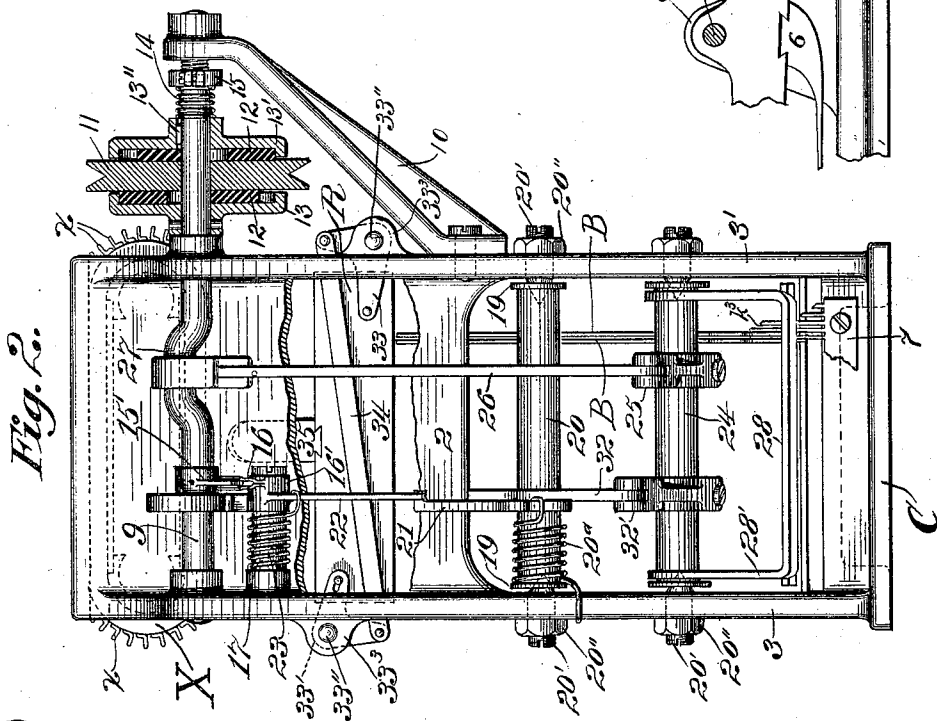
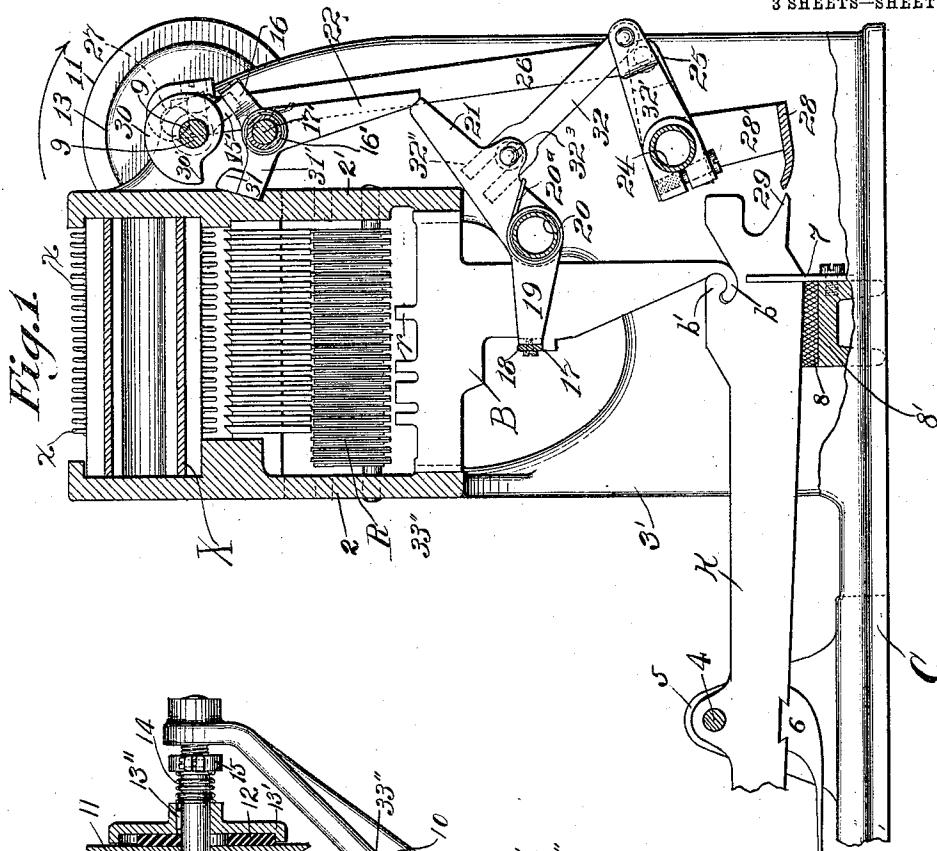


F. H. RICHARDS.
MECHANICAL MOVEMENT.
APPLICATION FILED JUNE 2, 1902.

947,473.

Patented Jan. 25, 1910.

3 SHEETS—SHEET 1.



Witnesses:

H. Jacobs
Fred. Maynard

Inventor:

F. H. Richards

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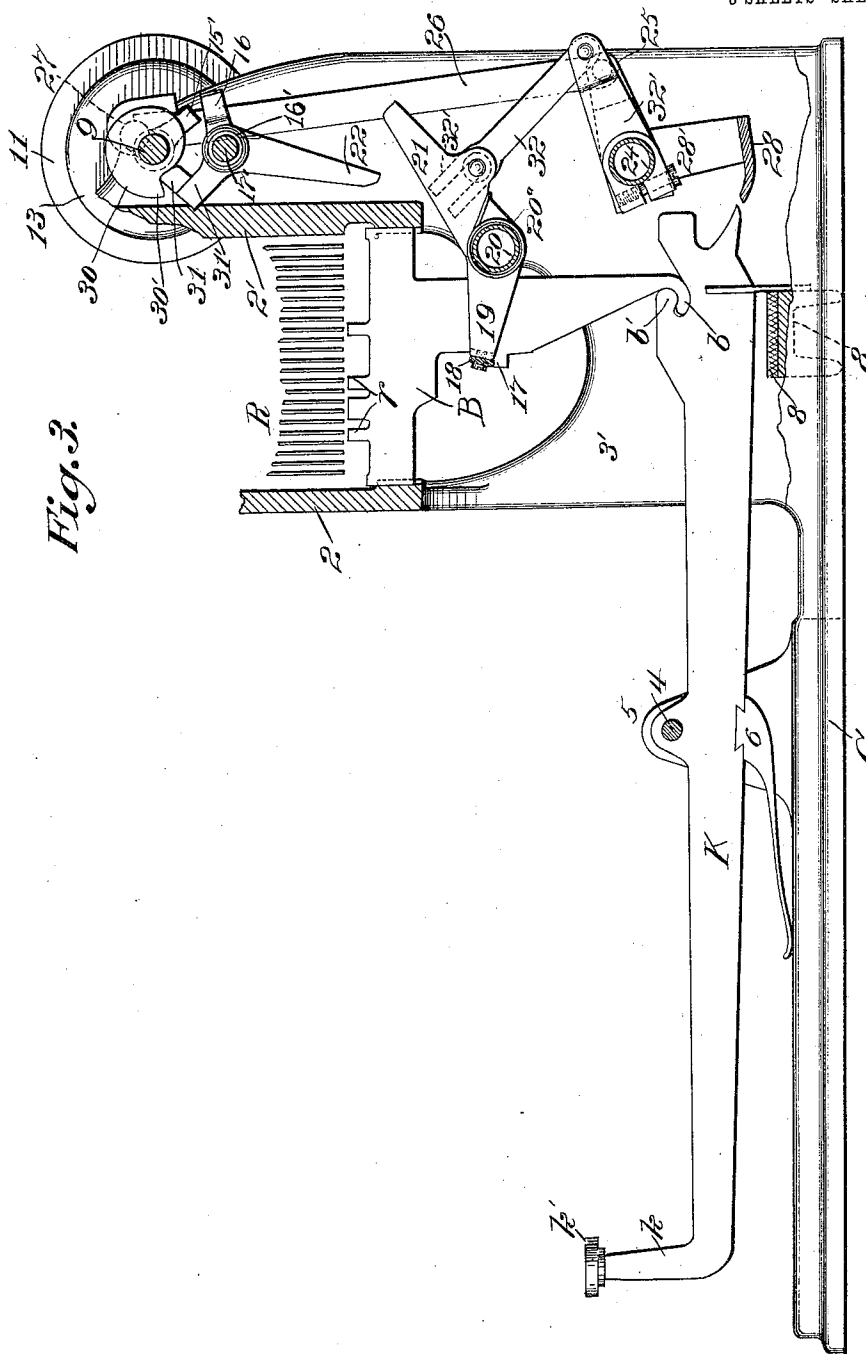


Fig. 3.

Witnesses:
H. Jacobs,
Fred. Chaynard.

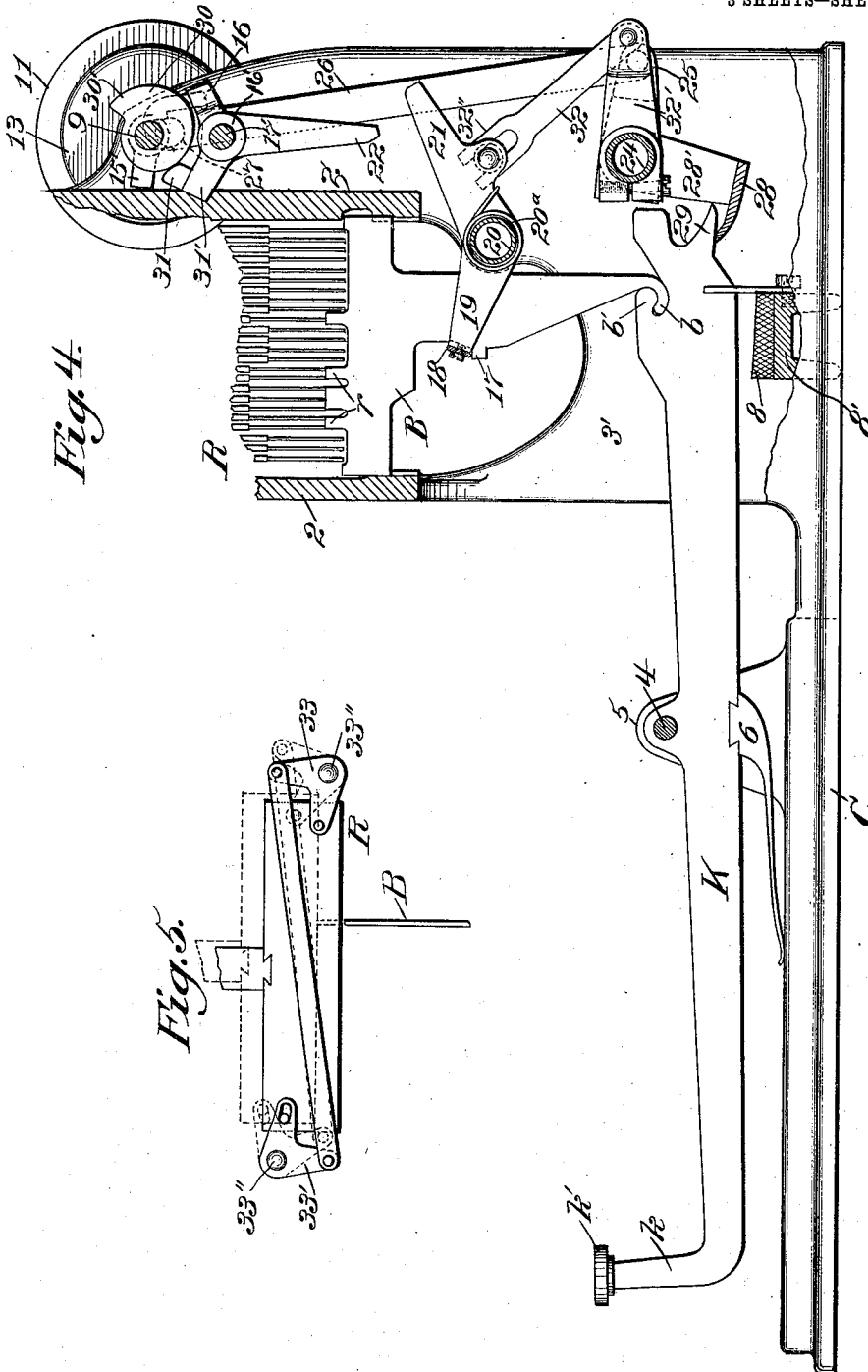
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3 SHEETS—SHEET 3.



Witnesses:
H. Jacobs
Fred E. Maynard.

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.

947,473.

Specification of Letters Patent. Patented Jan. 25, 1910.

Application filed June 2, 1902. Serial No. 109,903.

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, has an amount or character of movement imparted to it insufficient or incapable to effect that for which such member may be constructed and capable and which by its organization it is adapted to accomplish when fully functioned.

The present mechanical movement is susceptible of application to various purposes and in combination with various elements. Thus, for instance, it may be employed in connection with a selective mechanism embodying a so-called key-operative device, serving when properly connected with 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.

In carrying my present improvements into effect I have in the particular embodiment set forth in the accompanying drawings, and chosen by way of illustrating an application of the invention, represented so much of a key-operative mechanism as suffices to a full understanding of the invention, 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 that the motion initially imparted from the key suffices to move an actuatable member through a distance equal to that which the key upon its full movement might serve to accomplish.

In the illustrated construction of the mechanical movement, the elements combined with the key-operative mechanism comprise 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 positions but which restraint is released upon the initial actuation of any key, whereupon during the subsequent cycle of movements of the power-driven element the latter through suitable devices completes that motion which the actuated key tends to accomplish.

In my copending application Serial Number 131,004, filed Nov. 12, 1902, and allowed May 20, 1907, I have described and claimed a mechanical movement; therein stated to be distinguished from that set up herein by reason of the fact that the organization and construction of the devices and elements of the present 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 mechanical movement of my said copending application 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 upon such lever be maintained throughout such cycle of movements and afterward. That is to say while the kinematic relation exhibited in the mechanical movement illustrated in my present application is such as to cause a repetition of movement as long as the key lever remains depressed. The relation and construction illustrated in the movement of my said copending application 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 raise and afterward to again depress such end. Although this line is drawn in said other case to distinguish its scope, yet certain of the illustrated structure, properly claimable herein, is not limited in its function to a structure having a capability of repeating its cycle of movements during the continued depression of a lever.

In the drawings accompanying the present specification and setting forth such an embodiment, Figure 1 is partly an elevational view and partly a sectional view illustrating a portion of one of the keys of a key-opera-

tive mechanism with which there is organized a power-driven shaft and intermediate mechanism serving to restrain 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 side in Fig. 1; Fig. 3 is a view similar to Fig. 1, but shows the various parts in the position assumed by them immediately subsequent to the initial movement of the actuated key of the key-operative mechanism, which movement serves to release the power-driven element or shaft. Fig. 4 shows the parts in a position assumed by them at a more advanced stage, resulting from the motion imparted from the power-driven shaft. Fig. 5 is an elevational view of one of the actuable members whose motion is initiated by the actuation of a key and completed through the instrumentality of the released power-driven shaft, this view showing devices associated with the actuable member, whereby the same is compelled to move in a direction parallel to itself whether the point of application of the force moving it be in line with its center of resistance or whether such point of application be to one side or the other of such line.

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-operative mechanism, the performance of the function of any one 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 depressed, whereupon as the result of this initial movement further motion complementary of that initiated by the slightly depressed key is continued by other means from 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 pro-

duce 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 therefore 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 actuators, being keys of the key-operative mechanism, they are in the nature of slides B, mounted in suitable guideways in proper supports, here represented as cross-pieces 2, 2' extending between uprights 3, 3' erected upon a supporting base C. These various supporting members may evidently 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 but one of the members B in side elevation, and in edge view, two of the members, see Fig. 2, it is contemplated that there shall be ordinarily one of these members for each of the keys 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 shall be employed, depending upon the nature of the machine and the purpose for which the key-operative mechanism is employed. Each key-lever K has, in this instance, an upright portion k, at its outer end surmounted by a suitably characterized finger-piece k', while intermediate the end 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 6 secured to the lever operating to elevate such end. The several key-levers may be disposed side by side, and for their proper guidance may work in slots k³, 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 in this instance extending in the plane of the vibration of the lever and being located in 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 parts in a connection of this character.

If the outer end of a key-lever be depressed the corresponding actuatable member B will be elevated, and the parts are so related to each other that upon a full depression the member B will be moved a distance sufficient to enable it to accomplish the purpose 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 designed 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 form of connection between the two illustrated is both pushed and pulled by the key-lever.

A particular feature of the present invention relates to means in the nature of a supplemental actuator coöperative with the key lever whereby the operation of each member B, that is, its movement in the direction in which the connected key-lever when actuated tends to move it, may be continued and by such supplemental actuator completed and it be moved through its entire predetermined path of movement even though the lever be not fully functioned and to an extent less than suffices to shift it from one end of such path to the other.

In accordance with the present improvements I utilize a power-driven element which is held from accomplishing its intended purpose until the inner end of a key-lever shall have been elevated to a more or less extent, whereupon such power-driven device is released and connecting devices become operative to complete the movement initiated by the ascent of the inner end of the lever. In a convenient form thereof, this power-driven device comprises a shaft such as 9 mounted in suitable bearings, which in this instance are provided in the aforesaid uprights 3 and 3', an outboard bearing being also provided in 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 shown herein, the shaft is frictionally driven, a pulley or other driver 11 being loosely mounted thereon and being 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 11, by washer-like casings 13 and 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 while compelling the former to rotate with it, thereby enabling the friction to be regulated, which in this construction may be done by means of the tension exerted by a spring 14, controlled by an adjustable 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 15' extending from the shaft and with which engages an escapement in the nature of a forked arm or detent 16 whose hub portion 16' is pivotally mounted upon a stud 17' extending from the upright 3. As long as the arm 15' 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 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 17, all of which 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 ends 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 inwardly from the uprights and secured in position by proper lock nuts 20'' 20''.

Affixed to and extending from the aforesaid shaft 20 is a stop arm 21 the path of whose outer operative end intersects the path of movement of the corresponding end of an arm 22 extending from the aforesaid hub portion 16' of the detent 16. The relation and organization of the parts is such that when the key-levers are in their normal position the end of the arm 21 will be interposed in the path of the arm 22 with the two in contact and the arm 15' seated in the recess of the forked detent 16, thus preventing the rotation of the shaft 9 in the direction of the arrow in Fig. 1. Upon a slight movement of a member B, however, the cross-bar 18 will be lifted, withdrawing the end of the arm 21 from contact with the arm 22 and through the action of a spring 23 which encircles the stud 17' and is properly tensioned, the detent 16 will be withdrawn from engagement with the arm 15'. 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 some suitable mech-

anism, 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 to the shaft 20 is a rock shaft 24 connected by means of an arm 25 and a connecting rod 26 with a crank 27 on the shaft 9; thus during each full rotation of the shaft 9 an oscillation will be imparted to the rock shaft 24.

A cross-bar or plate 28 at the outer ends of arms 28', 28' extending from the rock shaft 24 is adapted to cooperate with the key-lever as follows: Each key-lever K at its rearward end is provided with a projection 29 above which when the lever is in its normal position the aforesaid bar or plate 28 is adapted to freely play when the oscillation of the shaft 24 occurs, and hence in such a position of the levers the bar is inoperative to engage with any one of the 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 the 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 relation of the parts being such that this result is effected) the bar will freely play across the upper surfaces of the extensions 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 the lever is sufficient to elevate the connected member B to the full amount that would be effected by the depression of the charactered end of the key-lever to its greatest extent. To insure the correct cooperative relation between the respective key-levers and this supplemental actuator 28, I have provided means for positively causing the insertion of the stop arm 21 into the path of the arm 22, after the latter shall have been shifted against the tension of spring 23 from a position as indicated in Fig. 3 to a position as indicated in Fig. 1 by means such as a cam 30 on the shaft 9 with the periphery of which engages a projecting finger or cam block 31 extending from an arm 31' fixed relatively to the aforesaid hub portion 16' rotatably mounted on the stud 17'. This means for positively inserting the stop arm 21 comprises a link 32 pivoted to an arm 32' extending from the aforesaid shaft 24 and whose bifurcated end portion 32'' embraces a pin 32³ extending laterally from the arm 21. During the movement of the supplemental actuator 28 toward the key-levers, the link 32 changes, somewhat, its position as indicated in Fig.

1, the pin 32³ sliding lengthwise of the slot in the bifurcated portion of the link. On the return movement, however, the pin contacting with the bottom of the slot is urged forward and the arm 21 caused to assume a position in which the arm 22 under the impulse of the spring 23 and as the cam block 31 drops down at the let-off edge 30' of the cam may impinge against it and be locked from movement. In this locked position of the arm 22, the detent 16 is interposed in the path of the stop arm 15 and the shaft 9 is stopped from rotation although this latter action does not occur until the bottom of the slot in the link end is somewhat withdrawn from the pin 32³, thus leaving the arm 21 free to be tilted upon the next actuation of a key-lever to an extent sufficient to permit the disengagement of the arm from the arm 22. A spring 20^a is also shown for insuring the contact of the cross-bar 18 with the shoulders 17 on the members B.

Evidently so far as concerns the utilization of the movements of the members B, the movement of each such member may be applied for 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 the 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 number of the members R may be adapted to be moved from any particular member B. For effecting this each member B may have one or more projections *r* adapted to contact with one or more of the members R, the relation as to number and position existing between the members R actuated, depending upon the position and size of the projections *r*. As organized in this instance, 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 moving force. In order, therefore, to maintain the rectilinear character of this movement and permit the same to accomplish with equal facility whatever the point of application of the force I have provided a construction comprising a pair of angle levers 33, 33' fulcrumed to fulcrum bars 33'', 33'' extending between lugs 33³ on the uprights 3, 3', each 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 34.

It is to be noted that the pivotal connection of one of the angle levers of each pair, the angle lever 33' in this instance, has a slotted connection with the supported member R 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 α 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 Dec. 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 35 having a beveled or cam-like edge adapted to co-operate with a corresponding row of settable pins on the belt.

An embodiment of a mechanical movement such as has been hereinbefore described operates substantially in the following manner: Assuming the parts to be in the position indicated in 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 cross-bar 18 will be elevated, thus causing the withdrawal of the arm 21 from contact with the stop arm 22. When the cam block 31 drops down and into contact with that portion of the cam 30 of the smallest radius the spring 23 will withdraw the detent 16 from arm 15 permitting the rotation of the shaft 9 from the rotating driving pulley 11. Through the action of the crank 27 and the connecting rod 26 the shaft 24 is turned in its bearings, thus bringing the cross-rail or supplemental actuator 28 under the projection 29 of the actuated key-lever and as the shaft continues to turn in the same direction the inner end of the lever is carried upward, while at the same time such cross-rail plays in the space above the projections of those key-levers which are not actuated. The shaft 24 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 play of the connected member B in its bearings. This member will actuate, as aforesaid, one or more of the members R according to the number and configuration of the projections r thereupon, and these members R in their turn will through their actuator portions 35 set up corresponding pins X upon the jacquard belt X.

During the forward rotary movement of the shaft 9 the hub 16' carrying the cam block 31, the arm 22 and the detent 16 will be gradually rocked against the resistance of the spring 23 as the block travels up the

surface of the cam 30. Before, however, the block reaches the let-off edge 30' of the cam the motion of the shaft 24 will have been reversed in its bearings thereby elevating the link 32 and causing the arm 21 to extend into the path of the arm 22. When the block 31 slips off the let-off edge of the cam and the spring 23 becomes operative to swing the arm 22, this arm and the various parts associated therewith will be locked by the arm 21. A slight relatively reverse movement of the shaft 24 now ensues, withdrawing the bottom of the slot in the bifurcated portion of the link 32 from the pin 32^a, whereupon the arm 15' engages with the detent 16 and the parts are brought to rest.

Having described my invention, I claim—

1. The combination of a driving member, a driven member frictionally engaged by said driving member, a detaining member engageable with said driven member, a plurality of selective members, each of which is operable for releasing the detaining member for permitting the driven member to operate, and mechanism including a selected member operable by said driven member, and a series of actuators, a portion of which is operable by said selected member.

2. A combination of a driving member; a driven member frictionally engaged by said driving member; a detaining member engageable with said driven member; a series of selective members, each of which may operate to release the detaining member and thereby permit the driven member to operate; and mechanism which includes a selected member operable by said driven member, and a series of actuators, a portion of which is operable by said selected member.

3. A combination of a driving member; a driven member frictionally engaged by said driving member; a detaining member engageable with said driven member; a plurality of selective members, which may operate to release the detaining member and thereby permit the driven member to operate; and mechanism which includes selected members operable by said driven member, and a series of actuators operable by said selected members.

4. A combination of a driving member; a driven member frictionally engaged by said driving member; a detaining member engageable with said driven member; a series of selective members, of which a plurality may operate to release the detaining member and thereby permit the driven member to operate; and mechanism which includes selected members operable by said driven member, and a series of actuators operable by said selected members.

5. A combination of a driving member; a driven member frictionally engaged by said driving member; a detaining member engageable with said driven member; a plu-

9. A combination of a driving member; a driven member frictionally engaged by said driving member; a detaining member engageable with said driven member; a plurality of selective members, each of which may operate to release the detaining member and thereby permit the driven member to operate; mechanism which includes a selected member operatable by said driven

13. A combination of a driving member;
a driven member frictionally engaged by
said driving member; a detaining member
engageable with said driven member; a plu- 120
rality of selective members each of which
may operate to release the detaining mem-
ber and thereby permit the driven member to
operate; mechanism which includes a select-
ed member and is operatable by said driven 125
member; a member adapted to operatively
engage a selected member and synchronously
therewith lock the remainder of said select-

bodying a plurality of members, a predetermined portion of which is controllable by each of said selective members. 65

18. A combination of a driving member; a driven member frictionally engaged by said driving member; a detaining member engageable with said driven member; a series of selective members, each of which may operate to release the detaining member and thereby permit the driven member to operate; mechanism which includes a selected member and is operatable by said driven member; a member adapted to operatively engage a selected member and synchronously therewith lock the remainder of said selective members; and a series of actuators embodying a plurality of members, a predetermined portion of which is controllable by each of said selective members.

19. A combination of a driving member: a driven member frictionally engaged by said driving member; a detaining member engageable with said driven member; a plurality of selective members which may operate to release the detaining member and thereby permit the driven member to operate; mechanism which includes selected members and is operatable by said driven member; a member adapted to operatively engage selective members and synchronously therewith lock the remainder of said selective members; and a series of actuators embodying a plurality of members, a predetermined portion of which is controllable by each of said selective members.

20. A combination of a driving member; 100
a driven member frictionally engaged by
said driving member; a detaining member
engageable with said driven member; a se-
ries of selective members, of which a plu-
rality may operate to release the detaining 105
member and thereby permit the driven mem-
ber to operate; mechanism which includes
selected members and is operatable by said
driven member; a member adapted to oper-
atively engage selected members and syn- 110
chronously therewith lock the remainder of
said selective members; and a series of ac-
tuators embodying a plurality of members, a
predetermined portion of which is con-
trollable by each of said selective members. 115

21. A combination of a driving member; a driven member frictionally engaged by said driving member; a detaining member engageable with said driven member; a plurality of selective members, each of which may operate to release the detaining member and thereby permit the driven member to operate; mechanism which includes a selected member and is operatable by said driven member; a member adapted to operatively engage a selected member and synchronously therewith lock the remainder of said selective members; and a series of ac-

tuators embodying a plurality of members, a predetermined portion of which is controllable by each of said selective members.

22. A combination of a driving member;
5 a driven member frictionally engaged by
said driving member; a detaining member
engageable with said driven member; a
series of selective members, each of which
10 may operate to release the detaining member
and thereby permit the driven member to
operate; mechanism which includes a selected member and is operatable by said
driven member; a member adapted to operatively engage a selected member and synchronously therewith lock the remainder of
15 said selective members; and a series of actuators embodying a plurality of members, a predetermined portion of which is controllable by each of said selective members.

23. A combination of a driving member;
20 a driven member frictionally engaged by
said driving member; a detaining member
engageable with said driven member; a
plurality of selective members which may
25 operate to release the detaining member and
thereby permit the driven member to operate; mechanism which includes selected members and is operatable by said driven member; a member adapted to operatively
30 engage selected members and synchronously therewith lock the remainder of said selective members; and a series of actuators embodying a plurality of members, a predetermined portion of which is controllable
35 by each of said selective members.

24. A combination of a driving member;
a driven member frictionally engaged by
said driving member; a detaining member
engageable with said driven member; a
40 series of selective members, of which a plurality may operate to release the detaining member and thereby permit the driven member to operate; mechanism which includes selected members and is operatable by said
45 driven member; a member adapted to operatively engage selected members and synchronously therewith lock the remainder of said selective members; and a series of actuators embodying a plurality of members,
50 a predetermined portion of which is controllable by each of said selective members.

25. A combination of a driving member;
a driven member frictionally engaged by
said driving member; a detaining member
engageable with said driven member; a
55 plurality of selective members, each of which may operate to release the detaining member and thereby permit the driven member to operate; mechanism which includes a selected member and is operatable by said
60 driven member; a member adapted to operatively engage a selected member and synchronously therewith lock the remainder of said selective members; and a series of actuators embodying a plurality of members,

a predetermined portion of which is controllable by each of said selective members.

26. A combination of a driving member;
a driven member frictionally engaged by
said driving member; a detaining member
engageable with said driven member; a
70 series of selective members, each of which may operate to release the detaining member and thereby permit the driven member to operate; mechanism which includes a selected member and is operatable by said
75 driven member; a member adapted to operatively engage a selected member and synchronously therewith lock the remainder of said selective members; and a series of actuators embodying a plurality of members,
80 a predetermined portion of which is controllable by each of said selective members.

27. A combination of a driving member;
a driven member frictionally engaged by
85 said driving member; a detaining member
engageable with said driven member; a
plurality of selective members which may
operate to release the detaining member and
thereby permit the driven member to op-
90 erate; mechanism which includes selected members and is operatable by said driven member; a member adapted to operatively engage selected members and synchronously therewith lock the remainder of said select-
95 ive members; and a series of actuators embodying a plurality of members, a predetermined portion of which is controllable by each of said selective members.

28. A combination of a driving member;
100 a driven member frictionally engaged by
said driving member; a detaining member
engageable with said driven member; a
series of selective members, of which a plurality may operate to release the detaining
105 member and thereby permit the driven member to operate; mechanism which includes selected members and is operatable by said driven member; a member adapted to operatively engage selected members and syn-
110 chronously therewith lock the remainder of said selective members; and a series of actuators embodying a plurality of members, a predetermined portion of which is controllable by each of said selective members.
115

29. A combination of a driving member;
a driven member frictionally engaged by
said driving member; a detaining member
engageable with said driven member; a plurality of selective members, each of which
120 may operate to release the detaining member and thereby permit the driven member to operate; mechanism which includes a selected member and is operatable by said driven member; means for causing the de-
125 taining member to engage the driven member; and a plurality of actuators, a number of which is operable by said selected member.

30. A combination of a driving member; 130

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thereby permit the driven member to operate; mechanism which includes a selected member and is operable by said driven member; a member adapted to operatively engage a selected member and synchronously therewith lock the remainder of said selective members; means for causing the detaining member to engage with the driven member; and a plurality of actuators, a number of which is operable by said selected member.

39. A combination of a driving member; a driven member frictionally engaged by said driving member; a detaining member engageable with said driven member; a plurality of selective members which may operate to release the detaining member and thereby permit the driven member to operate; mechanism which includes selected members and is operable by said driven member; a member adapted to operatively engage selected members and synchronously therewith lock the remainder of said selective member; means for causing the detaining member to engage the driven member; and a plurality of actuators, a number of which is operable by said selected member.

40. A combination of a driving member; a driven member frictionally engaged by said driving member; a detaining member engageable with said driven member; a series of selective members, of which a plurality may operate to release the detaining member and thereby permit the driven member to operate; mechanism which includes selected members and is operable by said driven member; a member adapted to operatively engage selected members and synchronously therewith lock the remainder of said selective members; means for causing the detaining member to engage the driven member; and a plurality of actuators, a number of which is operable by said selected member.

41. The combination of a driving member; a driven member frictionally engaged by said driving member; a detaining member engageable with said driven member; a plurality of selective members, each of which may operate to release the detaining member and thereby permit the driven member to operate; mechanism which includes a selected member and is operable by said driven member; a member adapted to operatively engage a selected member and synchronously therewith lock the remainder of said selective members; a plurality of differentially operative members, each operable by a selected member; means for causing the detaining member to engage the driven member; and a plurality of actuators, a number of which is operable by said selected member.

42. The combination of a plurality of selective members, each of which may operate

to release a detaining member, and operative mechanism which includes a selected member, and a plurality of actuators, a number of which is concurrently operable by said selected member.

43. The combination of a plurality of selective members which may be operable to release a detaining member, and operative mechanism including selected members, and a plurality of actuators, a number of which are operable concurrently by said selected member.

44. In a mechanical movement, the combination of an oscillating key lever K, slide B operatively connected to and movable in a straight line by the key-lever, bar 18 for returning the slide to normal position, and operative mechanism for said bar.

45. In a mechanical movement, the combination of an oscillatory member having a projection b' , a slide B movable in a straight line and having a projection b for engaging said projection b' and forming a pivotal connection, a bar 18, and operative mechanism for said bar.

46. The combination with an actuator, of an actuatable member and a supplemental actuator for continuing the movement of the actuatable member after its initiation, and a plurality of members operable concurrently by the first mentioned actuator.

47. The combination with an actuator, of an actuatable member and a power operated supplemental actuator for continuing the movement of the actuatable member after its initiation, and a plurality of members operable concurrently by the first mentioned actuator.

48. The combination with an actuatable member, of a power driven shaft, a clutch interposed between said member and said shaft, an actuator for initiating the movement of the actuatable member, a supplemental actuator operable from said shaft for continuing the movement of the actuatable member upon the initiation of such movement, and a series embodying a plurality of actuators, a predetermined number of which is operable by said first mentioned actuator.

49. The combination with an actuatable member, of a key mechanism adapted to initiate the movement thereof, a power driven shaft, a clutch interposed between said shaft and said member, an escapement for controlling the operation of said clutch, a stop arm shiftable from said actuatable member and operative to release said escapement, a supplemental actuator operable from said shaft for continuing the movement of the actuatable member after the initiation of such member, means also operable from said shaft for returning said escapement and said stop arm to their engaging positions, and a series embodying a plurality of actuators, a

predetermined number of which is operable by said first mentioned actuator.

50. The combination with a driving shaft, of a rock shaft, a number of slides, a number of members for transmitting the movement of the slides, levers for moving the slides, means for engaging the levers and completing the movement of the same and actuated by said rock shaft, and means engageable with the moved slide upon the inauguration of its movement for releasing the rock shaft to the power of the driving shaft.

51. The combination with a number of movement transmitters, of a number of slides each for engaging one or more of said transmitters, a number of key levers severally connected to said slides, and each of said levers having a contacting projection, a rock shaft, a bar carried by the rock shaft for engaging said contacting projection on a key lever after the same has partially traversed its stroke, means for rocking said shaft, a detent for normally holding said means idle, and means for releasing said detent and actuated by any slide upon the inauguration of its movement.

52. The combination with a driving member, of a driven member frictionally engaged by said driving member, a detaining member for said driven member, means for controlling the detaining member, and a series of actuators, a series of selective members each constructed and adapted to be operable upon said controlling means for effecting the release of the detaining member and upon a selected number of said actuators.

53. The combination with a driving member, of a member frictionally driven thereby, means for detaining the driven member, a series of selective members each of which is constructed and adapted to operate to re-

lease the detaining member and thereby permit the driven member to operate, a series of actuators, and mechanism which includes a selected member and a portion of said series of actuators operable by said selected member.

54. The combination with an actuatable member, of an actuator capable when fully functioned of moving said member through its entire path of movement, and a supplemental actuator for continuing the movement of such member when the movement is inaugurated by the actuator and the same not fully functioned.

55. The combination with a member movable through a predetermined path, of an actuator capable of moving said member through said path, and a supplemental actuator for completing the movement of said member upon the incomplete movement of said member by said actuator.

56. The combination with a series of members each movable through a predetermined path, of a series of actuators therefor each capable of imparting the said movement, co-operative means actuated by any one of said actuators upon the inauguration of its movement for positively effecting the completion thereof, and means actuated by said co-operative means for locking all the idle actuators in idle position upon its actuation.

57. The combination with a series of members having a substantially uniform path of movement, of a series of actuators each capable of imparting such movement and exposed to ununiform actuation, and a co-operative actuator capable of imparting such movement and exposed to uniform actuation.

FRANCIS H. RICHARDS.

Witnesses:

FRED. J. DOLE,
JOHN O. SEIFERT.