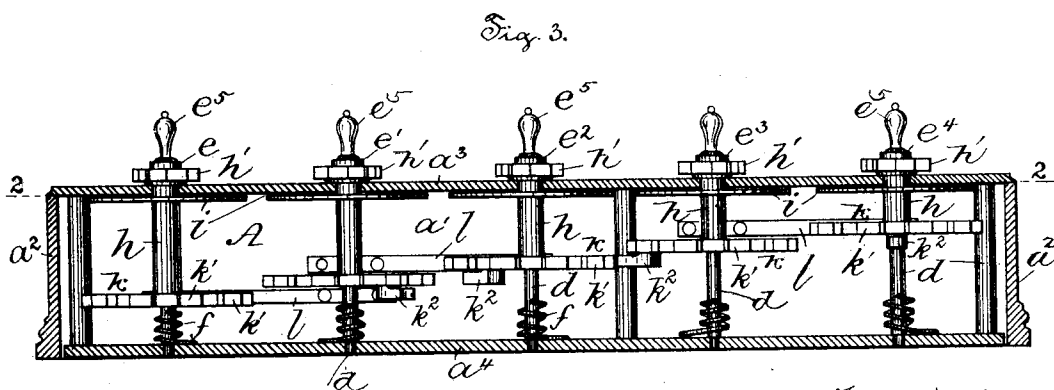
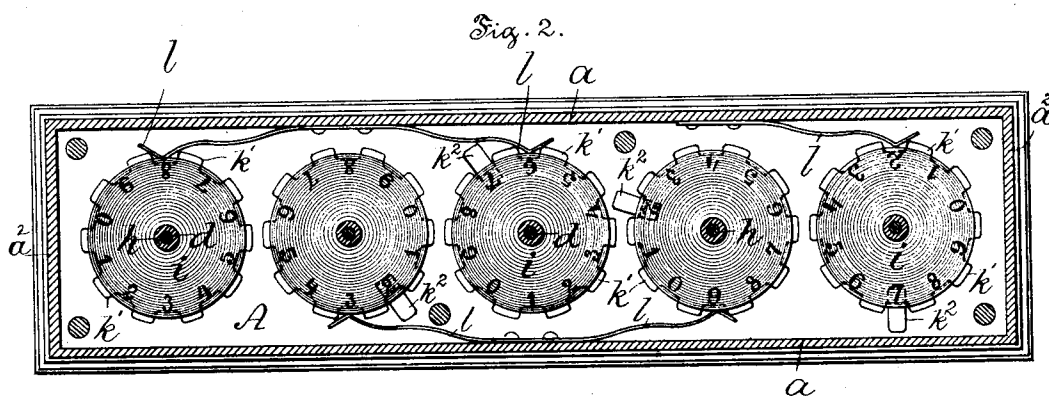
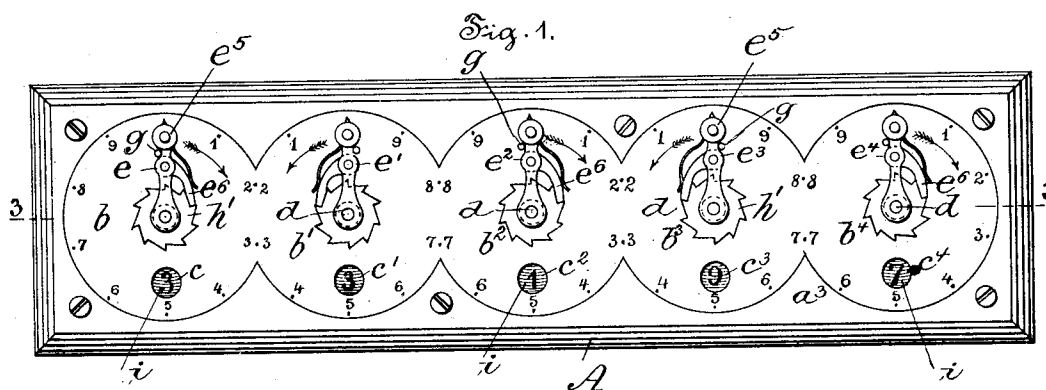


(No Model.)

J. S. HILLIARD.
ADDING MACHINE.

No. 477,416.

Patented June 21, 1892.



Witnesses:
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UNITED STATES PATENT OFFICE.

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ADDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 477,416, dated June 21, 1892.

Application filed September 11, 1891. Serial No. 405,376. (No model.)

To all whom it may concern:

Be it known that I, JOHN S. HILLIARD, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Adding-Machines, of which the following is a specification.

My present invention relates in general to that type of adding-machines in which all the indicating or number wheels except the units or digit wheel are actuated both manually and mechanically, and it relates more particularly to the construction and arrangement of mechanism and appliances for permitting of the actuation of said wheels.

The principal object of my present invention is to provide a simple, compact, durable, and comparatively inexpensive adding machine or instrument for accurately and expeditiously ascertaining the sum or aggregate of two or more numbers by mechanical means and by a series of simple and rapidly-performed manipulations.

My invention consists of an adding-machine comprising a series of number-indicating wheels, a series of spring-controlled hand-levers, dials provided with guide-numbers, pawl-and-ratchet connections between said levers and number-wheels, means for controlling the movements of said number-wheels, and mechanism for causing each complete revolution of one of said number-wheels to advance the next wheel of the series a distance corresponding to the space between two of its teeth.

My invention further consists of an adding-machine comprising a series of number-indicating wheels, a series of spring-controlled hand-levers, dials provided with guide-numbers, pawl-and-ratchet connections between said levers and number-wheels, a series of toothed wheels disposed in different planes, a single radial operating arm or tooth attached to each intermediate toothed wheels of said series, and detents for engaging each of said toothed wheels; and my invention further consists of the improvements in adding-machines hereinafter described, and pointed out in the claims.

The nature and objects of my present inven-

tion will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, and in which—

Figure 1 is a top or plan view of an adding-machine embodying features of my invention, showing a series of dials and spring-controlled hand-levers located at the top thereof. Fig. 2 is a horizontal section on the line 2 2 of Fig. 3, and Fig. 3 is a central longitudinal section taken on line 3 3 of Fig. 1, showing a series of toothed wheels disposed in different parallel planes and also showing a radial arm or tooth attached to one of the faces of each of the intermediate wheels of said series and adapted to mesh with the next succeeding wheel of the series.

In the drawings, A is a case or housing of preferably rectangular shape and comprising side plates a , end plates a^2 , a top a^3 , and a bottom plate a^4 . The top plate a^3 is provided upon its upper surface with a series of dials b , b' , b^2 , b^3 , and b^4 , and with a series of openings or windows c , c' , c^2 , c^3 , and c^4 , which may be covered by glass plates, if preferred, in order to protect the interior of the apparatus from dust or other extraneous matter. In the present instance there are five dials provided, respectively, with the numerals from "0" to "9," inclusive. The numerals are arranged around certain of the dials b , b^2 , and b^4 in advancing order from right to left and around the other dials b' and b^3 in a reverse direction, for a purpose to be presently described.

d are a series of spindles ranging transversely of the housing A and having their lower extremities supported in suitable bearings formed in or connected with the bottom plate a^4 and having their upper extremities projecting above the top plate a^3 and supported in suitable bearings disposed concentrically with relation to the center of each of the dials b , b' , b^2 , b^3 , and b^4 .

e , e' , e^2 , e^3 , and e^4 are a series of hand-levers keyed or otherwise attached to the extremities of the respective spindles d , that project above the top plate a^3 .

e^5 are a series of hand-knobs connected, respectively, with the hand-levers e , e' , e^2 , e^3 , and e^4 .

Each of the spindles d is adapted to be

manually rotated in the direction of the numbers on the corresponding dial taken in advancing order—that is, in the direction indicated by the arrows—by means of one of the 5 hand-knobs e^5 .

f are a series of helical springs having one of their respective extremities in engagement with the bottom a^4 of the housing A and the other extremity thereof, inserted and fitted 10 into radial holes or apertures in the respective spindles d , in engagement with one of the spindles d . These springs f , by reason of their resiliency, serve to automatically return the hand-levers e , e' , e^2 , e^3 , and e^4 and spindles 15 d to their normal positions after they have been operated manually in the manner above described.

g are a series of stops projecting from the top plate a^3 in order to engage the hand-levers e , e' , e^2 , e^3 , and e^4 to stop and retain them 20 normally in position in alignment with the zero characters of the respective dials. In some instances these stops g are disposed to the right of the zero characters and in other 25 instances they are disposed to the left thereof, according to the direction of rotation of the hand-levers e , e' , e^2 , e^3 , and e^4 .

h are a series of sleeves loosely mounted upon the spindles d , but held against end 30 play thereon. To the upper extremities of these sleeves h are attached a series of ratchet-wheels h' , disposed outside and on top of the housing A . The teeth of the wheels of this series of ratchet-wheels h' are arranged 35 to mesh with the spring-pawls e^6 , attached to the hand-levers e , e' , e^2 , e^3 , and e^4 when the latter are shifted manually, it being understood that the spring-pawls e^6 slide freely 40 over the teeth of the ratchet-wheels h' when the hand-levers are automatically shifted in a reverse direction by means of the springs f .

i are a series of number-wheels provided, respectively, upon their upper faces with the numerals from "0" to "9," arranged in 45 advancing order in reverse direction to the numerals on the corresponding dials. These number-wheels i are keyed or otherwise attached to the sleeves h , and are located beneath the top plate a^3 and in proximity therewith, so that the numerals upon their upper 50 faces are visible singly through the openings or windows c , c' , c^2 , c^3 , and c^4 .

k , Fig. 3, are a series of toothed wheels keyed or otherwise attached to the sleeves h 55 and provided, respectively, with teeth k' , Fig. 2, corresponding in number and position with the numerals upon the respective number-wheels i . Each of the wheels i of the series of number-wheels, except the last or left-hand 60 wheel, is provided upon one of its faces—in the present instance the under face—with a radially-projecting arm or tooth k^2 for engaging and actuating the next wheel of the series of wheels i . Moreover, these wheels 65 are respectively located in different parallel planes, so that the radially-projecting arm k^2 of each wheel of the series of wheels lies in

position for meshing with the teeth of the next succeeding wheel of the series to the left or of higher order and is out of range of the 70 preceding wheels thereof.

l are a series of spring-detents connected, respectively, with one of the side walls a of the housing A and provided with V-shaped 75 working extremities adapted to engage the respective teeth of the toothed wheels k , in order to cause the latter to come to rest with one of the series of numerals of the number-wheel opposite to or in alignment with the 80 openings or windows c , c' , c^2 , c^3 , and c^4 .

The mode of operation of the hereinabove-described adding-machine is as follows: The hand-levers e , e' , e^2 , e^3 , and e^4 may be turned 85 away from the stops by means of the knobs e^5 , and this motion of the hand-levers is imparted to the sleeves h , and consequently to the number-wheels i and toothed wheels k , by means of the pawl-and-ratchet connections e^6 90 and h' . As soon as the knobs e^5 are released the hand-levers are returned to their normal positions by the helical springs f ; but the sleeves h and parts connected therewith are prevented from turning in a reverse direction 95 by means of the detents l . Whenever any of the toothed wheels, except the last wheel k , of the series have made one complete revolution, the radial arm k^2 meshes with the next 100 succeeding wheel of the series and rotates it through a distance equal to the space between two teeth, so that each wheel of the series of wheels is rotated manually by means of the 105 hand-levers e , e' , e^2 , e^3 , and e^4 , and also automatically by the rotation of the next preceding wheel of the series or wheel to the right.

In use the two dials b^3 and b^4 at the right-hand side of the machine appertain to cents 110 and the other dials to dollars, and the numbers indicating different sums of money may be added together in the following manner: The zero characters on each of the number-disks are brought into alignment with the 115 openings or windows c , c' , c^2 , c^3 , and c^4 either by means of the hand-levers or in any convenient manner. The numerals expressing one of the quantities which are to be added together, and which in the present instance 120 will be supposed to be "322.06," are transferred to the machine in the following manner: The first hand-lever e^4 at the right side of the machine is shifted toward the right until it occupies a position in alignment with the numeral "6" on the dial b^4 , whereupon it is released and automatically returned by the 125 spring f to its normal position. This motion of the hand-lever causes the pawl-and-ratchet connection to advance the number-wheel until the numeral "6" is exposed to view beneath the opening or window c^4 , and the detent l retains the wheel in such position. The next 130 hand-lever e^3 is not shifted, because it already stands in alignment with the zero character of the dial b^3 . The next succeeding handles are respectively shifted and released in the manner above indicated until the numerals "3,"

"2," and "2" are visible through the openings or windows c , c' and c^2 , respectively. Assuming that the next quantity to be added is expressed by the numerals "9.91," the hand-lever 5 at the right of the machine is shifted until it is in alignment with the numeral "1" on the dial b^4 and then released, and this motion of the hand-lever e^4 causes the pawl-and-ratchet connection to again advance the number-wheel i until the numeral "7" is opposite the window c^4 , and this numeral "7" correctly indicates the result obtained by adding the numerals "6" and "1." The next hand-lever e^3 is shifted opposite the numeral "9" on the dial 15 b^3 and then released, and this motion of the hand-lever e^3 causes the pawl-and-ratchet connection to advance the number-wheel i until the numeral "9" is visible through the window c^3 . The next hand-lever e^2 is rotated into 20 alignment with the numeral "9" on the dial b^2 and then released, and this movement of the hand-lever e^2 causes the pawl-and-ratchet wheel to advance the number-wheel i until the number "1" is visible through the opening or window c^2 , and also causes the arm k^2 to 25 engage and rotate the toothed wheel k a distance equal to the space between its respective teeth k' , so that the numeral "3" is visible at the opening or window c' . The sum of the numbers "322.06" and "9.91" may be 30 ascertained by reading the numbers from left to right that appear at the windows c , c' , c^2 , c^3 , and c^4 , which sum is "331.97." Of course the numerals expressing other 35 quantities may be added together by assuming that each dial corresponds with a vertical column of figures—that is to say, represents tens, units, or other denominations—and then shifting the lever appertaining to each dial 40 into alignment with the dial-number that corresponds in value with the figure that occupies the corresponding vertical column. It being understood that the hand-levers are released after having been brought into alignment 45 with the proper dial-number and are automatically returned to normal position, whereby the operation of adding may be performed in an exceedingly-rapid manner.

Having thus described the nature and objects of my invention, what I claim as new, 50 and desire to secure by Letters Patent, is—

1. In an adding-machine, a series of spindles, a series of number-wheels rotatably 55 mounted on said spindles, a series of detents for engaging said number-wheels, a series of

rotatable hand-levers connected with said spindles, springs connected with said spindles and tending to return the hand-levers to normal position, and pawl-and-ratchet connections between said hand-levers and number- 60 wheels, substantially as and for the purposes set forth.

2. In an adding-machine provided with a housing, a series of rotatable number-wheels 65 mounted in said housing, a series of dials on the exterior of the top plate of said housing, a series of rotatable hand-levers mounted outside of said housing and disposed concentrically with relation to said dials, pins for stopping said hand-levers, springs tending to normally shift said levers into contact with said 70 pins, and pawl-and-ratchet connections between said hand-levers and number-wheels, substantially as and for the purposes set forth.

3. An adding-machine provided with a 75 housing and comprising a series of spindles projecting through the top plate of the housing, a series of rotatable sleeves on said spindles, a series of number-wheels on said sleeves, a series of dials concentric with said spindles, 80 a series of rotatable hand-levers connected with said spindles, pins or stops for engaging said levers, springs connected with said housing and spindles and tending to shift said levers into engagement with said stops or pins, 85 pawl-and-ratchet connections between said sleeves and levers, a series of toothed wheels connected with the lower extremities of said sleeves and disposed in different planes, radial arms extending from each intermediate 90 toothed wheel of the series, and detents for engaging said toothed wheels, substantially as and for the purposes set forth.

4. In an adding-machine, a series of spindles projecting through the top plate of the 95 housing, sleeves rotatably mounted on said spindles, number and toothed wheels connected with said sleeves, hand-levers connected with the projecting extremities of said spindles, springs for actuating said hand-levers, and pawl-and-ratchet connections between said levers and sleeves, substantially 100 as and for the purposes set forth.

In witness whereof I have hereunto set my signature in the presence of two subscribing 105 witnesses.

JOHN S. HILLIARD.

Witnesses:

HERMANN BORMANN,
THOMAS M. SMITH.