

Dec. 28, 1926.

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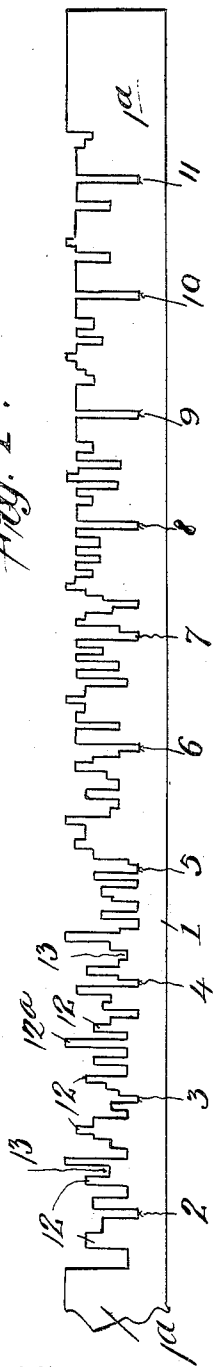
C. C. BALSTON

MECHANICAL MOVEMENT

Original Filed Feb. 29, 1924

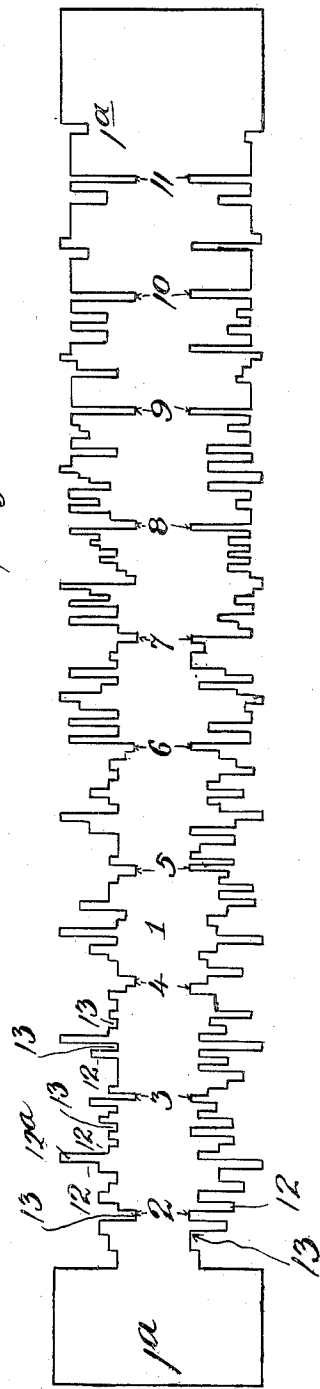
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Fig. 1.



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Fig. 2.



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Dec. 28, 1926.

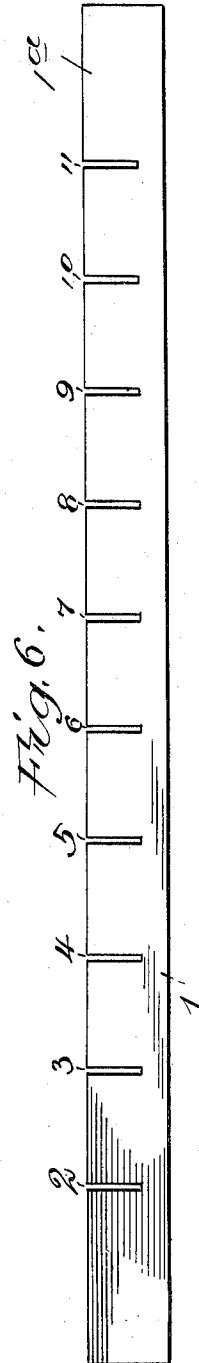
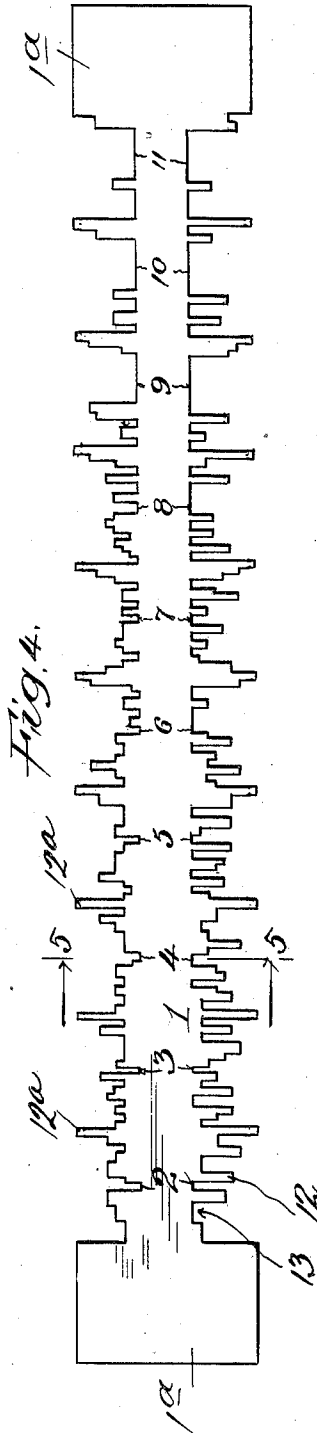
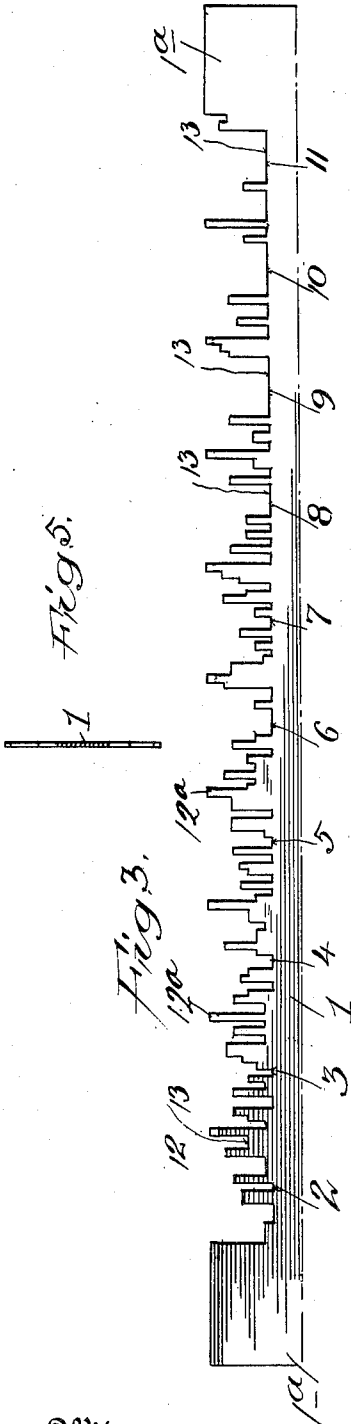
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Original Filed Feb. 29, 1924

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Dec. 28, 1926.

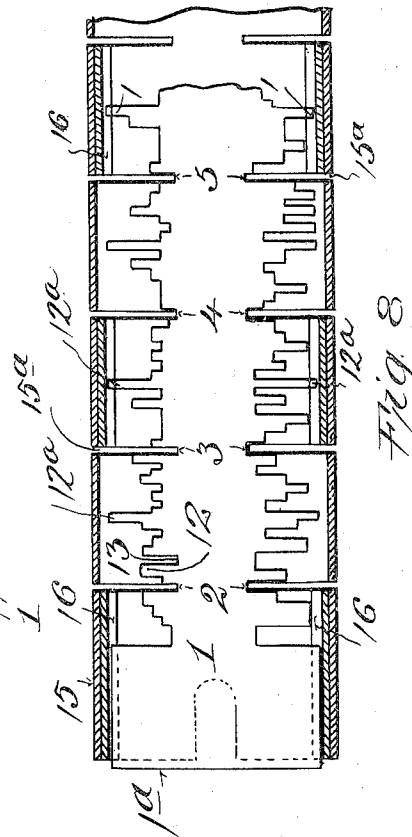
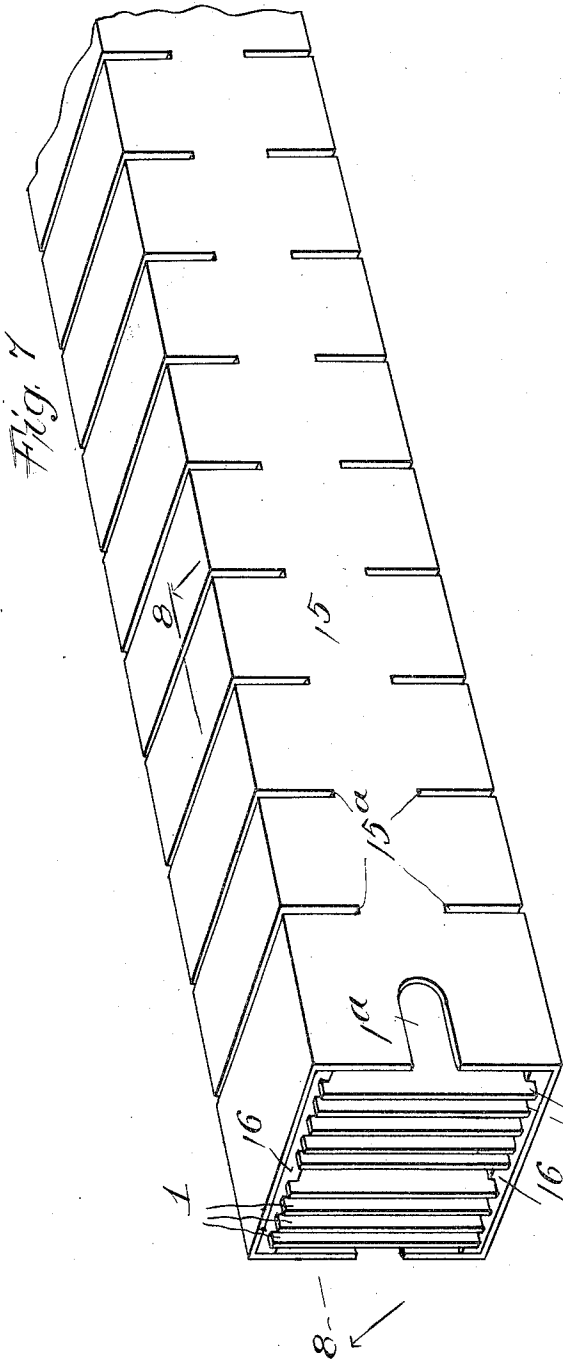
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MECHANICAL MOVEMENT

Original Filed Feb. 29, 1924

4 Sheets-Sheet 3



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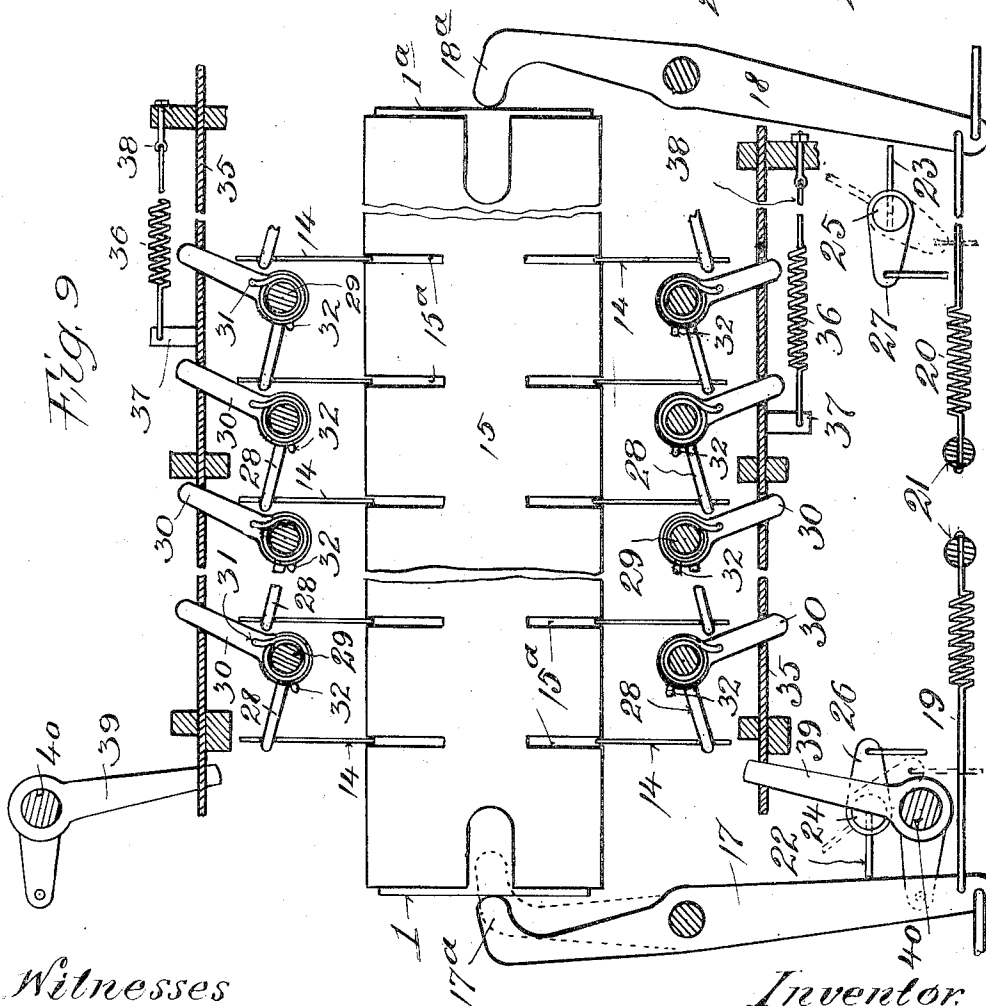
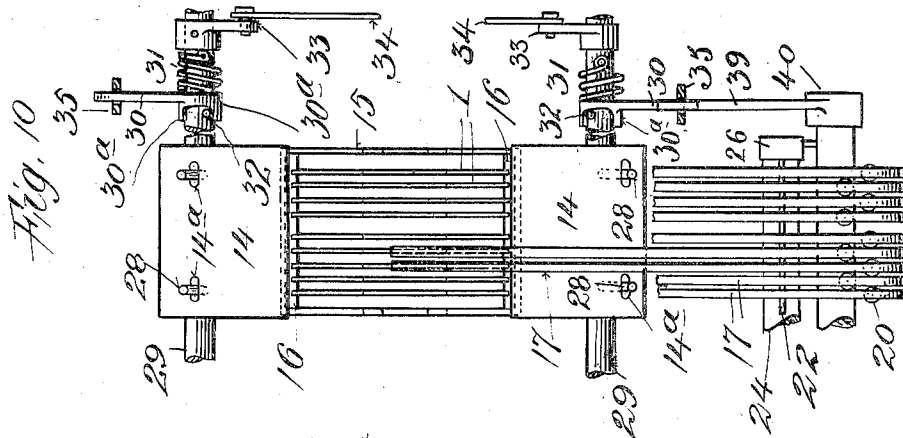
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C. C. BALSTON

MECHANICAL MOVEMENT

Original Filed Feb. 29, 1924

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE.

CLYDE C. BALSTON, OF NEW YORK, N. Y.

MECHANICAL MOVEMENT.

Refiled for renewal application Serial No. 654,285, filed February 29, 1924. This application filed December 18, 1924, Serial No. 756,844. Renewed May 26, 1926.

The object of my invention is to provide means for causing the desired action or movement from a master controlling bar or member to devices from which desired movements may be effected.

In the embodiment of my invention illustrated in the accompanying drawings I provide a bar or member having projecting and re-entrant parts, such as slots and projections integral with the bar, certain of which slots at spaced equal distances apart I term clearance slots, and the projections and slots on opposite sides of such clearance slots are adapted to serve with movable members for regulating or controlling movements of the latter, which bar is adapted to be shifted as required with respect to said members to permit the desired action of the latter according to the work to be accomplished.

Reference is to be had to the accompanying drawings forming part hereof, wherein—

Figure 1 is a face view of a bar embodying my invention, having slots and projections at one side thereof;

Figure 2 is a face view of a bar having slots or projections on opposite sides;

Figures 3 and 4 are views similar to Figures 1 and 2 illustrating the bars having slots and projections reversed somewhat to those shown in Figures 1 and 2;

Figure 5 is a section on the line 5, 5, in Figure 4;

Figure 6 is a face view of a blank having the clearance slots and ready to have the operating slots and projections produced therein;

Figure 7 is a perspective view illustrating means for slidably guiding a plurality of the aforesaid bars;

Figure 8 is a section on the line 8, 8, in Figure 7;

Figure 9 is a partly sectional side view of the parts shown in Figures 7 and 8, illustrating devices for shifting the bars, and devices controlled by said bars according to their shifted positions; and

Figure 10 is an end view looking from the left in Figure 9, part of the bar-shifting rockers being omitted.

Similar numerals of reference indicate corresponding parts in the several views.

The bars 1 are made of suitable material, such as relatively thin steel, of desired length and width, and are provided at spaced distances apart with any desired number of

clearance slots 2, 3, 4, 5, 6, 7, 8, 9, 10, 11. In Figures 1, 3, and 6 the series of clearance slots extend into the bar on one of its sides, while in the remaining figures two series of clearance slots extend into the bar on its opposite sides, and either such series of clearance slots extend from the edge of the bar a desired and definite distance, constituting what may be termed a base line. On opposite sides of the several clearance slots the bars 1 are provided with projecting and re-entrant parts shown as projections 12 and intermediate slots 13, said projections being of desired heights and the slots of desired depths, some of which slots may pass to the level of the bottoms or the base line of the clearance slots, and others may not pass so far into the bar 1. Between the clearance slots projections 12^a are slightly longer than the projections 12 to serve as supporting and guiding projections for bars 1 as the latter are shifted lengthwise, (see Figure 8). The projecting and re-entrant parts of bar 1 are so designed that such projections will co-act with and limit the movement of movable members 14, shown in the form of plates, adapted when caused or permitted to move toward the bar to rest upon said projections to limit the movement of said members 14 toward the bar according to Figures 1 and 2, whereas in Figures 3 and 4 it is designed that the slots 13 shall receive the members 14 to regulate the movement of said members toward the bar. In other words, the bar 1 having the projecting and re-entrant portions 12, 13 determines the extent of movement of members 14 toward bar 1 in accordance with the position of adjustment of said bar relatively to members 14. I have illustrated means for guiding any desired number of parallel spaced bars 1 to be shifted back and forth longitudinally, and for causing operation of members 14 in conjunction with said bars, whereby the bars 1, by regulating or controlling the movement of members 14, permit the latter to have more or less movement at different intervals toward bars 1, in accordance with the required operation or control of devices to be controlled by the members 14. Where bars 1 have clearance slots and projecting and re-entrant parts 12 and 13 at one side there will be one set of members 14 corresponding to such clearance slots, but where bars 1 are provided with sets of clearance

slots and re-entrant parts 12, 13 on both sides between pairs of such clearance slots, the members 14 are comprised in two sets, a primary set shown on the top sides of bars 1 and a secondary set shown on the lower sides of bars 1, the top edges of the bars having their corresponding primary projecting and re-entrant parts, such as pins and slots, and the lower edges of the bars having corresponding secondary projecting and re-entrant parts such as pins and slots.

To guide the bars 1 for longitudinal adjustment, I have shown a frame or casing 15 having opposed interior grooves at 16, at suitable distances apart, (which may be formed by grooved pieces secured within the frame), in which grooves the end portions 1^a and the extended ends of projections 12^a are guided, whereby the bars 1 are slidably supported and suitably spaced apart for longitudinal adjustment. Frame 15 is provided with transversely disposed slots 15^a, and bars 1 are so set within the frame that in their normal positions the clearance slots 2, 3, 4, etc. are in register with the slots 15^a, as shown in Figure 8, and the end portions 1^a of bars 1 preferably, when said slots are in register, project slightly from the ends of frame 15. When any of the bars 1 are shifted to the right or left respecting the slots 15^a of frame 15, the projecting and re-entrant portions 12, 13 of said bars will be correspondingly shifted with respect to slots 15^a. The arrangement I have illustrated is such that in the normal positions of bars 1, the guiding projections 12^a will be substantially centrally disposed between two slots 15^a, and when bars 1 are shifted to the right or left they will be shifted such a limited distance that the projections 12^a will not pass beyond or into the slots 15^a next adjacent the same to the right or left thereof.

Any suitable means may be provided for shifting bars 1 independently of one another, and singly or in any desired number simultaneously, and also for causing the members 14 to be moved toward bars 1 as required. To illustrate means for shifting bars 1, I have shown rock arms 17, 18 at opposite ends of each bar 1, and shown as having projections 17^a, 18^a to engage the ends of said bars. Springs 19, 20 are shown respectively connected with arms 17, 18 and with one or more stops or lugs 21 tending normally to move arms 17, 18 away from the corresponding bars 1. In the normal positions arms 17, 18 are adapted to bear against movable stops 22, 23 which will be moved out of co-action with the corresponding arms 17, 18, at the required time of operation of the latter. The stops 22, 23 are shown carried by shafts 24, 25 having crank arms 26, 27 that may be operated by any suitable means, at the required time. Arms 17, 18 may also be operated at any suitable

time by desired means for causing required adjustment or longitudinal shifting of bars 1. It is intended that members 14 may pass entirely down to the bottoms of the clearance slots 2, 3, 4, etc. of bars 1, or be stopped on their inward movement by the projecting or re-entrant parts of said bars, whereby the inward movement of members 14 is made variable, as required, to effect a variable movement to any device to be controlled from members 14. As an illustration of means to accomplish the purposes above stated, I have shown members 14 provided with slots 14^a receiving pins 28 carried by shafts 29 suitably journaled, upon which shafts are loosely journaled arms 30 operatively connected with the corresponding shaft by a coil spring 31, one end of each spring being connected with the corresponding arm 30 and the other end connected with the corresponding shaft 29. Each shaft 29 also has a pin 32 to engage spaced shoulders or stops 30^a on the corresponding arm 30 to permit independent swing of arm 30 relative to its shaft 29, and to cause positive return of the said shaft by its arm 30 to the normal position. Each shaft 29 is intended to transmit motion to a part to be controlled, which may be accomplished in any suitable manner, such as by a crank arm 33 secured on said shaft connecting with a rod 34, (Figure 10). The arrangement is such that a set of arms 30 may be freely rocked, and the members 14 operated by said arms will have such movement as is permitted by a bar 1 that has been adjusted to the right or left from its normal position. For this purpose I have shown a set of arms 30 passing through openings in a slide bar 35 mounted in suitable bearings, and normally held in set position, with members 14 retracted from bars 1, by spring 36, connected with slide 35, as at 37, and with a stationary bar 38. An arm 39 is connected with the slide bar 35, as by passing through an opening therein, and is mounted upon a shaft 40 suitably journaled and adapted to be operated at the required time by any suitable means.

Where bars 1 have a projecting and re-entrant member only on one side the frame 15 will be correspondingly slotted and one set of members 14 and their operating devices will be provided, and this entire action may be used in single or in double and multiple form, and where bars 1 have sets of projecting and re-entrant members on opposite sides two sets of members 14 and their operating devices will be provided. In accordance with my invention the bars 1 will all normally be set in the frame 15 with their clearance slots 2, 3, 4, etc., in register with the slots 15^a, in other words, with the clearance slots of the bars lying normally together, corresponding to and with reference to members 14, making long parallel

clearance grooves or slots transversely across all bars 1 regardless of the number thereof placed side by side, and members 14 will be held retracted from bars 1 with the lower edges of said members free from bars 1 and guided in slots 15^a of frame 15.

If one of the bars 1 be shifted, say, to the left in Figure 9, a desired distance (there being fifteen shifts of a bar 1, as illustrated) by the action of any bar controlling mechanism, (which may be controlled by a key, in the nature of a key board of a typewriting machine, linotype, telegraphing machine, adding machine, and other manually controlled machines) operating the rock arm 18 to push such bar 1, stop 22 will be suitably shifted to permit rock arm 17 to swing with bar 1, and bar 1 will be retained in such position, and then one or both of the slides 35 will be moved to the left in Figure 9, whereupon the corresponding members 14 will be advanced toward bars 1 and will be permitted to descend because the clearance slots of the non-shifted bars 1 will permit inward movement of members 14 only so far as the projecting and re-entrant parts 12, 13 of the said shifted bar 1 permit. In other words, the inward movement of members 14 may vary with respect to one another, whereby corresponding movements through connections 34 will be transmitted to devices to be operated or controlled by such movements of members 14. When a member 14 thus comes to rest upon shifted bar 1, by reason of engagement with, say, a relatively high projecting portion of bar 1, another member or members 14 may move farther down into such shifted bar 1, since all the arms 30 of a set of members 14 may move a definite distance by the operation of the actuating arm 39, and the corresponding spring 31 permits such movement of an arm 30 although the corresponding member 14 may have been stopped on the bar 1. The parts will then be restored, and members 14 and bar 1 will be returned to normal position ready for another operation, etc. It will be understood from the foregoing that if bar 1 has been shifted to the right, by causing arm 17 to push such bar (stop 23 having been properly shifted to permit proper operation of arm 18) and slides 35 have been operated, that the members 14 would have been moved inwardly in accordance with the positions of the projecting and re-entrant parts 12, 13, of bar 1. In the arrangement illustrated it may be assumed that spacings for fifteen slots and projections are provided between any two clearance slots of bar 1, and that from the normal substantially central position of projections 12^a in grooves 16, between slots 15^a, bars 1 may be shifted to the right or left a distance equal to seven or eight such slots

and projections in bar 1, and any intermediate distances. In other words, in the arrangement of the bars 1 I have shown either of them may be shifted to the right and left to several different positions from the normal central position, to accomplish the desired operation of members 14, but it will be understood that either of the bars 1 can be shifted the required limited distance in one direction for any operation of such bar instead of to the right or left from the normal central position. By the first named arrangement I gain the advantage of less movement of bar 1 from its normal position for a given adjustment than if the bar were shifted the entire distance between two clearance slots. Thus, by operating any bar 1 any required distance between its clearance slots, and causing members 14 to approach the shifted bar, such members will have imparted to them such variable movements as are required to cause operation, to a greater or less extent, of devices controlled by such members for producing the desired final results.

If the object to be attained by the movement of the said members is the setting of type for the production of mechanically spelled words, phrases, or whole numbers, the slots and pins or re-entrant parts and the aforesaid members 14 of the first section of the bars will represent the first character type of such words, etc., and the second section of such bars with the re-entrant parts and members 14 will represent the second type thereof, independent in action from the said first section and other sections, and the third section of said bars and the third pair of members 14 will represent the third type of such words, etc., and so on successively for the other sections of the bars and the members 14 thereof. When used in this way it will be readily seen that the first set of pins and slots to the right of each clearance slot represent a series of pins and slots or re-entrant parts corresponding to a complete word or phrase, etc., disposed partly in each section along such bar, according to the length of such word, etc. The first set of pins and slots to the left of such clearance slots is a different series, representing a different word or phrase, etc., disposed along such bar, and the other sets of pins and slots all represent different words, phrases, etc., corresponding to the other series of slots and pins disposed along such bars.

It is desirable for certain purposes to cause the members 14, or any one thereof, to seat against the projecting parts and in the re-entrant parts in either of the bars 1, to more and different positions than those represented by the projecting and re-entrant parts of the single form of bar 1, shown in Figure 1, but to lengthen the projecting parts or pins

12 to twice their length indicated in the drawings, in order to get more or different settings of any member 14, would, in light mechanism, produce projections or pins 12 of too weak structure, and, necessarily, owing to the greater length of movement thus required by members 14, would cause them to move against the shorter of such pins or projections a considerable distance. The better method of accomplishing the desired results without requiring such additional longer motions of said members 14, in order to impart to said members and to the slide 35 additional movements which would be required, is to provide bars 1 with projections and re-entrant slots on opposite sides, hereinafter termed the primary set and the secondary set, the latter of which may be of different contour than the former. Consequently, each side of bar 1 has a set of members 14, which sets are independent of each other. One of the main objects to be obtained by the latter arrangement, beside the aforesaid time saved in operation, is that any one of the members 14 of the primary set may operate or set some movable element or body of, say, a stop action, at any time that any of the several positions of primary member 14 is assumed, according to the length or depth of the pin or re-entrant part of bar 1 acted upon by a primary member 14, and a projecting and re-entrant portion of the opposite or secondary side of said bar 1 by the like action of member 14 of the secondary set of members, may operate the same or some other movable element in such stop action, with relation to or modifying the movement of the first mentioned operated element of such stop action. Assume that the projecting and re-entrant parts of the primary set of bars 1, grading by 1/16" range from 1/16" to 6/16" in length above the base line or bottoms of the clearance slots, six different positions may be given to a member 14, and consequently six different motions may be imparted to the corresponding slide 35, and the parts 33, 34 connected therewith, to similarly move any element or stop action that may be operated by part 34. Assume also that the secondary member 14 directly opposite the above named primary member 14, on the secondary side of bar 1, (projecting and re-entrant parts at the secondary side of said bars in such case being of six different lengths as stated above) will set to six different positions (through similar movement of its parts 33, 34) to cause some other movable element or stop to operate to its different positions. By such means the combination or variety of movement represented by 6 x 6 or 36 different motions may be imparted to such movable element or stop action. As illustrated herein, it may be pointed out that the projecting and re-entrant parts of each bar 1, whether in a single or double form, are arranged in sections, and that the sections are arranged in longitudinal series along such bar, viz: the left hand end of bars 1 comprises the first section having a clearance slot, preferably centrally disposed, and fifteen projections or pins and slots disposed on either side thereof, and in some cases is shown a single taller pin 12^a which serves as a guide for the bar, and the first set of primary and secondary members 14 bear relation to and act upon projections and slots of such first section only of bars 1. The second section of bars 1 comprises the next or second clearance slots, and the fifteen projections or slots (and guide pin 12^a if desired) and the second pair of primary and secondary members bear relation to such second section only, said latter members 14 being independent in their movements with respect to the projections and slots of the second section of bars 1, so far as the first set of members 14 are concerned, and so on, the bar herein shown being made of ten such sections, and for each such section is illustrated a pair of primary and secondary members 14. The bars 1 may contain any number of such sections with the corresponding members or pairs of members 14 according to the nature and extent of the combinations it is desired to make.

As previously stated, any number of the bars 1 may be placed in parallel order side by side at desired distances apart, and the members 14 may be made long enough to span the bars so arranged. When so disposed the clearance slots of the first sections of such bars will provide a clearance groove or slot across the central part of such first section of bars 1, for the corresponding member or members 14; the clearance slots of the second section will likewise provide a clearance groove or slot across such second section or bars 1, and so on for the other clearance slots and their respective sections. Since conservation of space is essential, it will be noted that the bars 1 illustrated herein, in single or double edged form, may be made of thin ribbon or flat steel and that all of the projections or pins or such bars may be punched or otherwise formed integral with the bars, and that such bars with their projections or pins and slots may be formed of soft steel and then hardened and tempered, or may be punched out of spring steel.

My invention may be utilized to control type printing wheels in writing machines, as in word and phrase writing machines, in linotype and type setting machines, in billing machines, in bookkeeping machines, in machines for prorating accounts and payroll machines in single and multiple columns of figures, in means for transmitting electric impulses, such as for telegraph typewriters, in signalling and switch devices for railway

and other signal systems, and in other relations wherein variable movements are to be transmitted or caused to be produced for various purposes.

5 While I have illustrated and described suitable devices whereby my invention may be carried into effect, it will be understood that my invention is not limited to the details of construction and arrangements of
10 parts set forth, as the same may be varied, within the scope of the appended claims, without departing from the spirit of my invention. Where I use the term "metal" in the specification and claims it is to be understood that the same is intended to include
15 any other material suitable for the purpose.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

20 1. A controlling bar comprising a piece of material having on one side a plurality of projecting and re-entrant parts of different graded lengths and depths spaced along the bar, and means to move said bar to a plu-
25 rality of different positions longitudinally.

2. A controlling bar comprising a relatively thin piece of metal provided on one side with spaced projections and intermediate re-entrant parts of varying lengths and
30 depths, and means to move said bar to a plurality of different positions longitudinally.

3. A controlling bar comprising a relatively thin piece of metal provided along one
35 side with spaced projections and intermediate re-entrant parts of varying lengths and depths, certain of said re-entrant parts terminating in the same plane through said bar, and means to move said bar to a plu-
40 rality of different positions longitudinally.

4. A controlling bar comprising a relatively thin piece of metal provided along one side with spaced projections and intermediate re-entrant parts of varying lengths and
45 depths, certain of said re-entrant parts terminating in the same plane through said bar, and being spaced equi-distantly apart, and means to move said bar to a plurality of different positions longitudinally.

50 5. A controlling bar comprising a relatively thin piece of metal provided along one side with spaced projections and intermediate re-entrant parts of varying lengths and depths, certain of said re-entrant parts terminating in the same plane through said bar,
55 and being spaced equi-distantly apart, said projecting and said other re-entrant parts being disposed between said latter re-entrant parts of the same plane.

60 6. A controlling bar having spaced clearance slots and projecting and re-entrant members between the clearance slots, and means to move said bar to a plurality of different positions longitudinally.

65 7. A controlling bar having spaced clear-

ance slots and projecting and re-entrant members between the clearance slots, said clearance slots having an approximately equal base line through said bar, and means to move said bar to a plurality of different
70 positions longitudinally.

8. A controlling bar having spaced clearance slots and projecting and re-entrant parts between the clearance slots, said clearance slots terminating on the same plane
75 through said bar, and means to slide said bar to a plurality of different positions longitudinally.

9. A controlling bar provided with spaced clearance slots, and projecting and re-entrant
80 parts of different lengths and depths between said clearance slots.

10. A controlling bar provided with spaced clearance slots and projections disposed substantially centrally between pairs
85 of such clearance slots and extending beyond the main body of said bar, the latter having projecting and re-entrant parts disposed between said clearance slots and on opposite sides of said extended projections.

11. A controlling bar comprising a piece of relatively thin metal having projecting and re-entrant parts of different graded lengths and depths on opposite sides of the bar and means to move said bar to a plu-
95 rality of different positions in a direction transverse to the line of projection of the projecting parts.

12. A controlling bar comprising a piece of relatively thin metal having clearance
100 slots on opposite sides, and spaced apart, said bar having projecting and re-entrant parts of graded lengths and depths on opposite sides of the bar between pairs of
105 clearance slots.

13. A controlling bar comprising a piece of relatively thin metal having clearance slots on opposite sides, the clearance slots on one side of the bar being opposed to the
110 clearance slots on the opposite side of the bar, said clearance slots on each side of the bar terminating in a base line along the bar, and projecting and re-entrant parts on opposite sides of the bar between corresponding
115 pairs of clearance slots.

14. A plurality of controlling bars spaced side by side, means for supporting said bars for independent movement, said bars comprising pieces of relatively thin metal having clearance slots on opposite sides, clear-
120 ance slots on one side being opposed to the clearance slots on the opposite sides of the bars, said clearance slots on each side of the bar terminating in a base line along the bar, and projecting and re-entrant parts on opposite sides of the bars between corresponding
125 pairs of clearance slots, the corresponding clearance slots of said bars being in alignment transversely of said bars when the latter are in normal positions.

15. A plurality of controlling bars spaced side by side, means for supporting said bars for independent movement, said bars comprising pieces of relatively thin metal having clearance slots on opposite sides, clearance slots on one side being opposed to the clearance slots on the opposite sides of the bars, said clearance slots on each side of the bar terminating in a base line along the bar, and projecting and re-entrant parts on opposite sides of the bars between corresponding pairs of clearance slots, the corresponding clearance slots of said bars being in alignment transversely of said bars when the latter are in normal positions, means to shift either of said bars longitudinally to different positions to move its clearance slots out of transverse alignment with the clearance slots of the other bars, and means to return said bars to their normal positions.

16. A controlling bar comprising a piece of material having on one side a plurality of series of projecting and re-entrant parts of different graded lengths and depths spaced along the bar, means for guiding said bar for longitudinal adjustment, and means to shift said bar longitudinally to a number of positions equal to the number of series of projecting and re-entrant parts.

17. A plurality of bars spaced side by side, means for guiding said bars for longitudinal adjustment, said bars comprising pieces of material each having on one side a plurality of series of projecting and re-entrant parts of different graded lengths and depths spaced along the corresponding bar, and means to shift said bars separately longitudinally to a number of positions equal to the number of series of projecting and re-entrant parts of each bar.

18. The combination of a plurality of bars spaced side by side, means for guiding said bars for longitudinal adjustment, and means to shift said bars longitudinally in opposite directions, said bars comprising pieces of material each having on opposite sides a plurality of projecting and re-entrant parts of different graded lengths and depths spaced along the corresponding bar.

19. A controlling bar comprising a piece of material having on one side a plurality of projecting and re-entrant parts of different graded lengths and depths spaced along the bar, means for guiding the bar for longitudinal adjustment, means to retain said bar in normal central position, and means to shift said bar longitudinally in opposite directions from said normal position.

20. A controlling bar comprising a piece of material having on one side a plurality of projecting and re-entrant parts of different graded lengths and depths spaced along the bar, means for guiding said bar for longitudinal adjustment, members opposed to said bar, and means to cause said members to ap-

proach said bar to co-act with its projecting and re-entrant parts.

21. The combination of a plurality of bars spaced side by side, means for guiding said bars for separate longitudinal adjustment, means for actuating said bars, said bars having a plurality of clearance slots, corresponding clearance slots on said bars being in normal alignment transversely of said bars, said bars having between the corresponding clearance slots a plurality of projecting and re-entrant parts of different graded lengths and depths spaced along the bars, members opposed to said bars and normally maintained opposed to said clearance slots, and means to cause said members to approach said bars to co-act with their projecting and re-entrant parts.

22. The combination of a plurality of bars spaced side by side, means for guiding said bars for separate longitudinal adjustment, said bars having on one side a plurality of clearance slots, corresponding clearance slots on said bars being in normal alignment transversely of said bars, said bars having between the corresponding clearance slots a plurality of projecting and re-entrant parts of different graded lengths and depths spaced along the bars, members opposed to said bars and normally retained opposed to said clearance slots, means to cause said members to approach said bars to co-act with their projecting and re-entrant parts, and means to shift said bars longitudinally in opposite directions to permit said members to enter the clearance slots of said bars, said members being adapted to enter clearance slots of unmoved bars and to simultaneously engage the projections of moved bars.

23. A controlling bar having spaced clearance slots and projecting and re-entrant parts between the clearance slots, members opposed to said bar, means for normally retaining said members in alignment with said clearance slots, and means to cause said members to move toward the bar to enter the clearance slots and to co-act with said projecting and re-entrant parts of the bar when the latter is shifted from a normal clearance position.

24. A controlling bar having spaced clearance slots and projecting and re-entrant parts between the clearance slots, members opposed to said bar, means for normally retaining said members in alignment with said clearance slots, means to cause said members to move toward the bar to enter the clearance slots and to co-act with said projecting and re-entrant parts of the bar when the latter is shifted from a normal clearance position, and means connected with said members to transmit different movements thereof.

25. A controlling bar having spaced clear-

ance slots and projecting and re-entrant parts between the clearance slots, members opposed to said bar, adapted to enter said clearance slots and co-act with said projecting and re-entrant parts of the bar, means to move all of said members simultaneously toward said bar, means to permit said members to move different distances toward said bar, and means to transmit different movements from said members.

26. The combination of a bar having spaced projecting and re-entrant parts, and having clearance slots adjacent thereto, with movable members opposed to said bar and corresponding to the number of said clearance slots, means for normally retaining said members out of co-action with said bar, and means to cause said members to co-act with the projecting and re-entrant parts of said bar.

27. The combination of a bar having spaced projecting and re-entrant parts, and having clearance slots adjacent thereto, with movable members opposed to said bar and corresponding to the number of said clearance slots, means for normally retaining said members out of co-action with said bar, means to cause said members to co-act with the projecting and re-entrant parts of said bars, and means to permit said members to have movement separately from each other according to their engagement with said parts of said bar.

28. The combination of a plurality of bars placed side by side, means for supporting said bars for independent movement, said bars having projecting and re-entrant parts, means for adjusting said bars longitudinally, members opposed to said bars, supporting devices for said members permitting the latter to have independent movement relative to the former, and means to simultaneously move said supported members to permit the latter to engage said bars.

29. The combination of a plurality of bars placed side by side, means for supporting said bars for independent movement, said bars having projecting and re-entrant parts, means for adjusting said bars longitudinally, members opposed to said bars, supporting devices for said members permitting the latter to have independent movement relative to the former, means to simultaneously move said supported members to permit the latter to engage said bars, and separate means operated by each member to transmit motion therefrom to an element to be controlled.

30. The combination of a plurality of bars spaced side by side, said bars having projecting and re-entrant parts on opposite sides, means to adjust said bars independently of each other, sets of members on opposite sides of said bars, supporting means for said members to permit them to have movements sep-

arate from their respective supporting means, means to cause each set of members to move toward and from said bars, separately from each other, and means operatively connected with each member to transmit movement of the latter to an element to be operated.

31. The combination of a plurality of bars spaced side by side, and having projecting and re-entrant parts, means to support said bars for longitudinal adjustment, means to separately move said bars longitudinally, a plurality of members opposed to said bars, a support for each member, an operating device for each member provided with a spring to actuate the latter, means to operate said devices simultaneously whereby said members may move more or less according to their engagement with said bars, and means operated by said members to actuate an element to be controlled.

32. The combination of a plurality of bars spaced side by side and having projecting and re-entrant parts, means to support said bars for longitudinal adjustment, means to separately move said bars longitudinally, a plurality of members opposed to said bars, a support for each member, an arm for each member, a spring co-acting with each such support and arm, and means to operate said arms conjointly whereby said members may move more or less according to their engagement with said bars.

33. The combination of a plurality of bars spaced side by side, and having projecting and re-entrant parts, means to support said bars for longitudinal adjustment, means to separately move said bars longitudinally, a plurality of members opposed to said bars, a support for each member, an arm for each member, a spring interposed between each such support and arm, a slide connected with said arms to operate them conjointly, means to reciprocate said slide to actuate said arms and members, whereby said members may move toward said bars more or less according to the engagement of said members therewith.

34. The combination of a plurality of bars spaced side by side, and having projecting and re-entrant parts, means to support said bars for longitudinal adjustment, means to separately move said bars longitudinally, a plurality of members opposed to said bars, a support for each member, an arm for each member, a spring interposed between each such support and arm, a slide connected with said arms to operate them conjointly, means to reciprocate said slide to actuate said arms and members, whereby said members may move toward said bars more or less according to the engagement of said member therewith, and separate means actuated by each of said members to operate elements to be controlled.

35. The combination of bars spaced side by

side and provided with clearance slots and having projecting and re-entrant parts between said slots, a frame having means for guiding said bars and provided with slots, 5 clearance slots of said bars being normally in alignment with the slots of said frame, means to adjust said bars longitudinally and separately, members guided in the slots of said frame, separate supporting devices 10 for said members, and means to operate said devices conjointly.

36. The combination of bars spaced side by side and provided with clearance slots and having projecting and re-entrant parts 15 between said slots, a frame having means for guiding said bars and provided with slots, clearance slots of said bars being normally in alignment with the slots of said frame, means to adjust said bars longitudinally and 20 separately, members guided in the slots of said frame, separate supporting devices for said members, an arm for each member, a spring interposed between each arm and each of said supporting devices, and means 25 to operate said arms conjointly, whereby said members may have variable movements toward said bars as limited thereby.

37. The combination of bars spaced side by side and provided with clearance slots 30 and having projecting and re-entrant parts between said slots, a frame having means for guiding said bars and provided with slots, clearance slots of said bars being normally in alignment with the slots of said frame, 35 means to adjust said bars longitudinally and separately, members guided in the slots of said frame, separate supporting devices for such members, an arm for each member, a spring interposed between each arm and each 40 of said supporting devices, means to operate said arms conjointly, whereby said members may have variable movements toward said bars as limited thereby, and means con-

trolled by each member to operate a corresponding element to be actuated. 45

38. The combination of a plurality of bars spaced side by side and provided with projecting and re-entrant parts, means to guide said bars for longitudinal adjustment, 50 means to adjust said bars longitudinally, sets of separate members on opposite sides of said bars, separate supporting means for each such member, the members of one such set being opposed to corresponding mem- 55 bers of the other such set, and means to simultaneously operate each set of members.

39. The combination of a plurality of bars spaced side by side and provided with projecting and re-entrant parts, means to guide 60 said bars for longitudinal adjustment, means to adjust said bars longitudinally, sets of separate members on opposite sides of said bars, separate supporting means for each such member, the members of one such set 65 being approximately opposed to corresponding members of the other such set, means to simultaneously operate each set of members, resilient devices interposed between 70 said operating means of each set of members and the supporting means of each member, and devices operated by each member to transmit corresponding motion therefrom to an element to be operated.

40. A plurality of bars spaced side by side, means for guiding said bars for longitudinal 75 adjustment, said bars comprising pieces of material each having on one side a plurality of series of projecting and re-entrant parts of different graded lengths and depths spaced along the corresponding bar, means to shift 80 said bars separately longitudinally to a number of positions equal to the number of series of projecting and re-entrant parts of each bar, and movable members opposed to said bars to co-act therewith.

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