(Model.)

3 Sheets—Sheet 1.

L. S. BURRIDGE & N. R. MARSHMAN.

ADDING MACHINE.

No. 513,452. Patented Jan. 23, 1894.

Fig. 1.

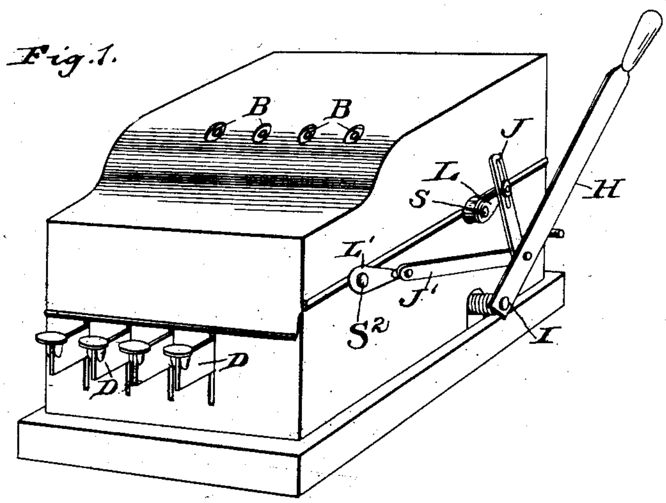


Fig. 2.

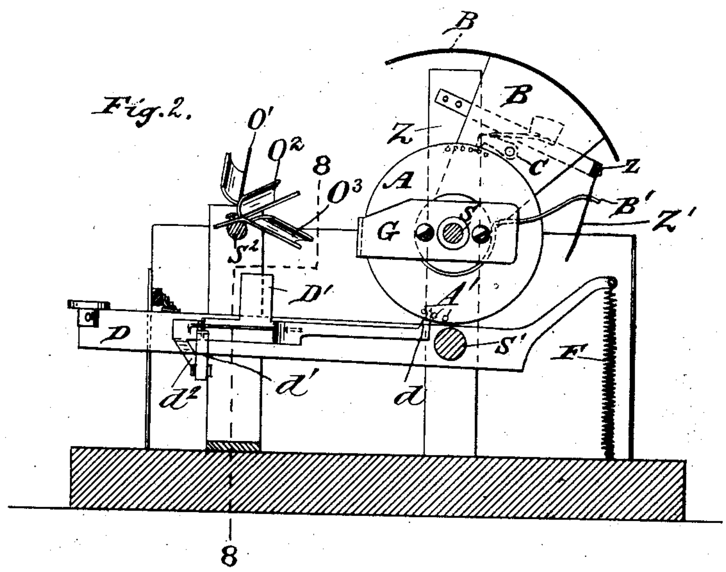
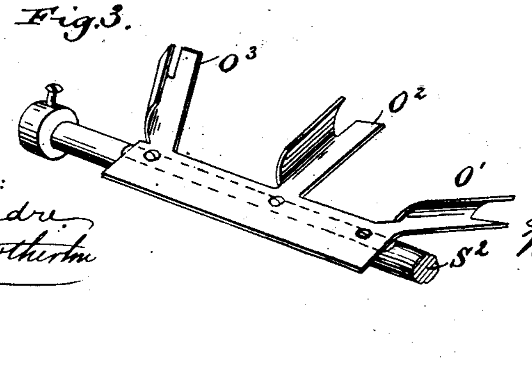


Fig. 3.



WITNESSES:

L. N. Legendre

Jas. Brotherton

INVENTORS

Lee S. Burridge

Newman R. Marshman

(Model.) 3 Sheets—Sheet 2.

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Fig. 4.

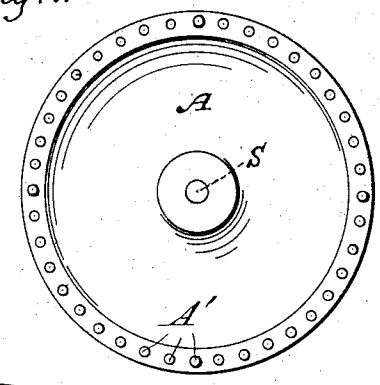


Fig. 5.

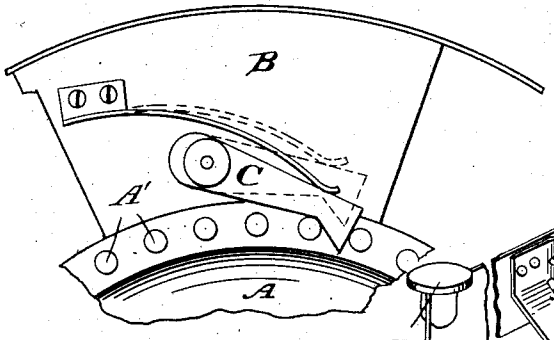


Fig. 7.

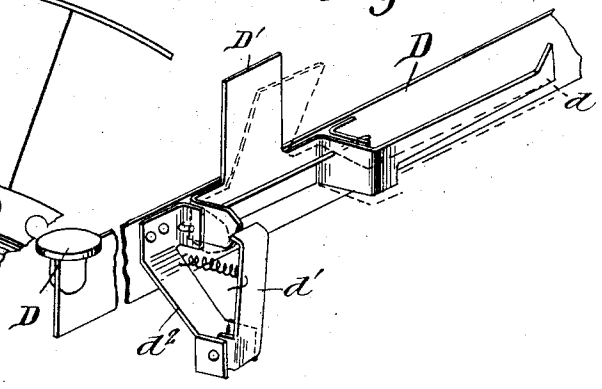
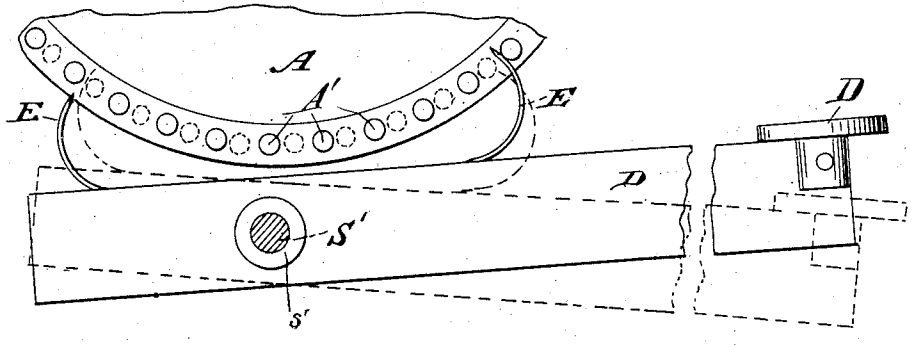


Fig. 6.



WITNESSES:
L. N. Legendre
Jas. L. Bottheim

INVENTORS
Lee S. Burridge
Newman R. Marshman

(Model.)

3 Sheets—Sheet 3.

L. S. BURRIDGE & N. R. MARSHMAN.

ADDING MACHINE.

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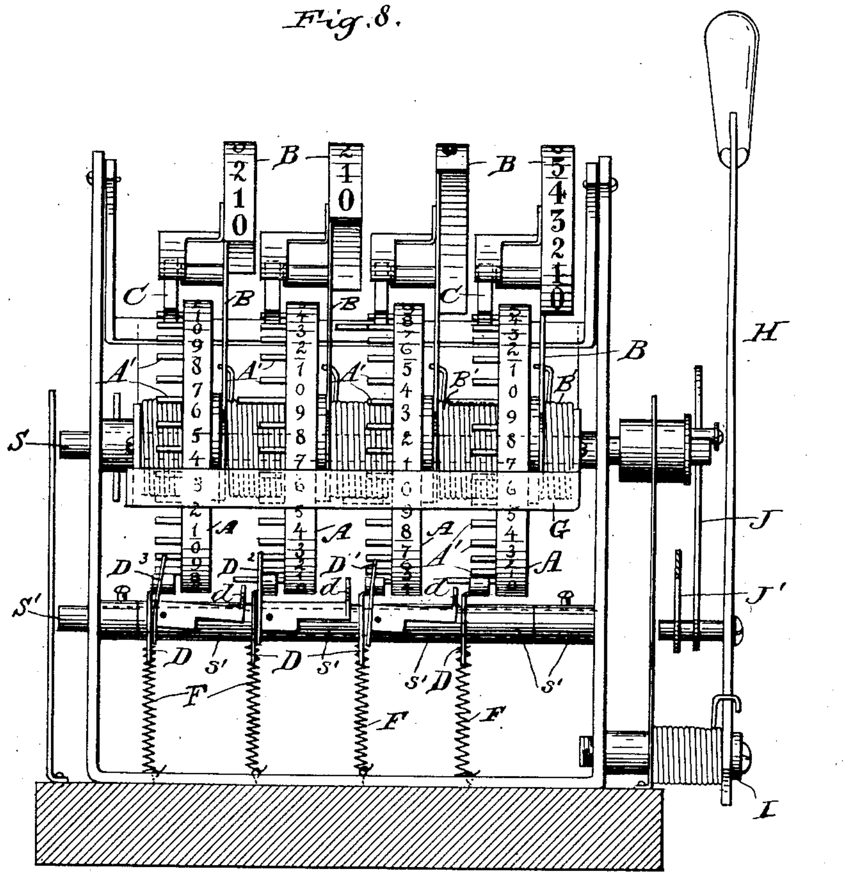
Fig. 8.



WITNESSES:

L. N. Legendre.
Jas Brotherton

INVENTORS

Lu S. Burridge
Newman R. Marshman

UNITED STATES PATENT OFFICE.

LEE S. BURRIDGE AND NEWMAN R. MARSHMAN, OF NEW YORK, N. Y.

ADDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 513,452, dated January 23, 1894.

Application filed June 19, 1893. Serial No. 478,146. (Model.)

To all whom it may concern:

Be it known that we, LEE S. BURRIDGE and NEWMAN R. MARSHMAN, citizens of the United States, residing at New York, in the county and State of New York, have invented a new and useful Adding-Machine, of which the following is a specification.

Our invention relates to improvements in adding machines in which all columns of figures are added together and the sum total shown in single numerals and also in which each particular number is shown independently of the total. We attain these objects by the mechanisms illustrated in the accompanying drawings, in which—

Figure 1 is a view of machine and case with cover closed. Fig. 2 is a sectional side elevation with cover removed. Fig. 3 is a detail view of shaft with finger pieces being a portion of the carrying over device. Fig. 4 is a side view of an adding wheel. Figs. 5 and 6 are enlarged views of the mechanisms on the adding wheels. Fig. 7 shows a key lever and trip lever. Fig. 8 is a sectional front elevation taken through lines 8—8 of Fig. 2.

The wheels A, A are the adding wheels rotating on the shaft S, which is supported by side pieces fastened to the base and have pins A′ projecting in line of the shaft and numerals on the periphery corresponding to the number of pins which number forty on each wheel in drawings. The single numerals are duplicated therefore four times.

The segments B, B are the indicator segments oscillating on the same shaft S; their radius is greater than that of the wheels A, and they have larger numerals from 0 to 9 on their periphery, and only one set; the pawls C, C are pivoted to the segments, so as to engage in the pins of the wheels A, and the springs B′ B′ are coiled over washers *s* that keep the wheels apart and are hooked on the segments B (Fig. 8) to impel them in the direction of engagement of the pawls C. The other end of the springs are passed through holes in a plate Z′ fastened to the stationary frame Z, (Fig. 2) which also serves as the arresting or zero point of the indicator segments.

D, D are key levers having for bearings the shaft S′, and kept apart by tubes *s′* fastened to them which are snug over the shaft. These key levers have keys for the fingers on one end and verges E, E on the fulcrum end; the verges engage in the pins A′ of the wheels A. The springs F, F serve to return the key levers when depressed, and the depression is controlled by the length of the slot in the front part of the casing, which also serves to keep the outer ends of the key levers apart.

The frame G (Figs. 2 and 8) is screwed to the two end washers *s* on the shaft S, which in turn are pinned to the shaft; said frame extends across all the wheels as shown in Fig. 8 and clears the wheels A, but when rotated serves to return the segments B.

The frame G is operated by the arm H, fulcrumed at I, through the pitman J and crank L which is pinned to the shaft S. When the frame G is at normal it serves as the reading line for the numerals on the wheels A. The reading line of the segments B is through holes in the cover of the case when closed down. It will be seen that each wheel A and segment B will move the space of one pin; hence one numeral space, by the depression and return of the corresponding key lever through the impelling spring B′, pawl C and escapement verge E. Each key lever and corresponding wheel and segment serves for a single column of figures, so that the two right hand keys and wheels represent cents and the left hand ones represent dollars.

The operation of the machine so far is as follows: The key levers may be depressed singly or together as many times as the required number to be added denotes in each column, as for instance if $12.50 is the number, the first key to the right is not touched, the next is depressed five times, the next twice and the next once, and if the three keys are depressed at once by as many fingers there would only be five strokes necessary (instead of eight) to add the number, each finger being raised above the keys after it has depressed the required number of times when less than the highest numeral in the number. The number $12.50 will be seen on the indicator segments through the holes in the cover, and will also be set up on the adding wheels. Now if the arm H is drawn over the indicator segments B will be returned to zero by the frame G, but the adding wheels will be arrested by the verges E which never come

out of engagement. Any subsequent number will therefore be added to what is already shown on the adding wheels.

We will now explain the carrying over of the tens from one column to the next. In the drawings (Fig. 8) it will be seen that every tenth pin on the wheels A is longer than the rest. D′, D², D³ are trip levers fulcrumed on the key levers as shown in Fig. 7 and extending under the numeral wheels to the right. It will be seen in the drawings that there are only three trip levers fulcrumed on the three key levers to the left, the first key lever to the right not having any trip lever mounted on it as that key lever operates the units wheel which is not "carried over," but said units wheel acts upon the trip lever mounted on the next key lever as further explained. The tooth *d* is in the path of the long pins but free of the short pins. *d′* are pawls pivoted to an arm d^2 secured to the key levers, with springs which serve to retain the trip lever in position either when normal or tripped by bearing against the slanting sides of the projection of the trip lever as shown in Fig. 7. S^2 is a shaft having fingers or finger pieces O′, O^2, O^3 which are in line of the trip levers D′ D^2 D^3 respectively when tripped and in which case finger pieces O′, O^2, O^3 depress the corresponding keys when the shaft S^2 is rotated. When however the trip levers D′, D^2, D^3 are in their normal position the finger pieces pass them without touching. The finger pieces O′, O^2, O^3 have a projecting flange bent at an angle and cut cam shaped as shown in Figs. 2 and 3, so that after a trip lever has been depressed it will be returned to its normal position, as the key lever returns, by the trip lever coming in contact with the cam shaped edge or when the pieces O′, O^2, O^3 return to normal, by being pushed back by the angular projecting flange. The finger pieces O′, O^2, O^3 are not in a horizontal line but in different portions of a circle like the spokes of a wheel, so that they will come in contact with the tripped trip levers one after the other, the right hand one O′ being the first to come in contact. The shaft S^2 is rotated by the arm H through the pitman J′ and crank I′ on the shaft S^2. Now when an adding wheel is rotated step by step by the depression of its corresponding key as before explained, until a long pin has tripped a trip lever by coming in contact with the tooth *d*, it will remain in such tripped position and will be depressed by its corresponding finger piece when the shaft S^2 is rotated, which will cause the corresponding wheel to move one; the key lever and wheel operated by the shaft S^2 and finger piece will be the next one to the left of the wheel whose long pin tripped the trip lever. The numerals on the adding wheels are set so that they read zero when the long pins have just tripped the trip lever. Suppose the reading line of the adding wheels shows 9999. If now the first key to the right is depressed once, the first trip lever D′, which is on the second key, will be tripped, and when the arm H is drawn over, the finger piece O′ will depress that key lever and through the motion of that wheel cause the next trip lever D^2 to be tripped in time for the next finger piece O^2 to depress that and so on until all the wheels will read 0000 at the reading line. The pitman J is slotted so that when drawing over the arm H, the frame G is not moved until the last finger piece O^3 has depressed the corresponding key lever (if the trip lever has been tripped) and allowed it to fly back. The operation of the arm H is therefore first to rotate the shaft S^2 and thereby do the carrying over, and then to return the indicator segments to zero through the frame G as explained. It is obvious that the arm H should be operated after every particular number has been set up by the keys. By this peculiar combination of elements we are enabled to operate all the keys at once, as the carrying is done independently of the fingering of the keys, and after the particular number has been set up through the keys by the fingers. Where the carrying is done, as in some machines, at the same time that the number is set up, not more than one key or wheel can be operated at once; hence our machine can be operated much more rapidly than would be the case if it were made to "carry" as in the usual manner, because in such case only one key could be operated at once, whereas all of ours can be operated simultaneously.

We do not confine ourselves to the pins shown on the adding wheels, as teeth cut in the periphery like an ordinary gear wheel would be equivalent, the only difference being that at every tenth tooth a pin or projection would have to be fastened or soldered, and a flange would also have to be fastened for the marking of the numerals.

We do not confine ourselves to the number of wheels and corresponding pieces as they may be increased indefinitely, The machine we show adds only to $99.99, but we have made models with eight wheels which add to $999,999.99.

We have shown in another application filed December 16, 1893, Serial No. 493,867, a cash register on the same general principle as this invention and shall claim therein certain features shown but not claimed in this application.

What we claim as new, and desire to secure by Letters Patent, is—

1. In an adding machine having a series of adding wheels and indicators therefor, each marked with the single numerals from 0 to 9 only, one such adding wheel and indicator for the units, one of each for the tens, and one of each for the hundreds and so on, with a single key for each adding wheel and indicator, constructed to advance such wheel and indicator uniformly but a single numeral space, and intermediate carry-mechanism constructed to move the wheels independently of

the fingering of the keys, whereby all the keys may be depressed simultaneously, substantially as described.

2. In an adding or similar machine the combination of a numeral adding wheel for each column of figures and a key lever having a trip lever fulcrumed thereon, adapted to be tripped by the numeral adding wheel next to the right as set forth.

3. In a carrying over device for adding or similar machines the combination of the trip levers with a shaft having projecting fingers for the purpose of acting on said trip levers when tripped as shown and described.

4. In a carrying over device for adding or similar machines, the combination of the trip lever with the pawl adapted to hold the trip lever in the normal or tripped position substantially as shown and described.

5. The combination in an adding machine of a numeral adding wheel having pins, with an indicator on the same shaft, having a pawl engaging in the pins of the adding wheel, and a spring impelling the indicator and thereby the adding wheel substantially as shown and described.

6. In an adding or similar machine the combination of the arm H with the slotted pitman J and pitman J′ imparting motion to the shafts S and S^2 respectively substantially as shown and described.

7. In an adding or similar machine the combination of a numeral adding wheel A, indicator segment B, key lever D with trip lever and rotatable shaft S^2 having finger pieces O all acting to perform a result as shown and described.

8. In a carrying over device for adding or similar machines the combination of a shaft like S^2 having finger pieces projecting like the spokes of a wheel but not in the same plane, with trip levers adapted to be acted upon by said finger pieces substantially as shown and described.

9. The combination of the adding wheel A, the indicator B, the spring B′, the pawl, C with the key-lever D having a single key mounted thereon and provided with the escapement, the said indicator and adding wheel being impelled by the said spring, substantially as shown and described.

10. In an adding or similar machine the combination of the wheels A, segments B, key levers D and trip levers, finger pieces O with arm H and intermediate mechanism substantially as shown and described.

LEE S. BURRIDGE.
NEWMAN R. MARSHMAN.

Witnesses:
JAS. BROTHERTON,
B. T. VETTERLEN.