

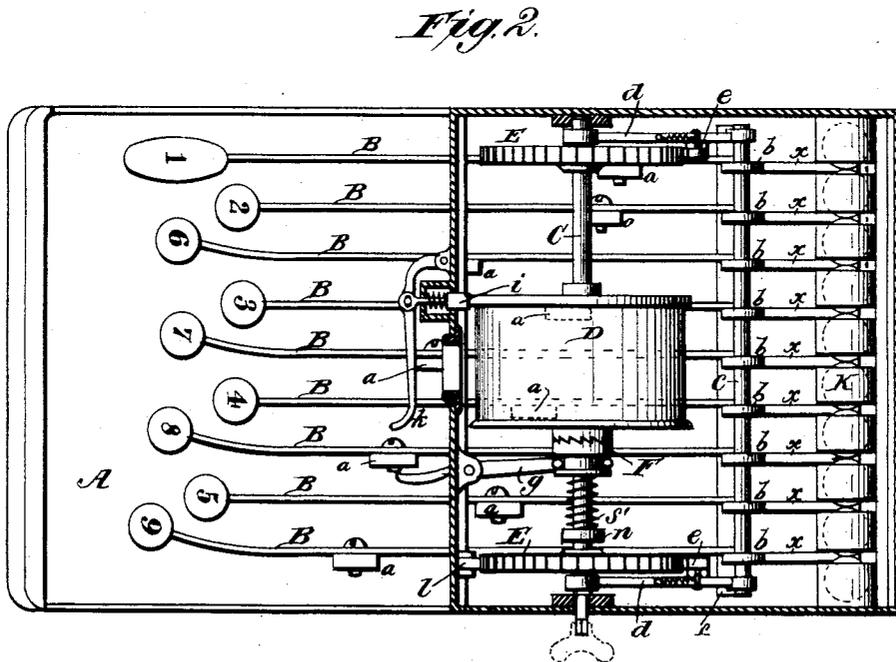
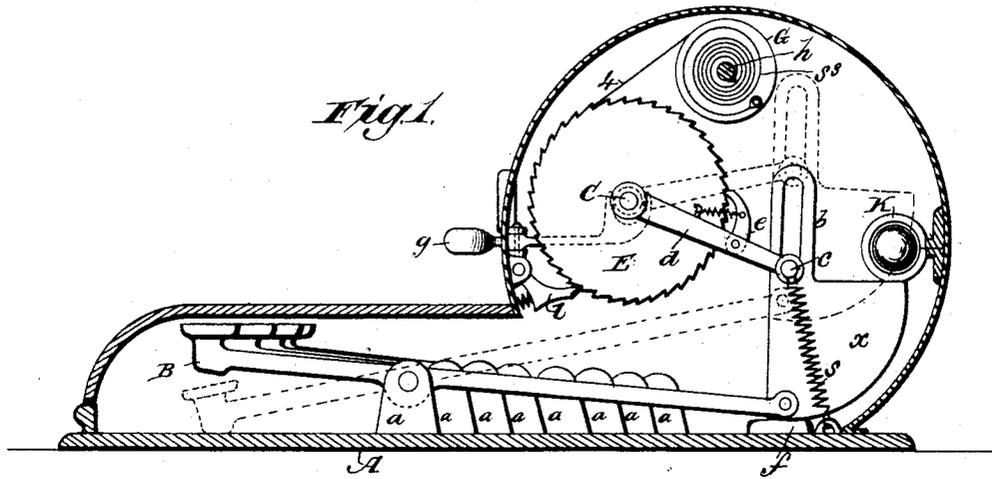
(No Model.)

2 Sheets—Sheet 1.

W. H. BEARDSLEY & L. M. HOSEA.
ADDING MACHINE.

No. 447,457.

Patented Mar. 3, 1891.



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Fig. 3.

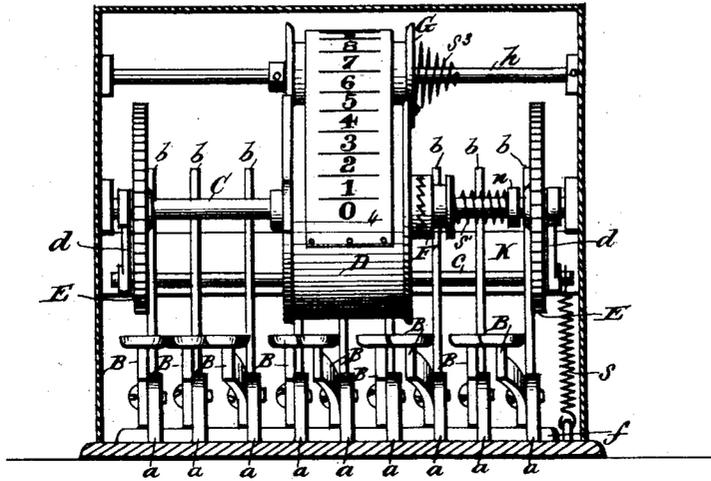


Fig. 4.

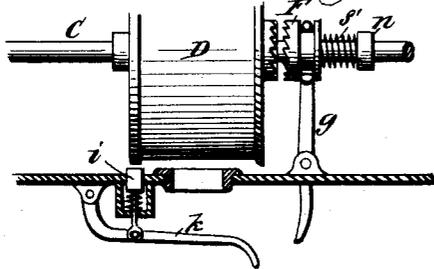
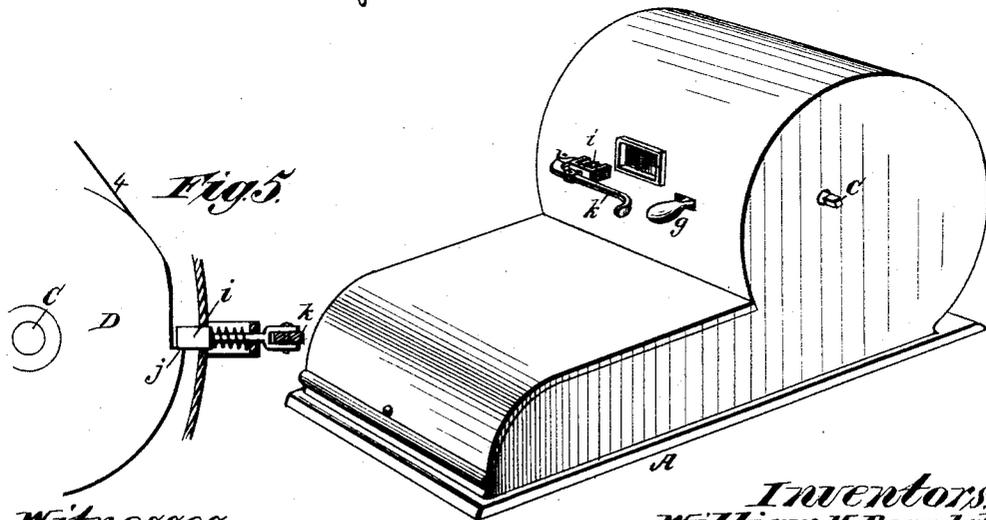


Fig. 6.



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UNITED STATES PATENT OFFICE.

WILLIAM H. BEARDSLEY AND LEWIS M. HOSEA, OF CINCINNATI, OHIO.

ADDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 447,457, dated March 3, 1891.

Application filed December 23, 1889. Serial No. 334,731. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM H. BEARDSLEY and LEWIS M. HOSEA, citizens of the United States, residing at Cincinnati, Ohio, have invented new and useful Improvements in Registers or Adding-Machines, of which the following is a specification.

Our invention relates to registers or adding-machines, its object being to produce a simple and compact hand instrument adapted to the use of book-keepers, cashiers, &c., for ascertaining the footings of columns of figures without incurring the uncertainty and labor attending the mental operations of addition.

To this end our invention consists in the apparatus hereinafter described, embodying, substantially, a bank of keys, placed in convenient relation to the thumb and digital fingers of a single hand, arranged to act selectively through transmitting and engaging mechanism upon a ribbon-drum, whereon is displayed a column of consecutive numbers, each of which in due rotation is brought into view, registering with a sight-aperture provided in the casing.

It consists, further, in various constructive details, hereinafter pointed out, tending to render the instrument certain in operation and convenient in use.

Mechanism embodying our invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of the machine with one side of the case removed to exhibit the mechanism; Fig. 2, a plan view omitting the ribbon-wheel; Fig. 3, a front elevation showing the interior parts entire; Fig. 4, a plan detail showing the clutch and brake mechanism of the ribbon-winding drum; Fig. 5, a detail elevation of the drum and brake, showing the stop function of the brake; and Fig. 6, a perspective view of the machine in its casing.

Referring now to the drawings, A designates the base-plate of the machine; B, the manipulating-keys; C, the main shaft carrying the ribbon-drum D, and further provided with two similar ratchet-wheels E, one near each end.

The keys B are levers of the first class, pivoted to projections *a* of the base-plate at cer-

tain predetermined points, so as to give the required elevation at the rear upon being pressed down in front a uniform distance. These levers are arranged in parallel series, terminating in front in "finger-tips" similar to those of a type-writer and arranged in a "finger-board," as indicated in Figs. 1 and 2, so that tip No. 1, for the use of the thumb, occupies a common end relation to the remaining tips, which extend in two parallel rows in substantially the positions natural to the fingers of the hand placed above them ready for manipulation. The thumb-tip No. 1 is somewhat elongated forward to allow for shifting the hand slightly forward and backward to reach either row desired, and the digital tips may be arranged in successive order, as shown, or the even numbers (following No. 1) may be in one row and the odd numbers in the other row. The key-levers terminate rearwardly at a common transverse limit, and each carries pivotally an upwardly-extending link *b*, occupying a common plane and having each a similar longitudinal slot embracing a cross-bar *c*, presently to be described. Each link may have a rear extension-plate *x*, to operate in connection with a key-arrester of preferred construction, as shown and presently to be described. The cross-bar *c*, embraced by all the slotted links *b* of the keys B and normally resting at the bottom of the slots, is a bar uniting the ends of two crank-arms *d* of equal length loosely centered on the shaft C near opposite ends adjacent to the ratchet-wheels E, one to each. Each arm *d* carries a spring-pawl *e*, engaging the ratchet-teeth of its adjacent ratchet-wheel E. Thus the elevation of any one of the key-links *b* elevates the cross-bar *c* and the arms *d*, and carries the ratchet-wheels E part of a revolution, according to the degree of elevation limited to the particular key, this being predetermined by the length of the key-lever and the relative position of its fulcrum *a*. The slots of the links are of equal length sufficient to permit the maximum movement of the bar *c* without lifting any key. The length of the ratchet-teeth upon the wheels E is proportioned to the increments of elevation as distributed between the nine keys of the apparatus, so that the action may be uniform and certain, and the pawls *e* may engage with certainty when

dropped back after each manipulation. The slots in the links *b* allow the cross-bar *c* to pass upward in each case without disengagement from the links. One or more coiled springs *s*, which may be conveniently arranged to connect the end or ends of the cross-bar *c* with the base, hold the bar *c* normally in its lowest position, resting at the bottom of the link-slots, thus holding all of the latter upon the common resting-bar or cushion *f* upon the base, and this also retains the key-tips all elevated in front ready for manipulation.

We may here explain that only one ratchet-wheel *E* is absolutely essential; but we prefer two, one at each end, as shown, in order to provide against any "sagging" or torsion in the rigid yoke formed by the cross-bar *c* and the crank-arms *d*.

The form of key-arrester which we prefer to employ is a ballway *K*, slotted across, as indicated at Fig. 2, to accommodate the extensions *x* of the links and containing a number of balls or rolling disks having an aggregate end-play for lateral displacement equal to the thickness of one of the extension-plates *x*. Each ball has a diameter a trifle greater than the distance between centers of the cross-slots or some fractional multiple thereof, so that when any extension-plate *x* is elevated into and through the slot of the ballway appropriated to it, as indicated by dotted lines in Fig. 1, the entire series of balls is displaced laterally against the end walls of the ballway and forms a preventing lock against the entrance of any other extension-plate *x*. Each plate *x* being of uniform thickness, it preserves the same displacement of the balls, whatever its relative position therein, so long as it is elevated, and only permits the action of another key when dropped down clear of the arrester, as indicated in full lines in Fig. 1.

As the key-arrester here indicated is not of my invention and is employed selectively only as among several kindred devices, we deem the foregoing description sufficient for present purposes.

The object of rotating the shaft *C* is to rotate a ribbon-drum *D*, centered thereon. The drum *D* is carried loosely upon the shaft, except when held in rotative connection by an end clutch *F*, the latter being substantially a crown-wheel having a ratchet-face engaging a similar ratchet-face at one side of the wheel *D*, and is held to the shaft by a pin-and-slot connection permitting lateral play sufficient to clear the drum *D*, being normally held to contact by a spiral spring *s'* acting against an abutment-collar *n*. The clutch may be thrown out of gear against the force of its spring by a lever-arm *g*, extending forward through and pivoted in the casing-front, as shown in Fig. 2.

Above the shaft *C*, upon a stud *h*, passed from side to side through the casing of the wheel, is a loose ribbon-wheel *G*, having a coiled spring *s³*, connecting it with the stud and rotating it always in one direction.

A suitable ribbon 4, either of textile material, such as silk, or a metallic ribbon of either steel or brass, with numbers in consecutive series printed, stamped, or engraved thereon, such as shown in Fig. 3, up to the full limit of numbers to be used, (say one thousand or more,) is provided and wound upon the reel *G*, the initial end being brought down (unwinding the wheel against the force of its spring) and secured to the periphery of the drum *D*, so that in the normal position of the latter the character 0 shows at the opening in the front of the case. To fix this limit and insure the return of the drum *D* to this position after use, (inasmuch as the tension of the spring *s³* acts through the ribbon 4 as a belt to rotate the drum *D* backward when released from its clutch *F*,) we employ as a friction-brake a spring-block *i*, inserted through the front of the case, bearing against one edge or flange of the drum *D*, and acting as a lock against a single ratchet-tooth *j* of said flange, as indicated in Fig. 5, to retain the ribbon normally at the 0 position at the sight-opening. When, therefore, in the use of the apparatus the drum *D* has been rotated forward by the keys, bringing down the ribbon to show a given number, upon releasing the clutch *F* the spring *s* rotates the drum *D* back again; but this action is regulated by the block *i* until the tooth *j* engages the block, when the motion of the drum is finally arrested. If the drum has been carried forward more than one revolution, and is thus arrested before the proper final stopping-point, the block *i* may be drawn forward by hand by its projecting stem and the tooth *j* cleared, when the drum will again continue its revolution.

For convenience in operating the brake-block *i* we attach to its stem a manipulating-lever *k*, bent over to bring its terminal in convenient "finger-and-thumb" relation to the lever *g*, as shown in Fig. 4. To retain the ribbon-drum *D* at the successive stages attained by the manipulation of the keys, we provide a permanent spring-pawl *l*, attached to the casing and bearing against one of the ratchets *E*.

The action of the device is as follows: The operator having the machine on the desk before him with the ribbon indicating 0, traces up the units column of figures with the eye in successive order from top to bottom, or vice versa, striking the appropriate key for each figure. The action of each key brings down the ribbon its appropriate number of increments, and the final reading will be the aggregated result. Suppose this to be 195. He writes down the 5 and proceeds to "carry" 19 as follows: Upon pressing the lever *g* and releasing the clutch *F* the reel tends to rotate the drum *D* and the ribbon back again to 0; but the present object being to stop the rotation at 19 (the carrying number) the operator controls the rotation by the lever *k*, in which a little practice insures facility to stop at the desired point and set the clutch

F. Should the ribbon slip past the desired point, say to 10, the reading is brought up to 19 by striking the 9-key or by applying a thumb-nut *m* to the projecting squared end of the shaft C, as indicated in Fig. 2, and rotating the shaft and drum to the desired point. The machine being thus set to the carried number, the addition of the tens-column is proceeded with in the same manner, carrying to the hundreds, and so on to the last column. The figures thus put down with the result of the last column constitutes the footing.

We claim as our invention and desire to secure by Letters Patent of the United States—

1. In a register or adding-machine, the combination of a series of manipulating-keys, a rotating drum actuated thereby, a ribbon-reel, a numbered strip or ribbon wound upon said drum and paying off from said reel, and a spring actuating said reel in opposition to the drum and transmitting its resistance through the ribbon as a belt, substantially as set forth.

2. The combination, in a register or adding-machine, of a series of manipulating-keys, a ribbon-winding drum actuated by said keys in progressive increments of rotation according to their relative values, a strip or ribbon having numbers in consecutive series indicated visually thereon, a reel from which the strip or ribbon passes to the drum, a spring actuating said reel in opposition to the winding action of the drum, a ratchet upon the drum-shaft, and a pawl engaging therewith to retain it in advanced positions, substantially as set forth.

3. In a register or adding-machine, the combination of a drum-shaft provided with a

ratchet wheel or wheels, a series of manipulating-levers arranged below and transversely to the shaft, having varying fulcrum positions, a series of duplicated slotted links pivotally secured to the rear of the levers in a common pivotal line and extending thence upward in a common plane, a yoke concentrically hung upon the drum-shaft, extending rearwardly, having its cross-bar embraced by all the link-slots, and a pawl or pawls upon the yoke-arms engaging said ratchet wheel or wheels, substantially as specified.

4. In a register or adding-machine, the combination, with a drum-shaft, a winding-drum loose thereon, manipulating-levers connected with said drum, actuating connections between the levers and drum, and a spring-retracted reel, of a number-carrying band permanently fastened to the reel and drum, substantially as described.

5. The combination of the drum-shaft, the loose drum, the adjustable clutch, the spring-retracted wheel, the ribbon, and the spring-impelled block acting as a brake upon the drum and engaging in a detent upon its periphery, substantially as set forth.

6. In combination with the loose drum, clutch, and friction-brake, the manipulating-levers *g* and *k*, arranged for conjoint operation, as set forth.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

WILLIAM H. BEARDSLEY.
LEWIS M. HOSEA.

Witnesses:

E. R. DONOHUE,
E. I. KERR.