

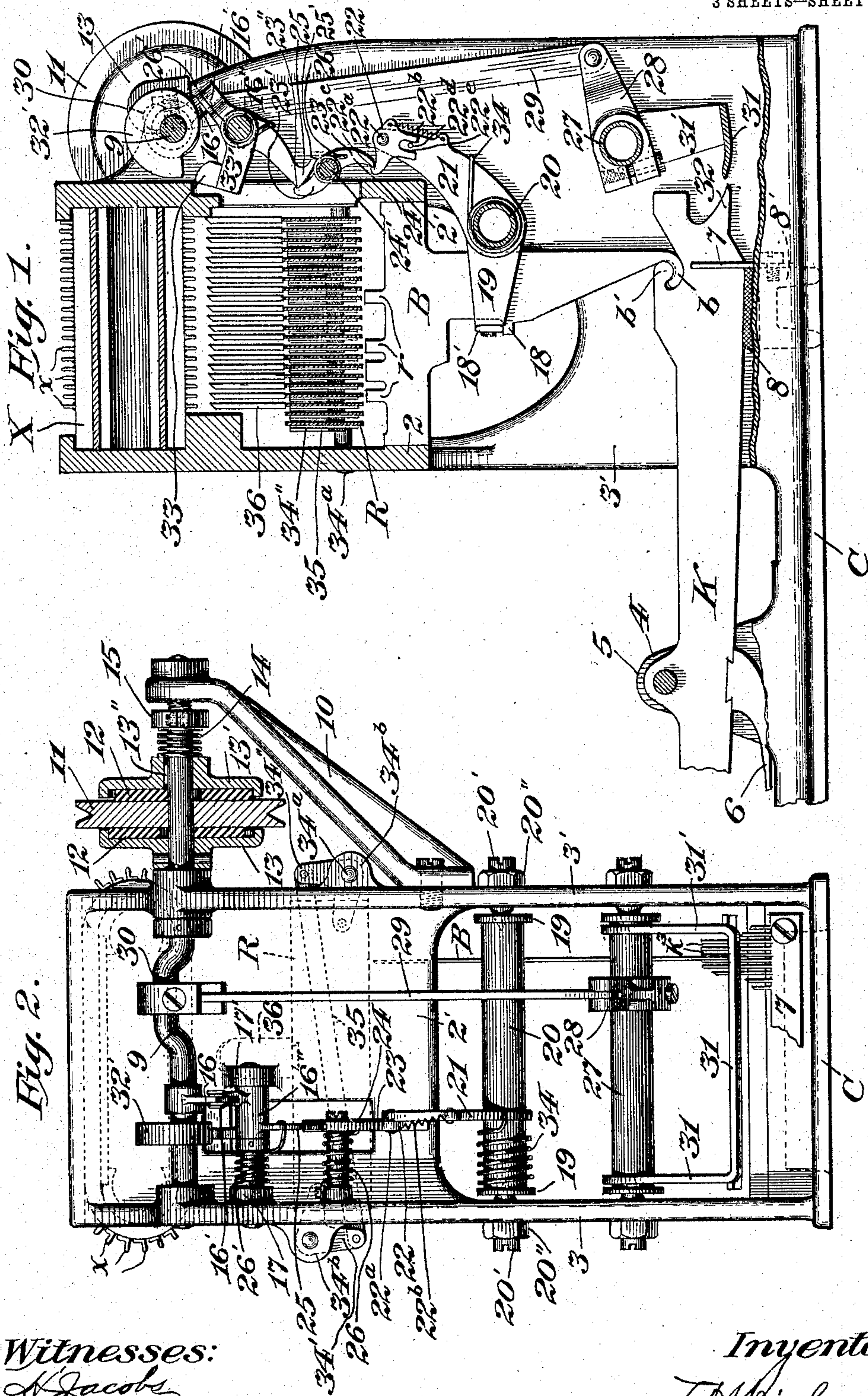
F. H. RICHARDS.  
MECHANICAL MOVEMENT.

APPLICATION FILED NOV. 12, 1902. RENEWED MAY 19, 1909.

947,474.

Patented Jan. 25, 1910.

3 SHEETS—SHEET 1.



Witnesses:

H. Jacobs

W. C. Abbott

Inventor:

F. H. Richards.



F. H. RICHARDS.  
MECHANICAL MOVEMENT.

APPLICATION FILED NOV. 12, 1902. RENEWED MAY 19, 1909.

947,474.

Patented Jan. 25, 1910.

3 SHEETS—SHEET 2.

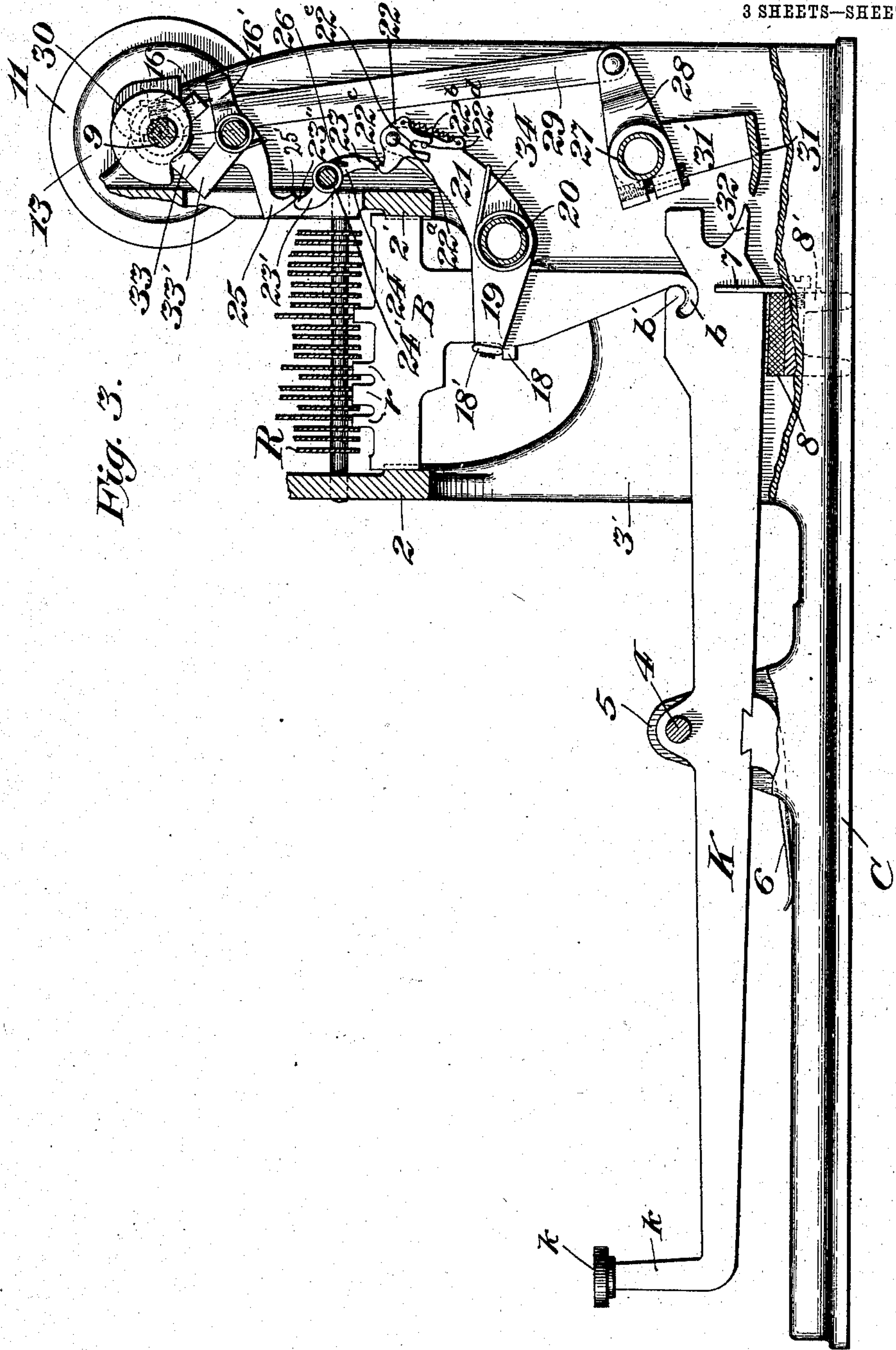


Fig. 3.

Witnesses:  
H. Jacobs  
A. C. Abbott

Inventor:  
F. H. Richards.

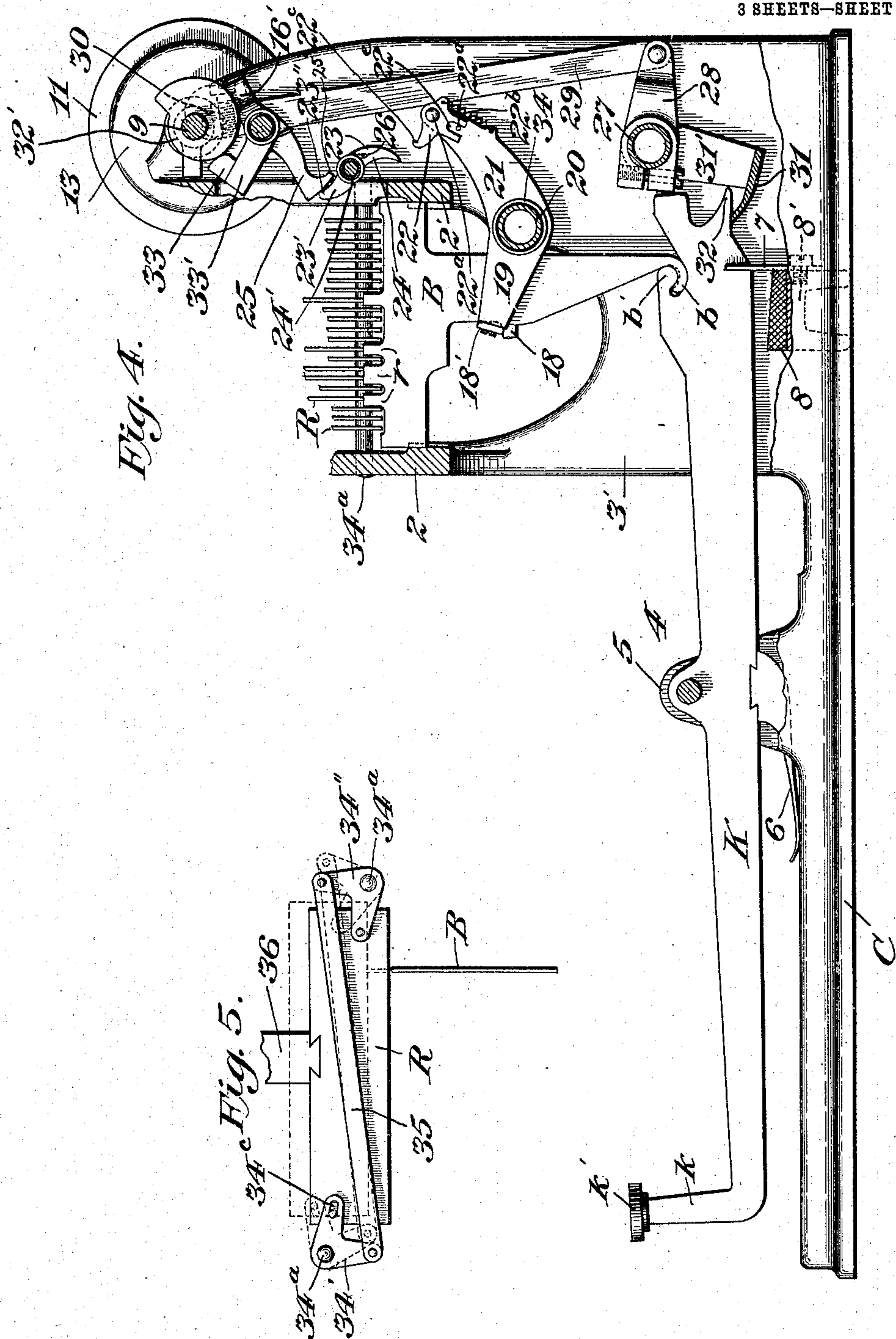
F. H. RICHARDS.  
MECHANICAL MOVEMENT.

APPLICATION FILED NOV. 12, 1902. RENEWED MAY 19, 1909.

947,474.

Patented Jan. 25, 1910.

3 SHEETS—SHEET 3.



Witnesses:  
H. Jacobs.  
A. C. Abbott

Inventor:  
F. H. Richards.



# UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT, ASSIGNOR, BY MESNE ASSIGNMENTS, TO AMERICAN TYPOGRAPHIC CORPORATION, A CORPORATION OF ARIZONA TERRITORY.

## MECHANICAL MOVEMENT.

947,474.

Specification of Letters Patent.

Patented Jan. 25, 1910.

Application filed November 12, 1902, Serial No. 131,004. Renewed May 19, 1909. Serial No. 496,934.

*To all whom it may concern:*

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Mechanical Movements, of which the following is a specification.

This invention relates to an organization of mechanical elements and devices designed to supplement the function and render complete the action of a member which, although it may operate as an actuator, may have a movement or character of movement imparted to it insufficient or incapable of effecting that for which such member may be constructed and which by its organization it is adapted to accomplish.

The present mechanical movement is closely related to that constituting the subject-matter of my pending application, Serial No. 109,903, filed June 2, 1902, and like the latter is susceptible of application to various purposes and in combination with various elements. For example, it may, like the mechanical movement disclosed in that application, be employed in connection with a selective mechanism embodying a so-called key-operative device serving when properly connected and related to the latter, to complete movements or operations which the several keys are designed to control, or bring about, even though the movement imparted to any one of the keys of the key-operative mechanism be merely an initial movement, and therefore less in extent than necessary to cause the key to effect its full designed function.

The mechanical movement disclosed in the present specification and drawings is clearly distinguished from that set forth in my prior application, by reason of the fact that whereas, the organization and construction of the devices and elements of the latter mechanical movement are such that the movement or movements initiated by the depression of a key lever and subsequently completed by the supplemental actuator, is repeated as long as the pressure (for actuating it) is maintained upon the key lever, the present mechanical movement on the other hand, is so organized as to complete one and only one cycle of operations initiated by the actuation of the key lever, even though the actuating pressure on such lever be maintained through-

out such cycle of movements and afterward. That is to say, while the kinematic relation exhibited in the mechanical movement of my prior application is such as to cause a repetition of movements as long as the key lever remains depressed, the relation and construction illustrated in the present movement accomplishes under the same conditions but one complete operation; and in order, therefore, in this latter case to repeat such operation it is necessary to first release the key lever and permit its free end to rise and afterward to again depress such end.

I have in the particular embodiment set forth in the accompanying drawings and chosen by way of illustrating an application of the present invention, as well as in the embodiment disclosed in my mentioned application, represented so much of a key-operative mechanism as suffices to its full understanding, and have illustrated as combined with such mechanism various details and mechanical elements so organized that the first or initial movement of an actuated key of the key-operative mechanism results in such an operation of associated elements as to move an actuatable member a distance equal to that which the key upon its full movement would accomplish.

In the illustrated construction the elements combined with the key-operative mechanism comprises a power-driven element, the transmission of motion from which is restrained during such time as the keys of the key-operative mechanism are in their normal position, but which restraint is withdrawn during the first portion of movement of an actuated key, whereupon and during the subsequent cycle of movements of the power-driven element it, through suitable devices, completes that motion which the actuated key tends to accomplish.

In the drawings accompanying the present specification and setting forth such embodiment, Figure 1 is partly an elevational, partly a sectional view illustrating a portion of one of the keys of a key-operative mechanism with which there is organized a power-driven shaft, means for restraining the motion derivable from such power-driven shaft until by the actuation of the key such restraint is withdrawn and the power-driven shaft becomes operative to complete that motion which the actuated key has inaugurated and which it tends to complete. Fig. 2 is an



elevational view from the rear of the mechanism, that is looking from the right hand in Fig. 1. Fig. 3 is a view similar to Fig. 1, but shows the various parts in the positions assumed immediately following the beginning of the movement of the actuated key of the key-operative mechanism, and which suffices to release the power-driven element or shaft. Fig. 4 shows the parts in the position assumed at a more advanced stage and resulting from the motion imparted from the power-driven shaft. Fig. 5 is an elevational view of one of the actuatable members whose motion is initiated by the actuation of a key and completed through the instrumentality of the released power-driven shaft, this view illustrating devices associated with the actuatable member, whereby the latter is compelled to move in a direction parallel to itself, whether the line of direction of the moving force passes through the point of application and the center of resistance or whether such line lies to one side or the other of such center.

Similar characters of reference designate corresponding parts in all figures.

The organization illustrated herein for the purpose of adequately disclosing the present invention is one in which the features of the latter are applied to a key-controlled mechanism, the performance of the function of any of the keys embodied in which is thereby rendered in a sense independent of the fact whether any key be operated to the full extent necessary for producing that which the key is designed to accomplish or whether the movement of a key as the result of the application of the finger of the operator is insufficient in itself to accomplish the designed result. In the practical use, therefore, of an organization of this character and embodying the invention it is sufficient in order to produce the result referable to any one of the keys of the mechanism that the proper key should be initially or slightly depressed, whereupon as the result of this initial movement further motion, complementary of that initiated by the slightly depressed key, is caused by the power-driven device of the mechanism. In the manufacture and assembling, moreover, of the various parts to form a complete and practical operative device it is contemplated that such a degree of engineering and constructive skill shall be employed as to produce a proportion of parts and character of connections adequate to transmit the necessary forces and create the necessary rigidity and precision. The exercise of such skill on the part of the designer and constructor to meet various conditions may therefore result in a mechanism the details of construction of which differ from those illustrated in the drawings hereto attached, which are there-

fore to be taken in the sense of being illustrative only of these matters.

In the illustrated form of the members directly actuatable from or whose motion is controlled by the various keys of the key-operative mechanism, they are in the nature of slides B mounted in suitable guideways on supports, here represented as crosspieces 2, 2', extending between uprights 3, 3', erected upon a supporting base C. These various supporting members may obviously constitute in whole or in part, portions of the framing of the machine or mechanism to which an embodiment of the present invention is applied.

While I have in the present case shown in side elevation, but one of the members B, it is contemplated that there shall be ordinarily one of these members for each of the keys comprised in the key-operative mechanism. I have furthermore illustrated but one key lever marked "K," deeming such showing to be sufficient for a comprehension of the present invention, but it is likewise contemplated that any proper number of such levers may be employed, depending on the nature of the machine and the purpose for which the key-operative mechanism is used. Each key lever K has in this instance an upright portion  $\frac{1}{2}$  at its outer end surmounted by a suitably characterized finger piece  $\frac{1}{2}'$ , while intermediate the ends of each key lever there extends therethrough a proper fulcrum bar such as 4 supported in uprights 5 on the base C. In its normal position each key lever is held with its outer end elevated, a spring such as 6 operating to elevate such end. The several levers may be disposed side by side and for their proper guidance may work in slots  $\frac{1}{2}^3$  formed in a guide bar 7 disposed transversely of the bank of levers, while to minimize the shock upon the descent of their inner ends, a strip 8 of yielding material may be located under the inner ends of the series of levers, the same being secured in this instance to a fixture 8' extending from side to side of the mechanism. Each key lever will be suitably connected with that member B which it serves to actuate, a curved finger b having its plane coinciding with the plane of vibration of the lever, in this instance extending from the latter and entering a corresponding undercut curved slot forming a journal member  $b'$ , in the upper portion of the rear end of the key lever. Freedom of pivotal movement it is evident results between the connected members in a connection of this character.

If the outer end of the key lever be depressed the corresponding actuatable member B will be actuated, and the parts are so related to each other that upon full depression the member B will be moved a distance sufficient to enable it to accomplish the pur-



pose for which it is designed. If, however, the outer end of the key lever be depressed to a less extent than aforesaid, the member B will be moved a proportionate part only of its full movement, which may be insufficient to enable it to attain the desired result; upon removing the finger from the key the actuated member B will then return idly with the key lever to its normal position under the tension exerted by the returning spring 6, by reason of the fact that the member B in the illustrated form of connection between the two is pulled downward as well as pushed upward by the key lever.

The particular feature of the present invention relates to means whereby the operation of each member B, that is, its movement may be completed in the direction in which the connected key lever when actuated tends to move it, even though the outer end of the lever be depressed to a less extent than suffices to shift it from one end of its path to the other, and which operation shall not be duplicated or repeated even though the actuated end of the key lever be held depressed, that is, despite the fact that the key lever be maintained during the operation of the member B and afterward, in any position other than its normal or elevated one. For this purpose I utilize a power-driven element which is held from accomplishing its intended function until the inner end of a key lever shall have been elevated to a more or less extent, whereupon said power-driven device is released and the associated devices become operative to complete the movement initiated by the ascent of the inner end of the lever. In a convenient form thereof these devices comprise a shaft such as 9 mounted in suitable bearings, which in this instance are provided in the aforesaid uprights 3 and 3', the outer end of the shaft being supported in an outboard bearing a bracket 10 secured to the upright 3'. In the present embodiment this shaft 9 is normally at rest, but is capable of being set in motion through the operation of a suitable clutch device. In a convenient form of the latter and as illustrated herein, the shaft is frictionally driven by a pulley or other driver 11, which is loosely mounted thereon and is driven from a suitable source of power (not shown). Suitable friction rings 12, 12, are pressed into close frictional contact with the opposite radial faces of the pulley by washer-like casings 13, 13', respectively, the former of which is rigidly secured to the shaft 9, while the latter is splined thereto, see the spline 13'', to permit the casing to move longitudinally of the shaft although compelling the casing to move with it, thereby enabling the friction to be regulated. This regulation may be effected by adjusting the tension of a spring 14 by means of an ad-

justable clamping nut 15 screwed onto the threaded end of the shaft.

If the shaft 9 is not restrained from movement it will rotate with the pulley 11 during the rotation of the latter. Normally, however, the motion of the shaft is prevented, even though the pulley be rotated, through the instrumentality of a stop arm 16 extending from the shaft and with which is adapted to engage an escapement in the nature of a forked arm or detent 16', whose hub portion 16'' is mounted upon a stud 17 supported in the upright 3, and a boss 17' on the crosspiece or web 2'. As long as the arm 16 is seated in the recess in the detent 16' no motion of the shaft 9 will ensue. Release of the stop arm from the detent is effected during the first portion of the movement of an actuated key lever through the instrumentality of suitable connecting mechanism, a form and construction of which will now be described.

Each member B is provided with a shoulder 18, all of which shoulders are substantially in the same plane crosswise of the series of members B. Against these shoulders is urged a cross-rail or bar 18' secured to the end of one or more arms 19, extending from a rock shaft 20 suitably mounted in the uprights 3, 3'. In this instance the mounting comprises pivot pins 20', 20', extending from the uprights and secured in position by proper lock nuts 20'', 20'', and the cross-rail is compelled to move downward in unison with a descending member B through the tension of a spring 34 coiled around the shaft 20.

Affixed to and extending from the aforesaid shaft 20 is an arm 21, to whose outer end is pivoted a latch 22 by a pin 22<sup>a</sup>. This latch is urged to a position by a spring 22<sup>b</sup> (connected at one end to the latch and the other to the arm 21), such that a detent 22<sup>c</sup> on the latch may engage the end of an arm 23 of a double arm lever 24, whose other arm 23' has a detent portion 23'', adapted to engage with a stop arm 25 extending from the hub portion 16'' of the escapement 16'. A pin 22<sup>d</sup> projecting from the arm 21 into a recess 22<sup>e</sup> on the latch, acts as a limit-stop determining the two extreme positions of the latch with relation to the arm 21. A spring 26 coiled around the stud 24' upon which the double arm lever 24 is mounted, urges such lever to the position it occupies in Fig. 1, that is, in which the arm 23' thereof operates to engage with the aforesaid stop arm 25.

The relation and organization of the parts are such that when the key levers are in their normal position and the shaft 9 is at rest, the latch 22 is in a position such that the detent thereon engages one arm of the double arm lever, while the other arm of this latter lever engages with the stop arm 25, at which time the arm 16 is seated in the recess of



the forked detent or escapement 16', thereby preventing the rotation of the shaft 9 toward the right in the position seen in Fig. 1. Upon a slight movement being imparted to a member B through the depression of the outer end of the key lever connected therewith, the crossbar 18' will be lifted depressing the arm 21 and rocking the double arm lever 24 by reason of the engagement existing between the detent on the latch and the end of the arm 23 of such double arm lever. The detent 23'' on the arm 23' thereupon disengages itself from the stop arm 25 and this latter together with the hub portion 16'' and escapement 16' are rocked over by a spring 26' and the stop arm 16 disengaged. The shaft 9 now being released, motion will thereupon be imparted to it from the rotating driving pulley 11.

The rotating shaft serves to continue the motion of the actuated member B through suitable mechanism, a simple form of which is illustrated in the drawings attached to the present specification, and will now be described. Extending from side to side and mounted in the uprights 3, 3', in like manner with the shaft 20, is a rock shaft 27 connected by means of an arm 28 and a connecting rod 29 with a crank 30 on the shaft 9; thus during each full rotation of the shaft 9 an oscillation will be imparted to the rock shaft 27. A crossbar or plate 31 secured to the outer ends of arms 31', 31', extending from the rock shaft 27, is adapted to cooperate with the key levers as follows: Each key lever K at its rearward end is provided with a projection 32, above which when the lever is in its normal position the aforesaid bar or plate 31 is adapted to freely play during the oscillation of the shaft 27, and in such a position of the levers the bar is inoperative to engage with any one of such projections. When, however, the inner end of a key lever has been elevated to a slight extent the aforesaid projection on the lever will be brought into a position in which its under surface becomes a surface with which the working edge of the bar contacts, and as the bar moves forward it becomes effective to elevate the lever as the result of such engagement. During this movement, moreover, the bar will freely play across and above the extensions 32 of those levers which have not been actuated, and hence will not only be ineffective to impart any motion to them, but will also operate to lock such levers temporarily from actuation. The extent of the movement imparted to a lever by this supplemental actuator 31 is sufficient to elevate the connected member B to the full amount that would be effected by the full depression of the characterized end of the key lever.

To preclude a repetition of the operation of the supplemental actuator after the same shall have effected the actuation of the actu-

ated member B to its fullest extent, means are adapted in the present case for stopping the rotation of the shaft 9 upon the completion of a full rotation thereof irrespective of the position in which the actuated key lever shall be held, whether but partially depressed or fully depressed. This means comprises a cam 32' on the shaft 9 having a spiral working face or periphery with which is adapted to engage a projecting finger or cam block 33 on an arm 33' fixed to the aforesaid hub portion 16'' rotatably mounted on the stud 17. Furthermore the stop arm 25 is provided with a heel 25' of sufficient length to preclude the detent 23'' from being shifted by the spring 26 during the entire angular movement of the hub portion 16'' away from the position in which such detent may reengage with the end of the arm and hold the escapement in place to lock the shaft 9 from rotation.

Evidently so far as concerns the utilization of the movements of the members B, the movement of each such member may be applied to any particular purpose required by the mechanism to which the mechanical movement is applied and to the accomplishment of which it is adapted. For the sake of illustration I have set forth herein such members B as being operative to effect a movement of transmitting members, one or more of which may be actuable from any particular one of the members B. Such transmitting members are indicated by R and they are mounted to move in the line of movement imparted to the members B. Any desired member of the members R may be adapted to be moved from any particular member B. For effecting such result, each member B may have one or more projections adapted to contact with one or more of the members B, the relation as to number and position existing between the members R actuated depending upon the position and size of the projections. If such be the construction adopted it may happen that contact may be made between some of the members R and a member B at one side or the other of the center of resistance to movement of such latter member, and hence were not these members properly mounted the tendency would be to tip the same upon the application of the actuating force. In order, therefore, to maintain the true rectilinear character of this movement and permit the same to be accomplished with equal facility whatever the point of application of the force, I have provided a construction comprising a pair of angle levers 34', 34'', fulcrumed to fulcrum bars 34<sup>a</sup>, extending between lugs 34<sup>b</sup> on the uprights 3, 3', each angle lever having one of its arms pivoted to a member R, while the other arms of each pair of levers are pivotally connected together by a link 35. It is to be noted that



one of the angle levers of each pair, the angle lever 34' in this instance, has a slotted connection with the supported member R, see 34<sup>c</sup>, thus enabling the member to be actuated and moved parallel to itself upon the application of the force exerted by the moving member B.

Although not evidently restricted to the use of any particular device or mechanism or species of the same, I may utilize the movement of the members R to set pins such as  $\alpha$  upon a jacquard belt X, an example of such a belt being set forth in my Patents Nos. 573,621, 573,622, and 573,623, granted December 22, 1896. When the application of the movement is for this purpose, each of the members R will be usually provided with an actuator portion such as 36, having a beveled or cam-like edge adapted to cooperate with a row of settable pins on the belt.

An embodiment of the mechanical movement such as has been hereinbefore described, operates substantially in the following manner: Assuming the parts to be in the position indicated by Fig. 1, upon the depression of the outer end of a key lever K the inner end will rise, and as a result of the initial movement of the connected member B the crossbar 18' will be elevated, thus causing the withdrawal of the detent 23'' from locking engagement with the stop arm 25 thereby releasing the stop arm 16 and permitting the shaft 9 to rotate from the rotating driving pulley 11. The cam block 33 dropping down into contact with that portion of the cam 32' of smaller radius, the upward motion of the crossbar 18' is continued by reason of the action of the crank 30 and the connecting rod 29 thus turning the shaft 27 in its bearings and bringing the cross-rail or supplemental actuator 31 under the projection 32 of the actuated key lever. As this shaft continues to turn in the same direction the inner end of the lever is carried upward, while at the same time such supplemental actuator plays in the space above the projections of those key levers which are not actuated. The shaft 27 is rocked in its bearings to a sufficient extent to elevate the inner end of the actuated key lever to an amount sufficient to fully accomplish the travel or play of the connected member B. This member will actuate, as aforesaid, one or more of the members R, according to the number and configuration of the projections  $\gamma$ , thereupon, and these members R in their turn will through their actuator portions 36 set up corresponding pins  $\alpha$  upon the jacquard X. During the forward rotary movement of the shaft 9 the hub 16'' carrying the cam block 33, the arm 25, and the forked detent 16' will be gradually rocked against the resistance of the spring 26' as the block travels up the surface of the cam. During this period the de-

tent 23'' is idly pressed against the heel 25' of the arm 25 by the action of the spring 26. As the cam block 33 reaches the let-off edge of the cam 32' the arm 25 will have been shifted backward to a position in which the edge thereof will slip into engagement with the detent 23'', which action is assured by the tension of the spring 26. In this position of the parts also the forked detent 16' will have been shifted across the path of the stop arm 16, which latter will seat itself in the socket of said detent upon a slight further angular movement of the shaft 9 and hence lock the shaft 9 from rotation further. In this locked position the cam block 33 will be opposite the portion of the cam of less radius again ready to move inward against such portion of the cam upon a subsequent actuation of any lever of the series.

It is manifest that in the organization and construction described, the motion of the supplemental actuator 31 being suppressed simultaneously with the suppression of the motion of the shaft 9 upon the completion of its full rotation, will be ineffective to repeat the elevation of the lever until after the actuated key lever has been released and the actuated member B permitted to descend; during the descent of this latter member the arm 21 carries the latch 22 backward to reengage its detent with the arm 23, the pivotal connection of the latch with the arm permitting the former to slip by the end of the double arm lever and reengage therewith.

Having thus described my invention, I claim—

1. The combination with an actuatable member, of an actuator capable of moving said member its entire distance, a supplemental actuator capable of continuing in the same direction the movement of the actuatable member after its initiation and the discontinuation of the movement thereby by the actuator, and means for confining the working of the operating supplemental actuator to a single non-repeating cycle of movements.

2. The combination with an actuatable member, of a manually controlled actuator capable of moving said member its entire distance, a power-operated supplemental actuator capable of continuing the movement of the actuatable member after its manual actuation and the discontinuation of the movement thereby by the actuator, and means for confining the working of the operating supplemental actuator to a single non-repeating cycle of movements.

3. The combination with an actuatable member of a key mechanism capable of initiating the movement thereof and of continuing such movement to its completion, a power-driven shaft, a clutch controlling the rotation of said shaft, an escapement for



controlling the operation of said clutch, a stop arm in coöperative relation with said escapement, a supplemental actuator operable from said shaft capable of maintaining the continuance and completion of the movement of the actuatable member after the initiation thereof by the key mechanism when said actuator does not complete the movement of said member.

4. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, an actuator driven from said driver and operating to actuate the actuatable member, and means comprising a manually controlled actuator capable of completing the movement of said member or of initiating such movement for the completion of the power driven actuator, and a detent for restraining the actuator from movement and for releasing it and permitting it at each single operation of such means to complete a single non-repeating movement and thereupon reëngage said detent.

5. The combination with an actuatable member, of a manually controlled actuator therefor capable of imparting to said member a complete movement, a power-actuated driver, a friction device through which the motion of the driver is transmitted, a supplemental actuator driven from said driver and operative to complete the movement of the actuatable member after its initiation and upon the cessation of actuation of said actuator, a detent for restraining the supplemental actuator from movement, means controlled by the manually controlled actuator for releasing such detent and means for reëngaging said detent after the completion of the movement of the said actuatable member.

6. The combination with an actuatable member having a predetermined working stroke, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, an actuator driven from the driver and operating to actuate the actuatable member, to the limit of its working stroke, an escapement controlling the operation of said actuator, key-controlled means for initiating the movement of said member and for actuating the same to the limit of its working stroke and means for returning the escapement to and for holding it in its locking position upon the completion of each full movement of the actuatable member.

7. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, an actuator driven from the driver and operating to actuate the actuatable member, an escapement controlling the operation of said actuator and

releasable only by key controlled means, said key-controlled means which operate to initiate the movement of the actuatable member and to release the escapement and means for returning the escapement to and for holding it in its locking position upon the completion of each full movement of the actuatable member.

8. The combination with a slide, of a key operative actuator for initiating the movement of the slide, a supplemental actuator and driving means therefor, for completing the movement of the slide after its initiation, an escapement controlling the operation of said supplemental actuator a detent for holding the escapement in its locking position and which when released permits the actuator to operate, a latch for tripping said detent, and an arm carrying said latch and shiftable by said slide.

9. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, an escapement controlling the operation of said actuator, a detent for holding said escapement in its locking position, key-controlled means for inaugurating the movement of said member and for releasing said detent and means for causing reëngagement of the detent upon the completion of each full movement of the actuatable member.

10. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, an actuator driven from the driver and operating to actuate the actuatable member, an escapement controlling the operation of said actuator, a detent for holding the escapement in its locking position, key-controlled means which operate to initiate and partially directly produce the movement of the actuatable member and to withdraw the detent and means for returning the detent to and for holding it in its locking position upon the completion of each full movement of the actuatable member.

11. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, an actuator driven from the driver and operating to actuate the actuatable member, an escapement controlling the operation of said actuator, a detent for holding the escapement in its locking position, key-controlled means which operate to initiate and partially produce the movement of the actuatable member and to withdraw the detent, means for returning the detent to and for holding it in its locking position upon the completion of each full movement of the actuatable member, and a cam for returning the escapement after its actuation to its original position.



12. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, an actuator driven  
5 from the driver and operating to actuate the actuatable member, an escapement controlling the operation of said actuator, a spring-pressed detent for holding the escapement in its locking position and which when released  
10 permits the actuator to operate, and a spring-pressed latch for tripping said detent.

13. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the  
15 driver is transmitted, an actuator driven from the driver and operating to actuate the actuatable member, an escapement controlling the operation of said actuator, a detent  
20 for holding the escapement in its locking position and which when released permits the actuator to operate, a latch for tripping said detent, and a cam for returning the escapement after actuation to its original position.

25 14. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, an actuator driven from the driver and operating to actuate the  
30 actuatable member, an escapement controlling the operation of said actuator, a spring-pressed detent for holding the escapement in its locking position and which when released permits the actuator to operate, a spring-pressed latch for tripping said detent, and a  
35 cam for returning the escapement after its actuation to its original position.

15. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the  
40 driver is transmitted, an actuator driven from the driver and operating to actuate the actuatable member, an escapement controlling the operation of said actuator, a detent  
45 for holding the escapement in its locking position and which when released permits the actuator to operate, a latch for tripping said detent, and a key operative device for shifting the latch and thereby tripping the de-  
50 tent.

16. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the  
55 driver is transmitted, an actuator driven from the driver and operating to actuate the actuatable member, an escapement controlling the operation of said actuator, a spring-pressed detent for holding the escapement in its locking position and which when re-  
60 leased permits the actuator to operate, a spring-pressed latch for tripping said detent, and a key operative device for shifting the latch and thereby tripping the detent.

17. The combination with an actuatable  
65 member, of a power-actuated driver, a fric-

tion device through which the motion of the driver is transmitted, an actuator driven from the driver and operating to actuate the actuatable member, an escapement control-  
70 ling the operation of said actuator, a detent for holding the escapement in its locking position and which when released permits the actuator to operate, a latch tripping said detent, a cam for returning the escapement  
75 after actuation to its original position, and a key-operative device for shifting the latch and thereby tripping the detent.

18. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the  
80 driver is transmitted, an actuator driven from the driver and operating to actuate the actuatable member, an escapement controlling the operation of said actuator, a spring-pressed detent for holding the escapement  
85 in its locking position and which when released permits the actuator to operate, a spring-pressed latch for tripping said detent, a cam for returning the escapement after its actuation to its original position,  
90 and a key-operative device for shifting the latch and thereby tripping the detent.

19. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the  
95 driver is transmitted, a key operative actuator for initiating the movement of the actuatable member, a supplemental actuator driven from the driver and operating to complete the movement of the actuatable  
100 member after its initiation, an escapement controlling the operation of said supplemental actuator, a detent for holding the escapement in its locking position and which when released permits the actuator to op-  
105 erate, and a latch for tripping said detent.

20. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the  
110 driver is transmitted, a key-operative actuator for initiating the movement of the actuatable member, a supplemental actuator driven from the driver, and operating to complete the movement of the actuatable  
115 member after its initiation, an escapement controlling the operation of said supplemental actuator, a spring-pressed detent for holding the escapement in its locking position and which when released permits the  
120 actuator to operate, and a spring-pressed latch for tripping said detent.

21. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the  
125 driver is transmitted, a key operative actuator for initiating the movement of the actuatable member, a supplemental actuator driven from the driver and operating to complete the movement of the actuatable  
130 member after its initiation, an escapement



controlling the operation of said supplemental actuator, a detent for holding the escapement in its locking position and which when released permits the actuator to operate, a latch for tripping said detent, and a cam for returning the escapement after its actuation to its original position.

22. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, a key operative actuator for initiating the movement of the actuatable member, a supplemental actuator driven from the driver and operating to complete the movement of the actuatable member after its initiation, an escapement controlling the operation of said supplemental actuator, a spring-pressed detent for holding the escapement in its locking position and which when released permits the actuator to operate, a spring-pressed latch for tripping said detent, and a cam for returning the escapement after its actuation to its original position.

23. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, a key operative actuator for initiating the movement of the actuatable member, a supplemental actuator driven from the driver, and operating to complete the movement of the actuatable member after its initiation, an escapement controlling the operation of said supplemental actuator, a detent for holding the escapement in its locking position and which when released permits the actuator to operate, a latch for tripping said detent, and an arm carrying said latch and shiftable by said actuatable member.

24. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, a key operative actuator for initiating the movement of the actuatable member, a supplemental actuator driven from the driver and operating to complete the movement of the actuatable member after its initiation, an escapement controlling the operation of said supplemental actuator, a spring-pressed detent for holding the escapement in its locking position and which when released permits the actuator to operate, a spring-pressed latch for tripping said detent, and an arm carrying said latch and shiftable by said actuatable member.

25. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, a key operative actuator for initiating the movement of the actuatable member, a supplemental actuator driven from the driver and operating to complete the movement of the actuatable

member after its initiation, an escapement controlling the operation of said supplemental actuator, a detent for holding the escapement in its locking position and which when released permits the actuator to operate, a latch for tripping said detent, an arm carrying said latch and shiftable by said actuatable member, and a cam for returning the escapement after its actuation to its original position.

26. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, a key operative actuator for initiating the movement of the actuatable member, a supplemental actuator driven from the driver, and operating to complete the movement of the actuatable member after its initiation, an escapement controlling the operation of said supplemental actuator, a spring-pressed detent for holding the escapement in its locking position and which when released permits the actuator to operate, a spring-pressed latch for tripping said detent, an arm carrying said latch and shiftable by said actuatable member, and a cam for returning the escapement after its actuation to its original position.

27. The combination with an actuatable member, of a key operative actuator for initiating the movement of such member, a power-actuated driver, a friction device through which the motion of the driver is transmitted, a supplemental actuator driven from the driver and operating to complete the movement of the actuatable member after its initiation, an escapement controlling the operation of said supplemental actuator, a detent for holding the escapement in its locking position and which when released permits the actuator to operate, a latch for tripping said detent, an arm carrying said latch and shiftable by said actuatable member, and an arm moving in unison with said escapement and provided with a heel over which said detent rides during the movement of the escapement.

28. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, a key operative actuator for initiating the movement of the actuatable member, a supplemental actuator driven from the driver and operating to complete the movement of the actuatable member after its initiation, an escapement controlling the operation of said supplemental actuator, a detent for holding the escapement in its locking position and which when released permits the actuator to operate, a latch for tripping said detent, an arm carrying said latch and shiftable by said actuatable member, an arm moving in unison with said escapement and provided with a heel over which said detent rides during the movement



of the escapement, and a cam for returning the escapement after actuation to its original position.

29. The combination with an actuatable member, of a key operative actuator for initiating the movement of such member, a power-actuated driver, a friction device through which the motion of the driver is transmitted, a supplemental actuator driven from the driver and operating to complete the movement of the actuatable member after its initiation, an escapement controlling the operation of said supplemental actuator, a spring-pressed detent for holding the escapement in its locking position and which when released permits the actuator to operate, a spring-pressed latch for tripping said detent, an arm carrying said latch and actuatable by said actuatable member, and an arm moving in unison with said escapement and provided with a heel over which said detent rides during the movement of the escapement.

30. The combination with an actuatable member, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, a key operative actuator for initiating the movement of the actuatable member, a supplemental actuator driven from the driver, and operating to complete the movement of the actuatable member after its initiation, an escapement controlling the operation of said supplemental actuator, a spring-pressed detent for holding the escapement in its locking position and which when released permits the actuator to operate, a spring-pressed latch for tripping said detent, an arm carrying said latch and shiftable by said actuatable member, and a cam for returning the escapement after actuation to its original position.

31. The combination with a slide, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, a key operative actuator for initiating the movement of the slide, a supplemental actuator driven from the driver, and operating to complete the movement of the slide after its initiation, an escapement controlling the operation of said supplemental actuator, a detent for holding the escapement in its locking position and which when released permits the actuator to operate, a latch for tripping said detent, and an arm carrying said latch and shiftable by said slide.

32. The combination with a slide, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, a key operative actuator for initiating the movement of the slide, a supplemental actuator driven from the driver and operating to complete the movement of the slide after its initiation, an escapement controlling the operation of said supple-

mental actuator, a spring-pressed detent for holding the escapement in its locking position, and which when released permits the actuator to operate, a spring-pressed latch for tripping said detent, and an arm carrying said latch and shiftable by said slide.

33. The combination with a slide, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, a key operative actuator for initiating the movement of the slide, a supplemental actuator driven from the driver and operating to complete the movement of the slide after its initiation, an escapement controlling the operation of said supplemental actuator, a detent for holding the escapement in its locking position and which when released permits the actuator to operate, a latch for tripping said detent, an arm carrying said latch and shiftable by said slide, and a cam for returning the escapement after its actuation to its original position.

34. The combination with a slide, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, a key operative actuator for initiating the movement of the slide, a supplemental actuator driven from the driver and operating to complete the movement of the slide after its initiation, an escapement controlling the operation of said supplemental actuator, a spring-pressed detent for holding the escapement in its locking position and which when released permits the actuator to operate, a spring-pressed latch for tripping said detent, an arm carrying said latch and shiftable by said slide, and a cam for returning the escapement after its actuation to its original position.

35. The combination with a slide, of a key operative actuator for initiating the movement of the slide, a power-driven actuator, a friction device through which the motion of the driver is transmitted, a supplemental actuator driven from the driver and operating to complete the movement of the slide after its initiation, an escapement controlling the operation of said supplemental actuator, a detent for holding the escapement in its locking position and which when released permits the actuator to operate, a latch for tripping said detent, an arm carrying said latch and actuatable by said slide, and an arm moving in unison with said escapement and provided with a heel over which said detent rides during the movement of the escapement.

36. The combination with a slide, of a power-actuated driver, a friction device through which the motion of the driver is transmitted, a key operative actuator for initiating the movement of the slide, a supplemental actuator driven from the driver and operating to complete the movement of



the slide after its initiation, an escapement controlling the operation of said supplemental actuator, a detent for holding the escapement in its locking position and which  
 5 when released permits the actuator to operate, a latch for tripping said detent, an arm carrying said latch and shiftable by said slide, an arm moving in unison with said escapement and provided with a heel over  
 10 which said detent rides during the movement of the escapement, and a cam for returning the escapement after actuation to its original position.

37. The combination with a slide, of a  
 15 key operative actuator for initiating the movement of the slide, a power-driven driver, a friction device through which the motion of the driver is transmitted, a supplemental actuator driven from the driver  
 20 and operating to complete the movement of the slide after its initiation, an escapement controlling the operation of said supplemental actuator, a spring-pressed detent for holding the escapement in its locking position  
 25 and which when released permits the actuator to operate, a spring-pressed latch for tripping said detent, an arm carrying said latch and actuatable by said slide, and  
 30 an arm moving in unison with said escapement and provided with a heel over which said detent rides during the movement of the escapement.

38. The combination with a slide, of a power-actuated driver, a friction device  
 35 through which the motion of the driver is transmitted, a key operative actuator for initiating the movement of the slide, a supplemental actuator driven from the driver and operating to complete the movement of  
 40 the slide after its initiation, an escapement controlling the operation of said supplemental actuator, a spring-pressed detent for holding the escapement in its locking position and which when released permits the  
 45 actuator to operate, a spring-pressed latch for tripping said detent, an arm carrying said latch and shiftable by said slide, an arm moving in unison with said escapement and provided with a heel over which said  
 50 detent rides during the movement of the escapement, and a cam for returning the escapement after actuation to its original position.

39. The combination with a key board, of  
 55 an actuatable member from one of the keys comprised in the key board, a power-actuated driver, a friction device through which the motion of the driver is transmitted, a supplemental actuator driven from the  
 60 driver and operating to insure after the movement is actually commenced the full movement of the actuatable member, an escapement controlling the operation of said actuator, a detent for holding the escapement  
 65 in its locking position and which when

withdrawn permits the supplemental actuator to operate, and a latch for tripping said detent.

40. The combination with a key board embodying a series of key levers each provided  
 70 with an extension adjacent to its rear end, of an actuatable member actuatable from one of the keys comprised in the key board, a supplemental power-driven actuator cooperative with said lever-extensions for insuring  
 75 at each operation the full movement of the actuatable member, an escapement controlling the operation of said supplemental actuator, means for actuating the escapement, and means for holding it in its locking position  
 80 upon the completion of each full movement of the actuatable member.

41. The combination with a key board embodying a series of key levers each provided  
 85 with an extension adjacent to its rear end, of an actuatable member actuatable from one of the keys comprised in the key board, a power-actuated driver, a friction device through which the motion of the driver is transmitted, a supplemental actuator driven  
 90 from the driver and cooperative with said lever-extensions to insure at each operation the full movement of the actuatable member, an escapement controlling the operation of said actuator, a detent for holding the escapement  
 95 in its locking position and which when withdrawn permits the supplemental actuator to operate, and a latch for tripping said detent.

42. The combination with a key board embodying a series of key levers each provided  
 100 with an extension adjacent to its rear end, of a slide actuatable from one of the keys comprised in the key board, a supplemental power-driven actuator cooperative with said  
 105 lever-extensions for insuring the full movement of the slide, an escapement controlling the operation of said supplemental actuator, means for actuating the escapement, and means for holding it in its locking position  
 110 upon the completion of each full movement of the slide.

43. The combination with a key board embodying a series of key levers each provided  
 115 with an extension adjacent to its rear end, of a slide actuatable from one of the keys comprised in the key board, a power-actuated driver, a friction device through which the motion of the driver is transmitted, a supplemental actuator driven from the  
 120 driver and cooperative with said lever-extensions to insure the full movement of the slide, an escapement controlling the operation of said actuator, a detent for holding the escapement in its locking position and  
 125 which when withdrawn permits the supplemental actuator to operate, and a latch for tripping said detent.

44. The combination with a key board embodying a series of key levers each provided  
 130



with an extension adjacent to its rear end, of a slide having motion transmitting edges of varying contours and actuatable from one of the keys comprised in the key board, a  
 5 supplemental actuator coöperative with said lever-extensions for insuring the full movement of said slide, and means for preventing said supplemental actuator from continuing to so operate after each such operation there-  
 10 by confining the working of the operating actuator to a single non-repeating cycle of movements.

45. The combination with a key board embodying a series of key levers each provided  
 15 with an extension adjacent to its rear end, of a slide having motion transmitting edges of varying contours and actuatable from one of the keys comprised in the key board, a supplemental power-driven actuator coöper-  
 20 ative with said lever-extensions to insure the full movement of the slide, a detent for preventing the operation of the supplemental actuator, means for withdrawing such de-  
 25 tent, and means for causing its reëngage-ment upon the completion of each full movement of said supplemental actuator.

46. The combination with a key board embodying a series of key levers each provided with an extension adjacent to its rear end,  
 30 of a slide having motion transmitting edges of varying contours and actuatable from one of the keys comprised in the key board, a

supplemental power-driven actuator coöper-  
 ative with said lever-extensions to insure the full movement of the slide, an escapement  
 35 controlling the operation of said supplemental actuator, means for actuating the escapement, and means for holding it in its locking position upon the completion of each full movement of the slide.  
 40

47. The combination with a key board embodying a series of key levers each provided with an extension adjacent to its rear end, of a slide having motion transmitting edges  
 45 of varying contours and actuatable from one of the keys comprised in the key board, a power-actuated driver, a friction device through which the motion of the driver is transmitted, a supplemental actuator driven from the driver and coöperative with said  
 50 lever-extensions to insure the full movement of the slide, an escapement controlling the operation of said actuator, a detent for holding the escapement in its locking position and which when withdrawn permits the  
 55 supplemental actuator to operate, and a latch for tripping said detent.

Signed at Nos. 9-15 Murray street, New York, N. Y., this 11th day of November, 1902.

FRANCIS H. RICHARDS.

Witnesses:

FRED. J. DOLE,

JOHN O. SEIFERT.