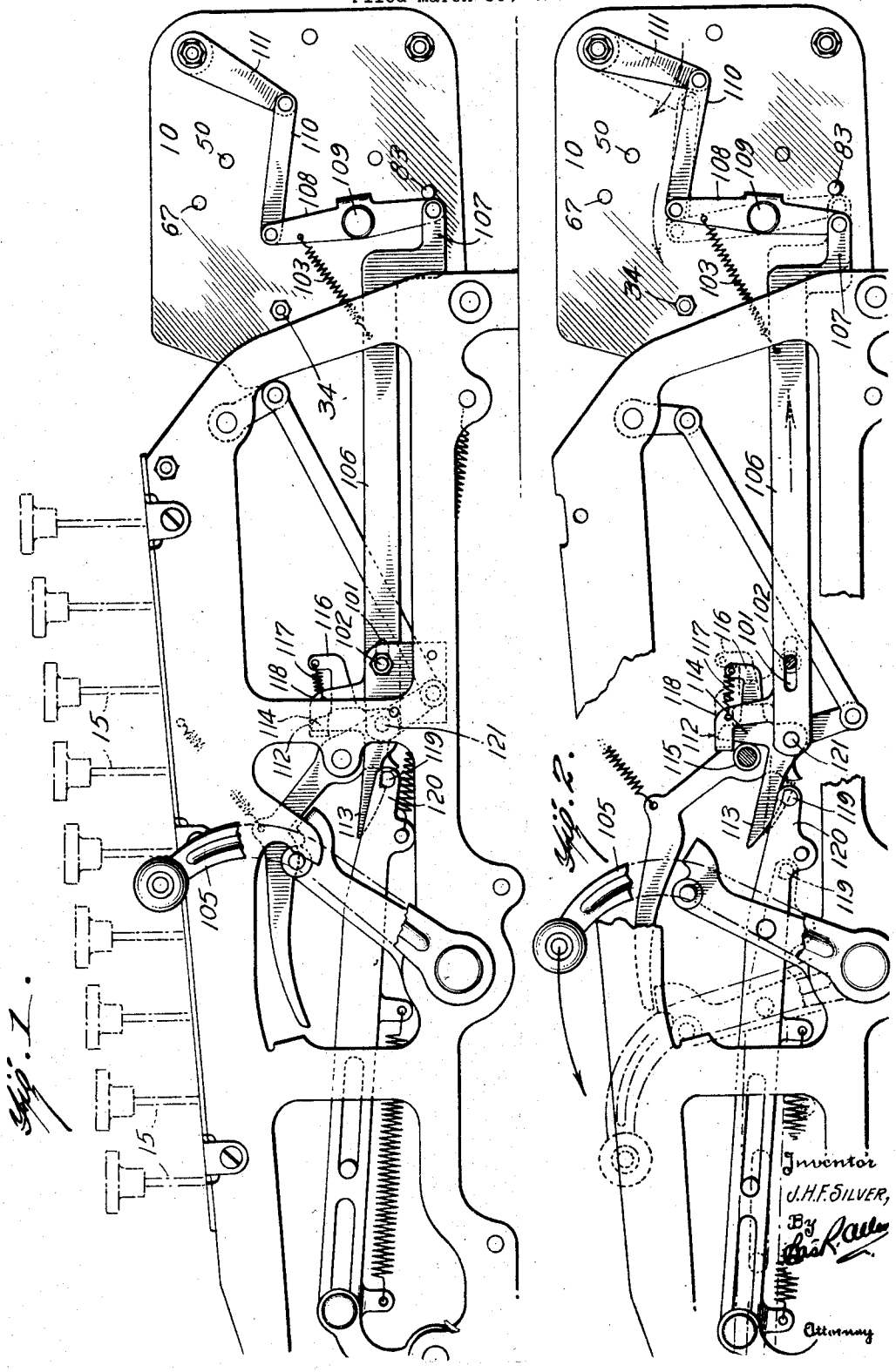
July 12, 1932. J. H. F. SILVER 1,866,950

CONTROL MECHANISM FOR CALCULATING MACHINES

Filed March 30, 1927 5 Sheets-Sheet 1



July 12, 1932. J. H. F. SILVER 1,866,950

CONTROL MECHANISM FOR CALCULATING MACHINES

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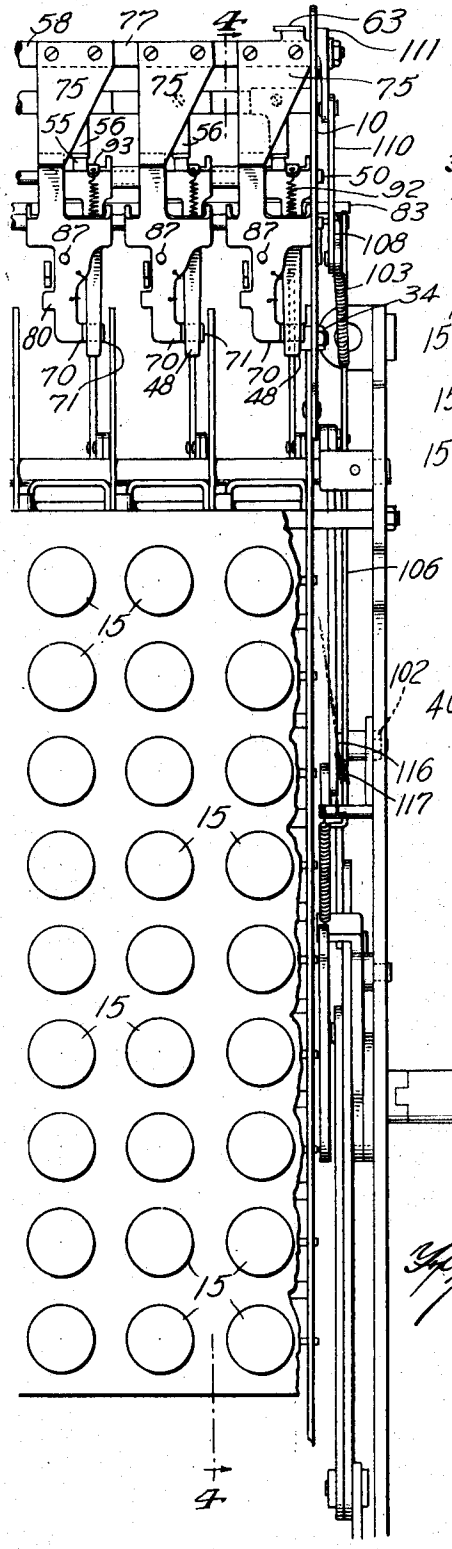


Fig. 3.

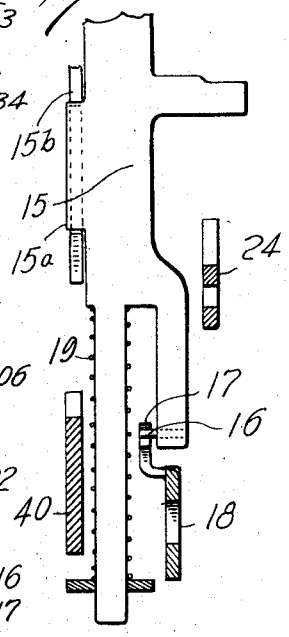


Fig. 9.

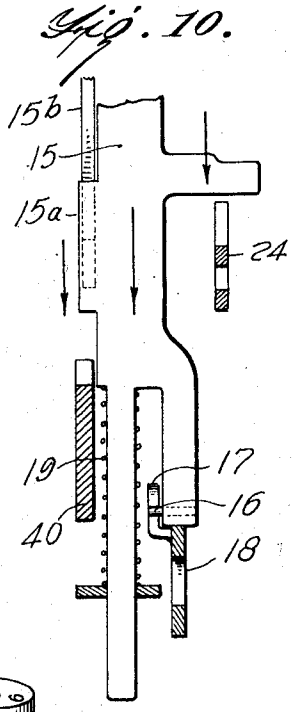


Fig. 10.

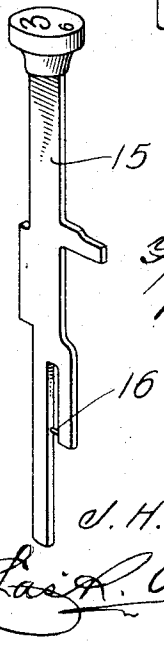


Fig. 8.

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CONTROL MECHANISM FOR CALCULATING MACHINES

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Fig. 4.

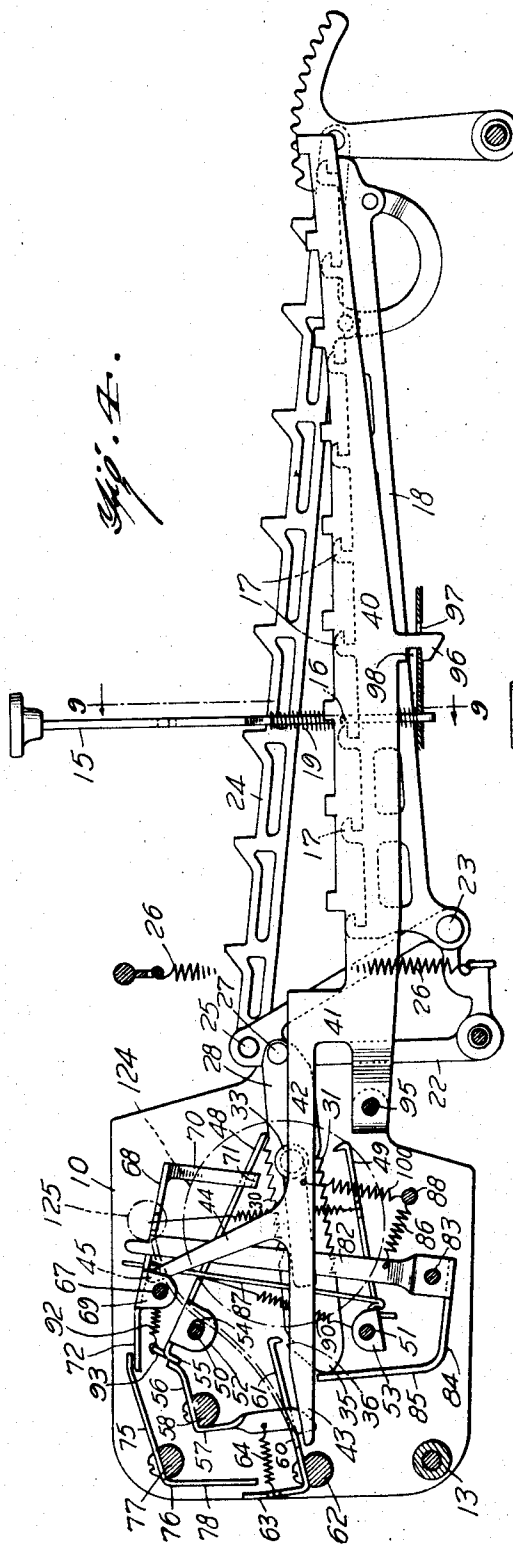
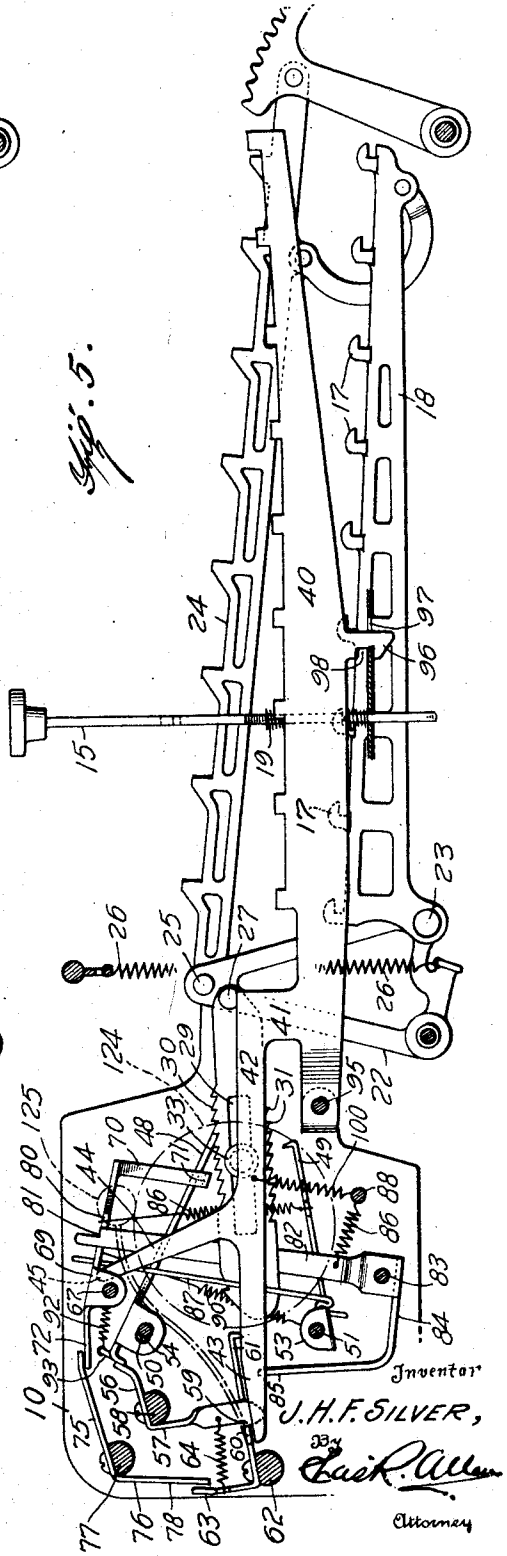


Fig. 5.



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CONTROL MECHANISM FOR CALCULATING MACHINES

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Fig. 6.

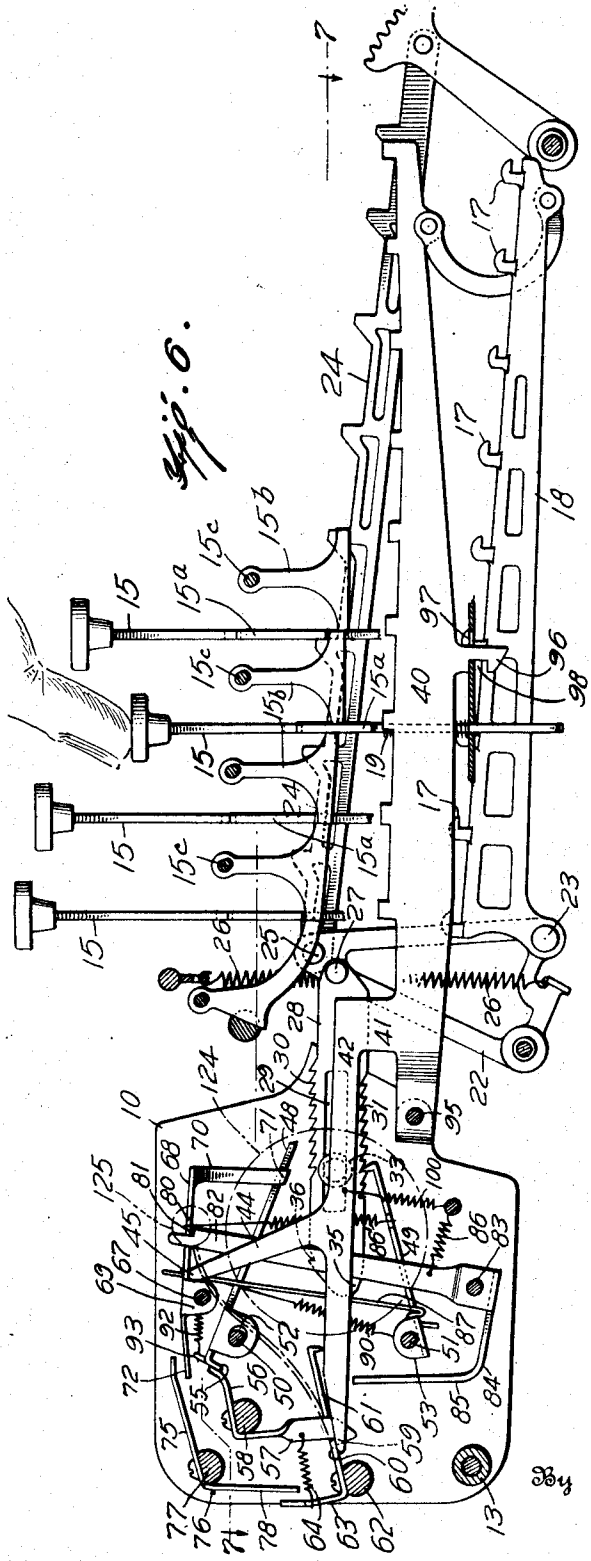
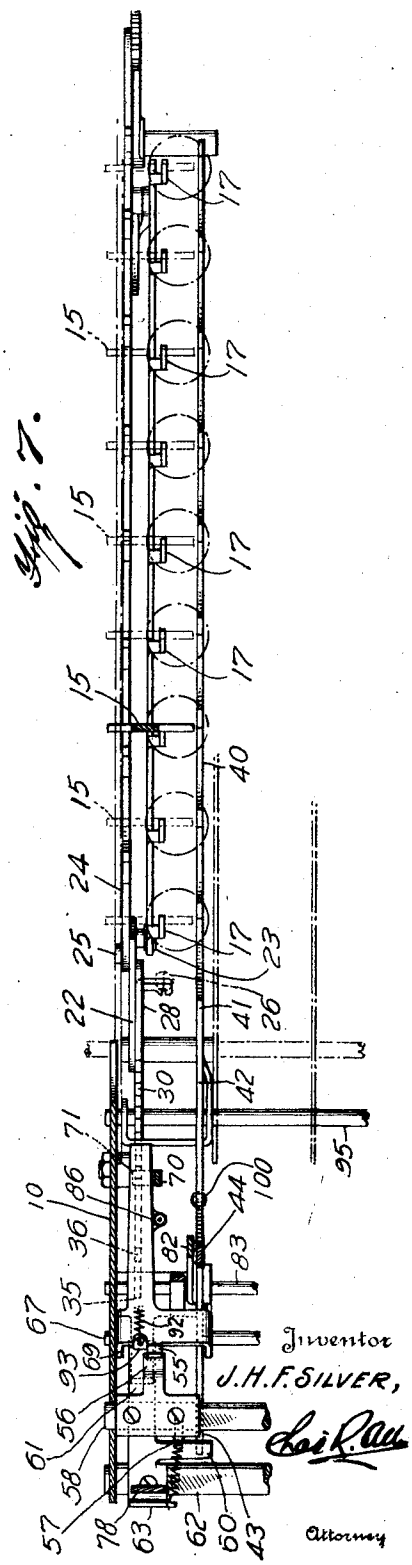


Fig. 7.



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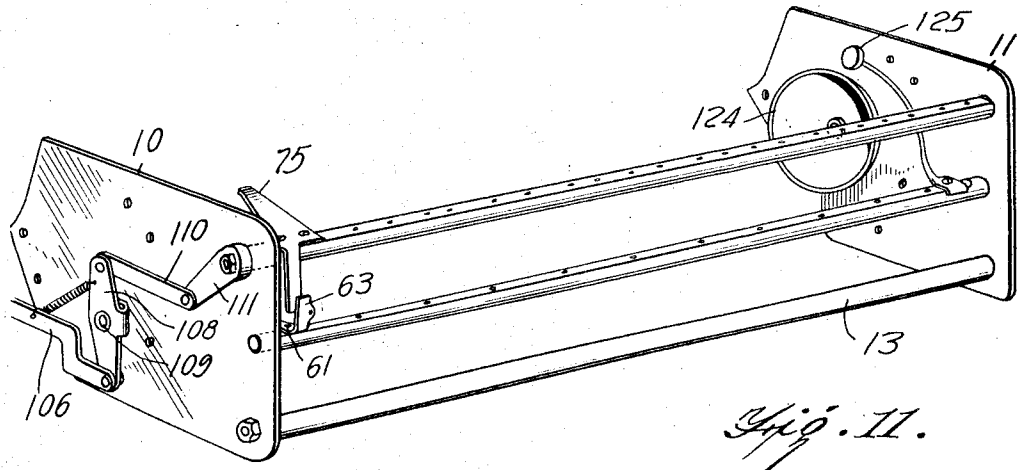


Fig. 11.

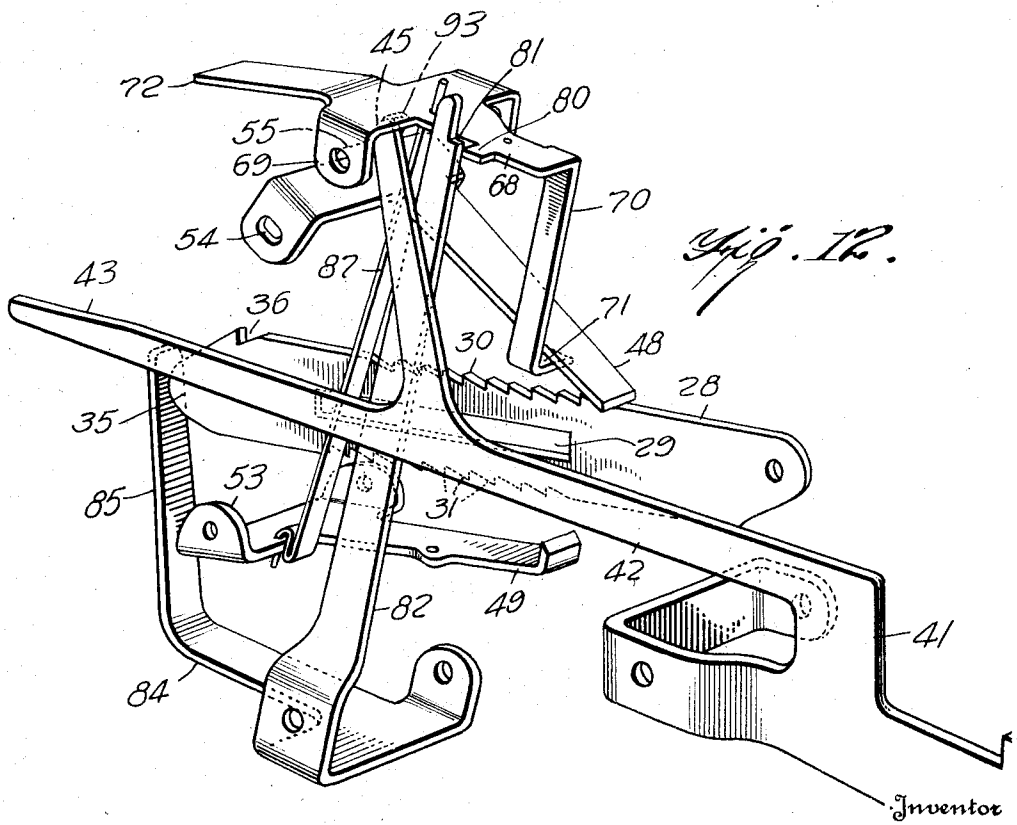


Fig. 12.

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UNITED STATES PATENT OFFICE

JOHN H. F. SILVER, OF PHILADELPHIA, PENNSYLVANIA

CONTROL MECHANISM FOR CALCULATING MACHINES

Application filed March 30, 1927. Serial No. 179,536.

My invention relates to calculating and adding machines, one of the important objects, briefly stated, residing in a very simple, highly effective and practicable type or attachment which may be readily placed upon or built into the existing calculating machine of the type generally known as key-driven type of machine, for the purpose of warning the operator by not only a visible signal but by means of an audible signal the instant the stroke of any one of the keys has not been completed, as when the key is but partially depressed.

I am aware of the fact that various attempts have been made to remedy this very serious difficulty in connection with calculating machines in an effort to assist the operator to continue his calculations without the necessity of "cancelling" and "repeating".

As it is well known to those familiar with the art, when a mistake is made, as when a key has not been fully depressed, the clearing lever must be pulled forward for resetting all of the keys to zero in that particular column. For this reason, operators of this type of machine have found it simpler and faster, on small calculations, to cancel and go over the problem rather than to stop and make the necessary correction.

With my improved attachment, I have provided means for automatically locking every key in all of the columns simultaneously. In this manner, it will be readily understood the operator is prevented from depressing keys of columns other than the one in which the partial stroke was made, as for instance, in the process of multiplying, and, should the operator fail to hear the audible signal, he may readily see at a glance, the particular key which was inadvertently partially depressed.

It is to be understood that I do not limit myself merely to the details of construction as shown, but that the scope of my invention extends to whatever construction may be defined by or included within the terms or language of the appended claims.

My Patent 1,636,718, July 26, 1927, discloses mechanism for locking all of the rows with the exception of the row in which a partial key-stroke was made.

In the drawings:

Figure 1 is a side elevation of a calculating machine of the key-driven type illustrating my invention in its normal position;

Figure 2 is a similar view partially broken away, showing the clearing lever in an intermediate and extreme forward position;

Figure 3 illustrates a top plan view thereof, a portion thereof being broken away;

Figure 4 is a central longitudinal section on the line 4—4 of Figure 3, looking in the direction of the arrows, portions of the calculating machine omitted for the purpose of clearness and illustrating the key in its normal or raised position;

Figure 5 is a similar view showing the key but partially depressed and locked;

Figure 6 shows a similar view but illustrates the location of the several parts as when the key is fully depressed and ready to be turned to its initial or normal position;

Figure 7 is a horizontal sectional view taken on the line 7—7 of Figure 6;

Figure 8 illustrates a view in perspective of one of the keys illustrating my improvement;

Figure 9 is a transverse sectional view taken on the line 9—9 of Figure 4;

Figure 10 is a similar view taken through Figure 5;

Figure 11 is a view in perspective of the frame work of my improved attachment clearly illustrating the bell of the actuating mechanism in connection therewith;

Figure 12 is a view in perspective on an enlarged scale of several of the details illustrating them in their coacting position.

My invention, in the form or embodiment shown in the drawings and briefly described, comprises a pair of oppositely disposed plates, 10 and 11, which may be readily riveted as at 12, or otherwise secured to the frame of the existing machine. These plates, 10 and 11, are suitably braced at their outer end by means of the usual tubular member, 13, with its associated rod and fastening means. It is to be understood, of course, that if my attachment is to be built into the machine, the

plates, 10 and 11, would merely be continued rearwardly from the side plates of the machine.

Inasmuch as calculating machines of this type are well known to those familiar with the art, I will make no attempt to go into detail with the existing or well known machines other than what is directly associated with my improved attachment hereto. An example of this type of calculating machine is disclosed in the Patent No. 1,252,738 filed April 20, 1908 and which was issued January 8, 1918.

Referring particularly to Figure 6 of the accompanying drawings, the locking dogs, 15^b, which are of course loosely hung or pivotally mounted in the usual manner upon the transversely extending rods, 15^c, are shown arranged as to permit a single keystem to pass between the entire series of locking dogs. In Figures 9 and 10 are illustrated the extreme positions of one of the locking dogs, 15^b, with respect to the extension, 15^a, of the keystem, 15. As is already well known in this art and as shown in Figure 6, the depressed keystem causes the locking dogs to swing and the entire series having but a limited amount of movement prevents more than a single keystem from being depressed at a time in each row. Upon the return of the depressed keystem the locking dogs, 15^b, will of course again receive their normal position.

On the lower portion of one of the legs of the operating key, 15, I rigidly secure a pin, 16, as is clearly illustrated in Figures 8, 9 and 10, which is extended partially across the slot formed between the two lower legs of the keys, 15. The purpose of the pins, 16, is to engage the upper curved surface of hook portions, 17, which may be either formed integrally with the upper edge of the usual key control lever, 18, or which may be secured thereto in any desired manner. When the keys are in their normal position, as is shown in Figure 4 of the accompanying drawings, the pins, 16, are free to move downwardly beyond the hook portion, 17, the said keys being held in their upper position by means of the usual springs indicated as at 19.

The rear end of the key control lever, 18, is, of course, pivotally mounted to the lower end of the bell crank member, 22, as at 23, and the toothed arm, 24, is likewise mounted to the upper end of the member, 22, as at 25, they being held in their raised position by means of the coil spring, 26, in the usual manner.

A relatively short distance below the pivot, 25, is loosely pivoted by means of a rivet, 27, or the like, what might be termed a main control piece, 28, which is provided in its approximate center with an elongated slot, 29. The upper and lower edges of the main control piece, 28, are provided with oppositely formed ratchet teeth, 30 and 31, for a purpose to be hereinafter described. A headed screw, 33, is adapted to pass through the slot, 29, and is secured to the plate, 10, by means of a nut, 34, for the purpose of guiding the main control piece, 28, during the operation of the keys, 15. The extreme rearward end of the main control piece, 28, is rounded to form a nose, 35, and is also provided at its upper edge adjacent to the nose 35, with a cut-out portion, 36, to form a tooth.

To the lock control lever, 40, and preferably near the rear end thereof, I provide an upwardly extending portion, 41, and a rearwardly extending and relatively narrow arm, 42, which terminates in a bevelled or reduced end, 43. A diagonally extending arm, 44, is integrally formed on the upper end of the arm, 42, and provided on its upper extremity with a rounded nose, 45. It is to be understood, of course, that the arms, 42 and 44, are stamped or otherwise integrally formed with the lock control lever, 40.

The pawls, 49 and 48, which, for clearness, may be termed up-pawls and down-pawls, are each pivoted at their rear ends to the rods, 50 and 51, which extend transversely across the supplemental frame of my attachment by means of angularly bent lugs or ears, 52 and 53. As is obvious from the drawings, the pawl, 48, is adapted to align with and engage the teeth, 30, of the main control piece, 28, whereas the pawl, 49, is in alignment with and adapted for engagement with the lower set of teeth, 31. The lugs or ears, 52, are provided with a slightly elongated slot or opening, 54, for a purpose to be further described.

The rear end of the down-pawl, 48, is formed with a downwardly extending toe, 55, which is adapted for engagement with the extreme end of the arm, 56, which is, in turn, bent downwardly forming an arm, 57. The members forming the arms, 56 and 57, are secured to a rod or shaft, 58, which is journaled in the plates, 10 and 11, of the supplemental frame. The lower extremity of the arm, 57, is slightly extended as at 59, for the purpose of forming a latch or dog, and is adapted to engage the outwardly extending arm, 60, which is integrally formed with the pawl, 61. The pawl, 61, is secured to and carried by the transversely extending rod or shaft, 62, and is provided on its outer end with an upwardly extending and angularly bent arm, 63. A coil spring, 64, is interposed between and connected to a depending arm, 57, and the upwardly extending arm, 63, for the purpose of preventing the accidental displacement of the dog, 59, with respect to the arm, 60.

Pivotally mounted upon a rod or shaft, 67, which is supported between the end plates, 10 and 11, is a plurality of pawl-lifting arms, 68, one for each column of keys, as is clearly illustrated in Figure 3 of the accompanying

drawings. Each of the arms, 68, is provided with a pair of downwardly bent ears or lugs, 69, which form the pivotal connection between the rod or shaft, 67. The forward end of each arm, 68, is bent downwardly, as at 70, and is provided with a horizontally disposed and angularly bent ledge or extension, 71, for the purpose of contacting with and lifting the down-pawl, 48, out of engagement with the ratchet teeth, 30, formed upon the upper edge of the main control piece. The rear end, 72, of the pawl-lifting arms is slightly bent downwardly and is adapted to be engaged by the forward end, 75, of a bell-crank member, 76 which might be termed a cancelling release arm. The bell-crank lever, 76, is secured to the transversely extending rod or shaft, 77, which is similarly constructed and mounted as is the shaft, 58.

The downwardly extending arm, 78, of the lever, 76, is adapted to be engaged by the upwardly extending arm, 63, which is, of course, integrally formed with the angularly bent pawl, 61, which, for the sake of clearness, I may term a stop-hook lever. The pawl, 61, is also in alignment with the main control piece, 28, so that at a predetermined period, as will be hereinafter further described, this pawl may be engaged by the notch or depression, 36. There being but one bell-crank member, 76, it is obvious that the remainder of the forwardly extending plates, 75, need not be provided with depending arms, 78.

Again referring to the pawl-lifting arms, 68, it will be noted with particular reference to Figures 3 and 12, that I have provided an outwardly extending and integrally formed lug or projection, 80, which is adapted to engage at certain intervals the ledge or reduced portion, 81, formed on the upper end of a vertically extending and relatively narrow arm, 82, which is mounted to oscillate upon a transversely extending rod or shaft, 83. This arm, 82, is provided at its lowermost edge with a substantially horizontal arm, 84, which is bent upwardly to provide the arm, 85. The upper end of the arm, 85, is in line with the nose, 35, of the main control piece, 28, and is adapted to be engaged thereby at predetermined intervals for rocking the arm, 82, whereby the lug, 80, will be disengaged from the ledge, 81. I provide a coil spring, 86, which is secured near the lower end of the arm, 82, and its opposite end to the stationary rod, 88, for the purpose of causing the ledge, 81, to bear against the lug, 80.

A spacing rod, or bar, 87, is provided with shoulders and reduced portions at their upper and lower ends, which are loosely mounted in suitable openings in the pawl-lifting arm, 68, and the lower or up-pawl, 49, so that they will have the same relative movement. A coil spring, 86′, is interposed between and connected to the up-pawl, 49, and the pawl-lifting arm, 68, for the purpose of applying tension on the shoulders of each end of the spacing member, 87, whereby the relative movement of these members will be assured.

Again referring to the rounded nose portion, 45, formed upon the upper end of the diagonally extending arm, 44, which is adapted to, at all times, support the pawl-lifting arm, 68, by bearing against the lower side thereof, I accomplish this continuous contact by means of a coil spring, 90, which is connected at one end to the pawl-lifting device and its opposite end to the relatively stationary rod or shaft, 51, as is clearly illustrated in Figures 4, 5 and 6.

For the purpose of permitting the down-pawl, 48, to bear against and engage the teeth, 30, of the main control piece and to yieldingly retain this pawl in its forward position by reason of the fact that the rod or shaft, 50, is mounted in an elongated slot, 54, I provide a relatively short coil spring, 92, and secure it at one end to the relatively stationary shaft, 67, and its opposite end to the lug, 93, which is preferably bent upwardly from the rearward end of the down-pawl, 48.

For the purpose of permitting the usual lock control lever, 40, to oscillate a predetermined distance about the rod or shaft, 95, I provide a downwardly extending lug, 96, which is adapted to pass through an opening, 97, suitably formed in that portion of the stationary frame. The cut-out portion, 98, formed in one edge of the depending lug, 96, as is illustrated in Figures 4, 5 and 6, will, of course, permit this movement. The lock control lever, 40, is yieldingly held in its normal position, as is shown in Figure 4, by means of the coil spring, 100, which has one end thereof connected to the arm, 42, and its other end secured to the transversely extending stationary rod, 88.

Referring now particularly to Figures 1 and 2, which indicate generally the resetting mechanism in connection with the usual resetting arm, 105, 106 indicates a slidably mounted lever, having a downwardly and off-set portion, 107. A rocking lever, 108, which is pivoted in its approximate center as at 109, is pivoted at its lower end to the off-set portion, 107, and has pivotally mounted to its upper end one end of a link, 110. The opposite end of the link is pivotally connected to the lower end of an oscillating lever, 111, which is, in turn, rigidly secured to the transversely extending rock shaft or rod, 77, and is located on the outer side of the end plate, 10. A coil spring, 103, is connected between the upper end of the rock lever, 108, and the rear end of the lever, 106, for the purpose of returning the lever, 106, to its rearward or extreme position. Near the forward end of the lever, 106, I provide a slot, 101, which is engaged by a bolt, 102, for sup-

porting and guiding the lever, 106, and the pawl, 113. The rod, 83, may be extended beyond the outer edge of the plate, 10, for the purpose of limiting the rearward movement of the slidably mounted lever, 106, supplemental to the slot and bolt, 101 and 102.

The automatic release for the purpose of moving the lever, 106, a predetermined distance or sufficiently to actuate the cancelling release arm, 76, which will raise the down-pawl, 48, through the medium of the pawl-lifting arm, 68, is indicated generally as at 112. A dog or pawl, 113, is pivotally mounted to the forward end of the lever, 106, and is provided on its upper end with an angularly disposed stop, 114, which is adapted to bear against the hub portion, 115, common to this type of calculating machines. Formed integrally with the arm, 114, is a rearwardly extending portion, 116, for the purpose of supporting one end of the coil spring, 117, whose opposite end is secured to a relatively stationary arm, 118, which is carried by the forward end of the lever, 106. A transversely extending pin, 119, is secured to the rear end of the sliding lever, 120, and its upper end is flattened for the purpose of more readily engaging the toothed portion of the pawl or dog, 113. When the lever, 120, is moved forwardly through the medium of the hand resetting arm, 105, to which it is, of course, pivoted, the pin, 119, will pull the dog or pawl, 113, forwardly and continue until the upwardly extending arm, 114, comes in contact with the hub portion, 115, when a continued movement of the lever, 120, will cause the upward movement of the dog, 113, about its pivot, 121. The pawl, 113, will now begin to be moved upwardly and be freed from the pin, 119, and be returned to its normal position as is shown in Figure 1 and as is illustrated in dotted lines in Figure 2 of the accompanying drawings.

The audible signal, which is associated with my improved key-locking mechanism and which is clearly illustrated in Figure 11 of the accompanying drawings, together with the diagrammatic illustrations shown in Figures 4, 5 and 6, consists of a bell or other audible device, 124, which is securely mounted on the inner side of the plate, 11. On the flattened side of the rock shaft, 62, I securely mount the hammer, 125, so that it will normally be spaced from the bell, 124, as is shown in Figures 4, 6 and 11, and which is adapted to strike the bell the instant the operator releases the downward pressure upon the key, 15, unless he has completed the full downward or operative stroke.

Operation

In the operation of my automatic control and audible and visible signal, as when the key, 15, is depressed by the operator, it comes in contact with the main lever which pulls the main control piece, 28, forward, which, being provided with ratchet teeth, 30, on its upper edge, permits the down pawl, 48, to slip or ride over them, corresponding in number with the numeral indicated upon the key depressed. Just previous to the end of the down stroke of the key, 15, the shoulder of the key comes in contact with the shoulder of the lock control lever, 40, forcing it downwardly or rocking about its pivot, 95, thus raising the rearward end, 43, and the angular arm, 44, of the arm, 42. The upward movement of the end, 45, of the arm, 44, lifts the pawl lifting arm 68 sufficiently to raise the down pawl, 48, to disengage it from the ratchet teeth, 30. At this time the down pawl disengage support, 82, is permitted to rock forward about its pivot, 83, to permit the ledge, 81, to engage beneath the extension, 80, of the pawl lifting arm, 68, and hold it in its elevated position, as is clearly shown in Figure 6.

By reason of the spacing rod, 87, being supported between the pawl lifting arm, 68, and the up pawl, 49, the raising of the arm, 68, of course, permits the pawl, 49, to correspondingly raise, by reason of the coil spring, 86. In this manner, the up-pawl, 49, engaging the ratchet teeth, 31, on the under side of the main control piece, 28, prevents the depression of said key until a full up stroke has been completed.

When the operator, after partially depressing a key, 15, removes his finger therefrom, the key returns a very slight distance upwardly, which upward movement simultaneously locks all of the keys in all of the columns other than the column containing the partially depressed key, and in addition thereto sounds the audible signal, 124. This is accomplished by means of the down-pawl, 48, which, having been in a sliding engagement with the ratchet teeth, 30, of the main control piece, 28, is now engaged by one of the teeth, 30, and pushed rearwardly against the tension of the coil spring, 92.

The rearward movement of the pawl, 48, is comparatively very slight and is limited, of course, by the elongated slot, 52, with respect to the shaft, 50, upon which the pawl is mounted. The slight rearward movement of the down-pawl, 48, is sufficient to cause the downwardly bent end, 55, thereof to engage the arm, 56, of the control lever hook release, 57, and rock the rod or bar, 58. The rocking movement of the dog, 59, is sufficient to release the lever stop hook, 61, and cause the shaft or rod, 62, to rock slightly. When the lever stop hook, 61, has moved downwardly, all of the columns of keys will be effectively locked by reason of the fact that a lever stop hook is provided for each column, all being mounted upon the same rock shaft, 62, and are adapted to engage the cut-out portions, 36, formed in the upper end of each of the

main control pieces. As has been already explained, the hammer, 125, will, at this moment, strike the bell, 124, and sound the audible alarm, which will permit, the operator a glance at the key board, and readily complete the operation by the continued downward pressure of the partially depressed key, 15. The fact that the key, which has been partially depressed indicating an incomplete stroke, remains in that position instead of returning to its normal or initial position, of course, provides a visible signal for the operator.

When the partially depressed key, 15, is further depressed to complete the operative stroke, the rocking movement of the lock control lever, 40, lifts the pawl lifting arm, 68, disengages the down-pawl, 48, from its locked position with respect to its teeth, 30, and the end, 43, of the arm, 42, lifts the lever stop hook, 61, rocks the shafts, 62, and disengages and unlocks the several columns of keys.

When a given key is partially depressed, the dogs 15^b are actuated to lock all of the keys of the column containing said partially depressed key. At this time none of the keys of the other columns are locked. Immediately upon release of said partially depressed key, the mechanism functions to release the dog 61 so as to lock all of the keys of all of the remaining columns simultaneously, and at the same time bring about the locking (against complete return movement) of the partially depressed key.

In order to return the partially depressed key to its initial position, it is necessary to depress said key to the lower extremity of its movement. The distance between the initial depressed position and the lower extreme position is such that said key may be intermittently depressed and released a number of times, each time causing the key to be locked (against complete return movement) in a lower plane.

I claim:

1. In a keyboard calculating machine, a plurality of columns of keys, means operative upon partial depression of a given key to lock all of the keys in the column containing said partially depressed key, and means operative upon release of said partially depressed key to effect locking of all keys of the remaining columns, said last named locking means including a key control lever associated with each column and having hook portions adapted to engage the keys of said column for holding down any key which is relieved of pressure after a partial depression.

2. In a keyboard calculating machine, a plurality of columns of keys, means active upon partial actuation of a key in a given column to lock against actuation all of the remaining keys of that column, and other means to lock all keys of all of the other columns so long as the partially actuated key remains in its partially actuated state, said other locking means including a member associated with each column of keys and capable of simultaneously preventing actuation of all of the keys in the column with which it is associated.

3. In a keyboard calculating machine, a plurality of columns of keys, means operative upon partial depression of a given key to lock against depression all of the remaining keys in the column containing said partially depressed key, and means operative upon release of said partially depressed key to effect locking against depression of all keys of the remaining columns, means operable upon complete depression of said partially depressed key for releasing one of said locking means, and means operable upon release and restoration to normal position of said completely depressed key for releasing the other locking means.

4. In a keyboard calculating machine, a plurality of columns of keys, means operative upon partial depression of a given key to lock against depression all of the remaining keys in the column containing said partially depressed key, and means operative upon release of said partially depressed key to effect locking against depression of all keys of the remaining columns, means automatically operable upon complete depression of said partially depressed key for releasing one of said locking means, and means operable upon release and restoration to normal position of said completely depressed key for releasing the other locking means.

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