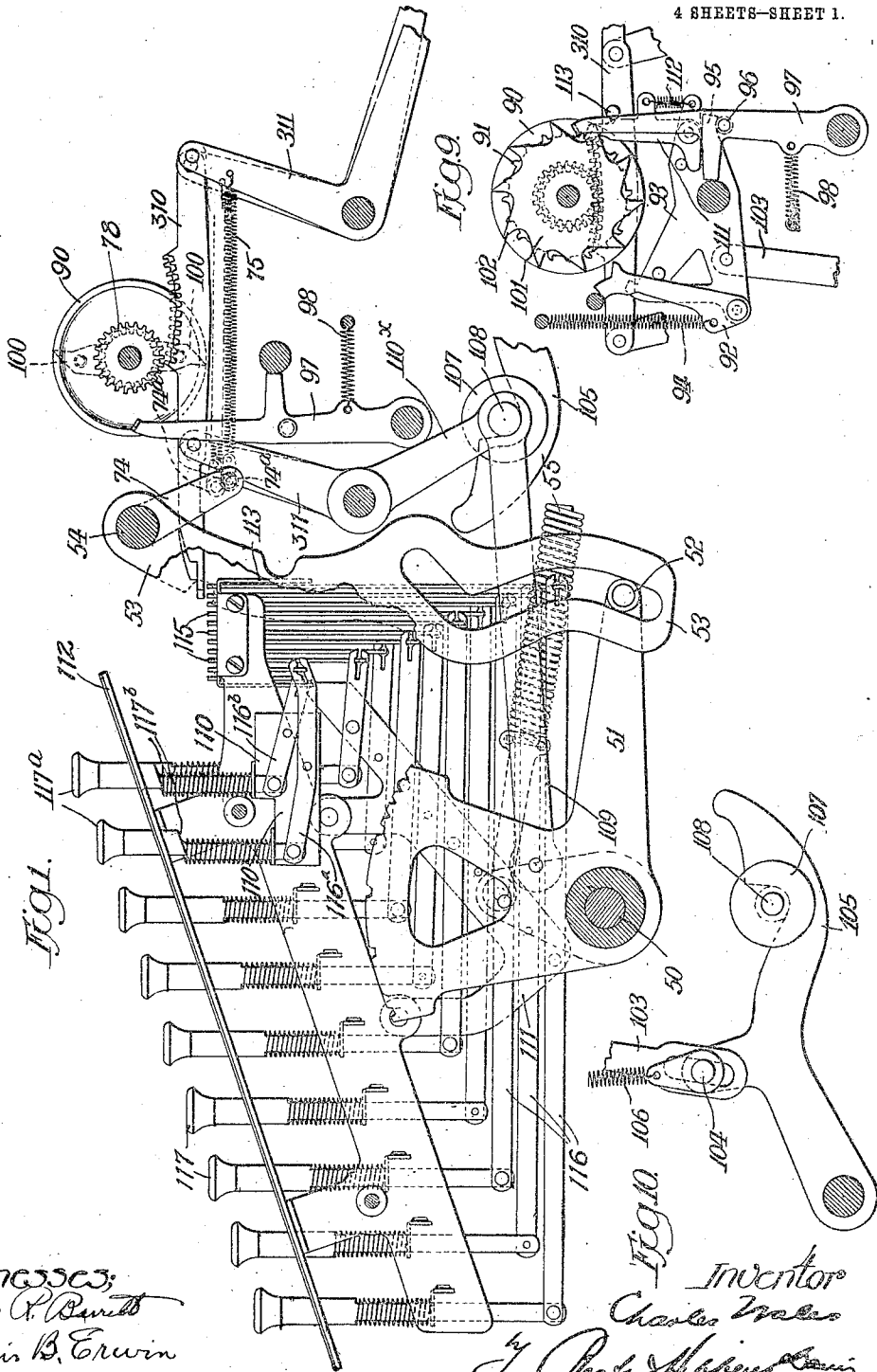


C. WALES.  
 ADDING MACHINE.  
 APPLICATION FILED AUG. 12, 1907.

990,174.

Patented Apr. 18, 1911.

4 SHEETS—SHEET 1.



Witnesses:  
 Edw. A. Bennett  
 Louis B. Erwin

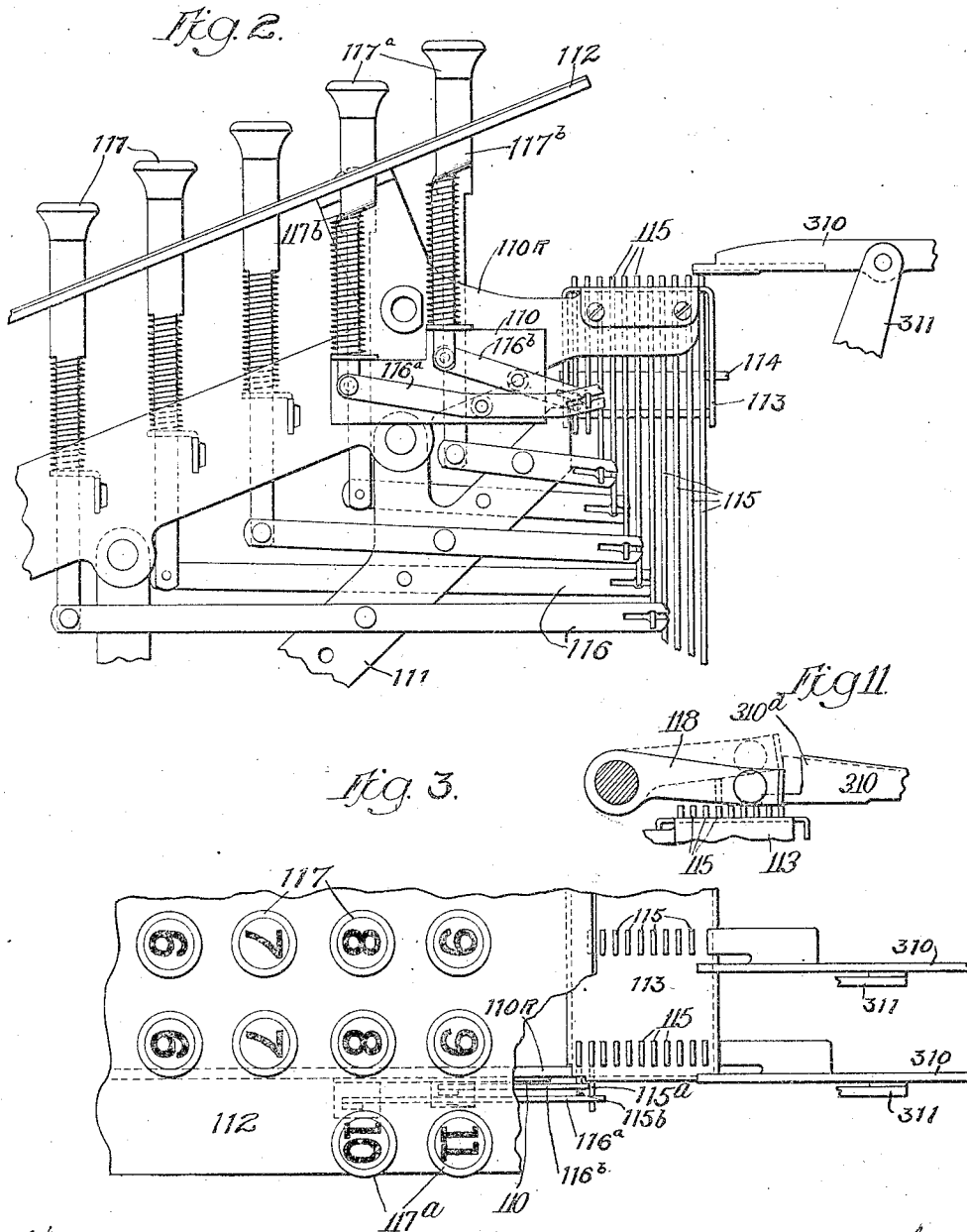
Inventor  
 Charles Wales  
 By *Peter H. Moore*  
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4 SHEETS—SHEET 2.



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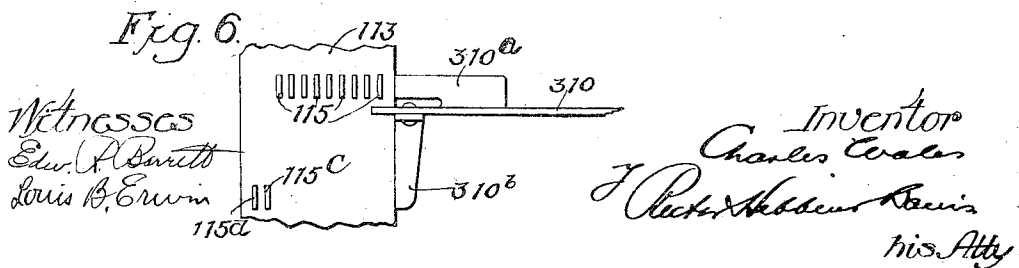
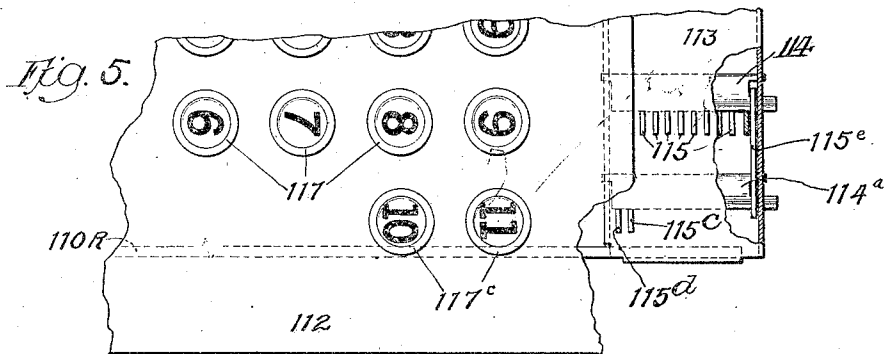
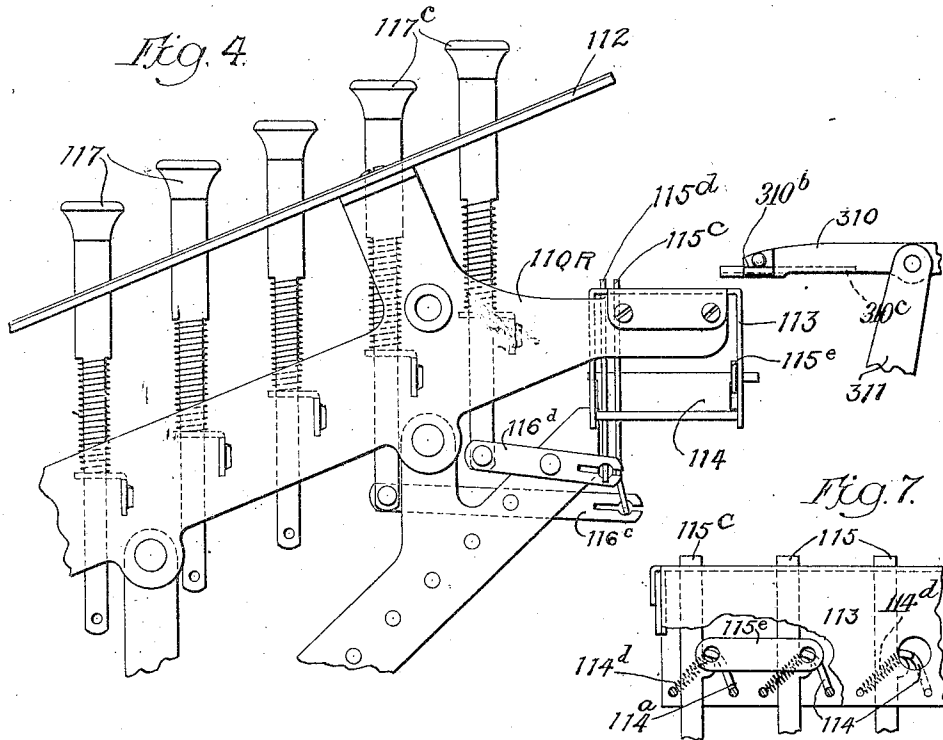
Inventor  
 Charles Wales  
 by *Richard M. Davis*  
 his Att'y.

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4 SHEETS—SHEET 3.

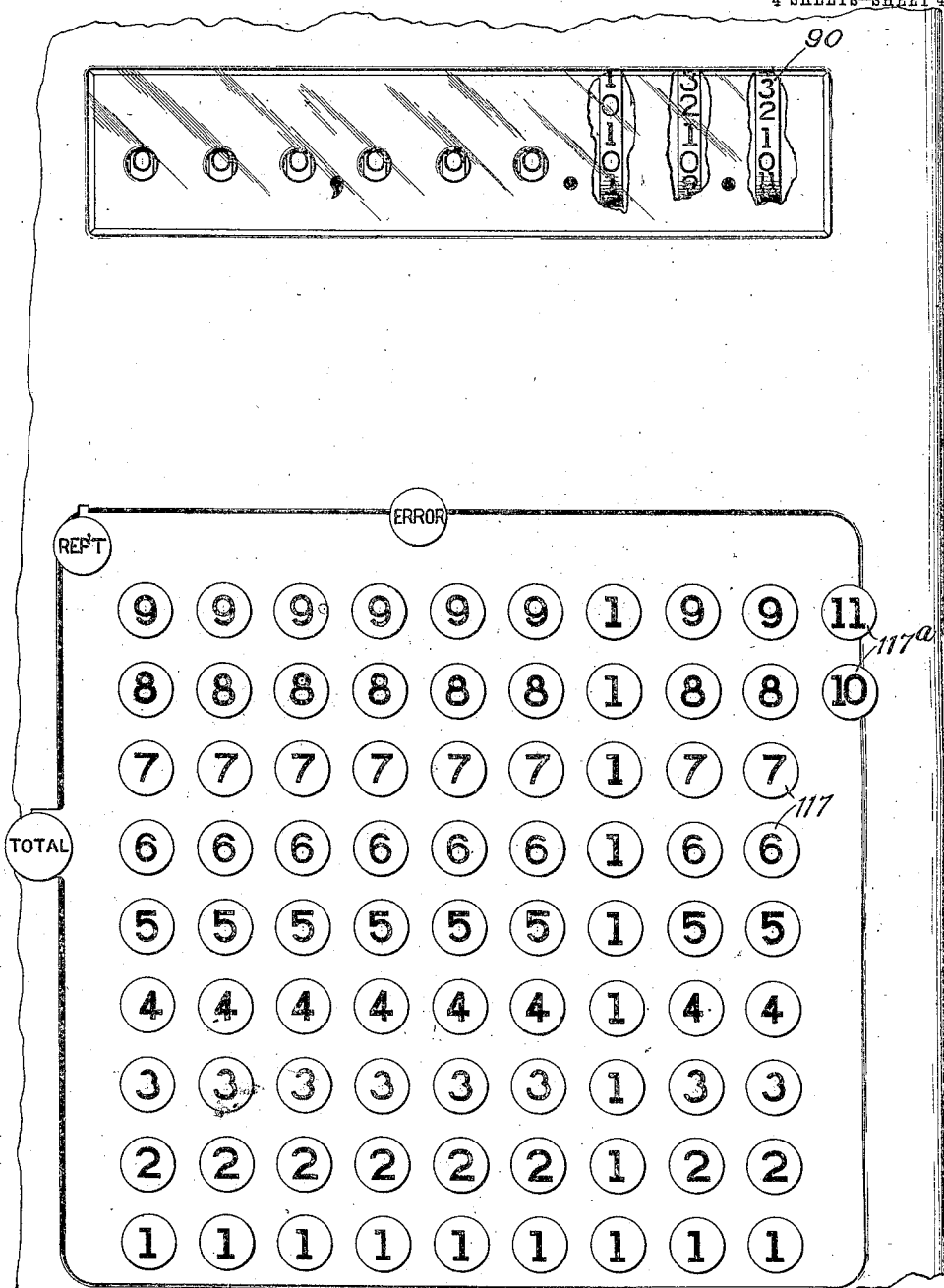


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4 SHEETS-SHEET 4.



Witnesses;  
 Edw. A. Barrett  
 Louis B. Erwin

Fig. 8.

Inventor.  
 Charles Wales  
 By Peter Hadden Rams  
 his Atty's

# UNITED STATES PATENT OFFICE.

CHARLES WALES, OF DETROIT, MICHIGAN, ASSIGNOR TO BURROUGHS ADDING MACHINE COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

## ADDING-MACHINE.

990,174.

Specification of Letters Patent.

Patented Apr. 18, 1911.

Application filed August 12, 1907. Serial No. 388,234.

*To all whom it may concern:*

Be it known that I, CHARLES WALES, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, 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.

The general object of the present invention is to adapt an adding machine to English currency. When designed for use with a decimal system of currency an adding machine usually has a number of parallel rows of amount keys each row numbered from 1 to 9 and wheels or dials correspondingly numbered. Of course this would not suffice for the English system where twelve keys would be required in the first bank if that bank is used for example to register and record pence. By the present invention it is proposed to provide for additional units in the primary bank without requiring any considerable disorganization or reorganization of a construction which might primarily be intended and adapted for recording and registering according to the decimal system.

For the purposes of the present disclosure the manner of carrying out the invention as applied to a well-known type of adding machine is illustrated and set forth, although it is to be understood that the invention is not necessarily limited to such particular application.

With the above-stated object in view the invention consists in certain novel features of construction and combinations of parts the essential elements whereof are recited in the appended claims and a preferred form of embodiment of which is described in detail hereinafter and fully illustrated in the accompanying drawings forming part of this specification.

Of said drawings Figure 1 represents in right-side elevation an adding machine of the type shown in Patent No. 745,539 issued December 1, 1903, to Charles Wales, not all the details of the machine being illustrated, however, as that is not essential to an understanding of the present invention; Fig. 2

is a similar right-side elevation on an enlarged scale and confined to that particular portion of the machine where the new parts embodying the invention are located; Fig. 3 is a fragmentary top plan view of the parts illustrated in elevation in Fig. 2; Fig. 4 is a view similar to Fig. 2 but illustrating a modified construction; Fig. 5 is a fragmentary top plan view of the parts illustrated in elevation in Fig. 4; Fig. 6 is another fragmentary top plan view in the nature of an extension of Fig. 5; Fig. 7 is a fragmentary rear elevation of parts illustrated at the right in Figs. 4 and 5; Fig. 8 is a plan view of a sufficient portion of the machine to illustrate changes in inscriptions on certain banks of amount keys and upon certain of the accumulator wheels; Fig. 9 represents certain transfer mechanism in left side elevation; Fig. 10 similarly represents restoring devices for such transfer mechanism; and Fig. 11 represents in right side elevation stop devices of the tens of shillings bank.

In a machine of the type shown in the above-mentioned patent the amount keys are arranged in a familiar manner ranging from front to rear in several parallel rows and such keys are numbered in each row correspondingly to provide for all the amounts in the several decimal places within the capacity of the machine. These amount keys are upheld by springs and each key is coupled to a lever which extends rearwardly for connection with a stop-pin or blade, there being a set or row of such stop-pins or blades for each row of keys. There is a rack bar for each set of stop-blades and in an operation of the machine the extent of movement of that particular rack bar is determined by its abutment against whichever one of the stop-blades has been elevated by depression of an amount key.

In the accompanying drawings the reference numeral 117 designates keys such as above referred to, 116 levers with which said keys connect and 115 stop-blades coupled to said levers, respectively. The reference numeral 310 designates a rack bar supported by radius links 311 and adapted to be reciprocated by the drawing forward of

a handle lever (not shown) secured to a rock shaft 50 and the restoration of said shaft by a spring 55 suitably cranked there-  
 to as shown in Fig. 1. An arm 51 secured  
 5 to the shaft 50 carries at its rear end a roller  
 52 engaging a cam slot in an arm or plate 53  
 and the latter is secured to a counter rock  
 shaft 54. The latter carries an arm 74 with  
 10 a stud 74<sup>a</sup> to abut the front edge of the for-  
 ward radius line 311 and by acting against  
 the same, when the operating handle moves  
 rearwardly, move the rack back to normal.  
 The forward movement of the rack is  
 15 brought about through the medium of a  
 spring 75, connecting the rear radius link  
 311 with said arm 74, so that its extent of  
 movement may be regulated by its abut-  
 ment against one or another of the stop-  
 20 blades 115. This rack bar coöperates with  
 a pinion 78 on a number wheel or dial 90.  
 It will be understood that there is a rack,  
 a pair of radius links, an arm 74 and spring  
 75 for each number wheel. These are all  
 25 well-known elements of a machine of the  
 type shown in said Wales patent and in ad-  
 dition to the above-enumerated parts may  
 be mentioned the broad pawl or latch 114  
 (Figs. 2, 4, 5 and 7) pivotally mounted in  
 30 the frame 113 which carries the stop-blades  
 and drawn by a suitable spring into engage-  
 ment with all of the stop-blades of the row  
 or set. Projections on the stop-blades co-  
 operate with the upper edge of this broad  
 35 pawl or latch in a well-known manner to  
 provide for temporarily maintaining the  
 operated stop-blade in elevated position  
 against the stress of the key spring. Under  
 this arrangement of course the depression  
 40 of a second key in the same row will have  
 the effect of releasing a previously depressed  
 key in that row. Suitable means are, as  
 usual, provided for displacing the latch or  
 45 detent at the proper time in an operation  
 of the machine so as to cause the automatic  
 return of any depressed keys to normal at  
 the conclusion of an operation of the ma-  
 chine.

Referring first to the constructions illus-  
 50 trated in Figs. 1 to 3, the increased capacity  
 for registration in the right-hand depart-  
 ment of the machine is provided for as fol-  
 lows: The right-hand row or set of stop-  
 blades is increased in number by two, the  
 55 additional blades being readily accommod-  
 ated in the frame 113 at opposite ends of  
 the usual row of nine stop-blades. The  
 right-hand rack bar 310 is permitted a  
 greater range of movement so that the rear-  
 60 most stop-blade may serve the usual func-  
 tion of the stop-blade just in front of this  
 additional blade, viz., to determine the ex-  
 tent of movement of the rack bar when reg-  
 istering one unit in the lowest decimal place.  
 The increased range of movement of the  
 65 rack bar also provides for its advancing far

enough to contact with the foremost stop-  
 blade which represents the highest number  
 in the lowest decimal place. This increased  
 range of movement is provided for by lo-  
 70 cating the stud 74<sup>a</sup> in the right arm 74 a  
 greater distance from the rock shaft 54  
 than corresponding studs of the other arms,  
 and consequently nearer the center on which  
 the forward radius links rock, all as illus-  
 75 trated in Fig. 1, where the studs appear in  
 dotted lines. In the present instance the  
 construction provides for a registration up  
 to eleven in the lowest decimal place, the  
 twelfth increment of movement in this bank  
 80 representing accumulation of pence to the  
 amount of one shilling and consequently  
 being carried to the next higher wheel.  
 Two additional keys 117<sup>a</sup> are mounted to  
 the right of the keys inscribed with num-  
 85 erals 8 and 9 in the row of keys which is  
 ordinarily the farthest one to the right.  
 This is illustrated in Figs. 3 and 8 where  
 the two additional keys are shown as in-  
 scribed with the numerals 10 and 11. The  
 90 nine regular keys of the usual right-hand  
 row are connected respectively with the  
 rearmost nine stop-blades of the right-hand  
 set of such blades whereas the two additional  
 keys 117<sup>a</sup> are connected respectively with  
 95 the foremost two stop-blades of this set.  
 The stems of said keys 117<sup>a</sup> are offset as  
 shown at 117<sup>b</sup>, Fig. 2, and their lower ex-  
 tremities are coupled respectively to levers  
 116<sup>a</sup> and 116<sup>b</sup> pivoted intermediate their  
 100 ends to a suitable supporting bracket 110,  
 and connected respectively with the fore-  
 most two stop-blades which have laterally  
 projecting lugs 115<sup>a</sup> and 115<sup>b</sup> embraced re-  
 105 spectively by the bifurcated rear ends of  
 the levers 116<sup>a</sup> and 116<sup>b</sup>. Thus depression  
 of the key bearing the numeral 10 will ele-  
 vate the tenth stop-blade counting from the  
 rear, whereas depression of the key bearing  
 the numeral 11 will elevate the eleventh or  
 110 foremost stop-blade.

It will be seen that the above-described  
 construction provides for two additional in-  
 115 crements of movement of the right-hand  
 rack bar 310. The wheel or dial coöperating  
 with said rack will be correspondingly in-  
 scribed with numerals from 1 to 11 and an  
 intervening zero, as shown in Fig. 8. Thus  
 such wheel instead of showing a zero upon  
 receiving an increment of movement beyond  
 120 the position in which it displays the numeral  
 9 will show the numeral 10 and with another  
 increment of movement will show the nu-  
 meral 11. This obviously provides for reg-  
 125 istration of pence and the usual transfer  
 mechanism associated with said wheel and  
 the next higher wheel will provide for car-  
 rying a twelve-pence registration to the shil-  
 lings wheel. The latter and the coöperating  
 rack bar, stop-blades and row of keys require  
 130 no alteration over the usual construction em-

played for the decimal system. Of course it will be understood that a second shillings wheel is necessary as a second complete rotation of the first shillings wheel must ensue before the accumulation of one pound. On this second shillings wheel the inscriptions will be simply alternating ones and zeros and with every other movement of this second shillings wheel there is a transfer to the pounds wheel. Of course the row of keys coöperating with the second shillings wheel will not bear inscriptions from 1 to 9 but the numeral one will be inscribed on each key of this row. These variations from the usual arrangement, as to inscriptions on amount keys and number wheels, are illustrated in Fig. 8. It will be understood that the arrangement of nine keys in the second shillings bank is simply a matter of convenience besides preserving symmetry of the key-board. The depression of any one of these keys has the same effect in limiting the advance of the corresponding rack bar a single step. Hence a single key in this bank would be sufficient so far as registrations on the second shillings wheel are concerned.

The means here shown whereby the movement of the rack bar which turns the tens of shillings wheel is rendered uniform for each key in the corresponding bank may be described as follows: The usual set of nine blades 115 is employed, each blade being connected with a key lever 116, the same as used in a machine of this particular type. However, these blades do not constitute stops for the rack bar. They simply perform the function of lifting the usual pivoted stop arm 118 (see Fig. 11). In the type of adding machine here shown, it is customary for this pivoted stop arm to perform the function of holding back a rack bar in any bank where no amount key has been depressed. The rear end of the stop arm is turned laterally for such purpose and so long as the stop arm remains in its normal lowered position, the front end of the corresponding rack bar will abut the same when the machine is operated, thus preventing any effective advance of the rack bar. Ordinarily when this pivoted stop arm is elevated by depression of any amount key, its laterally turned rear end is carried above the line of travel of the rack bar, so that the latter may pass beneath the arm for contact with the elevated stop-blade. In the present instance, a special formation of the rack bar for the tens of shillings bank is employed so that the extent of movement of this bar in any case will be determined by its abutment against the laterally turned rear end portion of the stop arm. Thus, as illustrated in Fig. 11, the front end of the rack bar is widened as at 310<sup>a</sup>. The lower front edge of the rack bar, as usual, abuts the stop arm to hold the rack bar at normal

position. The front edge of the widened portion 310<sup>a</sup> stands in rear of this lower front edge. Thus, when the stop arm 118 has been elevated by any one of the blades 115, its laterally turned rear end portion 70 still stands in the path of the widened portion of the rack bar, as illustrated in dotted lines in Fig. 11. It follows that the rack bar will partake of exactly the same extent of movement whichever one of the blades 115 is 75 elevated.

The construction provided for the purpose of effecting a transfer with every other movement of the tens of shillings wheel is illustrated in Figs. 9 and 10. The transfer 80 devices here shown are not novel, but are such as have been heretofore employed in machines of the type here shown. Each numeral wheel 90 carries a toothed disk 91 and a transfer pawl 92 is adapted to engage 85 this toothed disk to advance the number wheel one step. Said pawl is carried upon a pivoted plate 93 and a spring 94 tends to elevate the rear portion of said plate and cause the pawl to advance the number wheel. The 90 spring is, however, normally restrained by the engagement of a lip 95 at the forward part of said plate 93 with a stud 96 on a lever 97, the latter being drawn rearward by a spring 98. In the usual 95 construction of the Wales machine there are two transfer tripping arms, such as shown in dotted lines at 100 in Fig. 1, and each number wheel has two series of numerals running from 1 to 9 with intervening 100 zeros. These tripping arms act against a laterally turned portion of the lever 97 to carry the stud 96 from under the lip 95, so that the spring 94 may operate to effect the transfer. For the purpose of providing for 105 the transfer to the pounds wheel with every other advance of the tens of shillings wheel, the latter is provided with a disk 101 having ten tripping teeth or cam projections 102. With every other advance of this tens of 110 shillings wheel, one of said cam projections will act upon the lever 97 to carry the stud 96 from under the lip 95. The restoration of the lever 93 against the stress of the 115 spring 94 is effected through the medium of a depending slotted link 103, which embraces a rod 104 carried by a pair of cam levers 105, one of which appears in Fig. 10. Springs, one of which is shown at 106 in said figure, tend to elevate these cam levers. Their de- 120 pression for effecting restoration of transfer plates or levers is brought about through the operation of rollers 107, (one of which appears in Fig. 1 and also in Fig. 10) upon the upper cam edges of the levers 105. 125 These rollers are carried on a cross rod or bar 108, which constitute a pintle uniting pitmen 109 and crank arms 110. The pitmen 109 are cranked to the main rock shaft 50, so that in oscillations of the latter the 130

rollers 107 will be drawn forward and then returned over the cam edges of the levers 105.

The reference numeral 111 designates an overthrow preventing pawl mounted upon the forward end of the transfer plate 93 and engaging the toothed disk 91. A spring 112 tends to disengage said pawl from said disk, but is normally restrained from so doing by the engagement of a stud 113 on the rack bar 310 with the forward edge of said pawl, as shown in Fig. 9. This forms no part of the present invention, nor does the particular form of transfer mechanism above described, and it is not thought necessary to further describe these devices.

Passing now to the modification illustrated in Figs. 4 to 7, instead of lengthening the row of stop-blades making up the right-hand set and having the detent latch or broad pawl cooperate with the two additional stop-blades, these additional stop-blades are mounted to the right of the set of nine stop-blades of which they constitute an extension and a separate detent latch or pawl cooperates with the two additional stop-blades thereof coupled to move as one with the detent pawl which engages the nine stop-blades to the left. Two keys 117<sup>c</sup> are employed, these keys bearing the numerals 10 and 11 as do the keys 117<sup>a</sup> illustrated in Figs. 2 and 3 and being similarly located on the keyboard. These two additional keys are coupled at their lower extremities to levers 116<sup>c</sup> and 116<sup>d</sup> respectively the latter being pivoted intermediate their ends on a suitable part of the supporting frame-work and bifurcated at their rear ends for engagement respectively with stop-blades 115<sup>c</sup> and 115<sup>d</sup>. The latter protrude through the top of the frame-piece 113 in line with each other from front to rear as shown in Fig. 5 and in line with the keys 117<sup>c</sup>. The nine stop-blades 115 which with these two additional stop-blades make up a set of 11 pence-stops are located as usual in line with the row of nine keys with which they cooperate. The two additional stop-blades are of course located in advance of the said nine stop-blades. Consequently the latter do not collectively occupy the middle of the frame-piece 113 in that lateral portion thereof where they are located as will ordinarily be the case with the machine organized simply for decimal currency, but these nine stop-blades have a more rearward location collectively so as to provide for the location of the additional stop-blades in advance and as a continuation of the same set. Under this modified arrangement the right-hand rack bar 310 is required to be differently formed or constructed at its forward end as compared with the usual formation or construction. The usual lateral finger 310<sup>a</sup> cooperates with the nine stop-blades 115 but an additional supplemental finger 310<sup>b</sup> is secured

to the side of the rack bar opposite that where the usual finger 310<sup>a</sup> is located, said supplemental finger projecting laterally a sufficient distance to cooperate with the stop-blades 115<sup>a</sup> and 115<sup>b</sup>, as clearly illustrated in Fig. 6. It will be seen that with this construction of the right-hand rack bar the stop-blades 115 and 115<sup>c</sup> and 115<sup>d</sup> make up one set providing for eleven different degrees of advance of the rack bar. The usual detent latch or broad pawl 114 is employed for the nine stop blades 115 and a similar latch or broad pawl 114<sup>a</sup> is mounted in the frame-piece 113 and cooperates with the stop-blades 115<sup>c</sup> and 115<sup>d</sup>. The projecting ends of these latches or broad pawls which customarily connect with release mechanism illustrated for example in Patent No. 797,032 issued August 15, 1905, to said Charles Wales, are utilized in the present instance as a means of uniting the latches through the medium of a link 115<sup>e</sup> which as illustrated in Fig. 7 is apertured at its ends to embrace said projecting portions of the latches. Thus the latter are tied together so as to move in unison. A spring 114<sup>d</sup> is, however, preferably applied to each of the latches.

It will be seen that either of the above-described mechanisms is well adapted to fulfill the object primarily stated and it is to be understood that other modifications may be made in carrying out the invention without necessarily departing from the scope thereof.

What is claimed is:

1. In a machine of the character described, the combination of parallel rows of amount keys forming one set; a set of stops certain of which are operatively connected to the keys of one of said rows respectively and the others to the keys of the other row respectively; a differential accounting member whose extent of movement is determined by the operated stop; and detent means common to all the stops.

2. In a machine of the character described, the combination of parallel rows of keys and a single set of stops, the latter connected respectively to said keys with offset provisions to enable the keys of the parallel rows to cooperate respectively with the stops of the set; detent means common to said stops; and a differential accounting member whose extent of movement is determined by the particular stop operated.

3. In a machine of the character described, the combination of parallel rows of keys and a single set of stops, levers connecting the stops respectively to said keys, detent means common to said stops and a differential accounting member whose extent of movement is determined by the particular stop operated; there being offset provisions to enable the keys of the parallel rows as a set to cooperate respectively with



all the stops composing the aforesaid set to variously determine the extent of movement of said member.

4. In a machine of the character described, the combination of parallel rows of depressible keys, a set of vertically movable stops, levers pivoted intermediate their ends and connected on one side of the pivots to the keys respectively and on the other side to the stops respectively; and a reciprocating accounting member whose extent of movement is determined by abutment against one of the said stops; there being offset provisions to enable the keys of the parallel rows to cooperate respectively with the stops of the set to variously determine the extent of movement of said member.

5. In a machine of the character described, the combination of parallel rows of amount keys forming one set; a set of stops certain of which are in line with and operatively connected to the keys of one of said rows respectively and the others in line with and operatively connected to the keys of the other row respectively; a differential accounting member whose extent of movement is determined by the operated stop; and detent means common to all the stops.

6. In a machine of the character described, the combination of parallel rows of amount keys forming one set; a set of stops certain of which are operatively connected to the keys of one of said rows respectively and the others to the keys of the other row respectively; a differential accounting member whose extent of movement is determined by the operated stop; and detent means common to all the stops, the same comprising spring-held latches one for each department of stops and operatively connected together.

7. In a machine of the character described, the combination of parallel rows of amount keys forming one set; a set of stops certain of which are operatively connected to the keys of one of said rows respectively and the others to the keys of the other row respectively; a differential accounting member whose extent of movement is determined by the operated stop; and detent means common to all the stops, the same comprising a spring-held latch for each department of stops and a link connecting the latches.

8. In a machine of the character described, the combination of parallel series of amount keys, corresponding series of stops, operating connections between the keys and stops, a rack bar having laterally spaced portions for abutting stops of the different series respectively, and means for reciprocating the rack bar.

9. In a machine of the character described, the combination of parallel series of amount keys, corresponding series of stops, operating connections between the keys

and stops, a rack bar having oppositely extending projections for abutting stops of the different series respectively, and means for reciprocating the rack bar.

10. In a machine of the character described, the combination of parallel series of depressible amount keys, corresponding series of vertically movable stop blades, levers connecting the keys and blades, detent devices common to all the stop blades, a rack bar having laterally projecting fingers for abutment against stop blades of the series respectively, and means for reciprocating said rack bar.

11. In a machine of the character described, the combination with a series of independently rotatable accumulating wheels, of a differentially operable actuating device for each wheel with provisions for an increased range of movement of one such actuating device, as compared with others.

12. In a machine of the character described, the combination with a series of independently rotatable accumulating wheels, of a rack for each wheel, a pair of radius links for each rack, and a rocking structure to abut corresponding members of said pairs of links for moving the racks in one direction, the point of contact between one of such links and the said rocking structure being farther removed from the center on which the latter rocks than the points of contact between others of said links and said rocking structure.

13. In a machine of the character described, the combination with a series of independently rotatable accumulating wheels, of a rack for each wheel, a pair of radius links for each rack, a rocking structure to abut corresponding members of said pairs of links for moving the racks in one direction, the point of contact between one of such links and the said rocking structure being farther removed from the center on which the latter rocks than the points of contact between others of said links and said rocking structure; means for rocking the latter; and springs connecting the same with the links.

14. In a machine of the character described, the combination of a key-piece, a reciprocating bar, and a movable stop for holding said bar in normal position, said key-piece adapted to displace said stop to permit movement of the bar measured by abutment against the stop.

15. In a machine of the character described, the combination of a key-piece, a reciprocating shouldered bar, and a movable stop for holding said bar in normal position, said key-piece adapted to displace said stop to permit movement of the bar measured by abutment against the stop, above the shoulder of the bar.

16. In a machine of the character de-

scribed, the combination of a set of key  
pieces adapted to be separately elevated, a  
stop arm extending over said key pieces and  
arranged to be lifted by any one of them,  
5 and a reciprocating bar shouldered to pro-  
vide abutment edges in different vertical  
planes, one of such edges to abut the stop

arm when the latter is down and the other to  
abut said arm when it is lifted by one of the 10  
key pieces.

CHARLES WALES.

Witnesses:

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F. H. BOYER.