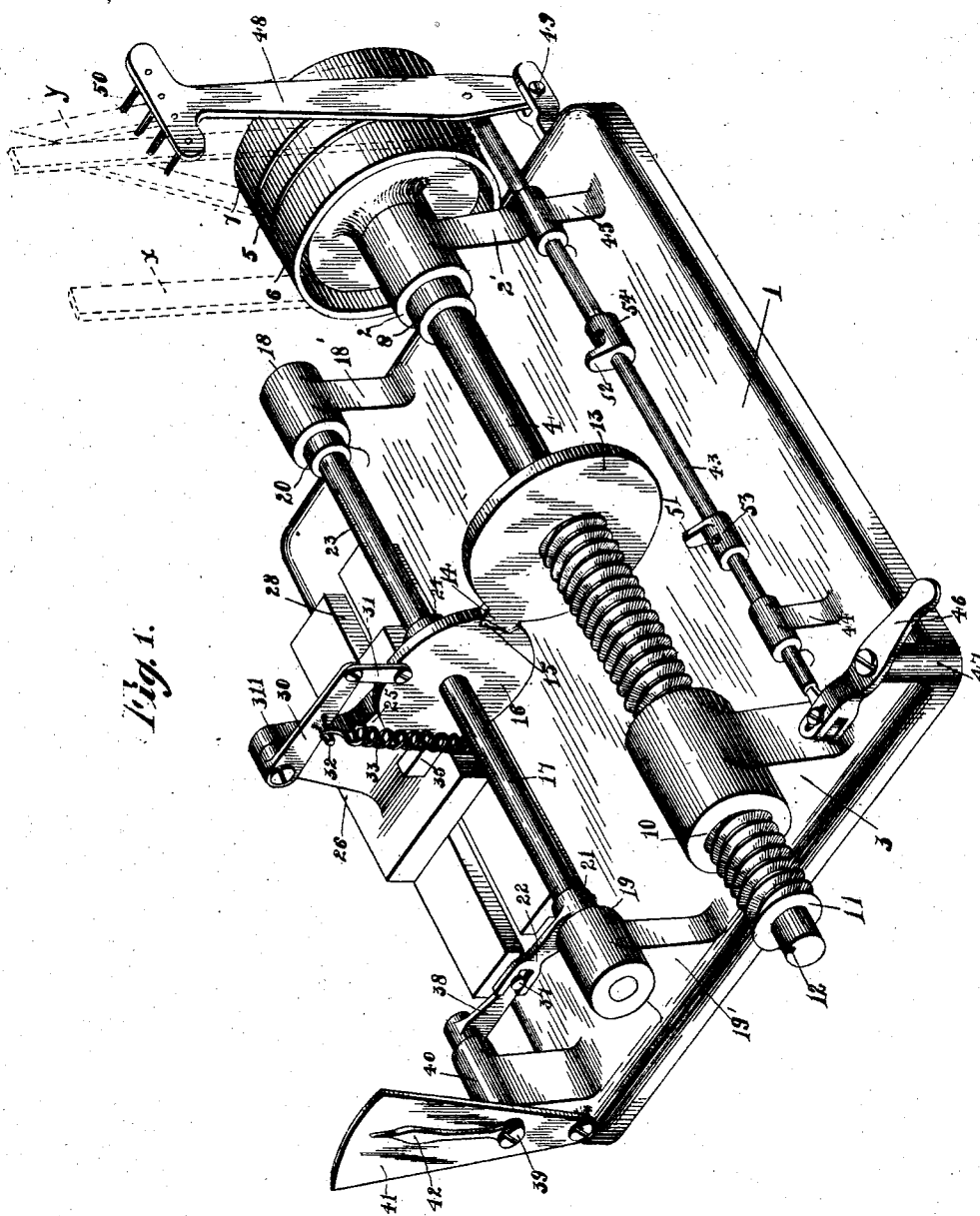


No. 854,056.

PATENTED MAY 21, 1907.

F. H. RICHARDS.
MECHANICAL MOVEMENT.
APPLICATION FILED APR. 23, 1902.

3 SHEETS--SHEET 1.



Witnesses:
 Frederick J. Hachenberg.
 R. W. Pittman

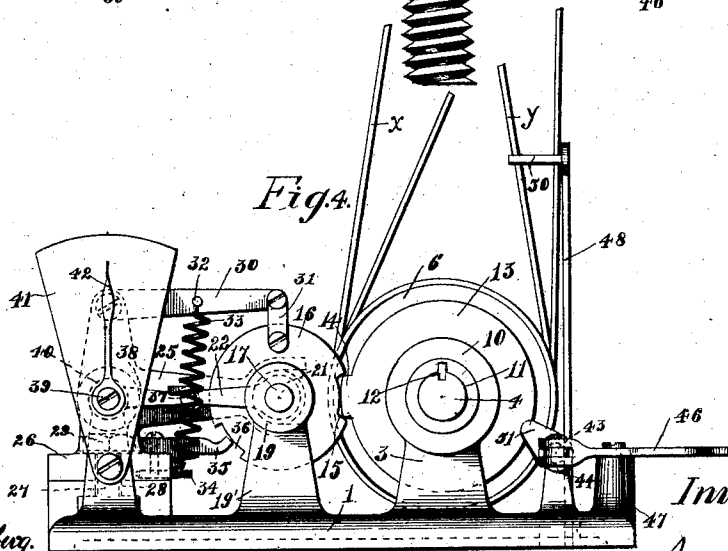
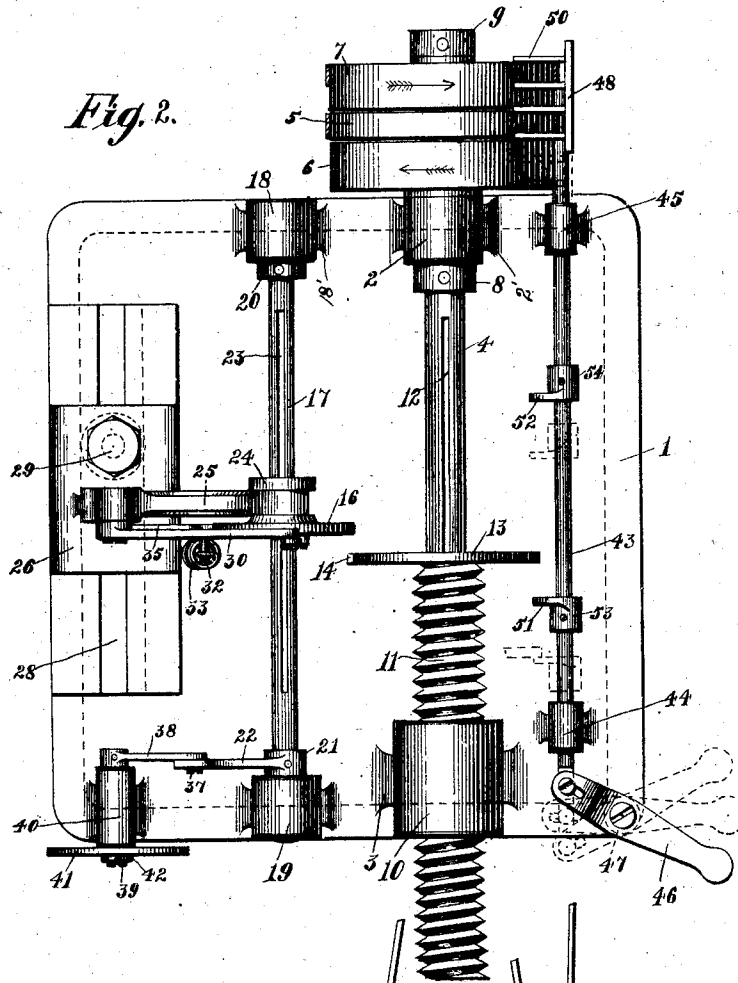
Inventor:
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3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

Fig. 3.

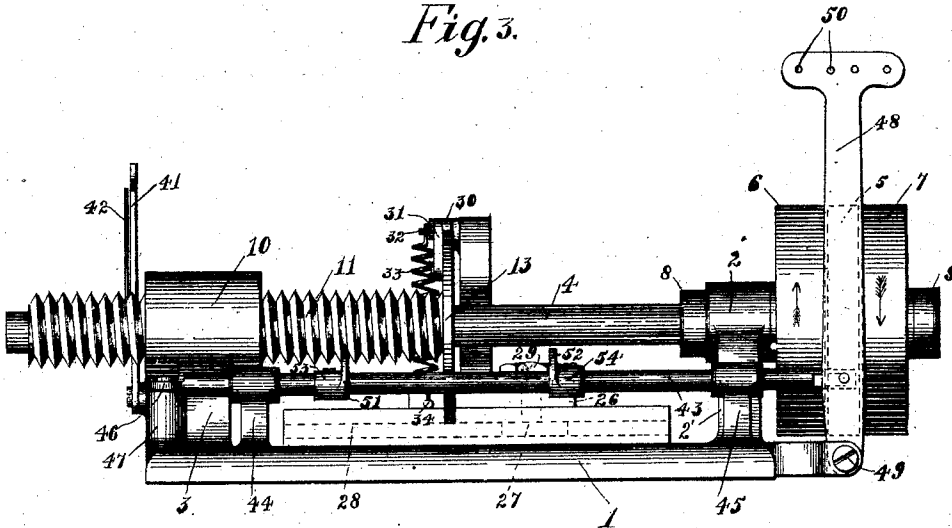


Fig. 5

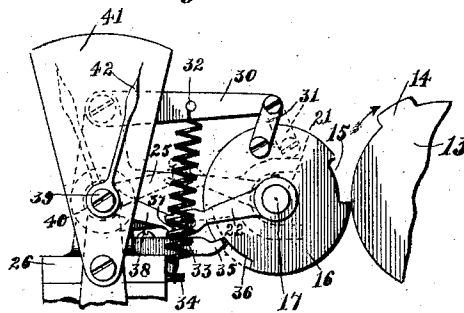
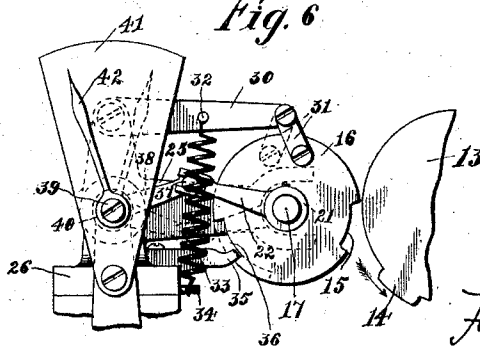


Fig. 6



Witnesses:

F. G. Hochenberg.

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Inventor:

F. H. Richards.

UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT, ASSIGNOR, BY MESNE ASSIGNMENTS, OF ONE-HALF TO AMERICAN TYPOGRAPHIC CORPORATION, A CORPORATION OF NEW JERSEY.

MECHANICAL MOVEMENT.

No. 854,056.

Specification of Letters Patent.

Patented May 21, 1907.

Application filed April 23, 1902. Serial No. 104,246.

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 Movement, of which the following is a specification.

This invention relates to the kinematic relationship existing among the co-operative members of a device in which the actuation of a member is effected at some point in the path of movement of a separate to-and-fro or reciprocative member.

My improved mechanical movement is adapted for use in a unit counting apparatus for a typographic composing machine.

A particular feature of the present improvements relates, furthermore, to means whereby the aforesaid reciprocative member, though it may be effective to accomplish the actuation aforesaid, may on the other hand serve the purpose merely of initiating the movement of the actuatable member, which movement is continued and the said actuatable member definitely placed in a predetermined position by such means.

A mechanical movement embodying the present improvements comprises suitable mechanisms or devices capable of co-operation at some point, preferably adjustable in the path of movement to and fro of the reciprocative member, combined with means whereby upon such co-operative engagement and shifting of the actuatable member forward in the direction of its movement, this movement is continued by a supplemental actuator brought into action as the result of the initial or primary displacement of the actuatable member.

I have shown in the drawing accompanying the present specification, mechanical parts or members operatively connected with each other, and in such embodiment constituting a disclosure of my present invention.

In these drawings, Figure 1 is a perspective view of such embodiment, the driving and driven or actuatable members being shown in this figure as being in engagement one with the other. Fig. 2 is a plan view of the various parts set forth in Fig. 1, but indicating the driving and actuatable members as having moved out of engagement with each

other after the actuation of the latter. Fig. 3 is a side elevation of the parts in the position that they occupy in Fig. 1. Fig. 4 is an end elevation corresponding to the side elevation of Fig. 3. Fig. 5 is a detail view representing the driving member as having disengaged itself from the actuatable member, and the latter as having assumed under the action of the subsidiary actuator one of its extreme or limiting positions. Fig. 6 is a view corresponding to Fig. 5, illustrating the actuatable member as having been shifted through the instrumentality of the driving member and the subsidiary actuating mechanism to its opposite limiting position. Fig. 7 is a diagrammatic view designed to illustrate the relation between the to-and-fro paths of the reciprocative driving member and the point of actuation of the driven or actuatable member when the same is made adjustable in the line of travel of the reciprocating member, the position chosen being such as corresponds substantially to the middle point of the line of travel of the reciprocative member and also to points adjacent to the opposite ends of its line of travel.

Similar characters of reference designate corresponding parts in all the figures.

In embodying the present mechanical movement in an operative device susceptible of application to a mechanism or machine in which a modification of motion such as it is capable of accomplishing is desired, there will be included a member, herein designated as the driving member, so mounted that it is capable of a reciprocative movement under the control of suitable means, and an actuatable member with which the driving member is capable of engaging at some point in its travel to and fro. In the embodiment herein disclosed, the relation is such that such engagement can take place during both of each to-and-fro movements. The construction of such driving member and the manner in which it is mounted is such as to enable this co-operative engagement to take place, and while I have illustrated the driving member as moving in unison with a threaded or screw-like element, resulting, when the driving member is operated, in a longitudinal movement as well as a rotary movement of the driving member, it is not intended that the application of this inven-

tion shall in all cases be restricted to the use of a driving member having a reciprocating and also rotary movement or a movement of this character. It is not intended that the application of this invention shall in all cases be restricted to the use of a driving member having a compound movement or a compound movement of such a character. I have illustrated, furthermore, the co-operative engagement as resulting from the engagement of a tooth-like projection on the driving member with either one or the other of the side walls of a recess on the actuatable member.

In the drawings hereto attached, the driving member comprises a head 13, projecting from which is a tooth 14 constituting the driver proper, while from said head there extends a threaded rod 11 which engages with a corresponding thread in a nut 10. It may be stated in further explanation of the particular organization illustrated in the drawings, that the various parts are mounted upon a base-plate 1, although obviously the supporting member upon which they are mounted will generally vary with the construction and nature of the machine with which the mechanism of the mechanical movement may be combined or to which it may be applied. In the particular construction herein set forth, the nut 10 is supported upon an upright 3 erected upon the base-plate, while a shaft 4 extending through the hollow bore of the threaded rod 11, serves to rotate and hence longitudinally shift the threaded rod and the head 13 by reason of the engagement of a keyway 12 in such shaft with a pin or key (not shown) extending from the parts mounted thereon. A well known form of device for imparting a to-and-fro movement to the head and its threaded rod, in other words, for accomplishing the rotation of the shaft 4 in opposite directions is illustrated, consisting of a fast and loose pulley construction. The two side pulleys 6 and 7 are loosely mounted upon the shaft while the intermediate pulley 5 (constituting the relatively narrow driving pulley) is fixed thereto, open and cross belts, designated respectively by *x* and *y*, being adapted to engage either with one loose pulley and the driving pulley, or with the other loose pulley and the driving pulley in the well known manner. In the construction illustrated, longitudinal movement of the shaft 4 is prevented by a collar 8 which bears against one side of the journal bearing 2 against the opposite side of which bears the hub of the pulley 6, a collar *g* being secured to the shaft to hold the loose pulley 7 thereon. Combined with the fast and loose pulley construction is a shipper rod 43 longitudinally reciprocative in bearings 44 and 45 erected upon the base 1 and having contact pieces 51 and 52, whose hub portions 53 and 54, respectively, are secured (preferably ad-

justably) to the shipper rod 43 with their contact arms in such position that the head 13 during the to-and-fro movement thereof may engage with them alternately to effect a similar movement of the shipper rod 43. By means of pins 50 extending from a lever 48 fulcrumed to the base by a bracket 49 and pivoted to the shipper rod, the aforesaid open and cross belts may be likewise shifted alternately onto the pulleys 6 and 7, it being readily understood that while one of the belts is acting as a driving belt the other belt of the pair is ineffective as a driver by reason of its engagement with one of the loose pulleys. Evidently the extent of travel of the head 13 and its associated parts may be altered by properly locating the aforesaid contact pieces upon the shipper rod; this rod is illustrated in the drawings as having pivoted to it a manually-operative lever 46 which is fulcrumed to a stud 47 on the base, thus enabling the direction of longitudinal movement of the head and threaded rod to be reversed at any point desired by the operator independently of the operation of the automatic reversing means hereinbefore described.

Coming now to a description of the actuatable member whose movement is effected through the engagement therewith of the driving member, this actuatable member is, in the present instance, in the form of a head 16 oscillatory about the axis of a shaft 17 journaled in bearings 18 and 19 erected upon the base plate. This head is provided with a recess 15 with the opposite end walls of which the sides of the tooth or projection 14 are adapted to engage.

A particular feature of the present invention relates especially to mechanism subsidiary, as respects its function, to the operation of the driver or driving member hereinbefore described, and effective to cause the ultimate and definite positioning of the actuatable member and its associated parts when their motion shall have been initiated by reason of the engagement of the moving toothed driving member with one or the other of the end walls of the recess 15. The action of the subsidiary mechanism, hereinafter to be described, is therefore supplemental to the action of the driver in so far as it positively continues the motion of the actuatable member arising from the engagement, as aforesaid. Hence, while the driver operates to actuate to some extent the actuatable member, it does not accomplish the shifting of the latter member to the final and ultimate position which it is designed it shall have, the subsidiary actuator being brought into play to effect the shifting of the actuatable member to its limiting position. This subsidiary actuator comprises, in its most convenient form a spring, such as 33, attached at one end to a fixed part and exerting a pull by

reason of its tension upon an arm 30 (to a projecting stud 32 of which, in this instance, the opposite end of the spring is attached) while the arm itself is pivoted at one end to an upright erected upon a block 26, which, it may be here premised, is preferably adjustably secured with reference to the base plate 1 for a purpose that will be more fully hereinafter set forth. To the vibratory end of the arm 30 is pivoted a link 31, the opposite end of which is likewise pivoted to the head 16 constituting the actuatable member. Now it is plain that (assuming the spring 33 to be under tension) when the line of effort exerted by the spring-pressed arm 30 passes through the pivotal axes of the link-to-arm and of the link-to-head connections and the axis about which the actuatable member turns, no motion will be transmitted to said actuatable member; neither will any motion be occasioned until the inclination of the line of effort exerted by the spring-pressed arm through the link on the actuatable member passes to one side or the other of the afore-said axis of the actuatable member to an amount sufficient to create a torque adequate to overcome the friction of the movable parts and the further resistance to movement which they may offer. When the torque shall have become of sufficient magnitude for this purpose, due to the engagement of the moving tooth 14 with one wall or the other of the recess 15, the spring 33 will then serve to turn the actuatable member independent of any effort exerted thereupon by such tooth. In order to control the action of the spring as an actuator and for the purpose of defining the limiting position in both directions which the actuatable member may assume, shoulders are formed thereupon or upon some part moving in unison therewith, which co-operate with a fixed stop to define such limiting positions. In the form of this controlling means here shown, the head 16 is provided with a recess 36 into which projects a finger or stop 35 extending from a fixed part and co-operable with the end walls of such recess to arrest the motion of the actuatable member.

As before stated, I prefer to make the block 26 adjustable, as by this means, and assuming that the head 16 is adjustable in unison with it I am enabled to vary the point in the line of travel in each direction at which engagement of the tooth 14 with either one or the other of the end walls of the recess 15 takes place; in other words, the point at which the actuatable member is actuated. For this purpose there extends from the block 26 an arm 25 which embraces an annular groove in the hub-like extension 24 of the head 16, and to enable the block 26 to be fixedly secured in a position to which it may have been adjusted, the same is slidable to and fro upon guideways having an undercut

or dovetailed slot 28 to the side walls of which the block may be clamped by means of a clamping device, such as a bolt and nut 29. The shaft 17 upon which the head 16 is mounted turns in unison with the latter; for permitting the longitudinal movement of such head along the rotative shaft the latter may be provided with a pin-and-slot connection, here consisting of a slot or keyway 23 formed in the shaft with which engages a pin or key (not shown), extending from the head 16 or its fixedly connected parts.

The motion of the shaft 17 may be taken therefrom in any desired manner and made use of in accordance with the requirements of the mechanism or machine with which the mechanical movement is combined. In the particular construction set forth in the drawings attached to the present specification I have shown an indicating device for indicating to the observer the motion of the shaft and the times when or during which the shaft occupies either one or the other of its limiting positions. This device comprises a furcated arm 22 attached to the shaft and in the slot between the side pieces of which arm there works a crosspin 37 extending from an arm 38 attached to a shaft 39 mounted in a bearing 40 erected on the base plate. To this shaft 39 is affixed a pointer 42 movable across the face of an indicator sector 41 from one side to the other thereof. The hub of the arm 22 is in close relation to the face of the journal bearing 19 supported on an upright 19', while longitudinal movement of the shaft to the right in Fig. 1 is prevented by a collar 20, which is in close relation to the face of the journal bearing 18 supported on an upright 18'.

An embodiment, such as has been hereinbefore described, of the present mechanical movement operates substantially in the following manner; Assuming that belt to be the driving belt for the time being, which serves to so rotate the shaft 4 as to move the threaded rod 11 and head 13 toward the right in Fig. 1 (an initial or starting position being assumed for these parts in which they occupy their extreme positions at the left in that figure) the head 13 will rotate and traverse its path from left to right until the uppermost face of the tooth 14 on the head comes into engagement with the opposed face of the recess 15, the position of the actuatable member being at this time as indicated in Fig. 6. Further rotation of the head will carry the actuatable member or head 16 in a direction contrary to the direction of motion of the hands of a watch until the link 31 shall have passed a vertical position and become inclined to the left or toward the rear of the machine to an extent sufficient to permit the spring 33 to perform its function as an actuator. If, during this action of the spring, the tooth 14 shall not have moved by reason of

the longitudinal movement of the threaded rod 11 out of the recess 15, the opposite, that is the lower, face of the tooth 14 will act as a retardant face until the stop 35 shall have
 5 contacted with that face of the recess 36 which is approaching it, this retardant effect ensuing of course only when the rotary motion of the head 13 is sufficiently slow to cause it to arise. Upon contact being made
 10 at this latter point the motion of the head 16 is arrested, but the relation of the parts is such as to permit the tooth 14 to freely pass out of the recess 15.

Combined rotary and longitudinal movement of the head 13 now continues until the same is brought into contact with the contact piece 52 upon the shipper rod 43, whereupon further longitudinal movement of the head effects the shifting of the belts, and, as
 20 will be readily understood, the reverse motion, both longitudinal and rotary, of the head. When during the traverse of the head 13 to the left in Fig. 1, the face of the tooth 14 opposite to that which functions as a
 25 working face during the immediately preceding motion comes in contact with the opposed end face of the recess 15, the motion of the actuatable member and its associated parts will be reversed, the stop 35 now being
 30 brought into contact as a result of the tension of the spring 33 with the opposite end wall of the recess 36, the link 31 now being inclined in the opposite direction and the final relative disposition of the parts being
 35 represented as in Fig. 6.

The combined motion of the driving member may be reversed at any point in its line of travel by the manual operation of the lever 46, as already described, while if the block 26
 40 is shifted to such an extent as to enable the tooth 14 to engage with the end walls of the recess 15 in the adjusted position of the actuatable member, the point in the line of travel of the driving member at which the actuatable member is operated may be altered.
 45 This latter alterability is indicated in a diagrammatic way in Fig. 7, in which the breaks O in the horizontal lines in changing from one plane to another represent in a conventional
 50 way the points at which the actuation of the actuatable member takes place, and by representing such breaks as occurring at different points in the horizontal lines a shifting of the position of the slide block is signified.

Having described my invention, I claim—

1. The combination with a rotative and reciprocatory driving member movable along a predetermined path, of an actuatable member adapted to be actuated thereby at some
 60 one point in the line of movement of the driving member.

2. The combination with a rotative and reciprocatory driving member movable to and fro along a predetermined path, of an actuatable member located in said path and

adapted to be actuated thereby at a predetermined point in the line of movement thereof in each direction.

3. The combination with a rotative and reciprocatory driving member movable along a predetermined path, of an actuatable member located in position to be initially actuated by said driving member at some point in the line of movement thereof, and an actuator for continuing the motion of the actuatable member after the inauguration of its
 75 motion by the driving member.

4. The combination with a rotative and reciprocatory driving member movable to and fro along a predetermined path, of an actuatable member located to be initially actuated thereby at some point in the line of movement of the driving member in each direction, and a subsidiary actuator for continuing the motion of the actuatable member
 85 after the inauguration of its motion by the driving member.

5. The combination with a rotative and reciprocatory driving member movable along a predetermined rectilinear path, of an actuatable member located to be actuated by said driving member at a predetermined point in the line of movement of the driving member.

6. The combination with a rotative and reciprocatory driving member movable to and fro along a predetermined rectilinear path, of an actuatable member located to be actuated by said driving member at a predetermined point in the line of movement of the driving member in each direction.

7. The combination with a driving member movable along a predetermined rectilinear path, of an actuatable member located to be initially actuated thereby at some point in the line of movement of the driving member, and an actuator for continuing the motion of the actuatable member after the inauguration of its motion by the driving member.

8. The combination with a driving member movable to and fro along a predetermined rectilinear path, of an actuatable member located to be initially actuated thereby at some point in the line of movement of the driving member in each direction, and a subsidiary actuator for continuing the motion of the actuatable member after the inauguration of its motion by the driving member.

9. The combination with a driving member movable to and fro along a predetermined path, of a rotative actuatable member located to be actuated by said driving member at a predetermined point in the line of movement of the driving member in each direction.

10. The combination with a driving member movable along a predetermined path, of a rotative actuatable member located to be initially actuated thereby at some point in

the line of movement of the driving member, and an actuator for continuing the motion of the actuatable member after the inauguration of its motion by the driving member.

11. The combination with a driving member movable to and fro along a predetermined path, of a rotative actuatable member located to be initially actuated thereby at some point in the line of movement of the driving member in each direction, and a subsidiary actuator for continuing the motion of the actuatable member after the inauguration of its motion by the driving member.

12. The combination with a driving member movable to and fro along a predetermined rectilinear path, of a rotative actuatable member located to be actuated by said driving member at a predetermined point in the line of movement of the driving member in each direction.

13. The combination with a driving member movable along a predetermined rectilinear path, of a rotative actuatable member located to be initially actuated thereby at some point of the driving member, and an actuator for continuing the motion of the actuatable member after the inauguration of its motion by the driving member.

14. The combination with a driving member movable to and fro along a predetermined rectilinear path, of a rotative actuatable member located to be initially actuated thereby at some point in the line of movement of the driving member in each direction, and a subsidiary actuator for continuing the motion of the actuatable member after the inauguration of its motion by the driving member.

15. The combination with a rotative driving member movable along a predetermined rectilinear path, of an actuatable member also movable along a predetermined path at will and located to be initially actuated by said driving member at a predetermined point in the line of movement of the driving member, and an actuator for continuing the motion of the actuatable member after the inauguration of its motion by the driving member.

16. The combination with a rotative driving member movable to and fro along a predetermined rectilinear path, of an actuatable member also movable along a predetermined path at will and located to be initially actuated by said driving member at a predetermined point in the line of movement of the driving member in each direction, and a subsidiary actuator for continuing the motion of the actuatable member after the inauguration of its motion by the driving member.

17. The combination with a rotative driving member movable along a predetermined path, of a rotative actuatable member also movable along a predetermined path at will

and adapted to be actuated by the driving member at some point in the line of movement thereof.

18. The combination with a rotative driving member movable to and fro along a predetermined path, of a rotative actuatable member also movable along a predetermined path at will and located to be actuated by said driving member at a predetermined point in the line of movement of the driving member in each direction.

19. The combination with a rotative driving member movable along a predetermined path, of a rotative actuatable member also movable along a predetermined path at will and located to be initially actuated by said driving member at a predetermined point in the line of movement of the driving member, and an actuator for continuing the motion of the actuatable member after its inauguration by the driving member.

20. The combination with a rotative driving member movable to and fro along a predetermined path, of a rotative actuatable member also movable along a predetermined path at will and located to be initially actuated by said driving member at a predetermined point in the line of movement of the driving member in each direction, and a subsidiary actuator for continuing the motion of the actuatable member after its inauguration by the driving member.

21. The combination with a rotative driving member movable along a predetermined rectilinear path, of a rotative actuatable member located to be actuated by said driving member at a predetermined point in the line of movement of the driving member.

22. The combination with a rotative driving member movable along a predetermined rectilinear path, of an actuatable member adapted to be initially actuated thereby at some point in the line of movement of the driving member, an actuator for continuing the motion of the actuatable member after its inauguration by the driving member, and co-operative stop faces for determining the limiting positions of said actuatable member.

23. The combination with a rotative driving member movable to and fro along a predetermined rectilinear path, of an actuatable member adapted to be initially actuated thereby at some point in the line of movement of the driving member in each direction, a subsidiary actuator for continuing the motion of the actuatable member after its inauguration by the driving member, and co-operative stop faces for determining the limiting positions of said actuatable member.

24. The combination with a rotative driving member movable along a predetermined path, of a rotative actuatable member adapted to be actuated thereby at some point in the line of movement of the driving member,

and co-operative stop faces for determining the limiting positions of said actuatable member.

25. The combination with a rotative driving member movable to and fro along a predetermined path, of a rotative actuatable member adapted to be actuated by said driving member at a predetermined point in the line of movement thereof in each direction, and co-operative stop faces for determining the limiting positions of said actuatable member.

26. The combination with a rotative driving member movable along a predetermined path, of a rotative actuatable member adapted to be initially actuated by said driving member at a predetermined point in the line of movement thereof, an actuator for continuing the motion of the actuatable member after its inauguration by the driving member, and co-operative stop faces for determining the limiting positions of said actuatable member.

27. The combination with a rotative driving member movable to and fro along a predetermined path, of a rotative actuatable member adapted to be initially actuated by said driving member at a predetermined point in the line of movement thereof in each direction, a subsidiary actuator for continuing the motion of the actuatable member after its actuation by the driving member, and co-operative stop faces for determining the limiting positions of said actuatable member.

28. The combination with a rotative driving member movable along a predetermined rectilinear path, of a rotative actuatable member adapted to be actuated thereby at some point in the line of movement of the driving member, and co-operative stop faces for determining the limiting positions of said actuatable member.

29. The combination with a driving member and an actuatable member, said members having co-operative faces adapted at times to engage and thereby initiate the movement of the actuatable member, of a subsidiary actuator for continuing the motion of the actuatable member after its inauguration by the driving member, and co-operative faces for determining the limiting positions of said actuatable member.

30. The combination with a driving member and an actuatable member, said members having opposite pairs of co-operative faces adapted at times to engage and thereby initiate the movement of the actuatable member first in one direction and then in the opposite, of a subsidiary actuator for continuing the motion of the actuatable member after its inauguration by the driving member, and co-operative faces for determining the limiting positions of said actuatable member.

31. The combination with a driving member and a rotative actuatable member, said members having opposite pairs of co-operative faces adapted at times to engage and thereby initiate the movement of the actuatable member first in one direction and then in the opposite, of a subsidiary actuator for continuing the motion of the actuatable member after its inauguration by the driving member, and co-operative faces for determining the limiting positions of said actuatable member.

32. The combination with a rotative driving member movable to and fro, and a rotative actuatable member, said members having co-operative faces adapted at times to engage and thereby initiate the movement of the actuatable member, of a subsidiary actuator for continuing the motion of the actuatable member after its inauguration by the driving member, and co-operative faces for determining the limiting positions of said actuatable member.

33. The combination with a rotative driving member movable to and fro in a rectilinear path and a rotative actuatable member, said members having co-operative faces adapted to engage and thereby initiate the movement of the actuatable member, of a subsidiary actuator for continuing the motion of the actuatable member after its inauguration by the driving member, and co-operative faces for determining the limiting positions of said actuatable member.

34. The combination with a driving member and an actuatable member, said members having co-operative faces adapted at times to engage and thereby initiate the movement of the actuatable member, of a spring pressed member having a shiftable connection with said actuatable member, whereby the line of effort is applied in different directions when said actuatable member is shifted, and co-operative faces for determining the limiting positions of said actuatable member.

35. The combination with a driving member and an actuatable member, said members having opposite pairs of co-operative faces adapted at times to engage and thereby initiate the movement of the actuatable member first in one direction and then in the opposite, of a spring-pressed member having a shiftable connection with said actuatable member, whereby the line of effort is applied in different directions when said actuatable member is shifted, and co-operative faces for determining the limiting positions of said actuatable member.

36. The combination with a rotative driving member movable to and fro and an actuatable member, said members having co-operative faces adapted at times to engage and thereby initiate the movement of the actuatable member, of a spring-pressed mem-

ber having a shiftable connection with said actuatable member, whereby the line of effort is applied in different directions when said actuatable member is shifted, and co-operative faces for determining the limiting positions of said actuatable member.

37. The combination with a driving member and rotative actuatable member, said members having co-operative faces adapted at times to engage and thereby initiate the movement of the actuatable member, of a spring-pressed member having a shiftable connection with said actuatable member, whereby the line of effort is applied in different directions when said actuatable member is shifted, and co-operative faces for determining the limiting positions of said actuatable member.

38. The combination with a rotative driving member movable to and fro and a rotative actuatable member, said members having co-operative faces adapted at times to engage and thereby initiate the movement of the actuatable member, of a spring-pressed member having a shiftable connection with said actuatable member, whereby the line of effort is applied in different directions when said actuatable member is shifted, and co-operative faces for determining the limiting positions of said actuatable member.

39. The combination with a driving member and a rotatively mounted actuatable member, said members having opposite pairs of co-operative faces adapted at times to engage and thereby initiate the movement of the actuatable member, of a spring-pressed arm, a link pivotally connecting said arm with the actuatable member and shiftable to incline the line of effort from one side of the axis of the actuatable member to the other, and co-operative faces for determining the limiting positions of said actuatable member.

40. The combination with a rotative driving member rectilinearly movable to and fro and a rotatively mounted actuatable member, said members having opposite pairs of co-operative faces adapted at times to engage and thereby initiate the movement of the actuatable member, of a spring-pressed arm, a link pivotally connecting said arm with the actuatable member and shiftable to incline the line of effort from one side of the axis of the actuatable member to the other, and co-operative faces for determining the limiting positions of said actuatable member.

41. The combination with a rotative driving member rectilinearly movable to and fro and a rotatively mounted actuatable member adjustable in line with the said movement of the driving member, said members having opposite pairs of co-operative faces adapted at times to engage and thereby initiate the movement of the actuatable mem-

ber, of a spring-pressed arm, a link pivotally connecting said arm with the actuatable member and shiftable to incline the line of effort from one side of the axis of the actuatable member to the other, and co-operative faces for determining the limiting positions of said actuatable member.

42. The combination of a driving head having a projecting tooth and a rotatively mounted actuatable head having a recess with the end walls of which said tooth is adapted to engage, and a spring-pressed member for continuing the movement of said actuatable head after such motion has been initiated by the driving head.

43. The combination of a driving head having a projecting tooth, means for traversing the driving head back and forth, a rotatively mounted actuatable head having a recess with the end walls of which said tooth is adapted to engage, and a spring-pressed member for continuing the movement of said actuatable head after such motion has been initiated by the driving head.

44. The combination of a driving head having a projecting tooth and a rotatively mounted actuatable head having a recess with the end walls of which said tooth is adapted to engage, a spring-pressed member for continuing the movement of said actuatable head after such motion has been initiated by the driving head, a threaded rod secured to the driving head, and a nut with which the thread on such rod engages.

45. The combination of a driving head having a projecting tooth and a rotatively mounted actuatable head having a recess with the end walls of which said tooth is adapted to engage, a spring-pressed member for continuing the movement of said actuatable head after such motion has been initiated by the driving head, a threaded rod secured to the driving head, a nut with which the thread on such rod engages, and means governed by said driving head for controlling the direction of motion thereof.

46. The combination of a driving head having a projecting tooth and a rotatively mounted actuatable head having a recess with the end walls of which said tooth is adapted to engage, a spring-pressed arm, and a link pivoted to said arm and to said actuatable head, for continuing the movement of said actuatable head after such motion has been initiated by the driving head.

47. The combination of a driving head having a projecting tooth, means for traversing the driving head back and forth, a rotatively mounted actuatable head having a recess with the end walls of which said tooth is adapted to engage, a spring-pressed arm, and a link pivoted to said arm and to said actuatable head for continuing the movement of

said actuatable head after such motion has been initiated by the driving head.

48. The combination of a driving head having a projecting tooth and a rotatively mounted actuatable head having a recess with the end walls of which said tooth is adapted to engage, a spring-pressed arm, a link pivoted to said arm and to said actuatable head, for continuing the movement of said actuatable head after such motion has been initiated by the driving head, a threaded rod secured to the driving head, and a nut with which the thread on such rod engages.

49. The combination of a driving member having a projecting tooth and a rotatively mounted actuatable head having a recess with the end walls of which said tooth is adapted to engage, a spring-pressed arm, a link pivoted to said arm and to said actuatable head, for continuing the movement of said actuatable head after such motion has been initiated by the driving head, a threaded rod secured to the driving head, a nut with which the thread on such rod engages, and means governed by said driving head for controlling the direction of motion thereof.

50. The combination of a driving head having a projecting tooth and a rotatively mounted actuatable head having a recess with the end walls of which said tooth is adapted to engage said actuatable head being adjustable in the line of movement of the driving head, and a spring-pressed member for continuing the movement of said actuatable head after such motion has been initiated by the driving head.

51. The combination of a driving head having a projecting tooth and a rotatably mounted actuatable head having a recess with the end walls of which said tooth is adapted to engage, said actuatable head being adjustable in the line of movement of the driving head, a spring-pressed arm, and a link pivoted to said arm and to said actuatable head, and a spring-pressed member for continuing the movement of said actuatable head after such motion has been initiated by the driving head.

52. The combination of a driving head having a projecting tooth, means for traversing the head back and forth a rotatively mounted actuatable head having a recess with the end walls of which said tooth is adapted to engage, said actuatable head being adjustable in the line of movement of the driving head, a spring-pressed arm, and a link pivoted to said arm and to said actuatable head, for continuing the movement of said actuatable head after such motion has been initiated by the driving head.

53. The combination of a driving head having a projecting tooth and a rotatively mounted actuatable head having a recess

with the end walls of which said tooth is adapted to engage, said actuatable head being adjustable in the line of movement of the driving head, a spring-pressed arm, a link pivoted to said arm and to said actuatable head for continuing the movement of said actuatable head after such motion has been initiated by the driving head, a threaded rod secured to the driving head and a nut with which the thread on such rod engages.

54. The combination of a driving rod having a projecting tooth and a rotatively mounted actuatable head having a recess with the end walls of which said tooth is adapted to engage, said actuatable head being adjustable in the line of movement of the driving head, a spring-pressed arm, a link pivoted to said arm and to said actuatable head for continuing the movement of said actuatable head after such motion has been initiated by the driving head, a threaded rod secured to the driving head, a nut with which the thread on such rod engages, and means governed by said driving head for controlling the direction of motion thereof.

55. The combination of a driving head having a projecting tooth and a rotatively mounted actuatable head having a recess with the end walls of which said tooth is adapted to engage, said actuatable head being adjustable in the line of movement of the driving head, a spring-pressed member for continuing the movement of said actuatable head after such motion has been initiated by the driving head, a threaded rod secured to the driving head, a nut with which the thread on such rod engages, and means governed by said driving head for controlling its direction of movement and comprising a shipper bar and contact pieces secured thereto.

56. The combination of a driving head having a projecting tooth and a rotatively mounted actuatable head having a recess with the end walls of which said tooth is adapted to engage, said actuatable head being adjustable in the line of movement of the driving head, a spring-pressed arm, a link pivoted to said arm and to said adjustable head for continuing the movement of said actuatable head after such motion has been initiated by the driving head, and means governed by said driving head for controlling its direction of movement and comprising a shipper bar and contact pieces secured thereto.

57. The combination of a driving head having a projecting tooth and a rotatively mounted actuatable head having a recess with the end walls of which said tooth is adapted to engage, said actuatable head being adjustable in the line of movement of the driving head, a spring-pressed arm, a link pivoted to said arm and to said actuatable

head for controlling the movement of said
actuatable head after such motion has been
initiated by the driving head, a threaded rod
secured to the driving head, a nut with which
5 the thread on such rod engages, and means
governed by said driving head for controlling
its direction of movement and comprising

a shipper bar and contact pieces secured
thereto.

FRANCIS H. RICHARDS.

Witnesses:

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