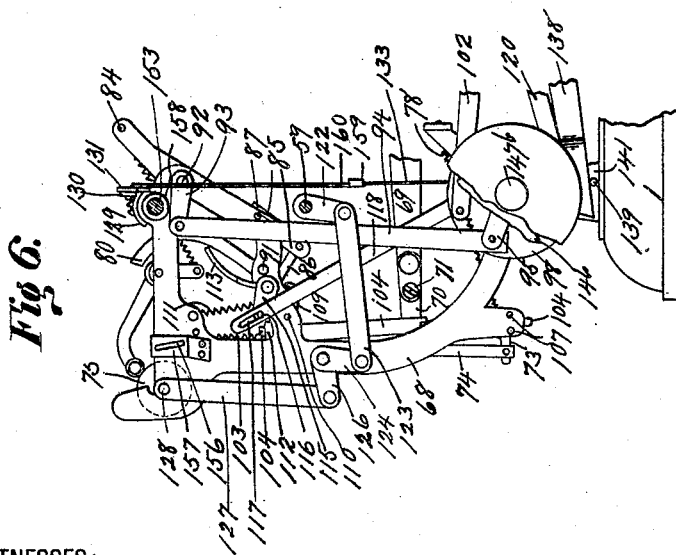
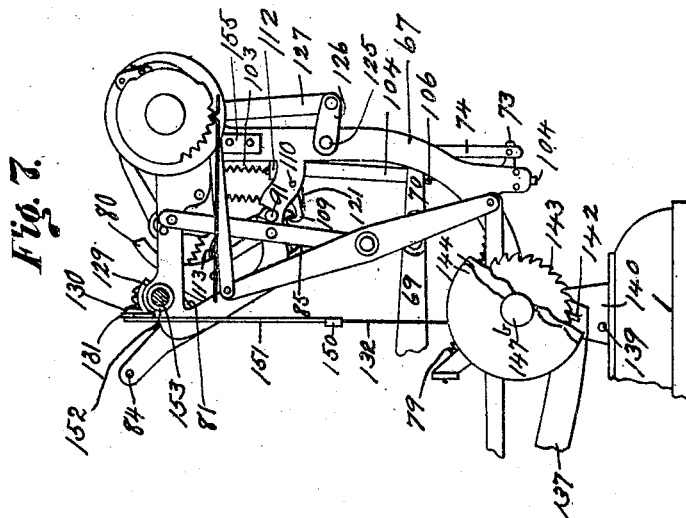
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WITNESSES:

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PRINTING MECHANISM FOR ADDING MACHINES.

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Fig. 8.

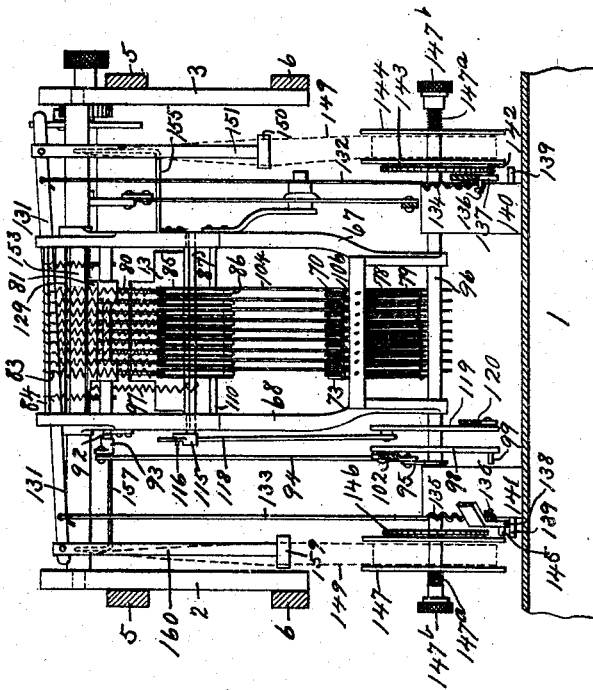
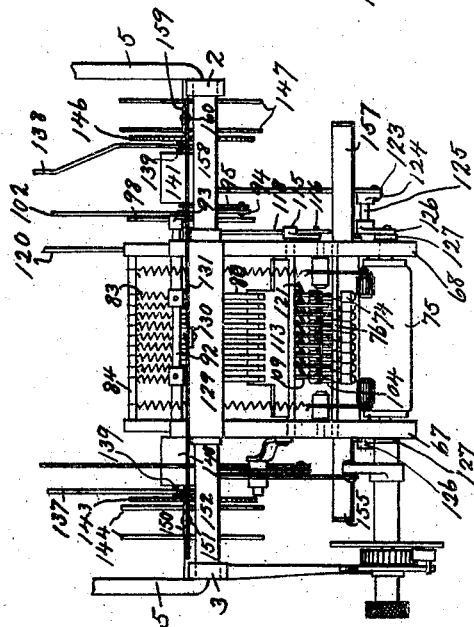


Fig. 9.



WITNESSES:
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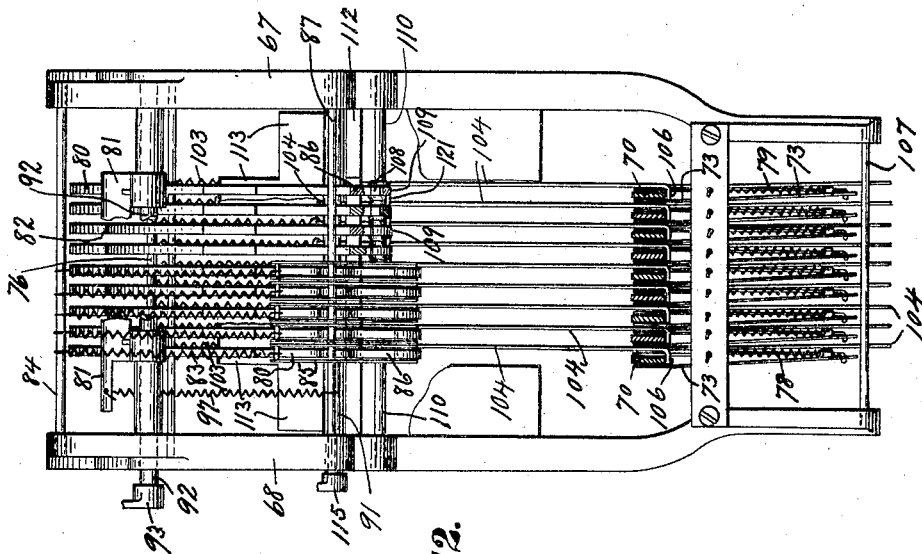


Fig. 12.

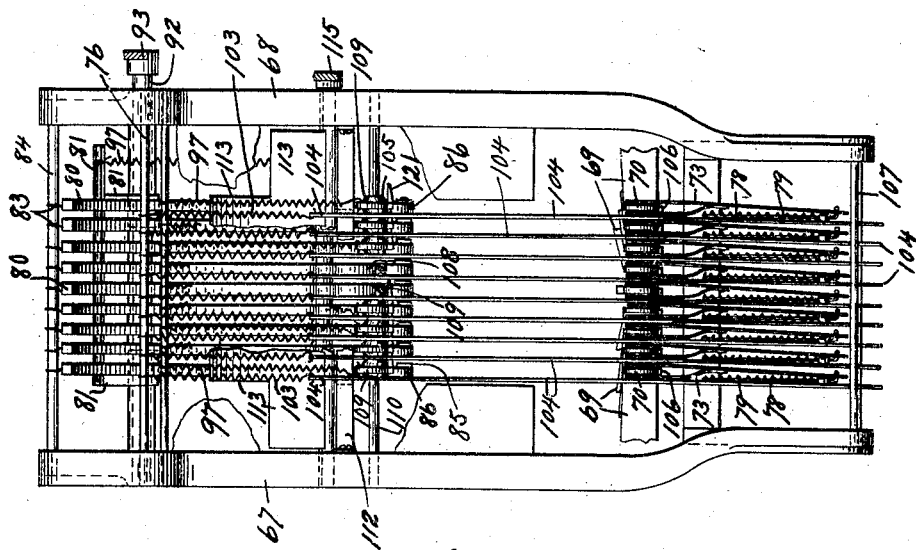


Fig. 11.

WITNESSES:

C. H. Barthoff
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INVENTOR

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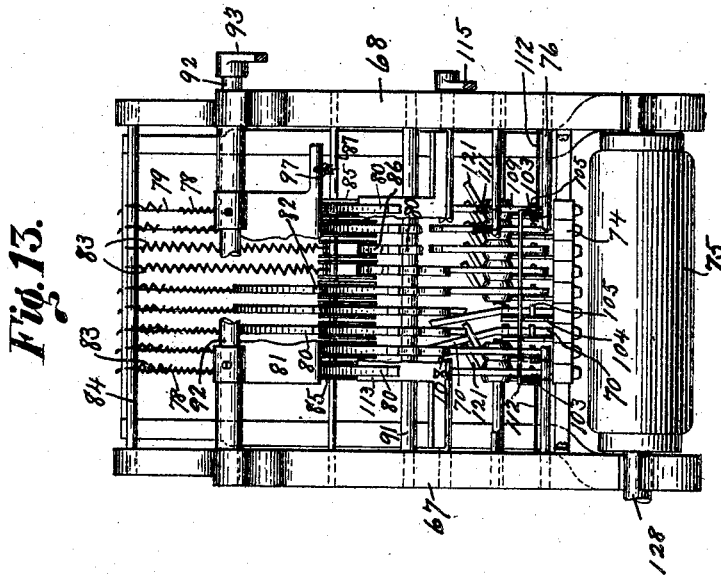
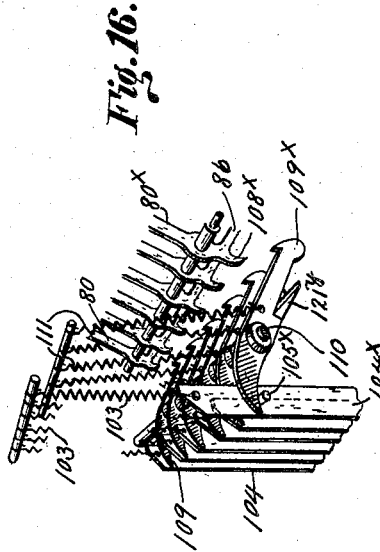
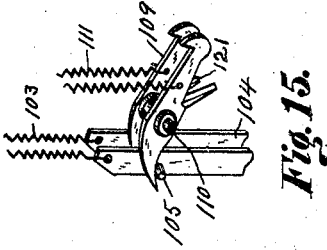
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PRINTING MECHANISM FOR ADDING MACHINES.

APPLICATION FILED SEPT. 15, 1903.

14 SHEETS—SHEET 8.



WITNESSES:

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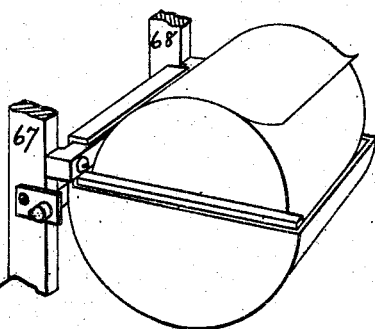
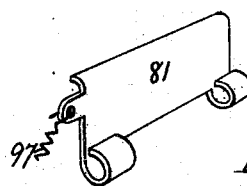
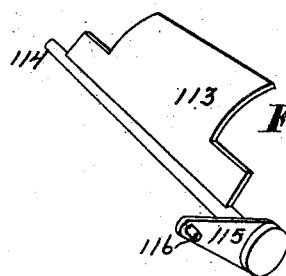
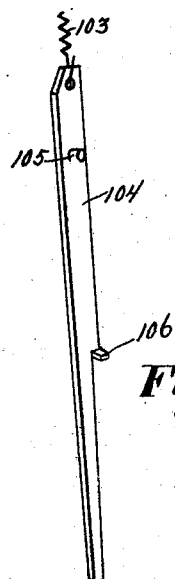
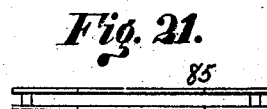
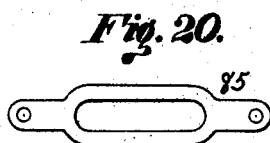
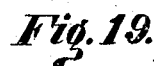
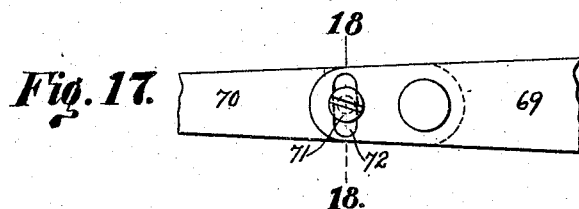
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PRINTING MECHANISM FOR ADDING MACHINES.

APPLICATION FILED SEPT. 15, 1903.

14 SHEETS—SHEET 9.



WITNESSES:

C. H. P. Smith
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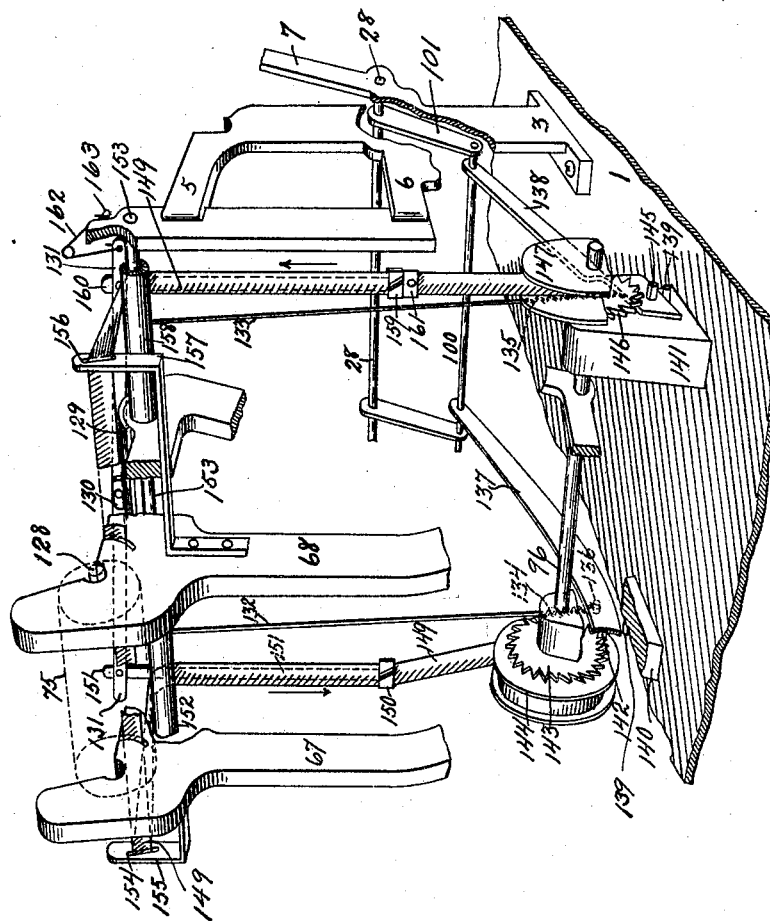
C. WALES.

PRINTING MECHANISM FOR ADDING MACHINES.

APPLICATION FILED SEPT. 15, 1903.

14 SHEETS—SHEET 10.

Fig. 25.



WITNESSES:

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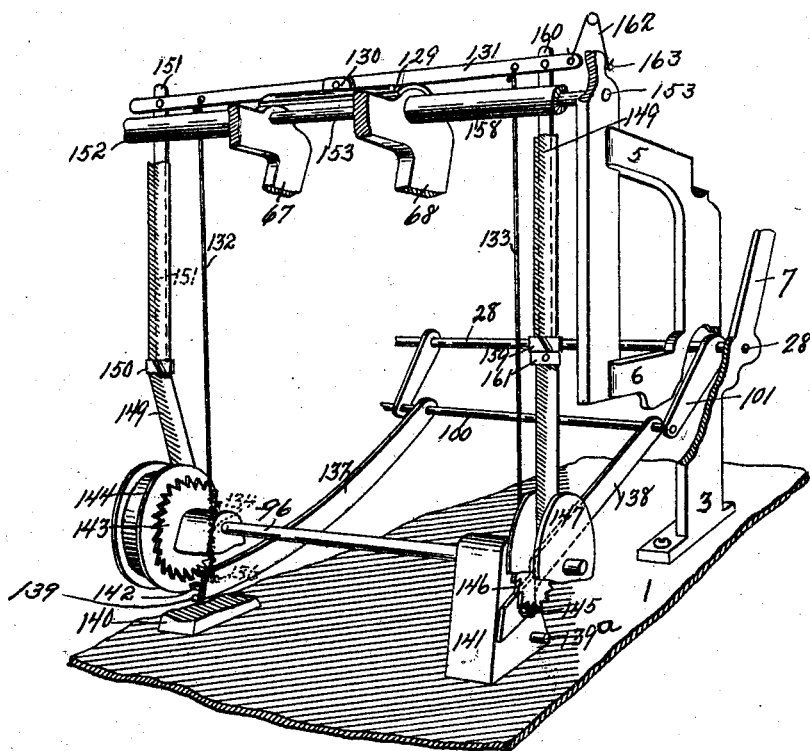
BY *William R. Baird*

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C. WALES.
 PRINTING MECHANISM FOR ADDING MACHINES.
 APPLICATION FILED SEPT. 16, 1903.

14 SHEETS—SHEET 11.

Fig. 26.



WITNESSES:

C. A. Benthoff
Chas. Face.

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C. WALES.
PRINTING MECHANISM FOR ADDING MACHINES.
APPLICATION FILED SEPT. 15, 1903.

14 SHEETS—SHEET 12.

Fig. 27.

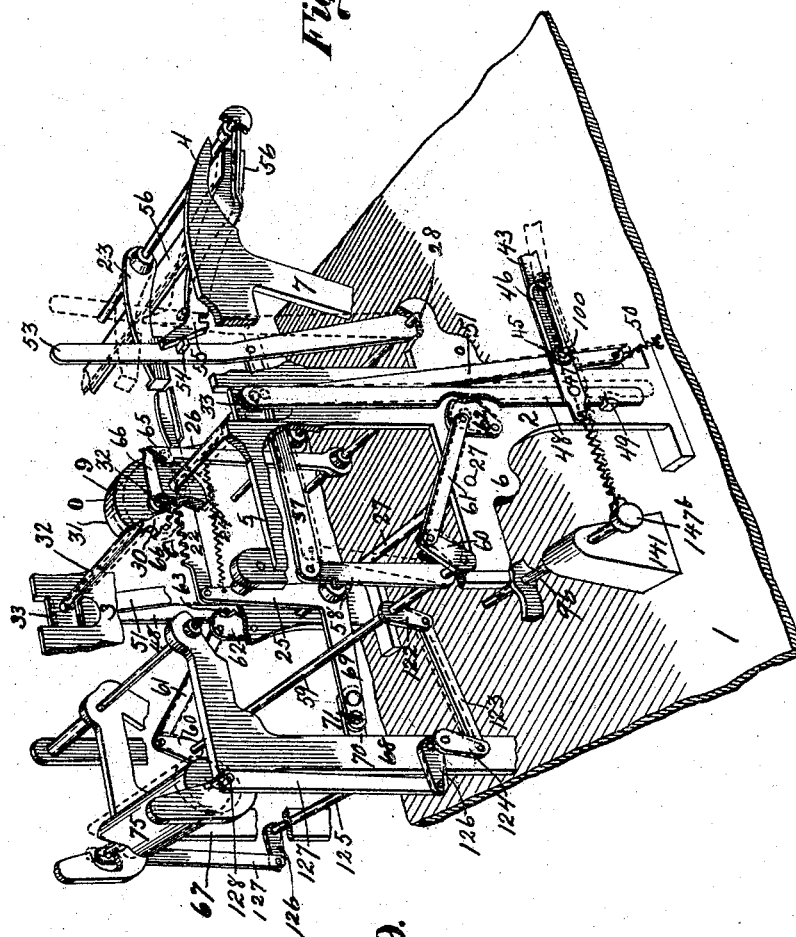
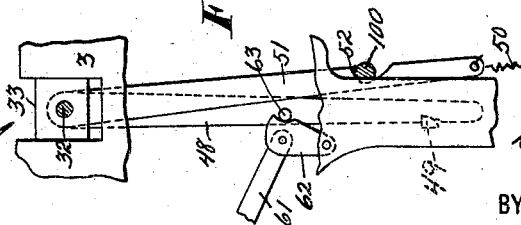


Fig. 29.



WITNESSES:

C. A. Benthall
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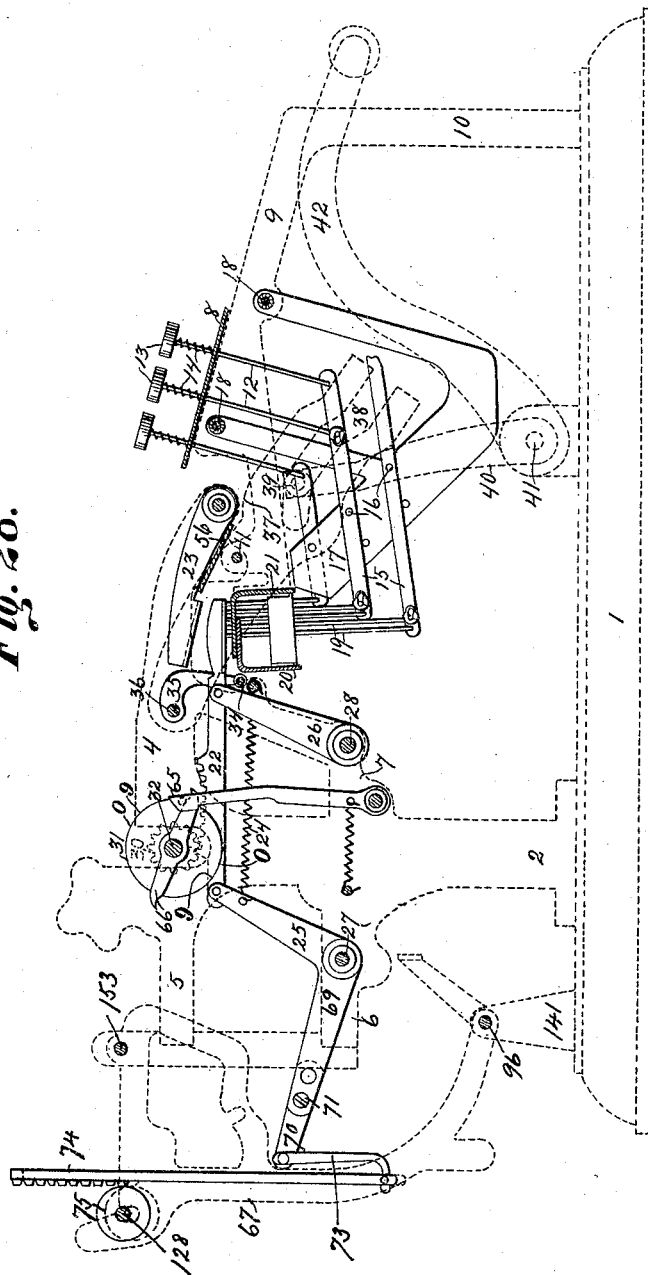
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C. WALES.
PRINTING MECHANISM FOR ADDING MACHINES.
APPLICATION FILED SEPT. 15, 1903.

14 SHEETS—SHEET 13.

Fig. 28.



WITNESSES:

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No. 794,205.

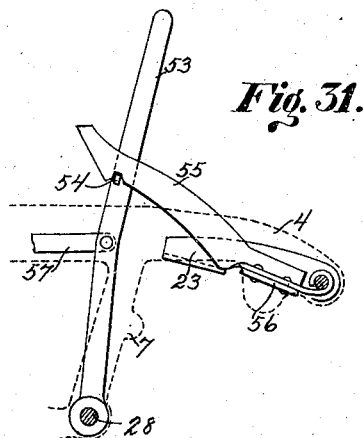
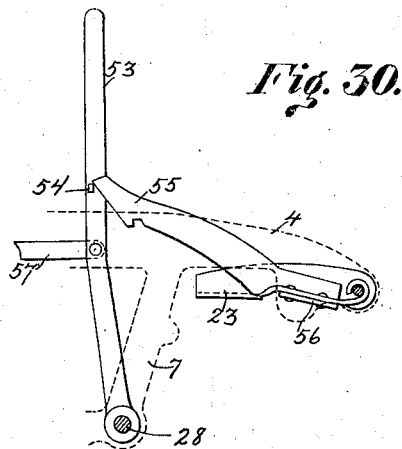
PATENTED JULY 11, 1905.

C. WALES.

PRINTING MECHANISM FOR ADDING MACHINES.

APPLICATION FILED SEPT. 15, 1903.

14 SHEETS—SHEET 14.



WITNESSES:

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UNITED STATES PATENT OFFICE.

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

PRINTING MECHANISM FOR ADDING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 794,205, dated July 11, 1905.

Application filed September 15, 1903. Serial No. 173,319.

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 Printing Mechanism for Adding-Machines, of which the following is a specification.

This invention relates generally to mechanism for printing or recording the results of the operation of adding or calculating machines, but more particularly to certain mechanism for this purpose specially applicable for use with an adding-machine which I have invented and which forms the subject-matter of an application for United States Letters Patent of even date herewith, to which application reference is made for a specific description of such adding or calculating machine. The general mechanism of the adding-machine comprises a keyboard and key-levers, which will remain in either one of their two positions (with the keys either raised or depressed) until removed therefrom by an impulse received from the operator through the keys or other parts of the machine. These key-levers operate a series of stops and interpose them into the path of racks which by suitable connecting mechanism determine the position of numeral or registering wheels, the position of each particular stop thus interposed determining the extent of rotation of the corresponding wheel, and consequently the particular numeral on the wheel at the predetermined point selected for view or registration when such rotation is checked. The numeral on the key depressed corresponds with the numeral on the wheel at the predetermined point referred to. Suitable stop-and-release mechanism is provided which holds the racks until the number desired to be added has been written on the keyboard by the depression of the proper keys. The racks are moved up to the determining-stops by springs and actuate the wheels during their return to their original positions, which return movement is effected through the operation of a main handle or lever, by the action of which all numeral-wheels are simultaneously rotated, which cor-

respond with all racks whose displacement has been determined by the interposition of their corresponding stops. Mechanism is also provided for resetting the displaced keys both by the usual operation of the machine or for purposes of correcting errors in displacement, carrying to the next adjacent wheels on the left when any particular wheel has been rotated nine or more spaces, and for resetting the wheels to expose zero at the observation-point referred to. It is obvious that if it is desired to make a permanent record of the results accomplished by these operations printing mechanism must be provided which will operate with and be governed in its action by the calculating mechanism. Such printing mechanism is the subject of this application, and in order that its construction and operation may be readily comprehended I will now proceed to describe it in detail, reference being had to the accompanying drawings, in which—

Figure 1 represents a vertical sectional view of the whole machine on an irregular plane cutting through from front to rear, the parts being in their normal or rest positions, parts being illustrated in dotted lines. Fig. 2 represents a similar view with the parts in the positions they assume near the end of the forward throw of the main operating lever or handle and immediately preceding the strokes of the hammers of the printing mechanism. Fig. 3 represents a similar view with the parts in the positions they assume at the strokes of the hammers. Fig. 4 represents a detail view, on an enlarged scale, illustrating the rebound of the hammers after striking. Fig. 5 represents a view of the machine in rear elevation. Fig. 6 represents a view in elevation of the left side of the printing mechanism. Fig. 7 represents a similar view of the right side of the printing mechanism. Fig. 8 represents a view in transverse vertical section on the plane indicated by the broken line 8 8 of Fig. 1 looking toward the rear of the machine, parts of the frame being omitted. Fig. 9 represents a plan view of the printing-machine with the operating-rods broken away. Fig. 10 represents a partial

plan view. Fig. 11 represents a view in rear elevation with the type-bars omitted and other parts broken away. Fig. 12 represents a transverse vertical sectional view on the same plane as that of Fig. 8 with some of the parts therein shown omitted. Fig. 13 represents a partial plan view with some parts omitted and others broken away. Fig. 15 represents a detail perspective view showing how two adjacent triggers contact. Fig. 14 represents a detail perspective view of one of the triggers. Fig. 16 represents a detail perspective view illustrating the trigger mechanism. Fig. 17 represents in side elevation a type-bar-elevating arm and its adjusting mechanism. Fig. 18 represents a sectional view on the plane indicated by the broken line 18 18 of Fig. 17. Fig. 19 represents in detail perspective view a type-bar and connections. Fig. 20 represents in flat face view a hammer-connecting link. Fig. 21 represents the same in edge view. Fig. 22 represents in perspective a hammer-trigger-throwing bar. Fig. 23 represents in perspective the hammer-setting shutter. Fig. 24 represents in perspective the hammer holding and releasing shutter. Fig. 25 represents in perspective view the ribbon-feeding mechanism in the positions assumed at end of the movement of the ribbon in one direction. Fig. 26 represents a similar view with the parts in the positions assumed when adjusted to reverse the movement of the ribbon. Fig. 27 represents in perspective view the mechanism for totaling a column of figures in normal position, the positions assumed after the throw of the totaling-lever being shown in dotted lines. Fig. 28 represents a view in side elevation, illustrating the relation of the type-bar mechanism with the registering mechanism during the totaling operation. Fig. 29 represents a view in elevation of the mechanism for dropping the numeral-wheel shaft for bringing the wheel into mesh with the rack. Fig. 30 represents in side elevation the hand means for raising the rack-retaining latches or stops to permit of movement of rack to reverse the rotation of the numeral-wheels, the stops being down. Fig. 31 represents in side elevation the same parts with the lever thrown and the stops raised. Fig. 32 represents in perspective view the paper-roll holder.

In order that the construction and operation of the printing mechanism and its relation to and dependence upon the adding mechanism may be more readily understood, I will first give a brief description of the adding mechanism, it being understood that such adding mechanism forms no part of the present invention, it being fully described and claimed in the application before referred to.

Referring particularly to the drawings by reference characters, the frame of the machine (illustrated in Figs. 1, 2, and 3 in dotted

lines and in other figures in part in full lines) comprises a base 1, preferably rectangular in shape, upon which is mounted on each side an upright, as at 2 3, from which project forwardly and rearwardly arms 4, 5, and 6, the forward arms being connected with the uprights by braces or brackets 7.

8 indicates the keyboard, from which supports the forward portion of the machine, which I denominate the "keyboard-section," a frame-piece, as at 9, being secured to and depending therefrom at each side, which terminate at their forward ends on depending legs 10, adapted to rest on base 1, said frame-pieces being connected at their rear ends to the main frame-arms 4 by means of a cross rod or bolt 11.

The whole machine 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 12, upon the tops of which are secured keys 13, held normally in their raised positions by springs 14, coiled around the key-rods between the keys and the keyboard. The keys and the trains of mechanism connected therewith are arranged in series, each comprising keys bearing numerals from "1" to "9," inclusive, and the series extending longitudinally of the machine side by side, that series on the right of the machine being intended to be operated to add units, the next series on the left tens, and so on, the number of series used being determined by the capacity necessary to fit each particular machine for its intended use. In the several views illustrating this mechanism only one series is generally used, inasmuch as all the series are constructed and operated alike, and the general mechanism, such as the main operating-lever, the resetting devices, &c., are connected to each of the series in the same manner. In each series the key-rods 12 are pivotally connected at their lower ends to key-levers 15, pivoted intermediate their ends, as at 16, to frame-pieces 17, secured to the keyboard frame-pieces 9 by cross rods or bolts 18, the pivotal points being so located with relation to the length of the key-levers as to give each key-lever the proper length forward and aft of its pivot to move a stop-bar, as at 19, upward when the key is depressed to a proper operative position, said stop-bars being pivotally connected to the rear ends of the key-levers and passing upward in longitudinal series through slots in angle-plates 20 21, secured to the frame-pieces 9 by suitable bolts. The parts described, together with parts of the stop, supporting, and releasing or key-resetting mechanism, form the so-called "keyboard-section," which may be removed bodily from the machine without removing any of the other mechanisms. When a key is depressed,

a corresponding stop-bar is raised in the path of a rack 22, raising at the same time a rack-retaining pawl or stop 23 out of the path in which the rack will now be moved forward by its spring 24 until it is checked by the raised stop, said stop 23 being shown raised in Figs. 2 and 28 and lowered in the path of the rack in Figs. 1, 3, and 27. Each rack 22 is mounted on the upper ends of arms 25 26, pivoted on cross-
 10 rods 27 and 28, mounted in the side frames, and is normally drawn forward by the spring 24, secured to arm 25 and the frame. The racks during this movement and when in normal or rest positions are below and out of mesh with the
 15 pinions 30, which are secured to the numeral-wheels 31, mounted on shafts 32, journaled in sliding blocks 33, mounted in the side frames. As the racks must be in mesh with these pinions in order to actuate the numeral-wheels,
 20 provision is made to drop these shafts before the racks are given their acting or rearward return stroke, the mechanism for effecting which will be described later. The arms 25 and 26 are normally held, Fig. 1, against the
 25 tendency of the spring 24 to move them forward by contact with rollers on a cross-rod 34, secured in the free ends of a series of curved arms 35, secured to a rock-shaft 36, journaled in the side frames, and to permit the racks to
 30 make their forward movement this shaft is rocked to move the rollers away from arms 26 by means of a bar 37, also secured to the rock-shaft, which is provided with an open-ended cam-slot 38, in which works a roller 39
 35 on a pin projecting laterally from a crank-arm 40, secured to the main rock-shaft 41, mounted in bearings on the frame of the machine, when said main shaft is rocked forward by the forward movement of the main handle or
 40 operating-lever 42. When this forward movement is taking place, a link 43 on a cross-rod, Fig. 27, is drawn forward by its connection with a crank-arm 44, Fig. 1, on the main shaft 41, drawing a cross-rod 100, carried by arms
 45 101, on which its inner or rear end is attached, Fig. 27, backward in a slot 46 in a link 47, pivoted to a latch-bar 48, depending from the end of wheel-shaft 32, Figs. 27 and 29, and when near the end of the stroke the roller
 50 pulls on the end wall of the slot the link 47 and latch-bar 48 are pulled forward the latter is disengaged from a catch 49 on the frame, by means of which it had supported the wheel-shaft, allowing the shaft and numeral-wheel
 55 to drop into mesh with the rack, this dropping being facilitated by a spring 50, which draws downward on a second latch-bar 51, also depending from the wheel-shaft. At the end of the next forward stroke the roller
 60 45 on cross-rod 100 is pressed under a shoulder 52 on latch-bar 51, again raising that latch-bar and the shaft, carrying with it the wheel again out of mesh with the rack. When it is desired to return the numerals back to normal
 65 position, so as to expose zero at the observa-

tion-point, it is necessary to put them into mesh with the rack during the forward stroke, and this is accomplished by drawing forward a hand-lever 53, Figs. 27, 30, and 31, pivoted to the frame, which simultaneously
 70 carries a pin 54 under and raises a latch 55, secured to a cross-plate 56, extending under the rack-retaining pawls or stops 23, thereby raising said pawls out of the path of the racks and by drawing on a link 57, Fig. 27, connecting it with an arm 58, secured to a rock-
 75 shaft 59, rocks said shaft and causes a crank-arm 60 at each end thereof to push forward links 61 and press pivoted plates 62 against pins 63, projecting from latch-bars 48, pushing the latch-bars off the catches 49 and causing the wheels to drop into mesh with the racks, the latter being pulled forward by their springs, turning the wheels back to zero.

A broad pawl or shutter 64, Figs. 1, 2, 3, 85 and 28, rests normally against each series of key stop-bars 19 and is manipulated by means of mechanism fully described in the copending application hereinbefore mentioned to reset or drop any raised stop of a series when
 90 another stop of said series is raised, thus correcting any error in depressing the keys, and a trigger 65, Figs. 27 and 28, acting in conjunction with a double-ended pawl 66 on each numeral-wheel and with a train of mechanism also fully described and illustrated in the
 95 aforesaid copending application, serves to carry one to each adjacent numeral-wheel on the left when any numeral-wheel has been rotated ten or more spaces.

The foregoing description sufficiently explains the construction and operation of the adding-machine to which the printing mechanism of the present application is applied, and I will now proceed to describe the printing
 105 mechanism and its connection and co-operation with the adding mechanism.

In the printing device there are two main mechanisms—to wit, that pertaining to and operating the type and that pertaining to and
 110 operating the hammers, the type being arranged on vertical type-bars and consisting of a type-bar for each series of keys and numeral-wheels, the type-numbers from "0" to "9" being arranged on the type-bars from
 115 top to bottom, increasing downward. These type-bars are brought into position through suitable connections to bring the type bearing the same number as the corresponding numeral-wheel exhibits when the key has been
 120 depressed by the operation of the main operating handle or lever during its forward stroke, and the hammers are set up into position and operated to strike the type through the same medium and during the same stroke,
 125 while during the operation of the return stroke of the handle the inking-ribbon is fed forward one step to present a fresh part to the next type. The paper upon which the results are printed is also fed by the proper
 130

connecting mechanism on the return stroke. The printing mechanisms are all supported by supplementary side frame-pieces, as at 67 and 68, forming parts or extensions of the main frame-pieces hereinbefore described. The arm 25, which supports the rack, is extended in the form of an elbow-lever, the arm 69 of which is of two pieces, the extension or end piece 70 being pivoted to the main body at 71, Figs. 1 to 3 and 17 and 18, and held so as to be adjustable on its pivot by means of a bolt or screw 71, passing through a transverse slot 72 in the main body and through the extension. The forward movement of a rack 22 will throw arm 69 upward and through the medium of a link 73, pivoted at one end to the end of extension 70 and at the other end to the type-bar 74, (illustrated in detail in Fig. 19,) will raise the type-bar a distance to bring the type bearing the number corresponding to that on the depressed key to a printing-point opposite to a roller or platen 75, over which the paper to be printed upon is passed. The type-bar is guided by a cross-rod 76 in the frame-pieces and a roller 77 on another cross-rod similarly supported, being held against these guides by a thrust-spring 78 on a rod 79, attached to link 73, a type-bar being shown in Fig. 2 raised to a position to bring the "9" type to the printing-point, the corresponding "9" key being shown depressed, and the corresponding rack being shown moved forward and stopped against the "9" key stop raised in its path. The provision of the adjustable end 70 of arm 69 is for the purpose of giving a neat adjustment to the upward throw of the type-bar to insure accuracy. The mechanism so far described is now ready to print, which act is performed by the corresponding hammer 80 of that particular series, there being a hammer for each type-bar in each train or series of adding and printing mechanisms. In the normal or rest position, as shown in Fig. 1, all of the hammers 80 are thrown back ready to strike and are maintained in that position by a shutter or broad pawl 81, whose outer downwardly-curved edge rests in notches 82 in the hammers, Figs. 2 and 3, and is held therein until at about the end of the forward stroke of the operating lever or handle, when the shutter is raised, permitting the hammer to strike under the stress of spring 83, Figs. 1 to 4, secured at one end at 84 to a cross-rod in the frame and carrying at the other end a link 85, (shown in detail in Figs. 20 and 21,) which is double and embraces the end of an arm 86 of the hammer, a cross-rod 87, secured in the frame, passing through a slot 88 in the link, and a pin 89 in the end of the link passing loosely through a hole 90 in the arm 86. When the slotted link 85 is drawn by the spring to the end of its stroke and the end wall of the slot reaches the cross-rod, as in Fig. 4, the hammer has reached the position shown in dotted lines in that figure and the impulse it has received carries it to the position shown in full lines, causing it to strike the type-bar, after which, owing to the play of the pin 89 in hole 90, it rebounds to the dotted-line position and does not bind upon the type-bar, the hammer being loosely pivoted on a cross-bar 91. The shutter (shown in detail in Fig. 24) is mounted on a pivot-rod 92, which has secured to it a crank-arm 93, which is pivotally secured at its outer end to a link or bar 94, connected loosely at its lower end by a link 95 with a cross-rod 96, and is yieldingly held in the notches 82 of the hammers by a spring 97, Fig. 24, connecting the shutter 81 with cross-rod 87 until a disk 98, Figs. 1 to 3, 5 and 8, journaled on cross-rod 96, has rotated far enough to cause a lateral pin 99 on said disk to strike the bar 94 (see 53) and raise it against the force of spring 97, thus raising the shutter out of the hammer-notches and releasing all of the hammers. This rotation of the disk 98 is accomplished during the forward movement of the main operating-lever 42, which by rotating the shaft 41 rocks the crank-arm 44, drawing link 43 and a cross-rod 100 (carried by arms 101, swinging from cross-rod 28) forward, drawing with them a link 102, connected to disk 98 above its center. The raising of the shutter 81 releases all of the hammers; but there is a releasing mechanism for the individual hammers, which have been set for striking, which is operated before this general release. When the type-bar is raised by the upward movement of the extension 70 of arm 69, as before described, a spring 103, secured to the fixed cross-rod 76, (from which spring is suspended a trigger-throwing bar 104, which is provided with a laterally-projecting pin 105 and a flange or fin 106, engaging under extensions 70, and is guided between two pins 107, projecting from the frame,) is permitted to carry up the bar 104. When a hammer has been set, a tooth 108 on it is engaged by the hook end of a trigger 109, pivoted on a cross-rod 110 and held in such engagement by a spring 111, connecting the trigger forward of its pivotal point with the frame. The trigger-throwing bar 104 in its upward movement, as described, brings its pin 105 into contact with the trigger and releases it from the hammer, leaving the hammer still held back until released by the general release movement before described, the upward movement of the bar 104 being limited by the striking of its fin 106 against the extension 70 of arm 69, as seen in Fig. 1, and the bar 104 being guided against a fixed flat bar 112. The hammers are all set up in striking position simultaneously by a shutter 113, (shown in detail in Fig. 23,) whose pintle 114 is journaled in the frame and has secured to it a crank-arm 115, provided with a pin 116, which works in a slot 117 in a link 118, connected at its lower end to a wrist-pin above the center of a disk 119, loosely journaled on

the cross-rod 96, Figs. 5 and 8. A wrist-pin below the center of the disk 119 is connected by a link 120 with the cross-rod 100, and when the last-named cross-rod is pushed rearward by the return movement of the main operating-lever the link 120 rotates disk 119 and pushes the link 118 and crank-arm 115 upward, causing the shutter 113 to press all of the hammers forward, thus setting them up into striking position. As the forward movement of the main operating-lever takes place the motions of these parts are reversed, thus drawing the shutter away from the hammers to the position shown in Fig. 1, leaving them free to strike the type-bars when released, as before described. The normal positions of the type-bars is with the zero-type at the printing-point, and when zero is to be printed—as, for instance, in printing “10,” “100,” “1,000,” &c.—raising of the type-bars which are in such normal positions. Inasmuch as the act of raising the type-bar also trips the triggers, some means must be provided to trip the triggers of the hammers which are to strike the zero-type. For this purpose each trigger, Figs. 14, 15, and 16, is provided with a fin 121, projecting laterally to the left under the next adjacent trigger. When ten is to be printed, the type-bar of the tens series is raised one step, while that of the units series remains in normal position. In raising the tens type-bar its pin 105 on its bar 104 strikes its individual release-trigger, as before described, and the trigger in descending at its forward end presses down on the fin 121 of the units-series trigger, also tripping that trigger and releasing its hammer. In the same manner in the printing, say, of “100,000,” the one key of the sixth series toward the left, and the operation of the connections in that series will cause its trigger-releasing bar (marked 104^x in Fig. 16) to cause its pin 105^x to trip its trigger 109^x from the hook 107^x of its hammer 80^x, and at the same time to press down fin 121^y, tripping the next trigger to the right, each trigger tripping its next right-hand neighbor down to and including that of the units series. The triggers being each held in engagement with its hammer by a spring 111 and the bars 104 being each raised by a spring 103 this arrangement for tripping the triggers to the right necessitates that the spring 103 of each series be strong enough to raise its bar against the pull of its own trigger-spring 111 and the springs 111 of all series to the right. To accomplish this, all of the springs 103 might be made of the same strength of the last one to the left; but this would be a waste of weight and material and would make the units-series spring 103 (and all others except the left-hand one) entirely too strong. To overcome this and to make the operation of all the series regular and easy, I graduate the springs 103 in strength, increasing from right to left, each

being made just strong enough to do its required work.

The operation of printing the results as far as described herein completes the adding and recording of the result of a single operation of all the machinery begun by depressing one key, say the “9” key, of the units series, as illustrated in Figs. 2 and 3. Now supposing another operation is to be performed, the “9” key of the units series is again depressed and the main lever pulled forward. This will again set up the type-bar of the units series (the paper having been moved upward one space, as hereinafter described) and the figure “9” will be printed under the “9” printed by the first operation. Let us now suppose that the sum of these two nines is to be printed. As hereinbefore described, the operation of the adding mechanism has caused the numeral “1” to be exposed in the tens series of units-wheels and the numeral “8” in the units series. To print these numerals, (the paper being moved up a space,) the numeral-wheel shaft is dropped, bringing the numeral-wheel pinions into mesh with racks by operating the hand-lever 53, Fig. 27, while the mechanism is in normal position. By moving the main operating-lever forward the racks are permitted to make their forward throws under the stress of springs 24, and the wheels in the two series are turned back to zero, being stopped by triggers 65. This forward movement of the racks, through medium of the arms 25 and 69, extensions 70, and link 73, raises the type-bars 74 of the two series up into printing position and the sum total of “18” is printed by the operation of the printing devices, as before described. In the regular operation of printing the single sums to be added the positions of the type-bars with relation to the platen is governed positively by the contact of the racks in their forward movements with the raised key-stops, but in printing the totals to prevent any over movement, due to the inertia of the parts, raising the type-bars slightly beyond the printing-point, such position being indicated in Fig. 28, and in order to properly print the total result as described the platen is raised up to correspond. This is done by the operation of the mechanism connected with the hand-lever 53, the rocking of shaft 59, Fig. 27, moving a crank-arm 122 thereon, and through the medium of a link 123 and a crank-arm 124 rocking a shaft 125, so as to throw up a crank-arm 126 and a bar 127, connected thereto and to the platen-shaft 128, thereby raising the platen to bring the printing-point up to correspond with the positions of the type-bars, in which positions the total sum is properly printed.

There is provided an inking-ribbon which must, as before mentioned, be moved step by step, one step after each printing operation,

which movements are effected through suitable mechanism actuated during the return stroke of the main operating-handle, the mechanism being specially illustrated in Figs. 5 and 26. Secured on top of the printing-frame pieces is a curved plate 129, from the edge of which projects a bracket 130, to which is fulcrumed, midway of its length, a bar 131, from near each end of which depends a rod, as at 132 and 133, each of said rods being connected at its lower end by a spring, as at 134 and 135, with a pin 136, projecting from each of two pawls 137 and 138, said pawls being pivotally connected at their forward ends to the cross-rod 100, carried by crank-arms 101 and secured upon rock-shaft 28, the pawls resting when in lowered positions upon pins 139 139^a, projecting from lugs 140 and 141, mounted on the base of the machine. The pawls are thus suspended from the fulcrumed bar 131 by the rods 132 and 133 and springs 134 and 135, and the arrangement is such that when pawl 137 is down, resting on pin 139^a, pawl 137 is up in position to cause a pin or tooth 142 thereon to engage the teeth of a ratchet-wheel 143, secured on a ribbon-spool 144, and, vice versa, when pawl 138 is down and resting on pin 139 pawl 137 is up and its pin or tooth 145 engages a ratchet-wheel 146 on the side of a spool 147, both spools being journaled on the shaft or rod 96, mounted in said lugs 140 and 141 and kept at proper tension by springs 147^a and thumb-nuts 147^b. The inking-ribbon 149 passes up at the front of spool 144 through a metal loop 150 at the lower end of a bar 151, depending from bar 131, thence over a roller 152 on a transverse shaft 153, thence rearwardly to and through a vertical guide-slot 154 in a bracket 155, secured to the frame, thence transversely in front of the platen 75, thence through a vertical guide-slot 156 in a bracket 157, secured to the frame, thence over another roller 158 on the shaft 153, and thence down through a loop 159 on a bar 160, depending from the opposite end of bar 131, to the rear side of spool 147. Secured to the ribbon near each end is a metal loop 161, (only one being shown.) The ribbon is fed along one step at a time during the return stroke of the main operating-lever by the backward stroke of the raised and engaged pawl, as at 137, until it is nearly all wound on the spool 144, when the loop 161 strikes the loop 159 on bar 160, forcing said bar upward, tilting the fulcrumed bar 131, raising the lowered pawl 137 into engagement with ratchet-wheel 146, lowering the raised pawl 137 out of engagement with ratchet-wheel 143, and thus reversing the movement or travel of the ribbon, the operation continuing until the ribbon is wound on spool 147, when another reversal takes place, these actions being repeated automatically as long as

the machine is operated. The reversing movement of the bar 131 is assisted by means of a spring 162, Figs. 5, 25, and 26, secured to it at one end, the opposite end of the spring being secured to a pin 163, projecting from the frame in the horizontal plane of the fulcrum of bar 131, so as to tend to hold the bar in either of its adjusted positions and to jump it quickly past the central point of its movement in the reversing operation.

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

1. The combination of numeral-wheels, racks for rotating them, type-bars, a platen, swinging arms pivoted to and supporting the racks, and connections between the swinging arms and the type-bars for adjusting the latter with relation to the platen.

2. The combination of numeral-wheels, racks for rotating them, type-bars, a platen, swinging arms for supporting the racks one of said swinging arms being extended to form an elbow-lever, and connections between the elbow-lever and type-bar for adjusting the latter with relation to the type-bars.

3. The combination of numeral-wheels, racks for rotating them, type-bars, a platen, swinging arms for supporting the racks, one of said swinging arms being extended to form an elbow-lever, and a link connection between the elbow-lever and type-bars for adjusting the latter with relation to the type-bars.

4. The combination of numeral-wheels, racks for rotating them, type-bars, a platen, swinging arms for supporting the racks, one of said swinging arms being extended to form an elbow-lever, means for adjusting the length of one of its arms, and connections between the adjustable arms of the elbow-lever and type-bars for adjusting the latter with relation to the type-bars.

5. The combination of a numeral-wheel, a rack for rotating it, a front and a rear swinging arm supporting the rack, the rear arm being formed into an elbow-lever, a platen, a type-bar bearing type from 0 to 9, means for adjusting the length of one arm of the elbow-lever, and a link connecting the outer end of said adjusting-arm with the type-bar.

6. The combination with the main operating-lever, a pivoted lever, an elbow-lever and a type-bar, of connections between the main operating-lever and one end of the pivoted lever, a rack supported on the other end of the pivoted lever and one arm of the elbow-lever, and connections between the other arm of the elbow-lever and the type-bar.

7. The combination with the main shaft, a crank-arm thereon, a pivoted lever, a link connecting the crank-arm with one end thereof, an elbow-lever, a rack pivotally connected with the other end of the pivoted lever and

one arm of the elbow-lever, a type-bar, and a link positively connecting the other arm of the elbow-lever with the type-bar.

8. The combination of a platen, vertically-slidable type-bars side by side, a hammer for each type-bar having a notch in its upper edge, means for setting the hammers in raised position, a spring-actuated shutter for engaging in all of the notches and retaining all of the hammers set, a trigger for each hammer, means for releasing the shutter, and means for releasing each trigger separately.

9. The combination of a platen, vertically-slidable type-bars side by side, a hammer for each type-bar having an arm beyond its pivot and a notch in its upper edge, a setting-shutter engaging all of the arms to set all of the hammers simultaneously, a shutter, spring-actuated to engage in all of said notches to retain all of the hammers in set position, a trigger for each hammer and separate means for releasing each shutter and each separate trigger.

10. The combination of a platen, a type-bar, a hammer, means for setting it, a trigger for retaining it in set position, means for adjusting the type-bar with relation to the platen, a spring-impelled trigger-throwing bar, and connections for permitting the trigger-throwing bar to operate.

11. The combination of a platen, a type-bar, a numeral-wheel, a rack for rotating it, a swinging bar and an elbow-lever for supporting the rack, a link connecting the elbow-lever with the type-bar, a trigger, a trigger-throwing bar having a fin engaging the elbow-lever, and a spring actuating the throwing-bar against the trigger.

12. The combination of a series of hammers having notches in their upper edges, a shutter for raising all of the hammers together, a spring-actuated shutter engaging all of the hammers to retain them raised, a trigger engaging each hammer, a main operating-lever, connections from the main operating-lever for tripping the retaining-shutter, numeral-wheels, racks for operating them, and connections from the racks for releasing the triggers.

13. The combination of a main operating-lever, a series of vertically-slidable type-bars, a series of hammers, means connecting with the operating-lever for setting the hammers, means for vertically adjusting the type-bars, a spring-actuated retaining-shutter for all the hammers, a release therefor, an individual release for each hammer, and spring-actuated means governed by the type-bar-adjusting means for operating the individual release.

14. The combination of a platen, a type-bar adjustable with relation thereto, a pivoted hammer arranged to strike the type-bar opposite the platen in any adjustment, a spring for actuating the hammer, a positive stop for the

spring near the end of the hammer-stroke, and a lost-motion joint between the hammer and spring.

15. The combination of a platen, a type-bar adjustable with relation thereto, a fixed cross-rod, a hammer pivoted on the cross-rod and provided beyond its pivot with an arm having a hole therein, a second fixed rod, a slotted link mounted on said second rod, a spring drawing on one end of the link, and a pin on the opposite end of the link smaller than the hole in the hammer-arm and engaging loosely therein.

16. The combination of a shaft journaled in the frame, a disk thereon, means for rocking the shaft, a series of hammers, a pivoted shutter engaging the whole series in the rear, an arm on the shutter, a crank-pin on the disk, and a link connecting the crank-pin and disk.

17. The combination of a shaft, journaled in the frame, a disk thereon, means for rocking the shaft, a series of hammers, a pivoted shutter actuated to engage the whole series in the rear, an arm on the shutter, a crank-pin on the disk, a pin on the arm, and a slotted link mounted on said pin and connected to the crank-pin.

18. The combination of a series of pivoted levers having notches in their edges, a spring-actuated pivoted shutter engaging in all of the notches simultaneously, a crank-arm connected to the shutter, a main operating-lever, a disk rocked by connections therefrom, a link depending from the crank-arm, and a pin on the disk adapted to engage and raise the link to release the shutter.

19. The combination of a series of pivoted levers having notches in their edges, a spring-actuated pivoted shutter engaging in all of the notches simultaneously, a crank-arm connected to the shutter, a main operating-lever, a shaft, a disk thereon rocked by connections from the operating-lever, a link depending from the crank-arm, a link loosely connecting it to the shaft, and a pin on the disk to engage and raise the first-named link.

20. The combination of a numeral-wheel shaft in vertically-adjustable bearings, a latch depending from the shaft for engaging the shaft in its raised position, a pivoted cam-piece adjacent to the latch, means for pressing the cam-piece against the latch to trip it, a rack normally spring-pressed forward when the shaft is down, a type-bar, and connections from the rack to adjust the type-bar to printing-point during said forward movement.

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.