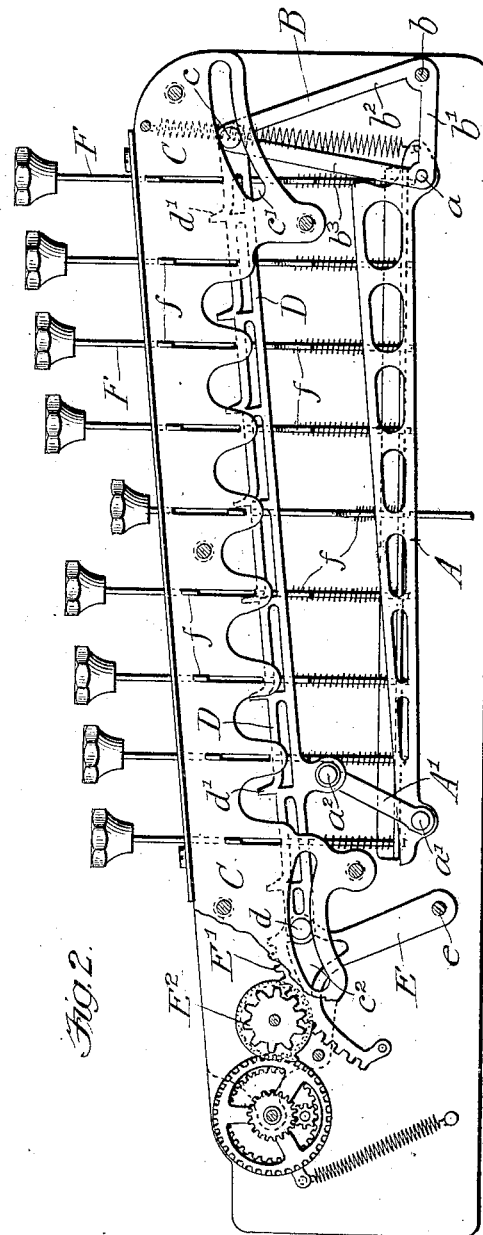
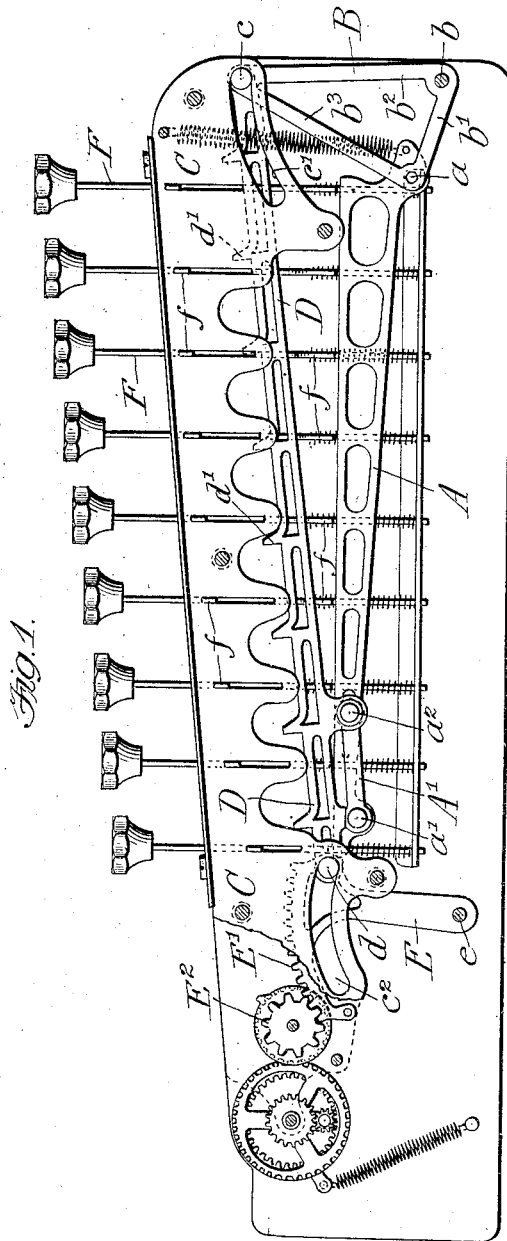


A. A. HORTON.
 ADDING AND CALCULATING MACHINE.
 APPLICATION FILED SEPT. 15, 1914.

1,156,600.

Patented Oct. 12, 1915.



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UNITED STATES PATENT OFFICE.

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ADDING AND CALCULATING MACHINE.

1,156,600.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ALLEN A. HORTON, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented certain new and useful Improvements in Adding and Calculating Machines, of which the following is a description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates more particularly to adding and calculating machines of the general type and character of that described in my prior Patent No. 1,016,501, dated February 6, 1912, and has for its principal object the provision of an improved construction of such machines, involving novel combinations and coöperations of parts, under which the necessary length of the machine is materially decreased as compared with that of my prior patent above referred to, the several operating keys in each row or bank of keys have a more uniform action upon the column-actuator or actuating lever associated with such bank of keys, and the necessary range of movement of the front end of said lever under the operations of the keys of higher value is reduced; all as herein-after more fully explained.

In the accompanying drawings, Figure 1 represents a side elevation of a single bank or section of a machine embodying my invention, with a part of the division frame-plate broken away to expose the parts beyond it, and with the operating keys all in normal position; and Fig. 2 a similar view with one of the operating keys depressed to its limit of movement.

The same letters of reference are used to indicate corresponding parts in the two views.

The column-actuator or actuating lever A of each bank or section of the machine, instead of being prolonged rearward of the keyboard of the machine and mounted at its extreme rear end upon a fixed fulcrum, as in the machine of my prior patent, is materially reduced in length, and terminates at its rear end in about the vertical plane of the rear end of the keyboard of the machine, and is there mounted upon a rising and falling or "floating" fulcrum *a*, such fulcrum or pivotal support for the rear end of the lever being carried by a triangular lever B which

is fulcrumed at its lower rear corner upon a fixed rod or fulcrum *b*. The lever B is in substance an elbow or bell-crank lever composed of the two arms *b*¹ and *b*², the third arm or side *b*³ of the triangular lever being merely a connecting and strengthening arm; or the lever B may be considered simply a triangular plate, with its middle portion cut away.

The lever is provided at its upper end with a laterally projecting stud *c* which travels in and is limited in its movements by a curved slot *c*¹ in the division plate C of the framework of the machine. Pivotaly connected to the upper end of the lever B, coincident with the axis of the stud *c* but upon the opposite side of the lever, is the rear end of a combined connecting and stop bar D. The front end of the bar D is pivotaly connected at *d* to an arm or lever E, pivotaly mounted at its lower end upon a fixed rod *e* and carrying an integrally formed gear-toothed rack E¹ curved in the arc of a circle struck from the pivotal support *e* of the lever, and meshing with the driving pinion F of the adding mechanism at the front of the machine. The pivot stud *d* of the front end of the bar D, like that at its rear end, is limited in its movements by a curved slot *c*² in the frame plate C.

The actuating lever A is connected, near its front end, by a pivoted link A¹ with the bar D, the pivotal connection *a*¹ of the link A¹ with the lever A being near the front end of the latter, as stated, and its pivotal connection *a*² with the bar D being at a point removed from the front end of the latter, so that when the parts are all in normal position, as shown in Fig. 1 of the drawings, the link A¹ occupies an approximately horizontal position, with its pivotal connection with the lever A at its front end and its pivotal connection with the bar D at its rear end, as shown.

Under the above described construction and arrangement of parts, when the front end of the actuating lever A is depressed the pivotal connection *a*¹ of the link A¹ with said lever will be carried downward, and the pivotal connection of the rear end of said link with the bar D will be drawn forward, thereby drawing the bar D bodily forward. Such forward movement of the bar D will swing the rack E¹ forward a

corresponding distance, and will also draw forward the upper end of the triangular or bell-crank lever B, such lever swinging upon its fixed fulcrum *b*. Such movement of the lever B upon its fulcrum will correspondingly lower its pivotal connection *a* with the rear end of the actuating lever A, constituting the pivotal support or fulcrum of said lever, so that the front end of the lever A will not only be lowered by the rocking of the lever upon its fulcrum *a*, but said fulcrum will itself be lowered by the rocking of the lever B upon its fulcrum. The position assumed by the parts when the 5-key is depressed to its limit of movement is shown in Fig. 2.

Owing to the connection of the front end of the lever A with the bar D by means of the link A¹, and the relation of the parts when in normal position, shown in Fig. 1 and heretofore described, it follows that the ratio of the downward movement of the front end of the lever A to the forward movement of the bar D is greatest at the beginning of the downward movement of the front end of said lever and least as it approaches the end of such downward movement, with the result that the keys of lower order in each row or bank of nine keys F are permitted to give the actuating lever A a greater movement, in proportion to their value, than the keys of higher order or value in such bank or row. It is therefore unnecessary to provide any substantially greater amount of lost motion between the keys of lower order or value and the actuating lever than between the keys of higher order or value and said lever, as has heretofore been usually required. In the particular construction shown in the drawings, the contact lug or projection of each of the operating keys, from the units key rearward to the 9-key, engages the upper edge of the actuating lever A at approximately the beginning of the downward movement of the key, with the result that the key is in engagement with said lever during substantially the entire downward movement of the key. This enables the keys to be given a much more uniform operation or "touch" than where the keys of lower order or value have considerable play or lost motion in respect to the actuating lever, and therefore have to be depressed a considerable distance before they come in contact with such lever, as in the machine of my prior patent above referred to and in other similar machines. With each of the keys in the row engaging the actuating lever at approximately the beginning of the downward movement of the key, there is an absence from the "touch" of the key of any sense of contact of the key with the actuating lever, and the key is permitted a smooth and even depression throughout its downward movement, which

is not possible where a substantial amount of play or lost motion between the keys and the actuating lever is required.

It of course requires more pressure upon the keys of higher order or value, near the rear end of the row, to depress the actuating lever A, since they engage said lever nearer its fulcrum than do the keys of lower order or value nearer the front end of the row, but by providing the keys with resetting springs of gradually increasing strength toward the front end of the row of keys may, if desired, be caused to offer a substantially uniform resistance to depression, so that they will all have the same "touch" in that respect.

The keys of higher order or value, toward the rear end of the row, are given a greater depth of movement (as indicated by their guide slots in the frame plate C) than are the keys toward the front end of the row, to enable them to impart a correspondingly greater movement to the actuating lever A and bar D, and consequently to the register-actuating rack E¹ which is pivoted to the front end of the bar D and actuated thereby, but, owing to the construction illustrated and described, and particularly the connection of the front end of the lever A to the bar D by the link A', the front end of the lever A is not required to have a range of movement directly proportionate to the values of the keys. On the contrary, as explained, it may have less movement, proportionately, for the keys of higher value, and consequently not be subjected to such extreme vibrations by the operations of such keys as would otherwise be necessary, its movement decreasing or slowing down, as it were, as it approaches its lower limit of movement under the operations of said keys.

The bar D has been referred to as a combined connecting and stop bar, for the reason that it serves to connect the actuating lever A and lever B with the register-actuating rack E E', and is further provided upon its upper surface with a plurality of stop shoulders *d'* which cooperate with lugs *f* projecting laterally from the key-stems F, and guided in vertical slots in the frame plate C. The relation of the shoulders *d'* upon the stop-bar D to the lugs *f* on the keys is such that when any key is depressed to its limit of movement its lug *f* is interposed in the path of the corresponding shoulder *d'* on the stop bar and engaged thereby, so that the forward movement of the stop bar (and consequently of the rack E¹ actuated by it) is definitely limited and determined in accordance with the position and value of the key.

The adding mechanism at the front of the machine, and its connections with the actuating rack E¹, may be of any suitable character, such, for instance, as those disclosed

in my prior patent above mentioned, or those disclosed in the pending application of Claiborne W. Gooch, Serial No. 820,680, filed February 24, 1914. The latter have been indicated in the drawings.

The provision of a rising and falling or "floating" fulcrum for the rear end of the actuating lever A, with the resulting shortening up of the machine as compared with that of my prior patent and other similar machines, is not broadly of my own invention, and is claimed here only in its relation to and combination with other features, and in respect to the particular construction shown.

Having thus fully described my invention, what I claim is:

1. In an adding machine, the combination with a main actuating lever, fulcrumed near one end and operatively connected with an adding mechanism at its opposite end, through mechanism operating to increase the movement of the adding mechanism relative to the movement of the lever as the latter is moved away from normal position of a plurality of operating keys arranged in a row parallel with said actuating lever and provided with contact surfaces or projections located immediately adjacent and at approximately uniform distances from the contact surface or edge of said lever, whereby said keys are given a substantially uniform touch in their coöperation with said lever.

2. In an adding machine, the combination with a main actuating lever mounted at one end upon a rising and falling or floating fulcrum and operatively connected at its opposite end with an adding mechanism, of a plurality of operating keys arranged in a row parallel with said actuating lever and provided with contact faces or projections located immediately adjacent and at approximately uniform distances from the contact surface or edge of said lever, whereby said keys are given a substantially uniform touch in their coöperation with said lever.

3. In an adding machine, the combination of a main actuating lever mounted at its rear end upon a rising and falling or floating fulcrum, a rocking support for said fulcrum, an operating rack for the adding mechanism at the front end of the actuating lever, a connecting bar or link between said rack and the rocking support for the fulcrum of the actuating lever, a connection between the front end of the actuating lever and said bar or link independent of the operating rack, and a plurality of operating keys arranged in a row parallel with the actuating lever and having contact surfaces or projections located immediately adjacent and at approximately uniform distances from the contact surface or edge of said lever,

whereby said keys are given a substantially uniform touch in their coöperation with said lever.

4. In an adding machine, the combination with a main actuating lever mounted at its rear end upon a rising and falling or floating fulcrum, a bell crank lever mounted at the rear end of the actuating lever and having a lower approximately horizontal arm which carries the fulcrum for said lever, and an approximately vertical arm extending above said fulcrum, an operating rack for the adding mechanism located at the front end of the actuating lever, a connecting bar or link pivoted at its front end to said rack and at its rear end to the vertical arm of the bell crank lever, a pivoted link connecting the front end of the actuating lever with the connecting bar or link, and a plurality of keys arranged in a row parallel with the main actuating lever and provided with contact surfaces or projections located immediately adjacent and at approximately uniform distances from the contact edge or surface of said lever, whereby said keys are given a uniform touch in their coöperation with said lever.

5. In an adding machine, the combination of a main actuating lever mounted at its rear end upon a rising and falling or floating fulcrum, a bell crank lever mounted in rear of said actuating lever and having a vertically extending arm and a forwardly extending approximately horizontal arm, which latter carries the fulcrum for the actuating lever, an operating rack for the adding mechanism pivotally supported near the front end of the actuating lever to swing forwardly and backwardly, a connecting bar or link pivoted at its front end to said rack and at its rear end to the vertical arm of the bell crank lever, a link pivoted at its front end to the main actuating lever near the front end of the latter and at its rear end to the connecting bar or link at a point removed from the front end of said bar or link, and a plurality of operating keys arranged in a row parallel with the actuating lever and provided with contact surfaces or projections located immediately adjacent and at approximately uniform distances from the contact surface or edge of said lever, whereby said keys are given a substantially uniform touch in their coöperation with said lever.

6. In an adding machine, the combination of an adding mechanism, an operating rack therefor, an actuating lever for said rack operating to give the rack a movement increasing relatively to the movement of the lever as the latter is moved from normal position, and a plurality of operating keys coöperating with said lever at varying distances from its fulcrum, whereby a greater range of movement of the lever relatively to the rack is permitted under the operations

of the keys remote from the fulcrum of the lever, and whereby a less degree of movement of the lever relatively to the rack is required under the operations of the keys nearer the fulcrum of the lever; substantially as described.

7. In an adding machine, the combination of an adding mechanism, an operating rack therefor, an actuating lever for said rack operating to give the rack a movement increasing relatively to the movement of the lever as the latter is moved from normal position, and a plurality of operating keys co-operating with said lever at varying distances from its fulcrum, the contact surfaces of said keys being located immediately adjacent and at approximately uniform distances from the contact surface or edge of said lever, whereby a greater movement of the lever relatively to the rack is permitted under the operations of the keys remote from the fulcrum of the lever, whereby a less movement of the lever relatively to the rack is required under the operations of the keys nearer the fulcrum of the lever, and whereby a uniform touch of all of the keys in their coöperation with said lever may be secured; substantially as described.

8. In an adding machine, the combination of a main actuating lever mounted at one end upon a rising and falling or floating fulcrum, and a plurality of operating keys coöperating with said lever at varying distances from its fulcrum, a rack for transmitting the movements of said lever to an adding mechanism, and connections between said rack and the free end of the lever operating to increase the movement of the rack relatively to the movements of the lever as the lever is moved from normal position; substantially as and for the purpose described.

9. In an adding machine, the combination with a main actuating lever mounted at one end upon a rising and falling or floating fulcrum, and a plurality of operating keys coöperating with said lever at varying distances from its fulcrum and provided with contact faces or projections located immediately adjacent and at approximately uniform distances from the contact surface or edge of said lever, of a rack for transmitting the movements of said lever to an adding mechanism, and connections between said rack and the free end of said lever operating to increase the movement of the rack

relatively to the movement of the lever as the lever is moved from its normal position; substantially as and for the purpose described.

10. In an adding machine, the combination of a main actuating lever mounted at its rear end upon a rising and falling or floating fulcrum, a rocking support for said fulcrum, an operating rack for the adding mechanism at the front end of the actuating lever, a connecting bar or link between said rack and the rocking support for the fulcrum of the actuating lever, a connection between the front end of the actuating lever and the bar or link operating to increase the movement of said bar and the rack relatively to the movement of the lever as the latter is moved from its normal position, and a plurality of operating keys coöperating with the actuating lever at varying distances from its fulcrum; substantially as and for the purpose described.

11. In an adding machine, the combination of the actuating lever A, the bell crank lever B upon whose forwardly projecting horizontal arm the rear end of the lever A is fulcrumed, the operating rack E, E' for the adding mechanism, pivoted at *e* to swing forwardly and backwardly, the connecting bar or link D pivoted at its front end to the rack E, E' and at its rear end to the vertical arm of the bell crank lever B, the link A' pivotally connecting the front end of the lever A with the bar D, and the operating keys F coöperating with the lever A; substantially as described.

12. In an adding machine, the combination of the main actuating lever A, the bell crank lever B to whose forwardly extending horizontal arm the rear end of the lever A is fulcrumed, the operating rack E, E' for the adding mechanism, pivoted at *e* to swing forwardly and backwardly, the bar or link D pivoted at its front end to said rack and at its rear end to the bell crank B and provided with the stop-shoulders *d'*, the link A' pivoted at its front end to the lever A and at its rear end to the bar D, and the operating keys F coöperating with the lever A and provided with the stop projections *f* coöperating with the stop-shoulders *d'* upon the bar D; substantially as described.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."