

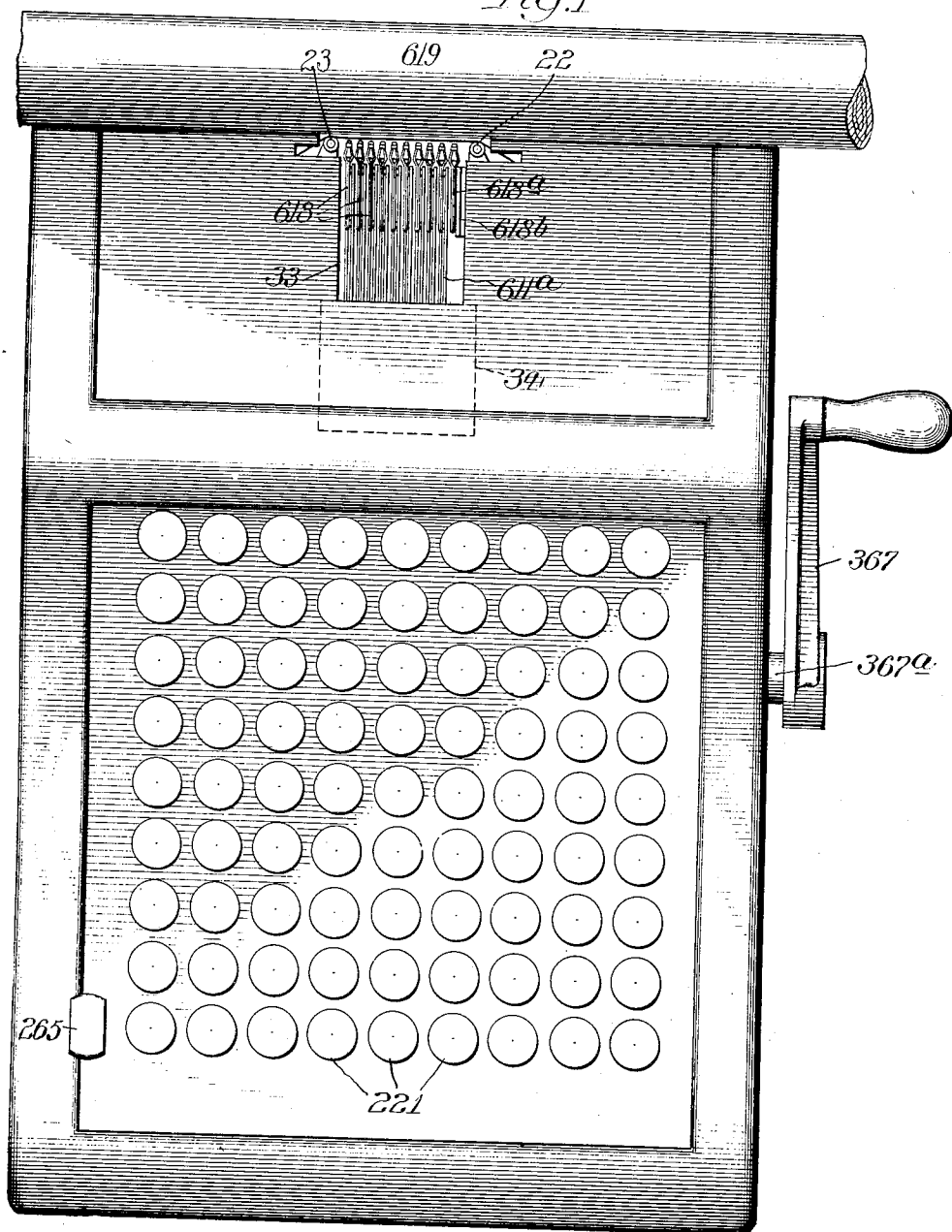
No. 823,474.

PATENTED JUNE 12, 1906.

A. MACAULEY.
ADDING MACHINE.
APPLICATION FILED JUNE 9, 1903.

5 SHEETS—SHEET 1.

Fig. 1



Witnesses:
Hendrick Barnett
Edw. R. Barnett

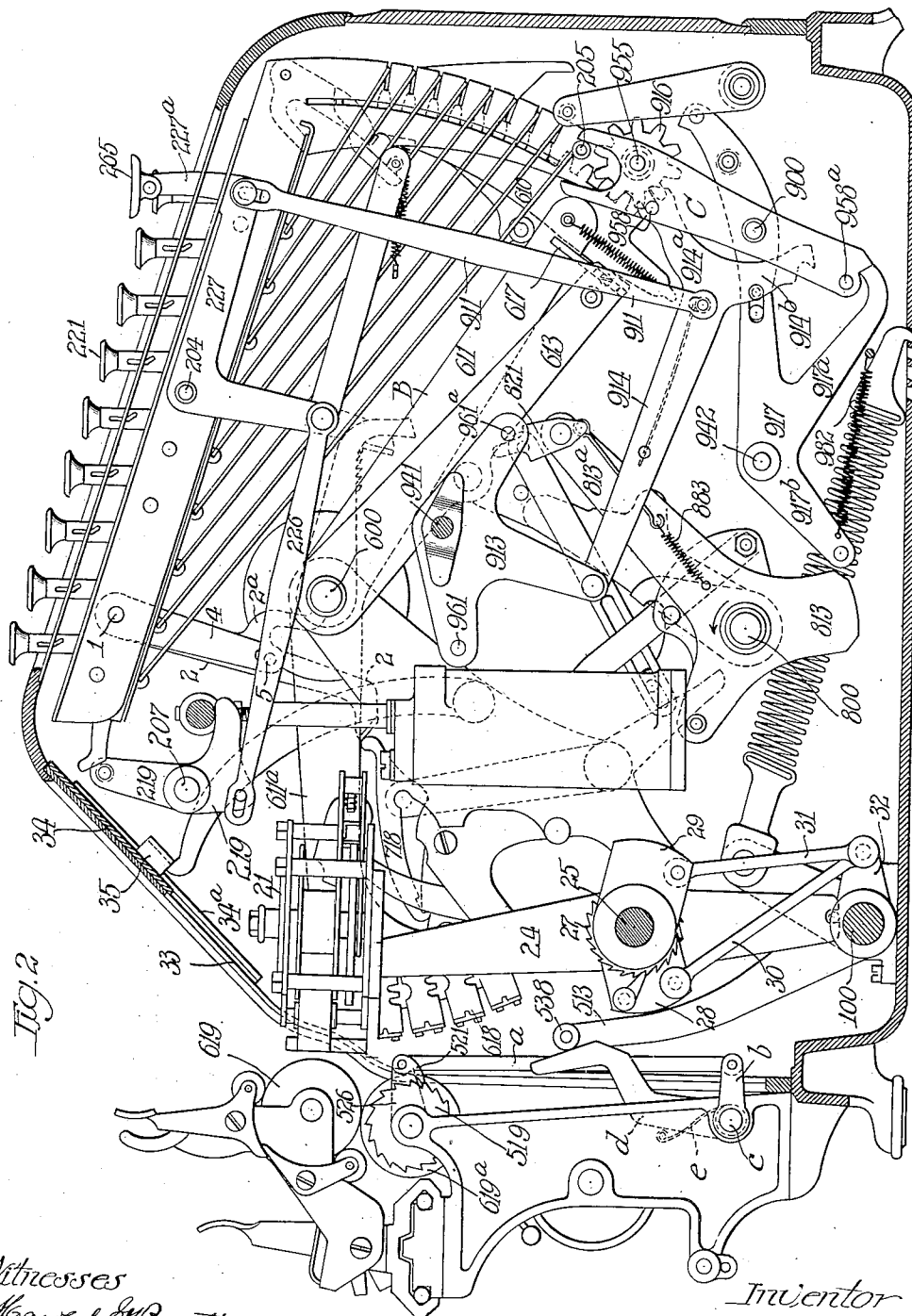
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5 SHEETS—SHEET 2.



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5 SHEETS—SHEET 3.

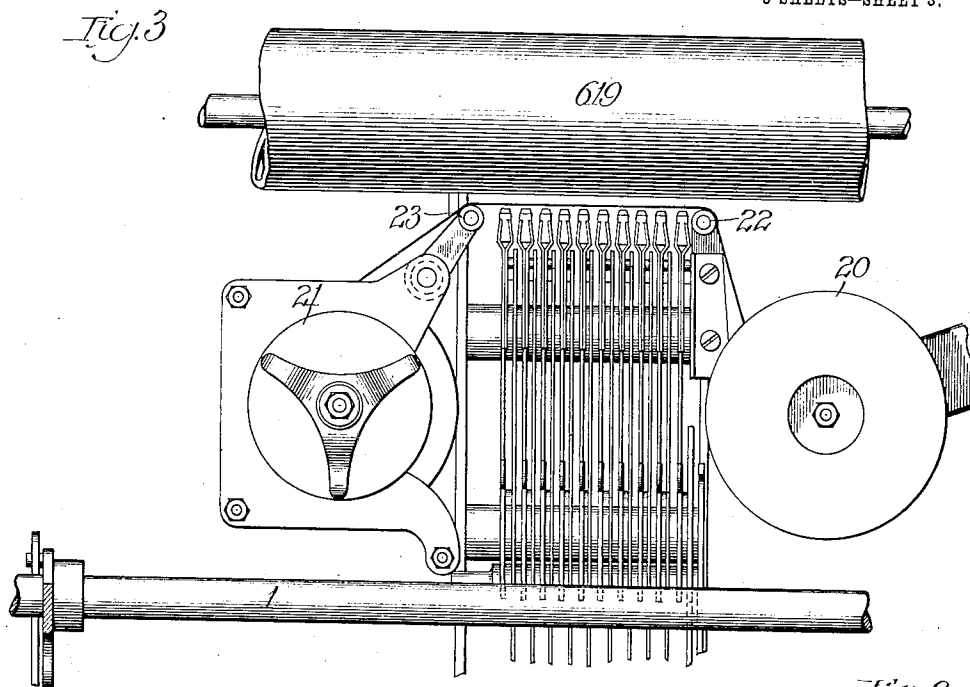


Fig. 6.

56.78
 647.56
 387.06
 3,400.43
 67.68
 44.35
 4,605.70
 507.05
 7,563.05
 123.45
 17,403.10*

Fig. 7

*
 76.86
 33.23
 444.04
 507.70
 644.03
 3.55
 56.07
 534.03
 606.07
 80.69
 706.05
 506.07
 4,198.36*

Fig. 8.

45.50^T
 606.05
 2.34
 40.50
 50.35
 745.06
 1,489.80^S
 776.50
 503.50
 55.04
 670.80
 4,506.00
 5.40
 8,007.04^T

Witnesses

Harold G. Barrett
 Edward W. Garrett

Inventor

Alma Macauley
 by Rector & Hibben
 His Attys.

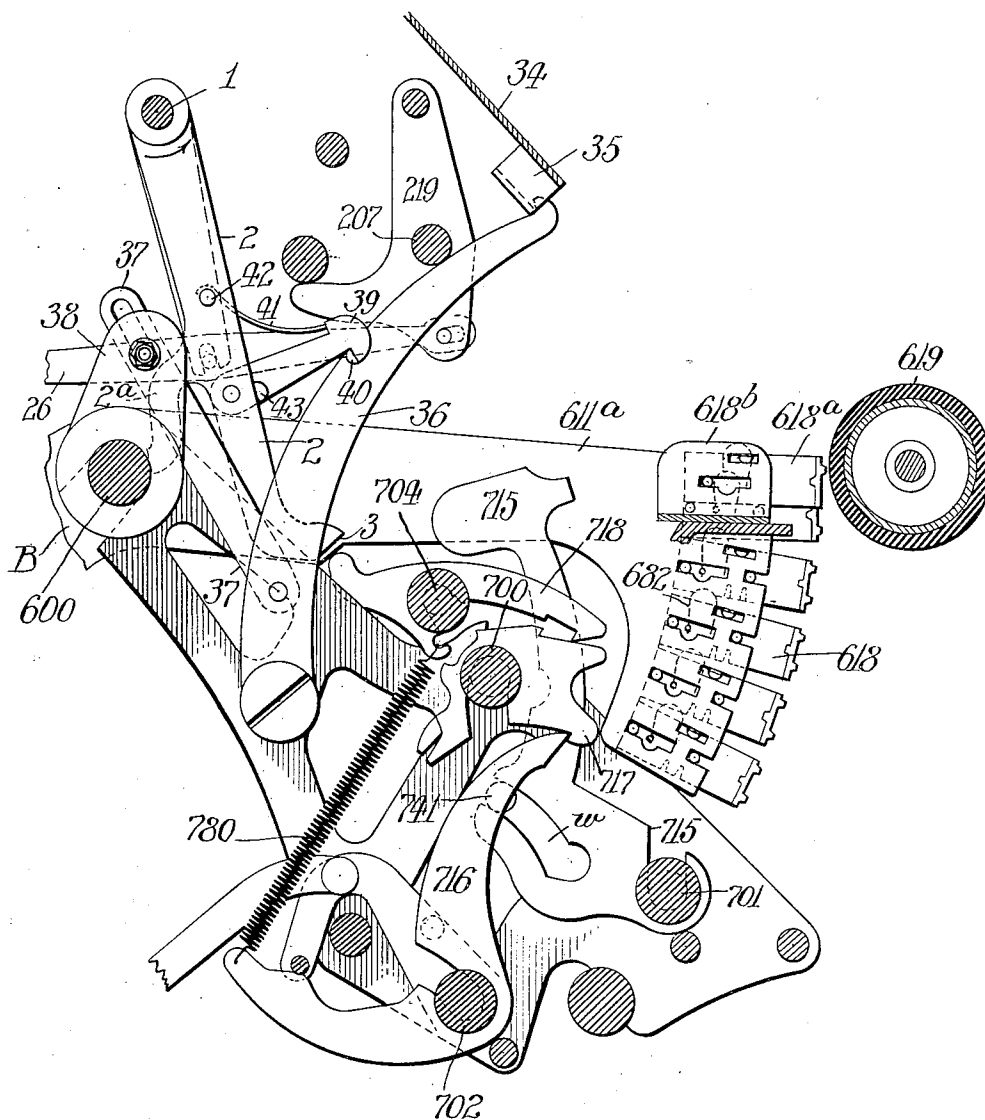
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5 SHEETS—SHEET 4.

Fig. 4



Witnesses;

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Edw. R. Barrett

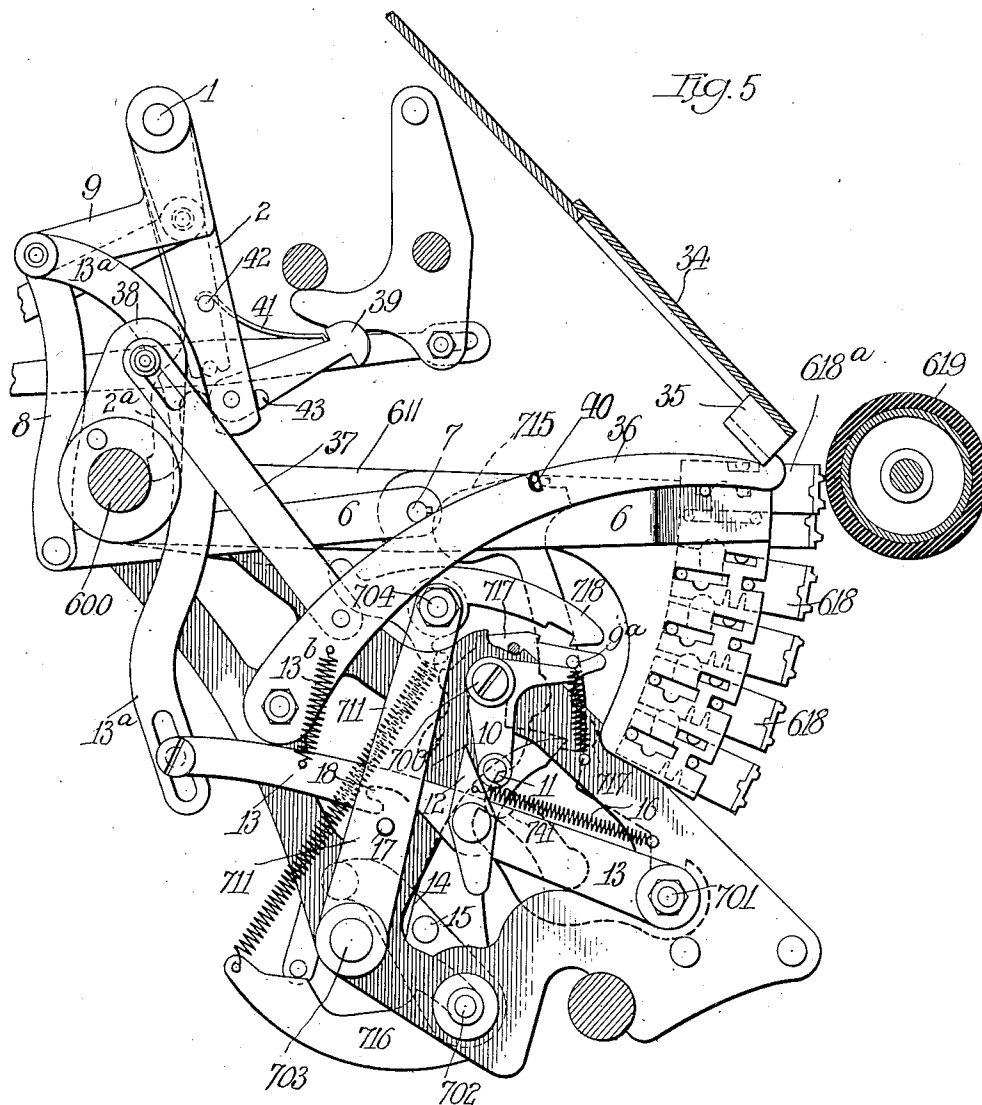
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No. 823,474.

PATENTED JUNE 12, 1906.

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ADDING MACHINE.
APPLICATION FILED JUNE 9, 1903.

5 SHEETS—SHEET 5.



Witnesses:
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UNITED STATES PATENT OFFICE.

ALVAN MACAULEY, OF ST. LOUIS, MISSOURI, ASSIGNOR, BY MESNE ASSIGNMENTS, TO BURROUGHS ADDING MACHINE COMPANY, OF DETROIT, MICHIGAN.

ADDING-MACHINE.

No. 823,474.

Specification of Letters Patent.

Patented June 12, 1903.

Application filed June 9, 1903. Serial No. 160,717.

To all whom it may concern:

Be it known that I, ALVAN MACAULEY, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Adding-Machines, of which the following is a description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates more particularly to improvements upon what is commonly known as the "Burroughs" adding-machine, illustrated and described in various Letters Patent of the United States, granted to William S. Burroughs, of which it will suffice to refer to Nos. 504,963 and 505,078, dated September 12, 1893; but it is applicable in its essential features to other adding-machines of a similar character or intended for a similar purpose.

The Burroughs machine and others of similar character are employed in banks and counting-houses for the purpose of printing lists of items or amounts, adding up such lists and printing at any time the total of the added items. As heretofore constructed, there has been no efficient or satisfactory provision for distinguishing in the lists of printed items or amounts, particularly where carbon duplicates of the list are made, those amounts which represent "totals" and those which represent individual items; and my invention has for its object the provision of means for causing the printing of totals to be accompanied by the printing of some distinguishing mark or character which will serve to identify such totals, both upon the original and upon the duplicate lists, and distinguish them from individual items. Again, in machines of this character it is essential that at the beginning of operations the machine shall be "clear"—i. e., that the adding-wheels shall have nothing added upon them and shall stand at zero or initial position—so that when a list of individual items is printed and added and the machine then operated to print the total of such list the proper amount of such total will be printed and not have included in it any amount standing upon the adding-wheels at the beginning of operations. In the ordinary use of machines of this character the printing of a total clears the machine or returns the adding-wheels to zero or initial position, and it

is therefore the practice at the beginning of operations to operate the machine in the manner to print a total in order to insure that the machine is clear before beginning the printing and addition of the individual items to be listed. In these machines as heretofore constructed if the machine is operated in a manner to print a total when the adding-wheels are already at zero or initial position nothing will be printed upon the sheet of paper, and there will therefore be nothing upon such paper to indicate whether or not the machine was cleared at the beginning of operations.

Another object of my invention is the provision of means for causing a distinguishing mark or character to be printed upon the paper whenever the machine is cleared, to thus indicate at the head of a column of items that the machine was cleared before the first item was printed.

Again, in the Burroughs machine and others as heretofore constructed the arrangement of the printing mechanism has usually been such that the printing point or line has been concealed from the view of the operator, so that a printed item cannot be seen until advanced from the printing-point by a movement of the paper-feeding mechanism. Owing to this arrangement of the printing devices also it has been difficult to adjust the paper upon which the items are to be printed to the exact position required for the printing of items or columns of items at a given point upon the paper, particularly where vertically-ruled sheets of paper for tabulated work are employed.

My invention has for one of its objects the provision of means for effecting the printing of items and amounts in sight of the operator of the machine while the operator is in normal position for operating the machine and the provision of means for permitting the paper to be readily adjusted in relation to the printing devices in such manner as to cause the items or columns of items to be printed in exactly the desired position upon the paper.

In the accompanying drawings, Figure 1 is a top plan view of a Burroughs machine embodying my invention; Fig. 2, an elevation of the left side of the machine within the casing, the latter being shown partly in section; Fig. 3, a detail top plan view of the printing

devices at the rear of the machine; Fig. 4, a detail side elevation of the type-segments and associated devices; Fig. 5, a view corresponding to Fig. 4, showing means for printing marks or characters indicating both totals and subtotals; and Figs. 6, 7, and 8 views of printing done by the machine.

The same characters of reference are used to indicate corresponding parts in the several views.

For a detailed description of the construction and operation of the machine illustrated in the accompanying drawings reference may be had to the prior patents above mentioned and earlier patents referred to therein. It will suffice here to explain that the keyboard of the machine comprises a plurality of rows of keys 221, Fig. 1, extending from front to rear of the machine, the keys in each row being numbered to represent the nine digits and the keys in the respective rows representing different denominations in increasing order from right to left.

Within the machine upon a central rock-shaft 600, Fig. 2, are hung a plurality of levers B, (one for each row of keys,) whose downwardly and forwardly extending arms 611 carry at their forward ends upwardly-extending gear-toothed racks 610, whose teeth are adapted to mesh with the pinions 916 of the adding-wheels, which are mounted upon a shaft 955 in the lower forward part of the machine, said shaft being itself mounted in a rocking frame, hereinafter described. The rearwardly-extending arms 611^a of the levers B carry at their rear ends the type-plates 618, Figs. 4 and 5, whose type are adapted to be forced against the platen-roller 619, over which the strip or sheet of paper upon which the printing is to be done is passed.

Each lever B is held in the normal position shown in Fig. 2 by a latch controlled by the corresponding rows of keys in the keyboard of the machine, and when any key in any row is depressed the latch of the corresponding lever is tripped and the front end of the lever and the rack 610 carried by it are released, so that they may (later) swing downward until arrested by a stop projected into the path of one of the moving parts by the operated key. The downward movement of the front end of the lever B will be accompanied by an upward movement of its rear end, which carries the type-plates 618, and the adjustment of parts is such that the movement permitted the lever prior to its being arrested by the stop of the operated key will bring the particular type representing the value of such key into printing position immediately in front of the platen 619. The levers B do not move immediately upon the tripping of their latches by the operated keys, but only upon the subsequent movement of the operating-handle 367, Fig. 1. This handle is secured upon the projecting right-hand end of a stub

rock-shaft 367^a, journaled in the right-hand side of the framework of the machine. This rock-shaft is connected with the rock-shaft 600 by a train of mechanism not necessary to be here illustrated or described, whereby when the shaft 367^a is rocked by pulling forward the operating-handle 367 the shaft 600 will be rocked in the same direction. Fast upon the rock-shaft 600 at opposite sides of the machine, Fig. 2, are two downwardly and forwardly extending levers 613, which are connected beneath the front ends of the levers 611 by a cross-bar 617, whose opposite ends extend upward along the sides of the outside levers 611. The operating-handle and parts moved by it are yieldingly held in and returned to normal position by suitable springs, so that when the operating-handle is pulled forward the frame composed of levers 613 and cross-bar 617 will be swung downward and rearward, and when the operating-handle is released said frame will be swung forward and upward again to normal position. This frame constitutes the restoring or resetting frame for the levers B, its downward and rearward movement at the operation of the handle permitting such levers B as have been released by the tripping of their latches to swing downward until arrested by the stops of the operated keys, as heretofore explained, and the return forward and upward movement of the frame serving to restore such levers to normal position upon the release and return of the operating-handle.

If the racks 610 of the levers B remained in mesh with the pinions 916 of the adding-wheels during the downward movement of the racks, at the forward movement of the operating-handle the pinions and adding-wheels would be turned distances corresponding to the values of the operated keys. In the present instance, however, the pinions 916 are swung forward out of gear with the racks 610 at the forward movement of the operating-handle and downward movement of the released racks, so that they are not turned by the racks during the downward movement of the latter; but at the return upward movement of the parts the pinions are swung rearward into gear with the racks and turned by the latter distances corresponding to the previous downward movement of the racks. This is accomplished by mounting the supporting-shaft 955 of the pinions 916 in a swinging frame composed of two side arms C, located at opposite sides of the machine and fast upon the opposite sides of a rock-shaft 900. The upper end of one of these arms C is bifurcated, as shown in Fig. 2, and cooperates with a stop 205, which limits the forward and backward movement of the rocking frame carrying the pinions. This rocking frame is operated for the purpose mentioned in the following manner and by the following means: Pivotal support-

ed upon a stud 941, projecting inward from the left-hand side frame of the machine, is a three-armed lever 913, whose vertically-de-
 5 rear end of a forwardly-extending arm 914, which is supported near its forward end by a long link 911, depending from a stud upon the front end of a bell-crank 227, fulcrumed upon the framework of the machine at 204
 10 and having at its forward end an upwardly-extending stem 227^a, carrying a finger-piece 265. This bell-crank 227 and its stem 227^a and finger-button 265 constitute the total-
 15 key of the machine, which is yieldingly held in and returned to its normal position, Fig. 2, by springs acting upon other parts of the machine connected with it and not necessary to be referred to here. It suffices for present
 20 purposes to say that the upper end of the link 911 is supported by the key or bell-crank 227 and that the lower end of the link is pivoted to and supports the forward end of the
 25 arm 914. At its front end this arm 914 is divided into two diverging arms 914^a and 914^b, the former of which extends upward immediately adjacent the side arm C of the rocking
 30 frame carrying the train of pinions and is provided with a notch engaging a stud 958 upon said side arm. Under this arrangement of
 35 parts it will be understood that if the arm 914 be swung bodily forward by forward movement of the lower end of the vertical arm of the lever 913 and lower end of the link 911 it
 40 will force forward the rocking frame carrying the pinions and disengage them from the racks 610. This movement of the parts is accomplished at the forward movement of the
 45 operating-handle by the following means: Journaled in the lower middle part of the machine is a rock-shaft 800, connected with the
 50 rock-shaft 367^a, which carries the operating-handle in such manner that the forward movement of the handle rocks the shaft 800 backward in the direction of the arrow in Fig.
 55 2. Fast upon the shaft 800 is a three-armed lever 813, whose upwardly and forwardly extending arm 813^a carries a pivoted wiper block or plate 821, adapted to cooperate with
 60 studs 961 and 961^a upon the backwardly and forwardly extending arms of the three-armed lever 913. A contractile spring 883, connected by a rod or wire to the lower end of the
 65 pivoted plate 821, tends to swing said plate into alinement with the lever-arm 813^a, upon which the plate is pivoted, and in the position of the parts shown in Fig. 2 holds the upper
 end of said plate against the rear side of the stud 961^a. When the operating-handle is pulled forward and the shaft 800 thereby
 rocked in the direction of the arrow, the upward and rearward movement of the lever-
 arm 813^a will engage one of the shoulders of the pivoted plate 821 with the stud 961^a of the three-armed lever 913, thereby forcing
 upward the forward arm of said lever and

swinging forward its depending vertical arm, which latter will force forward the arm 914 and cause its upwardly and forwardly extending front arm 914^a, engaging the stud 958, to swing forward the rocking frame C,
 70 carrying the pinions 916, and disengage the latter from the racks 610, so that the racks may swing downward without turning the pinions.

The lower end of the side arm C of the rock-
 75 ing frame is shaped to cooperate with the forward end of one arm 917^a of a lever 917, fulcrumed on a stud 942, projecting inward from the framework. A spring 982, connected at its
 80 forward end to a fixed stud and at its rear end to the rear arm 917^b of the lever 917, yieldingly holds said lever in the position shown in Fig. 2, with the front end of its arm 917^a engaged
 85 with the lower end of the side arm C of the rocking frame carrying the pinions and adding-wheels and serving to hold the latter in their normal rearward position. When the
 90 upper end of the rocking frame C is swung forward in the manner and by the means before explained, its lower end will be swung
 95 rearward, forcing downward the front end of the lever 917^a as the pointed lower end of the side arm C of the frame passes over the end of the lever-arm, and the latter then en-
 100 gages the forward side of the pointed lower end of the side arm and yieldingly holds the pinion-carrying frame in its forwardly-rocked position. The operations thus described,
 105 due to the forward movement of the operating-handle, will have swung the lever-arm 813^a and its pivoted plate 821 rearward into proximity with the stud 961 on the rear-
 110 wardly-projecting arm of the lever 913, and at the end of the forward movement of the operating-handle the pivoted plate 821 will
 115 stand in substantially the same relation to the stud 961 that it occupies in respect to the stud 961^a in Fig. 2, its upper end bearing against the forward side of the stud and the
 120 plate itself being rocked upon the lever-arm 813^a to a position opposite that occupied by it in Fig. 2. At the return or backward movement of the operating-handle the rock-
 125 shaft 800 will be rocked forward to normal position, and as the lever-arm 813^a swings forward the rear shoulder upon the pivoted
 130 plate 821 will engage the stud 961 of the lever 913 and force the rearwardly-projecting arm of said lever upward, thereby swinging its vertically-de-
 135 pending arm rearward and drawing the arm 914 backward to normal position, and in this backward movement the arm C will carry the rocking frame with it, owing to the engagement of the notched end of the arm 914^a with the stud 958 upon the
 frame C, thereby reengaging the pinions 916 with the racks 610 at the beginning of the return movement of the operating-handle, so that as the levers 611, carrying the racks, are
 returned to normal position by the restoring-

frame 613 to 617 the pinions and adding-wheels will be turned distances corresponding to the previous downward movements of the respective racks.

5 It will be understood that at the end of the forward movement of the operating-handle and of the downward movements of the respective racks which have been released by the operations of the keys in the rows corresponding to them the type-plates carried by the rear ends of the levers B will have been swung upward into positions to present at the printing-line immediately in front of the platen 619 the respective types corresponding to the values of the operated keys, and while the parts are in such position at the end of the forward movement of the operating-handle those types are forced rearward against the platen by means of strikers or hammers, hereinafter described, to effect the printing of the amount represented by the operated keys, an inked ribbon being passed between the types and the paper upon the platen-roll.

25 Under the operation above described merely the amount of the individual item represented by the operated keys will be printed upon the strip or sheet of paper, and it will be next in order to explain how the total of all of the amounts or items accumulated upon the adding-wheels may at any time be printed. It will be understood that if the pinions of the adding-wheels were allowed to remain in mesh with the racks 610 during the downward movement of the latter the pinions would be turned backward by the downward movement of the racks. The pinions are free to turn backward upon their shaft 955 to but not beyond zero position. 40 If, therefore, any rack be allowed to swing downward while in mesh with its pinion, it will turn such pinion backward until the pinion reaches zero position, whereupon the arresting of the pinion will arrest the movement of the rack. Thus if the pinion and its adding-wheel be standing at "9" it can turn backward nine-tenths of a revolution and the rack engaged with it can move downward a corresponding distance. If it be standing at 45 "5," it can move backward five-tenths of a revolution and the rack a corresponding distance, and so on, with the result that if all of the racks be released and the operating-handle be drawn forward while the pinions are permitted to remain in mesh with the racks 55 each pinion will be turned backward the exact distance which it has been moved forward from zero position, and the racks will all be permitted to move downward corresponding distances, and this downward movement of the racks will cause corresponding upward movements of the type-plates 618, carried by the rear ends of the levers B, so that there will be brought to the printing-line the types corresponding to the numbers

which have been displayed upon the adding-wheels. In other words, the totals which have been displayed upon the adding-wheels will by the return of those wheels to zero position be transferred to and presented by the types at the printing-line at the rear end of the machine, so that by then forcing said types rearward against the platen the total of all the items previously added upon the adding-wheels may be printed-upon the strip or sheet of paper. The pinions are left in mesh with the racks whenever it is thus desired to print a total by throwing out of operative position the arm 914, whose forward movement disengages the pinions from the racks 80 in the manner heretofore explained. This is accomplished by depressing the total-key 265, which through the medium of the link 911 swings the front end of arm 914 downward and disengages its member 914^a from the stud 958 upon the pinion-carrying frame C, so that when the operating-handle is then pulled forward the arm 914 will move idly forward and leave the frame C in its normal position, with the pinions 916 in engagement 90 with the racks 610.

If the pinions were permitted to remain in mesh with the racks during the return upward movement of the latter, at the release and backward movement of the operating-handle they would be turned forward again to the respective positions which they occupied prior to the operation of printing the total in the manner described, so that at the end of the operation there would remain accumulated upon the adding-wheels the amount which had previously been added up on them, and succeeding items or amounts would thereafter be added to this aggregate of the preceding items. This is permitted 105 when it is desired to merely print what is termed a "subtotal" and not clear the machine; but for the purpose of printing what may be termed a "grand" total and clearing the machine means are provided for swinging the pinions of the adding-wheels out of engagement with the racks prior to the return upward movement of the latter, so that the pinions and adding-wheels will be left in zero position at the end of the operation of the machine and the latter be thereby cleared. 115 This is accomplished by means of the hooked lower end of the depending member 914^b of the arm 914, which hooked end is adapted to coöperate with a stud 958^a upon the lower end of the side arm C of the pinion-carrying frame. The depression of the total-key 265 swings this hooked end of the arm 914 downward into proximity to the stud 958^a, and when the arm 914 is moved forward at the forward movement of the operating-handle the hook catches over the stud 958^a, and when the arm 914 is then drawn rearward again at the beginning of the rearward movement of the operating-handle, as heretofore 130

explained, the engagement of the hook with the stud pulls the lower end of the rocking frame C rearward and swings its upper end forward and disengages the pinions from the racks, so that the latter may move upward to normal position without turning the pinions. In printing a subtotal and not clearing the machine the total-key 265 is depressed and held down while the operating-handle is drawn forward, but is released and permitted to swing upward (and to draw the front end of the arm 914 upward with it) prior to the backward movement of the handle, with the result that the hooked arm 914^b will not engage the stud 958^a upon the rocking frame C at the backward movement of the handle and the pinions will be left in mesh with the racks during the return upward movement of the latter and be thereby turned forward again to the positions which they occupied prior to the downward movement of the racks.

As will be understood from the foregoing description, the operation of printing a total and clearing the machine consists in depressing the total-key 265 and holding it down during both the forward and backward movements of the operating-handle, while the operation of printing a subtotal and not clearing the machine consists in depressing the total-key and pulling forward the operating-handle and then releasing the key prior to the backward movement of the handle. The depression of the total-key serves by means not necessary to be described in detail to trip the latches of all of the racks, so that the latter will be free to move downward at the forward movement of the operating-handle to the extent permitted by the respective pinions with which they are engaged.

It will next be necessary to explain the means employed for forcing the types against the platen-roller 619 to effect the printing. These means are illustrated and described in detail in the Burroughs patent, No. 505,078, heretofore referred to, and only such illustration and description will be given here as may be necessary to an understanding of my present invention. Referring to Fig. 4, it will be seen that the rear end 611^a of each of the levers B (which carry the racks at their forward ends) is extended into the form of a sector, upon which are mounted the type-plates 618. These plates are mounted in radial guideways upon the sector-shaped end of the lever and are yieldingly held in retracted or forward position by springs 682, so that they may be forced radially outward or rearward and then retracted by their springs. Each plate carries two type-numbers, the uppermost type on the upper one of the five plates on each lever representing a cipher, and those below it the nine digits in regular order.

The type-plates upon the respective levers are forced rearward against the platen 619 by means of hammers or strikers 715, fulcrumed

at their lower rear ends upon a rod 701 and provided with curved slots *w*, in which fit studs 741, carried by bent levers 716, fulcrumed on a rod 702. Coiled springs 780, connected to the forward ends of the lower horizontal arms of said levers 716, tend to swing their vertical arms rearward and carry their studs 741 through the slots *w* in the strikers 715, and thereby swing the upper ends or heads of said strikers rearward into contact with the type-plates 618 to force the latter against the platen. The levers 716 are normally restrained from such movement under the stress of the springs 780 by latches 717, engaging the upper ends of the levers 716 and fulcrumed on a rod 700. These latches are adapted to be tripped by hooked tripping-pawls 718, hung upon a rod 704, supported in the upper ends of a pair of side arms 711, Fig. 5, fastened at their lower ends upon a rock-shaft 703. At each operation of the machine at the end of the forward movement of the operating-handle the shaft 703 is rocked in a direction to swing the rod 704 and the pawls 718 carried by it in a forward direction, and the hooked ends of the pawl engage shoulders upon the upper sides of the latch-plates 717 and lift the lower rear ends of the latter and release the levers 716, which levers are thereupon rocked by the springs 780 and by their slot-and-pin connections with the levers 715 throw the upper ends of the latter rearward against the type-plates which are at the time in line between them and the platen-roller 619.

In the Burroughs machine as manufactured and as described in the prior patents provision is made for tripping the latches 718 successively from left to right and for preventing any latches being tripped at the left of the left-hand lever 611^a, which may be operated so as to avoid the printing of unnecessary ciphers at the left of the figures making up the printed item; but these features of the machine have nothing to do with my present invention and need not be described.

Coming now to the first of the improvements constituting my present invention, as will be seen in Figs. 1 and 4, there is provided, in addition to the type-plates 618, carried by the levers 611^a, a type-plate 618^a, mounted in guideways upon a fixed plate 618^b, secured to the frame of the machine at the right-hand side of the right-hand lever of the group of levers 611^a. This type-plate 618^a carries a single type of any suitable character, in the present instance an asterisk, (*,) which character will be printed upon the paper at the right-hand end of the printing-line whenever the type-plate is forced rearward against the platen. A striker or hammer 715 and cooperating devices, such as have been described, is provided for this type-plate 618^a. Such hammer forms the right-hand one of the group of hammers and may therefore be as-

sumed to be the one exposed to view in Fig. 4, the other hammers being hidden by the one there shown. There is a lever 716, latch 717, and tripping-pawl 718 for each hammer, and that shown in Fig. 4 may be assumed to be associated with the hammer 715, which coöperates with the type-plate 618^a, those for the remaining hammers at the left being hidden by those shown in Fig. 4. At the upper left-hand corner of the view shown in Fig. 4 there is a rock-shaft 1, (also shown in Figs. 2 and 3,) to which is secured a downwardly and rearwardly projecting arm 2, provided at its lower end with an inclined rear edge 3 and also having on its forward side a depending branch arm 2^a, normally resting against the shaft 600 and limiting the forward movement of the arm 2. When the arm 2 is in the position shown in Fig. 4 and the rod 704, carrying the pawls 718, is swung forward, the upturned forward end of the right-hand pawl of the group (which coöperates with the hammer devices associated with the type-plate 618^a) will contact with the inclined or beveled end of the arm 2 and be forced downward as it rides beneath said arm, thereby rocking the pawl and throwing its rear end upward and preventing its hook from engaging the shoulder upon the latch 717 and tripping the latter. The hammer 715, which coöperates with the plate 618^a, will therefore not be released when the machine is operated with the arm 2 in the position shown in Fig. 4, and nothing will be printed upon the paper by the type carried by the special plate 618^a. As shown in Figs. 2 and 4, however, the rock-shaft 1 has secured to and depending from it a second arm 4, provided at its lower end with an open slot or notch in which fits a stud 5 upon a link 226, which is connected at its forward end to the depending arm of the bell-crank lever 227 and at its rear end having a slot-and-pin connection with the lower end of a lever 219, fast upon a rock-shaft 207. When the total-key 265 is depressed, therefore, and the link 226 forced rearward, the shaft 1 will be rocked and the lower end of the arm 2 carried thereby swung upward and rearward out of the path of the upturned rear end of the pawl 718, so that in this position of the parts the hooked front end of the pawl will engage and trip the latch 717 when the pawl is swung forward, and thereby release the hammer 715 and permit it to be swung rearward against the type-plate 618^a and force the type carried by the latter against the platen 619 to print the asterisk or other character represented by such type. In this manner and by these means whenever the total-key 265 is depressed and held down during the forward and backward movement of the operating-handle for the purpose of printing a total and clearing the machine the asterisk or other special designating character will be printed

upon the paper immediately at the right of the printing of the total thereon, and thus indicate that the amount with which it is associated represents a total and not an individual item, as shown in Fig. 6. Likewise if after a total has been printed and the machine cleared, but before any individual items have been printed, the total-key be depressed and held down while the operating-handle is moved forward and backward the devices coöperating with the special type-plate 618^a will be operated in the same manner as if a total were being printed, with the result that the asterisk or other designating character will be printed alone upon the paper. This furnishes a convenient means for indicating at the beginning of operations that the machine is clear, for if the special designating character is printed alone at the head of a list of items it will always indicate that the machine was clear at the beginning of the printing of such list, as in Fig. 7.

The foregoing arrangement is efficient and satisfactory for the two purposes described; but for the purpose of printing two separate characters to designate and distinguish totals and subtotals, respectively, I provide the arrangement of devices shown in Fig. 5, where instead of mounting the special type-plate 618^a upon a fixed part of the framework of the machine I mount it upon the rear end of a lever 6, fulcrumed at 7 and having pivoted to its forward end the lower end of a link 8, connected at its upper end to the forward end of a bent arm 9, fast upon the rock-shaft 1. The type-plate 618^a is provided with two type characters, the lower one of which designates totals and the upper one of which designates subtotals. Any suitable characters for this purpose may be employed—as, for instance, the letter "T" for totals and the letter "S" for subtotals. The upper one of these type characters stands normally at the printing-line, while the lower one is brought to the printing-line when the rear end of the lever is swung upward by the depression of the total-key 265, which serves to rock the shaft 1, as before explained, and said shaft communicates such motion through the bent arm 9 and link 8 to the lever 6. If the total-key be depressed, therefore, and held down during the forward and backward movement of the operating-handle, the type-plate 618^a will be forced against the platen while the rear end of the lever 6 is in elevated position and the lower type upon the plate at the line of print, so that the character represented by the lower type will be printed upon the paper. When, however, a subtotal is to be printed, the total-key is released at the end of the forward movement of the operating-handle or very beginning of its backward movement, so that the lever 6 will drop back to normal position, bringing its upper type to the printing-line, and for the purpose of caus-

ing the type-plate 618^a to be then driven rearward against the platen, notwithstanding the release of the total-key and its return to normal position, I provide the following arrangement of devices illustrated in Fig. 5: In the construction there illustrated the lower end of the arm 2 and the tripping-pawl 718 coöperating with it of Fig. 4 are dispensed with and other means provided for tripping the latch 717, which engages the lever 716, coöperating with the hammer 715, which strikes the special type-plate 618^a. To this end the latch 717 is provided with a stud 9^a, which projects to the right over the rear end of the upper horizontal arm of a bell-crank 10, fulcrumed upon the shaft 700 and provided upon the lower end of its vertically-depending arm with an antifriction-roller 11, adapted to coöperate with the upper end of a tripping pawl or lever 12, fulcrumed near its middle upon a lever-arm 13, supported at its rear end upon the rod 701 and having a slot-and-pin connection at its forward end with the lower end of a curved link 13^a, which is pivoted at its upper end to the forward end of the bent arm 9, fast upon the rock-shaft 1. Fast upon the shaft 702 (which is a rock-shaft) is an upwardly and forwardly projecting arm 14, provided with an outwardly-projecting stud 15. At each forward movement of the operating-handle the shaft 702 is rocked rearward, swinging the arm 14 in that direction and carrying the stud 15 upward and rearward beneath the lower end of the lever 12, carried by the arm 13. The lower end of the lever 12 is above the path of travel of the stud 15 when the parts are in the position shown in Fig. 5; but when the front end of the arm 13 is depressed the lower end of the lever 12 is lowered into the path of travel of the stud 15 on the arm 14. A spring 16, connected to the upper end of the lever 12, yieldingly holds it in normal position against the forward side of the antifriction-roller upon the lower end of the bell-crank 10, and when the arm 14 is swung rearward (with the lever-arm 13 in depressed position) the stud 15 will contact with the lower end of the lever 12 and rock it idly upon its pivot as it passes by; but as the arm 14 is swung forward again at the backward movement of the operating-handle the stud 15 will contact with the rear side of the lower end of the lever 12 and rock it in the opposite direction, with the result that its upper end will force rearward the lower end of the vertical arm of the bell-crank 10 and throw upward the rear end of its horizontal arm, which latter will lift the latch 717 with whose pin 9^a it is in contact, tripping said latch and releasing the lever 716, which coöperates with the hammer 715, associated with the type-plate 618^a, with the result that said hammer will be swung rearward into contact with the plate and drive the latter against the platen-roller 619.

As will be understood from the foregoing description, whenever the total-key of the machine is depressed and held down during the forward and backward movement of the operating-handle the lever 6 will be rocked on its fulcrum 7 and the lower type upon the type-plate 618^a be brought to the printing-line. The front end of the lever-arm 13 will also be depressed and carry the lower end of the lever 12 into the path of the stud 15 upon the arm 14, which stud at the return backward movement of the operating-handle will rock said lever 12 and cause it to trip the latch of the hammer coöperating with the type-plate 618^a, and thus print upon the strip or sheet of paper the type character designating a total. If this printing is effected at the time of clearing the machine, such character will be printed at the right-hand end of the amount representing the total, while if it be printed by operation of the machine after the latter has been cleared and preparatory to the printing of a new list of items it will be printed alone upon the paper and serve to indicate that the machine has been cleared, as before explained.

The foregoing arrangement suffices for the printing of the total character whenever the machine is operated in the manner described; but additional provision is necessary for the printing of the character designating sub-totals. As heretofore explained, this character is represented by the upper one of the two types upon the type-plate 618^a and must therefore be printed while said type-plate is in its lower or normal position. At the operation of printing a subtotal the total-key is released at the end of the forward movement or beginning of the backward movement of the operating-handle, as before explained, which release permits the rock-shaft 1 and parts connected with it (including the lever 6, carrying the type-plate 618^a) to return to normal position; but if the lever-arm 13, which is depressed by the rocking of the shaft 1 consequent upon the depression of the total-key, as heretofore explained, were permitted to resume its normal position, at the release of such key the lower end of the lever 12, carried by such arm, would be lifted out of the path of the stud 15 upon the arm 14, so that it would not be operated to trip the latch 717, coöperating with the hammer 715, associated with the type-plate 618^a. Provision is therefore made for retaining the lever-arm 13 in lower position during the backward movement of the operating-handle notwithstanding the release of the total-key and the return of the lever 6 and type-plate 618^a to normal position. This provision consists of a stud 17 projecting from one of the side arms 711 of the swinging frame which carries the tripping-pawls 718, which stud coöperates with a notch or recess 18, formed in the under side of the lever-arm 13.

The open lower end of this notch or recess 18 normally overlies the stud 17, and when the lever-arm is depressed by the depression of the total-key of the machine the stud enters the notch. Near the end of the forward movement of the operating-handle the frame 711, carrying the tripping-pawls 718, is swung forward, as heretofore explained, and the stud 17 thereby carried forward into the forwardly-extended portion of the notch 18, when the total-key is then released. Therefore the engagement of the stud with the notch will prevent the front end of the lever-arm 13 being drawn up by its spring 13^b until after the frame 711 has been swung rearward again and the stud 17 disengaged from the notch. This does not occur until the operating-handle has moved backward far enough to cause the stud 15 upon the arm 14 to have passed beneath and rocked the lever 12 and tripped the latch 17 of the hammer 715, so that notwithstanding the release of the total-key prior to the backward movement of the operating-handle the tripping-lever 12 is held down in the path of the stud 15 long enough to permit the latter to release the latch of the hammer, after which the frame 711 will be swung rearward to normal position and the stud 17 be disengaged from the notch 18 in the lever-arm 13, and the spring 13^a will then lift the front end of the latter to normal position. In the manner and by the means explained, therefore, if the total-key be depressed and held down during the forward and backward movement of the operating-handle the total character will be printed upon the paper at the beginning of the backward stroke of the handle, as in Fig. 6, while if the total-key be released prior to the backward stroke of the handle the subtotal character will be printed upon the paper at the beginning of the backward movement of the handle, as in Fig. 8.

I am aware that it has been heretofore proposed in adding-machines of this general character to employ two inking-ribbons of different color, one for the printing of individual items and the other for the printing of totals, whereby the totals might be distinguished from the individual items in the printed lists; but such provision for distinguishing the totals from the individual items did not extend to the carbon copies, where duplicate lists were made in that manner, and there would be nothing upon such carbon copies to distinguish the totals from the individual items, nor did it serve to distinguish totals from subtotals upon either the original list or the duplicates. My invention provides a means for indicating the totals upon the duplicate lists, as well as the original, and for distinguishing the totals and subtotals on all of them, and in these respects is a marked improvement upon the means heretofore employed, as stated.

Under the construction and arrangement of parts heretofore employed in the Burroughs machine the inking-ribbon has been located and arranged and operated, as shown in Fig. 1 of the Burroughs patent, No. 504,963—that is to say, it has been wound upon a spool mounted upon a horizontal axis in the extreme upper and rear portion of the machine, and thence led rearward and downward in a vertical direction over suitable guides between the platen-roller and printing-types, and thence forward around a second spool located upon another horizontal axis in the lower part of the rear end of the machine, the ribbon thus moving in a vertical direction between the platen and type and being of sufficient width to cover the entire group of type-carrying levers. The platen has likewise been mounted in a swinging frame, either such as shown in the above-mentioned Letters Patent or in the Letters Patent to William H. Pike, No. 595,864, dated December 21, 1897. Under each of these constructions the printing-line was entirely hidden from the sight of the operator standing in a normal position for operating the machine, so that such operator could not see the printed items until they had been advanced a considerable distance from the printing-point, except by swinging backward the frame carrying the platen, somewhat after the manner of the movement of some type-writer platens for a similar purpose. A further feature of my present invention consists in a rearrangement and reconstruction of the parts, whereby the operator standing in normal position at the machine may easily and clearly see each printed item at the end of the operation of the machine by which it has been printed, and thus not be obliged to either wait until such item has been advanced a considerable distance from the printing-line by succeeding operations of the machine or to swing the platen-carrying frame backward in order to observe the item. This improvement obviates the necessity of mounting the platen in a swinging frame, although such arrangement may be retained, if desired, and it presents the same advantages in an adding-machine which are attained in "sight-writing" type-writing machines as compared with type-writing machines in which the printing-line is hidden from view and can only be observed by swinging up the platen or paper-carriage. To this end I have removed the ribbon-carrying spool from the upper rear end of the machine and entirely cut away the portion of the casing which formerly inclosed such spool, thereby affording the operator a clear and unobstructed line of vision to the printing-platen of the machine, Figs. 1 and 2. I have also removed the ribbon-carrying spool from the lower part of the machine and provided a narrow horizontally-arranged rib-

bon, mounted upon two vertically-arranged spools 20 and 21 at opposite sides of the type-carrying levers, as shown in Fig. 3. This ribbon is led rearward from the spool 20 over a vertical guide-roller 22, thence across the rear side of the type-plates carried by the levers, thence over a vertical guide-roller 23, and thence around the spool 21. This rearrangement of the ribbon mechanism and provision of the narrow horizontally-arranged ribbon and cutting away of the upper rear portion of the casing of the machine enables the operator while standing in normal position at the front of the machine to clearly see the upper edge of the ribbon led across the rear faces of the type-plates and the surface of the paper on the platen immediately above the ribbon, and as the platen is turned slightly to advance the paper at the end of each operation of the machine and after the printing has been effected it follows that each individual item is exposed to the view of the operator at the end of the operation of the machine at which it has been printed, notwithstanding the fact that the ribbon travels in a fixed horizontal path across the printing-line of the machine instead of being reciprocated to and from said printing-line, as in the ordinary visible-writing type-writers and notwithstanding the platen is or may be mounted in fixed position. In Figs. 1 and 3 the platen may be assumed to be mounted in a fixed portion of the framework, while in Fig. 2 it is shown mounted in the swinging frame of the Pike patent.

The platen-roller 619 rests upon a cooperating feed-roller 619^a, Fig. 2, and the spindle of the latter roller has fast upon it a ratchet 519, with which coöperates a pawl 521, carried by an arm 526, hung upon the spindle of the feed-roller and having pivoted to it the upper end of a link *a*, which is pivoted at its lower end to an arm *b*, projecting forward from a rock-shaft *c*. This rock-shaft has projecting upward from it an arm *d*, whose upper end coöperates with an antifriction-roller 538 upon the upper end of an arm 513, fast upon a rock-shaft 100. At each forward movement of the operating-handle and backward movement of the rock-shaft 100 the pawl 521 is retracted over the ratchet 519, and at the return movement of the operating-handle and rock-shaft a spring *e*, bearing on the arm *d*, restores the parts to normal position and causes the pawl 521 to turn the ratchet. Thus at the end of each operation of the machine the paper is advanced slightly from the printing-point and the printed item brought above the upper edge of the inking-ribbon into the view of the operator.

The ribbon-spools are operated by a lever 24, fulcrumed on a shaft 25 and carrying at its upper end a pawl (not shown) coöperating with a ratchet on the left-hand ribbon-spool 21 and by gearing (not shown) con-

necting the shaft 25 with the spindle of the right-hand ribbon-spool 20. At its lower end the lever 24 is provided with a notch, in which fits a stud projecting from the rock-shaft 100, which serves to rock the lever 24 upon its fulcrum-shaft 25 and cause its pawl to actuate the ribbon-spool at its upper end. The shaft 25 has fast upon it a ratchet 27, with which coöperate pawls carried by plates or arms 28 29, hung upon said shaft, said arms being connected by links or pitmen 30 31 with an arm 32, fast upon and projecting forward from the rock-shaft 100, the result of which arrangement is that the ratchet 27 and shaft 25 will be turned by the movement of the rock-shaft 100 in each direction and moved one step at the forward stroke of the operating-handle and another step at its backward stroke.

In the Burroughs machine as heretofore constructed and shown in the Burroughs Patent No. 504,963 it was necessary to leave a considerable open space in the upper rear part of the machine beneath the upper ribbon-spool to accommodate the extreme upward movements of the type-carrying levers. In my improved machine the cutting away of the upper rear portion of the casing to permit the operator to see the printing-line necessitates the provision of an opening 33 in the inclined upper portion of the rear side of the machine, Figs. 1 and 2, through which opening the type-carrying levers may pass out of the casing at their extreme upward movements, and I have provided an automatic closure for this opening, serving to normally close it and prevent the entrance of dust and dirt into the casing. This automatic closing device consists in the present instance of a slide 34, mounted in guides 34^a upon the under forward side of the inclined portion of the casing and adapted to slide by gravity into its lower rearward position and normally close the opening 33. It is provided upon its under side near its lower end with a lug 35, adapted to be engaged by the upper rear end of a long arm or lever 36, Figs. 4 and 5, pivoted or fulcrumed to the framework at its lower end. This lever 36 has pivoted to it near its lower end the lower rear end of a link 37, which link at its upper forward end has a slot-and-pin connection with an arm 38, fast upon the rock-shaft 600. When this lever-arm 36 is swung rearward and downward, it permits the slide or shutter 34 to move with it to the position shown in Fig. 5 and close the opening 33 in the casing, and when the lever is swung upward and forward it carries the slide 34 with it and exposes said opening, so that the type-carrying levers are free to move upward through it. In Fig. 4 the lever and slide are shown in their upper forward positions, and they are held in such positions by a latch 39, which is pivoted at its forward end to the arm 2, heretofore de-

scribed, and is provided at its rear end with a hook engaging a stud 40 upon the side of the lever-arm 36. A spring 41, fastened at its rear end to the latch 39 and bearing at its forward end upon a stud 42 upon the arm 2, presses the rear end of the latch downward and yieldingly holds it in normal position, its downward movement when not engaged with the stud 40 being limited by a stud 43 upon the latch near its rear end, which stud 43 bears against the rear edge of the arm 2, to which the latch is pivoted. By means of the spring 41 and stud 43 the latch 39 is therefore normally held in the position shown in Fig. 4, so that if at such time the lever-arm 36 be swung upward and forward from its lower and rear position its stud 40 will ride under the nose of the latch 39 and be caught and held by its hook in the position shown in Fig. 4. If with the parts in this position the total-key of the machine be depressed, the shaft 1 will be rocked in the direction of the arrow and the arm 2 swung upward and rearward, as heretofore explained, which movement of the arm will carry the latch 39 out of engagement with the stud 40 of the lever-arm 36 and permit the latter to swing rearward and downward to normal position, and the slide 34 will follow the lever and close the opening in the casing. The connection of the lever-arm 36 with the arm 38 on the rock-shaft 600 by means of the link 37 will cause the arm to be swung upward to the position shown in Fig. 4 whenever the operating-handle is pulled forward; but if the total-key of the machine be depressed at such time the latch 39 will not engage the stud 40 upon the lever-arm 36, and the latter and the slide 34 will therefore drop back to normal position upon the return movement of the operating-handle and close the opening in the casing. It will therefore be understood from the foregoing description that if the operating-handle of the machine be pulled forward at any time when the closure-slide is in its lower position such slide will be lifted away from the opening in the casing and be maintained in its moved position unless the total-key of the machine is depressed at such time, and that thereafter whenever the total-key is depressed the slide will be released and dropped back to position to close the opening in the casing. In the practical use of these machines the slide will always be in closed position at the beginning of any series of operations of the machine, since at the completion of any preceding series of operations of the machine the total-key will have been operated in connection with the printing of the total at the foot of the list, thereby releasing the slide and permitting it to move downward to closed position. Upon operating the machine to print the first item in the new list the lever-arm 36 will be swung upward and forward and engaged by the latch 39, and the

slide thereby moved and held in its upper position, and it will remain in this position, leaving the opening in the casing exposed, until the list of items is completed and the total printed, whereupon at the printing of such total it will be released and dropped back to its lower position, closing the opening in the casing and excluding dust and dirt therefrom during the time the machine may remain out of use.

I claim—

1. In an adding-machine, the combination of printing and adding mechanism, for printing individual items and accumulating and printing the total thereof, and means for automatically printing with the total a suitable character to distinguish it from the individual items; substantially as described.

2. In an adding-machine, the combination, with printing and adding mechanism, and means for "clearing" the machine, of means for printing a distinguishing character as an incident to the operation of clearing the machine; substantially as described.

3. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating the total thereof and printing said total either with or without "clearing" the machine, and means for printing with the total a given distinguishing character when the machine is not cleared and another distinguishing character when the machine is cleared, to indicate subtotals and totals, respectively; substantially as described.

4. In an adding-machine, the combination of printing and adding mechanism, for printing individual items and accumulating and printing the total thereof, a special key requiring operation at the printing of a total, and printing devices controlled by said key and operating to print a distinguishing character whenever the operation of the machine is accompanied by operation of said key; substantially as described.

5. In an adding-machine, the combination, with printing and adding mechanism, and means for "clearing" the machine, of a special key requiring operation at the clearing of the machine, and printing devices controlled by said key and operating to print a distinguishing character whenever the machine is cleared; substantially as described.

6. In an adding-machine, the combination of printing and adding mechanism, for printing individual items and accumulating and printing the total thereof, a special printing device comprising a movable type-carrier, a spring-operated striker or hammer for forcing the type of said carrier against the platen, a latch normally restraining said striker from movement, a trip for said latch, and a "total-key" controlling the operation of said trip; substantially as described.

7. In an adding-machine, the combination

of printing and adding mechanism, for printing individual items and accumulating and printing the total thereof either with or without "clearing" the machine, two special type characters representing totals and subtotals respectively, and means for causing one of said characters to print when the machine is operated to print a total and clear the machine, and the other of said characters to print when the machine is operated to print a total without clearing the machine; substantially as described.

8. In an adding-machine, the combination of printing and adding mechanism, for printing individual items and accumulating and printing the total thereof either with or without "clearing" the machine, a special type-carrier bearing two type characters representing totals and subtotals respectively and movable to bring either character to the printing-line at will, and a "total-key" controlling the position of said special type-carrier and the operation of the printing devices cooperating with it, whereby upon operating the machine in conjunction with said total-key to print a total and clear the machine one of said type characters will print, and upon operating the machine in conjunction with the total-key to print the total without clearing the machine the other of said type characters will print; substantially as described.

9. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof either with or without "clearing" the machine, said printing devices comprising a platen and a series of type-carriers movable to bring their different types to the printing-line, and the adding mechanism comprising a train of accumulating-pinions, means intermediate the type-carriers and pinions whereby upon turning the pinions backward to initial position the type-carriers will be moved corresponding distances and bring to the printing-line types representing the total previously accumulated upon the adding mechanism, a "total-key" controlling such backward movement of the pinions and setting of the type-carriers, and a special printing device controlled by said total-key and operating to print a distinguishing character in connection with the printing of a total; substantially as described.

10. In an adding-machine, the combination of printing and adding mechanism, for printing individual items and accumulating and printing the total thereof either with or without "clearing" the machine, and an adjustable type-carrier bearing two type characters representing totals and subtotals respectively, one of which characters stands at the printing-line when the carrier is in normal position, a "total-key" connected with said

type-carrier and operable to bring the other type character to the printing-line, and printing devices cooperating with said type-carrier and controlled by said total-key, said devices being normally inoperative but brought into operation by the total-key; substantially as described.

11. In an adding-machine, the combination of printing and adding mechanism, for printing individual items and accumulating and printing the total thereof either with or without "clearing" the machine, a special type-carrier bearing two type characters representing totals and subtotals, respectively, and movable to bring either of said characters to the printing-line, a spring-operated hammer or striker for forcing said type-carrier toward the impression-platen, a latch for holding said striker out of operation, and a tripping device for said latch controlled by the "total-key;" substantially as described.

12. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof either with or without "clearing" the machine, a special type-carrier bearing two type characters representing totals and subtotals, respectively, one of which characters normally stands at the printing-line, a "total-key" and connections cooperating with the type-carrier for moving it to bring its other type character to the printing-line, a spring-operated striker or hammer for forcing the type-carrier toward the impression-platen, a latch normally holding said striker from movement, and a tripping device for said latch normally inoperative but moved to operative position by operation of the total-key; substantially as described.

13. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof either with or without "clearing" the machine, a special type-carrier bearing two type characters representing totals and subtotals, respectively, one of which characters normally stands at the printing-line, a "total-key" and connections cooperating with the type-carrier for moving it to bring its other type character to the printing-line, a spring-operated striker or hammer for forcing the type-carrier toward the impression-platen, a latch normally holding said striker from movement, a tripping device for said latch normally inoperative but moved to operative position by operation of the total-key, and means for preventing its return to inoperative position after the release of the total-key; substantially as described.

14. In an adding-machine, the combination of the levers B carrying the racks 610 at their forward ends and the type-plates 618 at their rear ends, the accumulating-pinions

916 cooperating with the racks and the platen 619 cooperating with the type-plates, the spring-actuated hammers 715 cooperating with the type-plates; the latches 717 normally restraining said hammers from movement, the tripping-pawls 718 for tripping said latches, the special type-plate 618^a bearing a type character representing totals, a spring-actuated hammer 715 cooperating with said type-plate, a latch normally holding said hammer from movement, a normally inoperative trip for said latch, and a "total-key" and connections for rendering said trip operative when the total-key is operated; substantially as described.

15. In an adding-machine, the combination of the levers B carrying the racks 610 at their forward ends and the type-plates 618 at their rear ends, the accumulating-pinions 916 cooperating with the racks and the platen 619 cooperating with the type-plates, the spring-actuated hammers 715 cooperating with the type-plates, the latches 717 normally restraining said hammers from movement, the tripping-pawls 718 for tripping said latches, the special type-plate 618^a carried by the lever 6 and bearing two type characters representing totals and subtotals, respectively, the "total-key" and connections between the same and the lever 6 for causing the depression of the total-key to move the lever 6 and bring the total-type character to the printing-line, the spring-actuated hammer 715 cooperating with the type-plate 618^a the latch 717 normally restraining said hammer from movement, and a tripping device for said latch normally inoperative but set for operation by the depression of the total-key; substantially as described.

16. In an adding-machine, the combination of the levers B carrying the racks 610 at their forward ends and the type-plates 618 at their rear ends, the accumulating-pinions 916 cooperating with the racks and the platen 619 cooperating with the type-plates, the spring-actuated hammers 715 cooperating with the type-plates, the latches 717 normally restraining said hammers from movement, the tripping-pawls 718 for tripping said latches, the special type-plate 618^a carried by the lever 6 and bearing two type characters representing totals and subtotals, respectively, the "total-key" and connections between the same and the lever 6 for causing the depression of the total-key to move the lever 6 and bring the total-type character to the printing-line, the spring-actuated hammer 715 cooperating with the type-plate 618, the latch 717 normally restraining said hammer from movement, the bell-crank 10 cooperating with the stud 9 upon said latch, the pivoted arm 13 carrying the tripping-pawl 12 cooperating with the lower end of the bell-crank 10, the swinging

arm 14 carrying the stud 15 normally traveling beneath the pawl 12, and a connection between the total-key and the arm 13 for causing the depression of said key to lower said arm and bring the tripping-pawl 12 into the path of the stud 15; substantially as described.

17. In an adding-machine, the combination of the levers B carrying the racks 610 at their forward ends and the type-plates 618 at their rear ends, the accumulating-pinions 916 cooperating with the racks and the platen 619 cooperating with the type-plates, the spring-actuated hammers 715 cooperating with the type-plates, the latches 717 normally restraining said hammers from movement, the tripping-pawls 718 for tripping said latches, the special type-plate 618^a carried by the lever 6 and bearing two type characters representing totals and subtotals respectively, the "total-key" and connections between the same and the lever 6 for causing the depression of the total-key to move the lever 6 and bring the total-type character to the printing-line, the spring-actuated hammer 715 cooperating with the type-plate 618, the latch 717 normally restraining said hammer from movement, the bell-crank 10 cooperating with the stud 9 upon said latch, the pivoted arm 13 provided with the notch 18, the tripping-pawl 12 pivoted on said arm, the swinging arm 14 provided with the stud 15, a connection between the total-key and the arm 13 for lowering the latter and bringing the end of the pawl 12 into the path of the stud 15, and the swinging arm 14 provided with the stud 17 cooperating with the notch 18 in the arm 13; substantially as described.

18. In an adding-machine, the combination of a platen-roller located at the rear side of the machine, a plurality of type-carriers located side by side in front of said platen and each carrying a plurality of types movable upon the carrier, means for adjusting said type-carriers vertically and forcing their types rearward into contact with the platen at a printing-line along its forward side and within the normal range of view of the operator, and an inking-ribbon movable in a horizontal path along said printing-line, between the types and the platen; substantially as described.

19. In an adding-machine, the combination of a platen-roller located at the rear side of the machine, a plurality of type-carriers located side by side in front of said platen and each carrying a plurality of types movable upon the carrier, means for adjusting said type-carriers vertically and forcing their types rearward thereon into contact with the platen at a printing-line along its forward side and within the normal range of view of the operator, an inking-ribbon movable in a fixed horizontal path along said

printing-line, between the types and the platen, and means for automatically turning the platen at each operation of the machine, after the printing has been done, to carry the printed amount above the inking-ribbon and bring it into the view of the operator at the end of the operation; substantially as described.

20. In an adding-machine, the combination of a platen-roller journaled in fixed bearings at the rear side of the machine, a plurality of type-carriers located side by side in front of said platen and each carrying a plurality of printing-types movable upon the carrier, means for adjusting said type-carriers vertically and forcing their types rearward thereon into contact with the platen-roller at a printing-line along the forward side of the same and within the normal range of view of the operator, an inking-ribbon led between said types and platen, and means for turning the platen at each operation of the machine, after the printing has been done, to bring the printed amount into the view of the operator of the machine at the end of the operation; substantially as described.

21. In an adding-machine, the combination of a platen-roller journaled in fixed bearings at the rear side of the machine, a plurality of type-carriers located side by side in front of said platen and each carrying a plurality of printing-types movable upon the carrier, means for adjusting said type-carriers vertically and forcing their types rearward thereon into contact with the platen-roller at a printing-line along the forward side of the same and within the normal range of view of the operator, and an inking-ribbon movable in a horizontal path along said printing-line, between said types and platen; substantially as described.

22. In an adding-machine, the combination of a platen-roller journaled in fixed bearings at the rear side of the machine, a plurality of type-carriers located side by side in front of said platen and each carrying a plurality of printing-types movable upon the carrier, means for adjusting said type-carriers vertically and forcing their types rearward thereon into contact with the platen-roller at a printing-line along the forward side of the same, an inking-ribbon movable in a fixed horizontal path along said printing-line, between the types and platen, and means for turning the platen at each operation of the machine, after the printing has been done, to carry the printed amount above the inking-ribbon and bring it into the view of the operator of the machine at the end of the operation; substantially as described.

23. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating

and printing the total thereof, a casing inclosing said mechanism and provided with an opening through which the type-carriers of the printing mechanism are adapted to pass, a shutter for normally closing said opening, means for moving the shutter away from the opening at the operation of the machine to print an individual item, and means for returning the shutter to normal position when the machine is operated to print a total; substantially as described.

24. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof, a casing inclosing said mechanism and provided with an opening through which the type-carriers of the printing mechanism are adapted to pass, a shutter for normally closing said opening, means for moving the shutter away from the opening at the operation of the machine to print an individual item, means for holding the shutter in such moved position during the printing of succeeding individual items, and means for releasing the shutter and returning it to normal position at the printing of a total; substantially as described.

25. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof, a casing inclosing said mechanism and provided with an opening through which the type-carriers of the printing mechanism are adapted to pass, a shutter for normally closing said opening, means for moving the shutter away from the opening at the operation of the machine to print an individual item, a latch for holding the shutter in such moved position during succeeding operations of the machine to print individual items, and a trip for said latch operated at the printing of a total; substantially as described.

26. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof, said printing mechanism employing the type-carriers carrying the type plates and adapted to be swung upward to bring the different type-plates to the printing-line, the casing inclosing the printing and adding mechanism and provided with the opening 33 to accommodate the upward movements of the type-carriers, the shutter 34, mounted to reciprocate to and from the opening 33, to alternately close and open the same, means for moving said shutter away from the opening to permit the passage of the type-carriers at succeeding operations of the machine, and means for returning the shutter to normal position, to close said opening at the conclusion of operations of the machine, substantially as described.

27. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof, said printing mechanism employing the type-carriers 611^a carrying the type-plates 618 and adapted to be swung upward to bring the different type-plates to the printing-line, the casing inclosing the printing and adding mechanism and provided with the opening 33 to accommodate the upward movements of the type-carriers, the shutter 34, mounted to reciprocate to and from the opening 33, to alternately close and open the same, means for moving said shutter away from the opening to permit the passage of the type-carriers at succeeding operations of the machine, a latch for holding said shutter in moved position, and a trip for said latch; substantially as described.

28. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof, said printing mechanism employing the type-carriers 611^a carrying the type-plates 618 and adapted to be swung upward to bring the different type-plates to the printing-line, the casing inclosing the printing and adding mechanism and provided with the opening 33 to accommodate the upward movements of the type-carriers, the shutter 34, mounted to reciprocate to and from the opening 33, to alternately close and open the same, means for moving said shutter away from the opening to permit the passage of the type-carriers at succeeding operations of the machine, a latch for holding said shutter in moved position, and a trip for said latch automatically operated at the printing of a total; substantially as described.

29. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof, said printing mechanism employing the type-carriers 611^a carrying the type-plates 618 and adapted to be swung upward to bring the different type-plates to the printing-line, the casing inclosing the printing and adding mechanism and provided with the opening 33 to accommodate the upward movements of the type-carriers, the shutter 34, mounted to reciprocate to and from the opening 33, to alternately close and open the same, means for automatically moving said shutter away from said opening at the operation of the machine to print an individual item, and means for returning the shutter to normal position at the end of operations of the machine; substantially as described.

30. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof, said printing mechanism employing the type-carriers 611^a carrying the type-plates 618 and adapted to

be swung upward to bring the different type-plates to the printing-line, the casing inclosing the printing and adding mechanism and provided with the opening 33 to accommodate the upward movements of the type-carriers, the shutter 34, mounted to reciprocate to and from the opening 33, to alternately close and open the same, means for automatically moving said shutter away from said opening at the operation of the machine to print an individual item; and means for automatically returning said shutter to normal position at the operation of the machine to print a total; substantially as described.

31. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof, said printing mechanism employing the type-carriers 611^a carrying the type-plates 618 and adapted to be swung upward to bring the different type-plates to the printing-line, the casing inclosing the printing and adding mechanism and provided with the opening 33 to accommodate the upward movements of the type-carriers, the shutter 34, mounted to reciprocate to and from the opening 33, to alternately close and open the same, means for automatically moving said shutter away from said opening at the operation of the machine to print an individual item, a latch for holding said shutter in moved position, and a trip for said latch; substantially as described.

32. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof, said printing mechanism employing the type-carriers 611^a carrying the type-plates 618 and adapted to be swung upward to bring the different type-plates to the printing-line, the casing inclosing the printing and adding mechanism and provided with the opening 33 to accommodate the upward movements of the type-carriers, the shutter 34, mounted to reciprocate to and from the opening 33, to alternately close and open the same, means for automatically moving said shutter away from said opening at the operation of the machine to print an individual item, a latch for holding said shutter in moved position, and a trip for said latch automatically operated at the printing of a total; substantially as described.

33. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof, said printing mechanism employing the type-carriers 611^a carrying the type-plates 618 and adapted to be swung upward to bring the different type-plates to the printing-line, the casing inclosing the printing and adding mechanism and provided with the opening 33 to accommodate the upward movements of the type-carriers, the slide 34, mounted in guideways 34^a

upon the casing and adapted to slide to and from the opening 33, means for moving said slide away from said opening to permit the passage of the type-carriers through said opening at succeeding operations of the machine, and means for returning said slide to normal position and closing the opening at the operation of the machine to print a total; substantially as described.

34. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof, said printing mechanism employing the type-carriers 611^a carrying the type-plates 618 and adapted to be swung upward to bring the different type-plates to the printing-line, the casing inclosing the printing and adding mechanism and provided with the opening 33 to accommodate the upward movements of the type-carriers, the slide 34, mounted in guideways 34^a upon the casing and adapted to slide to and from the opening 33, means for moving said slide away from said opening to permit the passage of the type-carriers through said opening at succeeding operations of the machine, a latch for holding the slide in such moved position, and a trip for the latch; substantially as described.

35. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof, said printing mechanism employing the type-carriers 611^a carrying the type-plates 618 and adapted to be swung upward to bring the different type-plates to the printing-line, the casing inclosing the printing and adding mechanism and provided with the opening 33 to accommodate the upward movements of the type-carriers, the slide 34, mounted in guideways 34^a upon the casing and adapted to slide to and from the opening 33, means for moving said slide away from said opening to permit the passage of the type-carriers through said opening at succeeding operations of the machine, a latch for holding the slide in such moved position, and a trip for the latch automatically operated at the printing of a total; substantially as described.

36. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof, said printing mechanism employing the type-carriers 611^a carrying the type-plates 618 and adapted to be swung upward to bring the different type-plates to the printing-line, the casing inclosing the printing and adding mechanism and provided with the opening 33 to accommodate the upward movements of the type-carriers, the slide 34, mounted in guideways 34^a upon the casing and adapted to slide to and from the opening 33, means for automatically moving said slide away from the

opening at the operation of the machine to print an individual item, and means for returning the slide to normal position at the conclusion of operations of the machine; substantially as described.

37. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof, said printing mechanism employing the type-carriers 611^a carrying the type-plates 618 and adapted to be swung upward to bring the different type-plates to the printing-line, the casing inclosing the printing and adding mechanism and provided with the opening 33 to accommodate the upward movements of the type-carriers, the slide 34, mounted in guideways 34^a upon the casing and adapted to slide to and from the opening 33, means for automatically moving such slide away from the opening at the operation of the machine to print an individual item, a latch for holding said slide in moved position, and a trip for said latch; substantially as described.

38. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof, said printing mechanism employing the type-carriers 611^a carrying the type-plates 618 and adapted to be swung upward to bring the different type-plates to the printing-line, the casing inclosing the printing and adding mechanism and provided with the opening 33 to accommodate the upward movements of the type-carriers, the slide 34, mounted in guideways 34^a upon the casing and adapted to slide to and from the opening 33, means for automatically moving such slide away from the opening at the operation of the machine to print an individual item, a latch for holding said slide in moved position, and a trip for said latch automatically operated at the printing of a total; substantially as described.

39. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof, a casing inclosing said mechanism and provided with an opening through which the type-carriers of the printing mechanism are adapted to pass, a shutter for normally closing said opening, means for automatically moving the shutter away from the opening at the operation of the machine to print an individual item, a latch normally operating to hold the shutter in such moved position, a total-key requiring operation for the printing of a total, and a trip for the latch operated by said key; substantially as described.

40. In an adding-machine, the combination of printing and adding mechanism for printing individual items and accumulating and printing the total thereof, a casing inclosing said mechanism and provided with an

opening through which the type-carriers of the printing mechanism are adapted to pass, a shutter for normally closing said opening, means for automatically moving the shutter
5 away from the opening at the operation of the machine to print an individual item, a latch normally operating to hold the shutter in such moved position, a total-key requiring operation for the printing of a total, and
10 means operated by the depression of said key to maintain the latch out of operative position; substantially as described.

41. In an adding-machine, the combination of printing and adding mechanism for
15 printing individual items and accumulating and printing the total thereof, and means for printing with the total and at one side thereof and as an incident to the printing of such total a suitable character to distinguish it
20 from individual items; substantially as described.

42. In an adding-machine, the combination, with printing and adding mechanism, and means for "clearing" the machine, of
25 means for printing a distinguishing character at one side of the column of individual items and as an incident thereto whenever the machine is cleared; substantially as described.

43. In an adding-machine, the combination of printing and adding mechanism, for
30 printing individual items and accumulating and printing the total thereof, of printing mechanism comprising a plurality of type-carriers located side by side and a special type-carrier located at one side of the first-mentioned type-carriers and bearing a distinguishing type character, and means coöperating
35 with said special type-carrier to cause said character to be printed at one side of the total whenever the machine is operated to print a total; substantially as described.

44. In an adding-machine, the combination of printing and adding mechanism, for
45 printing individual items and accumulating and printing the total thereof, of printing mechanism comprising a plurality of type-carriers located side by side and a special type-carrier located at one side of the first-mentioned type-carriers and bearing a distinguishing type character, and means coöperating
50 with said special type-carrier to cause said character to be printed at one side of the column of individual items whenever the machine is cleared; substantially as described.

45. In an adding-machine, the combination of printing and adding mechanism, for
55 printing individual items and accumulating and printing the total thereof either with or without clearing the machine, and a special printing device for printing a distinguishing character whenever the machine is operated
60 either to print a total or to clear the machine; substantially as described.

46. In an adding-machine, the combination of printing and adding mechanism, for

printing individual items and accumulating and printing the total thereof, a special type-carrier bearing a distinguishing type character, and means coöperating with said special type-carrier to cause said character to be
70 printed whenever the machine is operated to print a total or clear the machine; substantially as described.

47. In an adding-machine in which individual items and the total thereof are accumulated and printed, means for automatically
75 or incidentally printing with the total a suitable character to distinguish it from the individual items.

48. The combination with an adding-machine adapted to accumulate and record individual items and to record the sum of items previously accumulated and recorded, of means for automatically printing a suitable
80 character whenever the sum of previously-accumulated items is recorded to distinguish the same from the individual items, and means for preventing the operation of the devices for printing such distinguishing character when items are being recorded.
85

49. The combination with an adding-machine adapted to accumulate and record individual items and to record the sum of items previously accumulated, of a type-carrier
90 mounted independently of the devices by which the items and total thereof are recorded, a hammer adapted to actuate said carrier, means holding said hammer in inoperative position during the recording of individual items, and means for automatically
95 releasing said hammer when the machine is adapted to record the sum of previously-recorded items, substantially as and for the purpose described.

50. The combination, in an adding-machine adapted to accumulate and record individual items and to also record the sum of items previously accumulated, of a type-carrier mounted independently of the devices by
100 which the items and total thereof are recorded, a spring-operated hammer adapted to move said type-carrier to print a distinguishing character adjacent a number printed by the recording devices, a detent normally preventing movement of said hammer, and
105 means controlled by the "total" device of the machine for releasing said detent.

51. The combination with an adding-machine adapted to accumulate and record individual items and to record the sum of items
110 previously accumulated, of a type normally in printing position for printing a distinguishing character, and means controlled by the "total" device of the machine for actuating said distinguishing type-carrier.

ALVAN MACAULEY.

Witnesses:

B. G. CHAPMAN,
CHRISTINE WICKLINE.