No. 868,582. PATENTED OCT. 15, 1907.

F. H. RICHARDS.

MECHANICAL MOVEMENT.

APPLICATION FILED JULY 30, 1901.

3 SHEETS—SHEET 1.

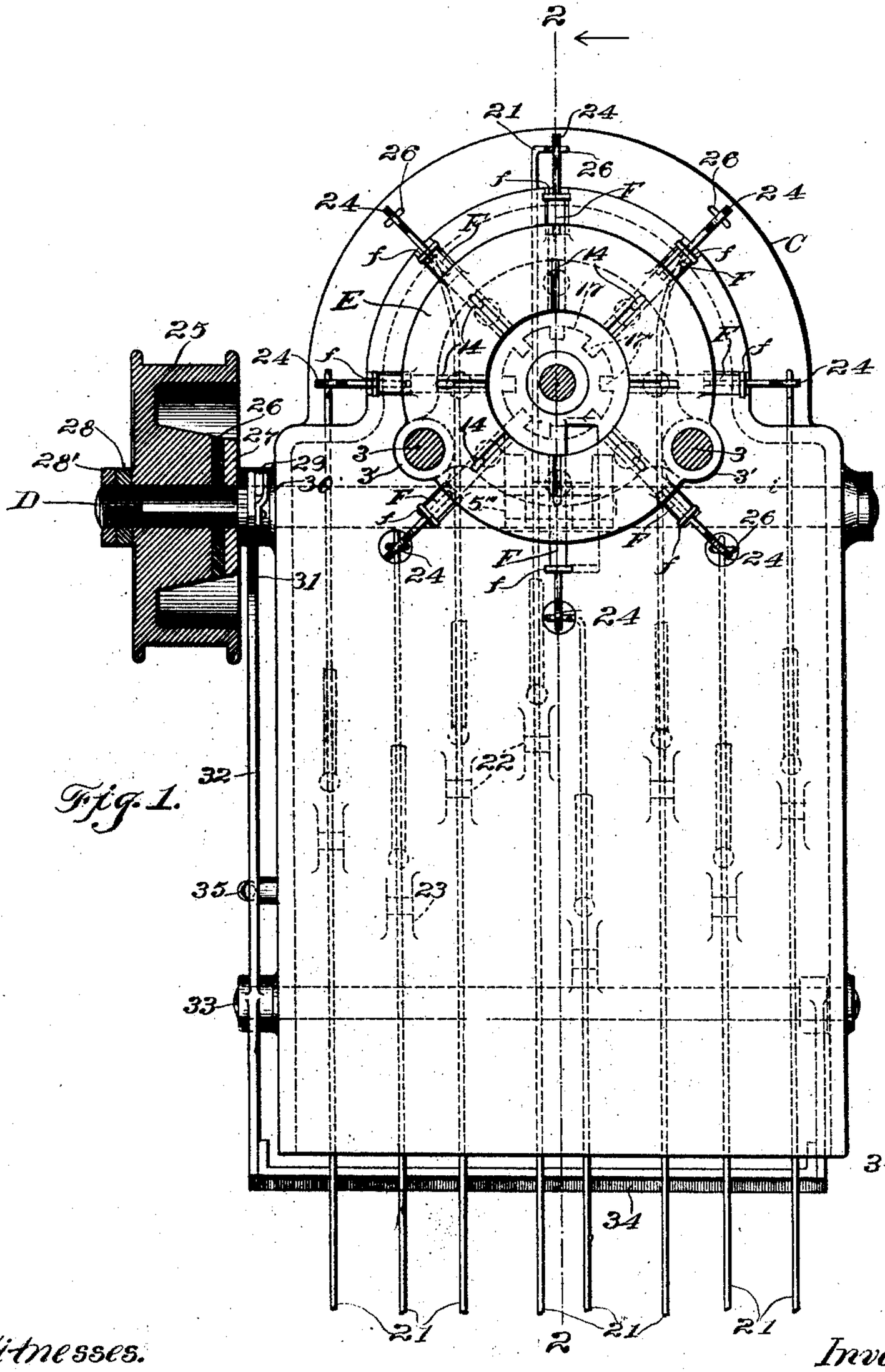

Fig. 1.

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3 SHEETS—SHEET 2.

Fig. 6.

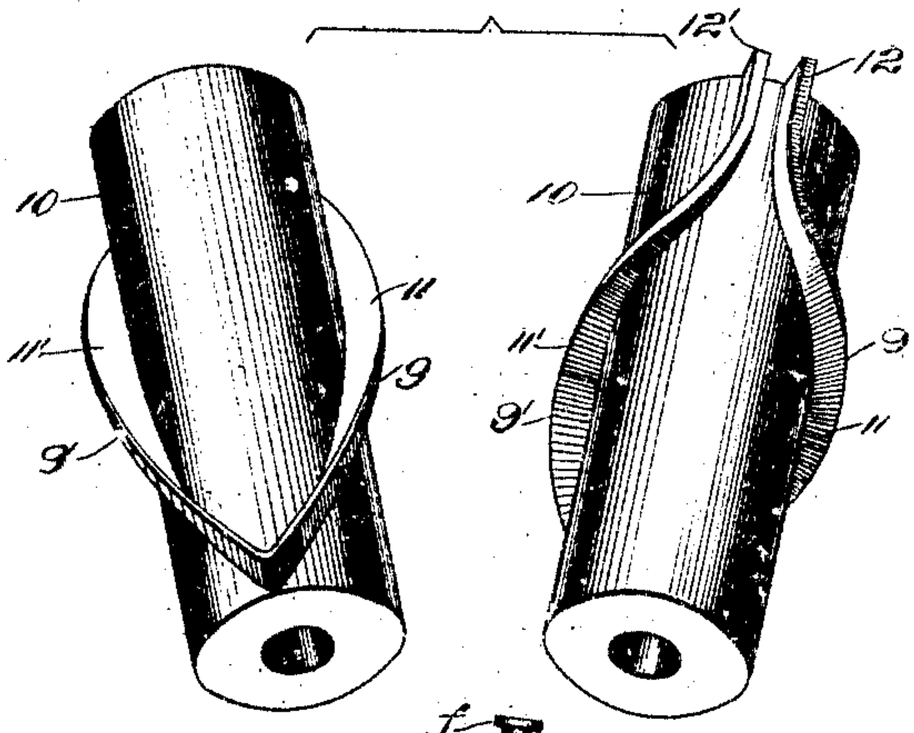


Fig. 7.

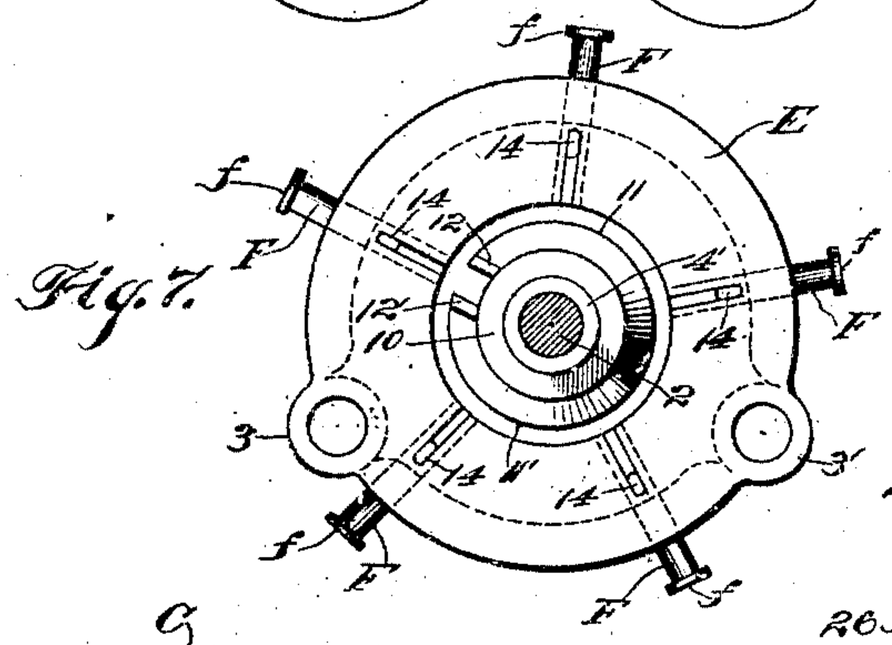
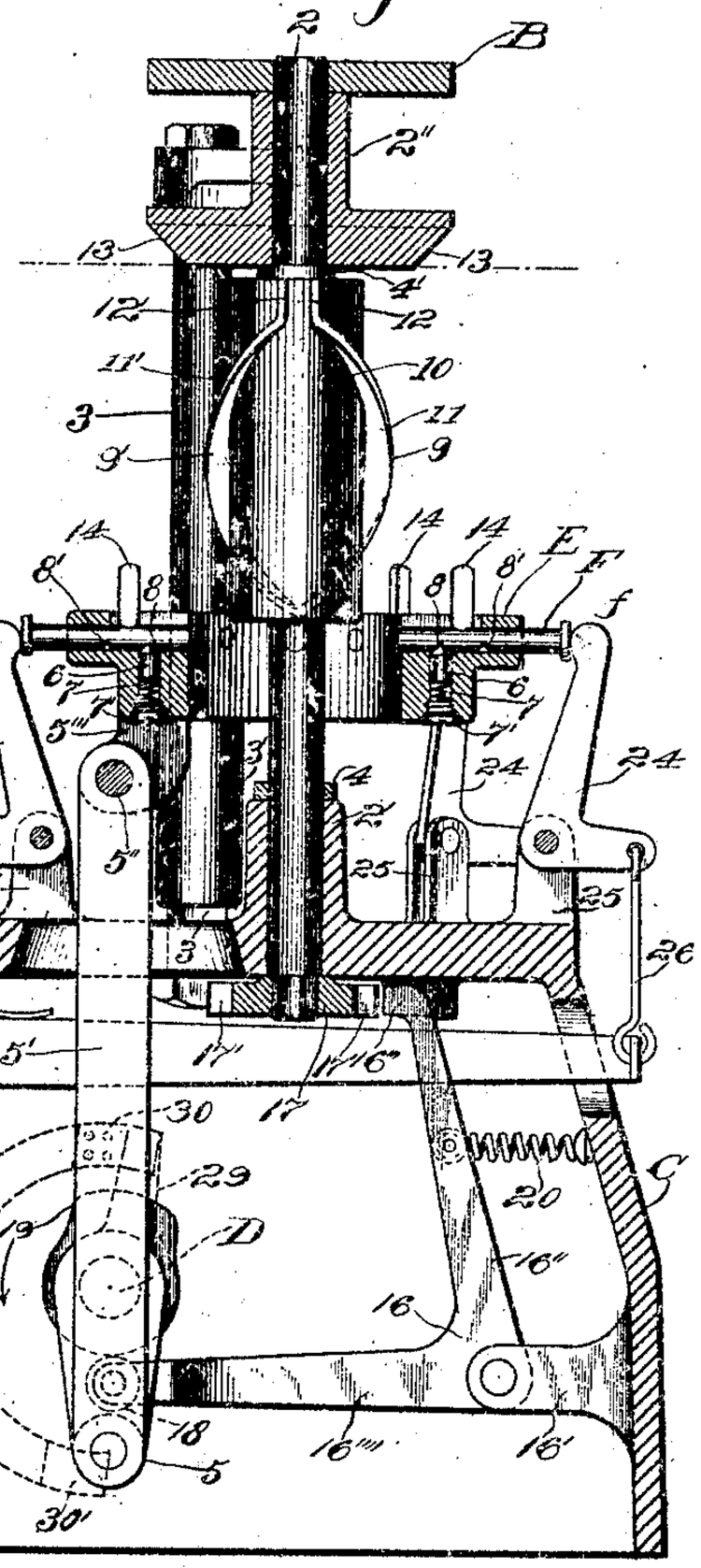


Fig 2.



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3 SHEETS—SHEET 3.

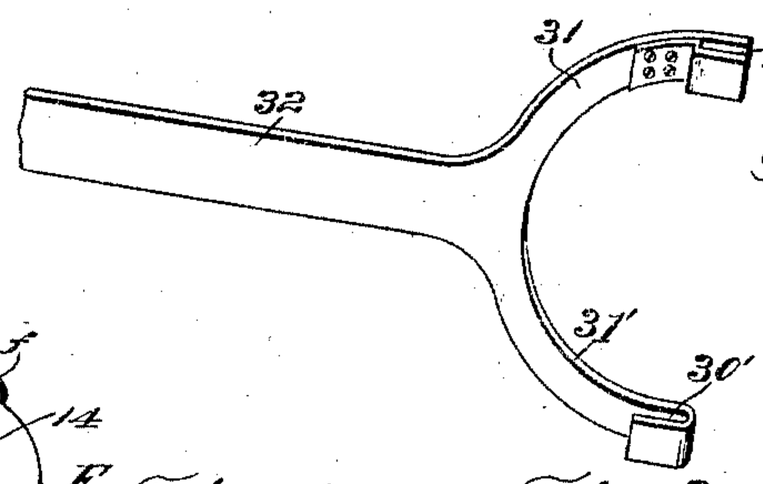

Fig. 8.

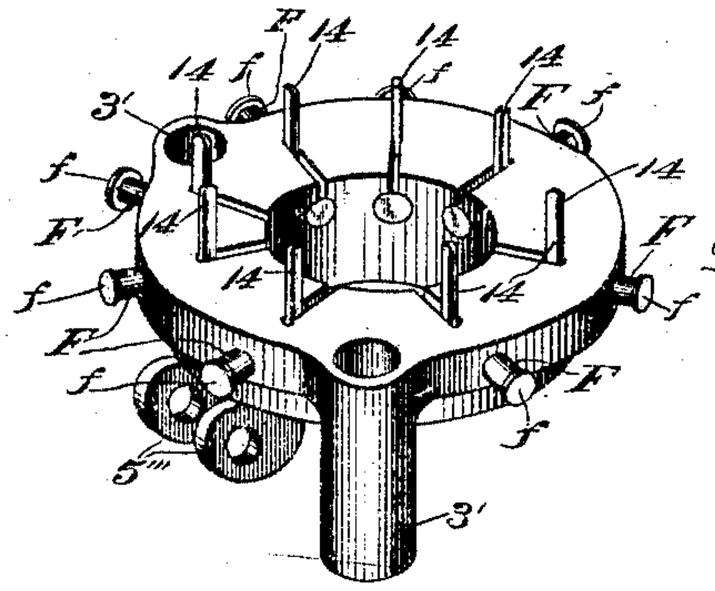

Fig. 4.

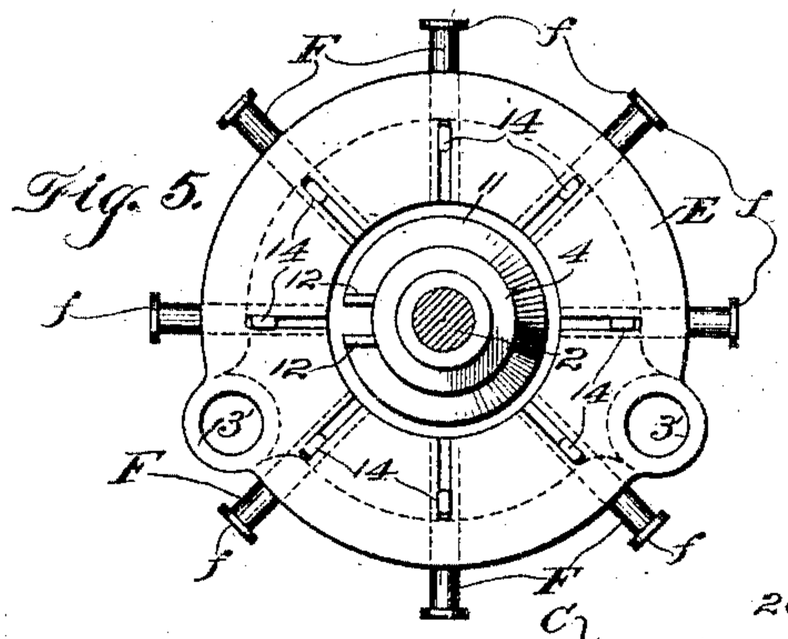

Fig. 5.

Fig. 3.

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UNITED STATES PATENT OFFICE.

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

MECHANICAL MOVEMENT.

No. 868,582. Specification of Letters Patent. Patented Oct. 15, 1907.

Application filed July 30, 1901. Serial No. 70,215.

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 that class of mechanical movements in which the kinematic relation and organization is such as to adapt the same to the controlling of a movable member in its movement and its location in definite and predetermined positions, thus pertaining to that species of mechanisms known as "synchronizing mechanisms".

The present invention has for an object to provide a mechanical movement of this character in which a movable member may be located at will in any desired one of a plurality of positions through the agency of a power or otherwise driven element normally inoperative to effect the movement of the said movable member, but capable of being operatively connected therewith at the will of the operator to thereby position such movable member in a selected, predetermined relationship.

In the drawings which accompany the present specification, and wherein there is illustrated an embodiment of the present mechanical movement, Figure 1 is a plan view thereof, part, however, being shown in section. Fig. 2 is a vertical section of the embodiment, the plane of the section being taken on the line 2—2 in Fig. 1, and the section being viewed in the direction of the arrow adjacent to that line, certain of the parts being shown in elevation, while the mechanism designed for locating the said movable member in various predetermined positions is, in this figure, shown as inoperative to perform its function. Fig. 3 is a view similar to Fig. 2, the parts, however, being taken in a position in this figure in which the power-driven member has been operatively connected with the positioning mechanism, and this latter through actuation has shifted the movable member to a selected, predetermined position, said mechanism being represented in a position just after certain actuators embodied therein have been rendered inoperative. Fig. 4 is a perspective view of a carrier provided with a number of actuators designed, when operatively positioned, to coöperate with and shift the movable member. Fig. 5 is a cross-section on the plane of the line 5—5 in Fig. 2. Fig. 6 sets forth perspective elevational views from opposite sides of the movable member. Fig. 7 is a cross-section similar to Fig. 5, illustrating a modified form of construction; and Fig. 8 is a detail of an escapement device embodied in the present organization of constructive details.

Similar characters of reference designate corresponding parts in all figures.

The member, hereinbefore referred to as the movable member, and the positioning of which is adapted to be controlled by means embodying the present invention, in certain definite and predetermined relationships, for instance, with respect to a part or parts included in a machine or apparatus, of which the present mechanical movement constitutes a component part, is mounted in any suitable manner, according to the character of the movement which it is desired it shall possess. As illustrated, this member, designated in a general way by B, is mounted for rotarial movement, and is shown as a disk or wheel attached to a rotatable shaft 2 mounted in appropriate bearings. This wheel may carry dies, types or impression devices of suitable character when the present movement is utilized for the selective location of such instrumentalities at a given point, for instance, the impression point of a machine. Such devices are here shown, in a conventional way, see *x*.

The supporting framework on which the various parts and devices of the present embodiment are mounted may be of any convenient form and construction and obviously constitute an auxiliary part of another framework, or be a frame by itself. The latter is the case here, the same being shown as a box-like frame, designated in a general way by C, one end of said shaft 2 being journaled in a bearing 2′ on the upper portion of the framework, while the opposite end of the shaft is similarly journaled in a bearing 2″ connected by uprights 3, 3 with the frame; a collar 4 attached to the shaft 2 and a shoulder 4′ thereon, is provided in this instance for preventing the longitudinal movement of the shaft in its bearings.

The power-driven member through whose agency, movement of the movable member B is accomplished, is herein shown as a shaft (see D) mounted in bearings provided at the sides of the framework C. Normally, this shaft is inoperative to accomplish any movement of the member B, as the former at such times has no operative connection with such member. For the purpose of connecting the one with the other at will, to thereby effect the necessary shifting movement of the member B to locate it in a selected and definite position, there is provided a plurality of devices severally setable at will to coöperate with a coöperative part, each such device being effective when so set to turn the member B through an angle preferably differing from that resulting from the operation of any other device. These setable devices or actuators are conveniently supported upon a carrier, designated in a general way by E, which is so mounted as to have a reciprocatory movement substantially in line with the axis of the

shaft 2. For the convenient mounting of this carrier, the same is shown provided with bearings 3′ embracing the uprights 3, 3 and permitting the carrier to be reciprocated to and fro along these uprights from the shafts D. While a crank 5 is shown connected by a link 5′ with the pivot-pin 5″ passing through projections or ears 5‴ on the carrier for this purpose, it is evident that any other means for converting a rotary motion into a reciprocatory one would be within the scope of the invention.

The means embracing the actuators, for turning the movable member B, includes also a device which cooperates with a set actuator during the longitudinal movement of the carrier E to effect the rotary movement of the shaft 2, and hence the movable member B about the axis of the former. The actuators F, here shown as pins mounted in appropriate openings in the carrier and capable of assuming two positions,—one, the inoperative, shown in Figs. 2 and 3, in which they are incapable of coöperation with complemental means moving in unison with the movable member; and another position, the operative one, in which they are capable of so coöperating.

The movement of each actuator from an inoperative to an operative position is in a direction toward the axis of the shaft 2; and there is preferably provided, as shown, a detent device for yieldingly holding each pin in its two positions. This device may consist of a detent 6 (one for each actuator) located in a suitable opening in the carrier, and pressed by a spring, as 7, inserted between the end of the detent, and a screw-stop 7′ to engage with either one of two notches 8 and 8′, respectively, corresponding, the former with the inoperative position of the actuator, and the latter with its operative position, when separately engaged with the detent.

For effecting the rotation of the member B and its connected parts during the longitudinal movement of the carrier E, a pair of helically disposed reaction faces, designated by 9 and 9′, are in fixed relation to a cylindrical part 10 secured to the shaft 2, one or the other of which faces is adapted to engage with the end of an actuator when the same is moved inward to its operative position. These faces 9 and 9′, are in the present construction, shown as constituting the side-faces of flanges 11, 11′ helically-disposed on the cylindrical part 10. At their lower ends these working faces converge and may intersect with each other, as indicated in Fig. 6, while at their upper ends they merge into faces 12 and 12′, respectively, extending outwardly from the cylindrical part and lengthwise thereof, substantially in line with the direction of carrier movement. The distance between the two faces 12 and 12′ is preferably substantially equal to the thickness of each actuator, in order that when an actuator has assumed the upper end of its reciprocatory movement, it may cause the movable member B and connected parts to assume a definite position, in which it will be locked from movement in either direction as long as the actuator remains between the faces.

Although eight actuators are shown, it is evident that a greater or lesser number may be used, within the capacity of the present construction, and depending upon the number of predetermined positions which it is desired that the movable member shall be capable of assuming; which in turn corresponds to the number of impression devices employed, if these instrumentalities be mounted upon the carrier. These actuators are arranged concentrically around the axis of the shaft 2, as seen in plan view, and are conveniently all located in the same plane transverse to this axis. Upon examination of Fig. 6, it will be noticed that one of the removable reaction faces, here consisting of the face 9, is somewhat longer, measured helically in the direction of its length, than the other face 9′; and it will be further noticed, by examining Fig. 5 in this connection, that the greatest number of actuators capable of coöperating with this longer face is 5. This unsymmetrical arrangement of the working faces is here provided, since, by reason of the illustrated disposition and number of the pins constituting the actuators, they are brought diametrically opposite each other; and if the angle formed by the lower ends of the flanges 11, 11′ were directly opposite the opposed faces 12 and 12′, such angle would interfere with the actuator directly opposite to that last operated to turn the movable member and its parts, for it is evident that the movable member is left in that position which the last projected actuator causes it to assume as the actuator moves with its carrier upward. If, however, a number and disposition of actuators are used in which the actuators are not located diametrically opposite to each other,—for instance, as shown in Fig. 7,—a symmetrical arrangement of the reaction faces may be preserved.

After a projected actuator has by contact with the surface 9 or 9′ and, as a result of the upward movement of the carrier, turned the movable member and caused it to assume a position determined by the circumferential position of the given actuator, it is designed that the actuator shall be withdrawn from its operative position and caused to assume an inoperative one. This retraction is conveniently effected by means of a cam face 13, which is here shown as a conical cam face formed on a cam, constituting an integral extension of the bearing 2″ of the shaft 2. Each actuator F is provided with a projection 14 adapted to coöperate, when the actuator has been set in its operative position and carried upward with the cam face 13, and as a result of the continued upward movement of the carrier to slide the actuator outwardly, the detent-pin 6 in the meantime being withdrawn from the notch 8′ and caused to engage with the notch 8, thus holding the actuator in its retracted position. When all the actuators are retracted, it is evident from this description that the carrier with its actuators may reciprocate to and fro without causing any coöperation with either surfaces 9 or 9′, and thus leaving the movable member B, etc., in the position which they have last been caused to take. There is also shown a locking device for securely holding the movable member and its associated parts in the position to which they have last been turned, this locking device consisting of a lever 16 fulcrumed to a bracket 16′ extending from the framework C and having one of its arms 16″ provided with a detent portion 16‴ adapted to enter any one of a series of notches 17′ in a locking-wheel 17 attached to the lower end of the shaft 2. These notches are so related to the positions which the various actuators cause the movable member to assume and to the detent portion 16‴, that a notch will come opposite the latter portion for each predetermined ro-

tarial position of the movable member. The arm 16'''' of the lever 16 carries a cam-roll 18 which is adapted to engage at proper periods with a cam 19 secured to the shaft D and through coöperation therewith the lever is actuated to move the detent portion 16''' into a locking position. A spring 20 may also be provided for operating the lever in opposition to the movement imparted to it by the cam 19.

It is apparent from the foregoing that when any actuator is moved to its operative position and brought by the longitudinal movement of the carrier into engagement with either the face 9 or the face 9', that the movable member, etc., will turn through the smaller of the two angles through which it must rotate in order to assume a position corresponding to that of the projected actuator.

For the purpose of enabling any particular actuator to be moved to its operative position and thereby, on the upward movement of the carrier, cause the movable member to rotate through the necessary angle, I have shown fulcrumed levers 21 corresponding to the number of actuators mounted on the carrier. These levers project beyond the framework C at the front and are fulcrumed intermediate their ends in any appropriate manner, for instance, by a proper fulcrum-pin 22, which passes through the lever and connects the same with dependent lugs 23 extending downwardly from the under surface of the upper portion of the framework.

Toward the rear, each lever connects with means for actuating its respective actuator. An intermediate motion-transmitting device, herein shown, comprises for each actuator an angle-lever 24 suitably fulcrumed to lugs 25 on the framework, one end of each angle-lever being connected by a link 26 with the end of the corresponding lever 21 while the opposite end of the angle lever is preferably provided with a working surface adapted to engage with the head *f* of the proper actuator. So constructed, it is evident that when the outer end of any lever 21 is depressed that end of the connected angle-lever 24 which contacts with the actuator will be moved inward, thereby thrusting the actuator inward and causing it to assume its operative position.

So far as the operation of the present embodiment is concerned, it is immaterial whether the shaft D is continuously rotating or not. If the shaft rotates continuously, then during the time the outer end of a selected lever 21 is depressed the corresponding actuator F will be caused to assume its operative position each time the carrier E reaches the lower end of its stroke, and, the projected actuator will be operative to bring the movable member to the same definite position each time the carrier reaches the upward end of its stroke. I have therefore shown a construction which will prevent a projected actuator from being operative more than once from any single depression of its corresponding lever 21. The construction embodies an escapement for preventing more than half a rotation of the shaft D at the operation of a lever.

The shaft D is here driven frictionally from a driving-pulley, such, for instance, as 25, mounted thereon and serving to impart motion thereto through a friction-disk 26 located between the hub of the pulley and an opposing disk 27 rigid with the shaft, said disk 26 being preferably of a compressible nature, such, for instance as leather, and the friction being regulated by means, such as a nut 28, locked in position by a check-nut 28' engaging with a thread on the end of the shaft. The friction exerted between the friction surfaces is ordinarily sufficient to cause the rotation of the shaft with the pulley when the latter is rotated, as by a belt (not shown), but when the same shaft is rigidly held from rotation, the pulley may turn thereon without imparting motion to the shaft. For preventing the rotation of the shaft there is an arm 29 rigid therewith with which is adapted to engage in succession, escapement members 30 and 30' on the ends of the respective arms 31 and 31' of an escapement-lever 32 fulcrumed intermediate its ends as by a fulcrum-rod 33 passing through the sides of the framework. At its outer end this escapement-lever is provided with a cross-bar 34 disposed beneath the set of levers 21 and adapted to be engaged and actuated by each lever upon its depression, an arm 34' at the opposite end of the cross-bar pivotally supporting such end of the bar on the rod 33. It will be noticed that the escapement members 30 and 30' are oppositely facing, they constituting sockets in which the end of the arm 29 may be received. When any lever 21 is depressed, the outer end of the escapement-lever 32 is likewise depressed and releases the arm 29 from the escapement member 30, assuming the motion is in the direction of the arrow in Fig. 2, enabling the shaft to make a semirotation, whereupon its motion will be arrested, if the lever 21 remains depressed, by reason of the engagement of the arm 29 with the escapement member or socket 30'. Upon removing the finger from the lever 21, this lever and the escapement-lever 32 assume their normal positions by reason of the tension of a spring 35, thereby releasing the arm 29 from the socket 30', whereupon the shaft continues its rotation until stopped by engagement with the socket 30.

The operation of a mechanism constructed in accordance with the foregoing, is as follows: Assuming that the pulley 25 is rotating in the direction of the arrow in Fig. 2, a lever 21 corresponding to the position which it is desired that the movable member B shall assume is depressed, the arm 29 is released from the socket 30 and the shaft D turns through a semirotation. Simultaneously with the actuation of the lever 21, the corresponding actuator F has been projected inward through the intervening mechanism, and when the shaft D starts rotating causing the ascent of the carrier E through the crank-connection described, the projected actuator comes in contact with either the face 9 or 9', and thereafter and during the further ascent of the carrier the movable member and its associated parts are turned until the actuator enters the opening between the faces 12 and 12', in which position the movable member will remain. This position corresponds to that of the actuated lever 21, and is the one desired. During the last stage of the upward movement of the carrier the projection 14 on the operated actuator comes in contact with the cam face 13 and the actuator is moved outward, the detent 6 ultimately engaging with the recess 8 corresponding to the inoperative position of the actuator. If the lever 21 remains depressed no further action takes place. Upon the release of the lever, however, the escapement-lever 32 assumes its normal position, releasing the arm 29

from the socket 30′ and there results from this release, the further semirotation of the shaft D, during which the carrier E is drawn downward to its idle position with the parts in a position for a second selection.

Having described my invention, I claim—

1. A mechanical movement embodying in combination with an adjustable member, a shiftable carrier; a plurality of settable devices mounted on the carrier and respectively adapted when set to be brought by the moving carrier into coöperative relation with said adjustable member; means for selectively setting said settable devices when the carrier is in a predetermined position; and power actuated means for shifting the carrier.

2. A mechanical movement embodying in combination with an adjustable member, a reciprocative carrier; a plurality of settable devices mounted on the carrier and respectively adapted when set to be brought by the moving carrier into coöperative relation with said adjustable member; means for selectively setting said settable devices when the carrier is at one end of its reciprocative movement; and power actuated means for shifting the carrier.

3. A mechanical movement embodying in combination with an adjustable member, a shiftable carrier; a plurality of settable devices mounted on the carrier and respectively adapted when set to be brought by the moving carrier into coöperative relation with said adjustable member; means for selectively setting said settable device when the carrier is in a predetermined position; and a normally restrained actuator released by the operation of setting one of said settable devices for shifting the carrier.

4. A mechanical movement embodying in combination with an adjustable member, a shiftable carrier; a plurality of settable devices mounted on the carrier and respectively adapted when set to be brought by the moving carrier into coöperative relation with said adjustable member; means for selectively setting said settable devices when the carrier is in a predetermined position; means for shifting the carrier; and mechanism for automatically returning a set device to its normal unset position after cooperation with said adjustable member.

5. A mechanical movement embodying in combination with an adjustable member, a reciprocative carrier; a plurality of settable devices mounted on the carrier and respectively adapted when set to be brought by the moving carrier into coöperative relation with said adjustable member; means for selectively setting said settable devices when the carrier is at one end of its reciprocative movement; means for shifting the carrier; and mechanism for returning a set device to its normal unset position when the carrier is adjacent to the opposite end of its reciprocative movement.

6. A mechanical movement embodying in combination with an adjustable member, a shiftable carrier; a plurality of settable devices mounted on the carrier and respectively adapted when set to be brought by the moving carrier into coöperative relation with said adjustable member; means for selectively setting said settable devices when the carrier is in a predetermined position; a normally restrained actuator released by the operation of setting one of said settable devices for shifting the carrier; and mechanism for automatically returning a set device to its normal unset position after coöperation with the adjustable member.

7. A mechanical movement embodying in combination with an adjustable member having a helical cam face, a shiftable carrier; a plurality of settable devices mounted on the carrier and respectively adapted when set to be brought by the moving carrier into coöperative relation with said helical cam face; means for selectively setting said settable devices when the carrier is in a predetermined position; and power actuated means for shifting the carrier.

8. A mechanical movement embodying in combination with an adjustable member having a helical cam face, a reciprocative carrier; a plurality of settable devices mounted on the carrier and respectively adapted when set to be brought by the moving carrier into coöperative relation with said helical cam face; means for selectively setting said settable devices when the carrier is at one end of its reciprocative movement; and means independent of said device setting means for shifting the carrier.

9. A mechanical movement embodying in combination with an adjustable member having a helical cam face, a reciprocative carrier; a plurality of settable devices mounted on the carrier and respectively adapted when set to be brought by the moving carrier into coöperative relation with said helical cam face; means for setting said settable device when the carrier is at one end of its reciprocative movement; a normally restrained actuator released by the operation of setting a settable device for reciprocating the carrier; and means for automatically returning a set device to its normal unset position adjacent to the opposite end of the reciprocative movement of the carrier and after coöperation with the said helical cam face.

10. A mechanical movement, embodying in combination with an adjustable member, a shiftable carrier; a plurality of settable devices mounted on the carrier and respectively adapted when set to be brought by the moving carrier into coöperative relation with said adjustable member; means for selectively setting said settable devices when the carrier is in a predetermined position; means for shifting the carrier; and a locking device for temporarily maintaining said adjustable member in position to which it is adjusted by the coöperation of the set device on the reciprocating carrier with the adjustable member.

11. A mechanical movement embodying, in combination, an adjustable member provided with a pair of oppositely inclined helical cam faces; a carrier; a plurality of settable devices mounted on the carrier and each adapted when set to coöperate with a cam face on the adjustable member; a key mechanism for setting a determinate one of the settable devices on the carrier; and means for actuating the carrier and thereby causing the coöperation of a set device thereon with a helical cam face on the adjustable member.

12. A mechanical movement embodying in combination, a rotatably adjustable member provided with a pair of oppositely inclined helical cam faces; a carrier reciprocative longitudinally of the axis of rotation of the adjustable member; a plurality of settable devices mounted on the carrier and each adapted when set to coöperate with a cam face on the adjustable member; a key mechanism for setting a determinate one of the settable devices on the carrier; means for actuating the carrier and thereby causing the coöperation of a set device thereon with a helical cam face on the carrier; and means for automatically returning a set device to its normal unset position.

13. A mechanical movement embodying in combination, a rotatably adjustable member provided with a pair of oppositely inclined helical cam faces; a carrier reciprocative longitudinally of the axis of rotation of the adjustable member; a plurality of settable devices mounted on the carrier and each adapted when set to coöperate with a cam face on the adjustable member; a key mechanism for setting a determinate one of the settable devices on the carrier; a driver adapted to reciprocate said carrier; means for normally restraining the driver from so actuating the carrier, said means embodying a clutch; and means interposed between the key mechanism and the clutch for releasing the restrained driver upon the selection and setting of a settable device and thereby permit the driver to reciprocate the carrier.

14. A mechanical movement embodying in combination, a rotatably adjustable member provided with a pair of oppositely inclined helical cam faces forming at one end a synchronizing recess; a carrier reciprocative longitudinally of the axis of rotation of the said adjustable member; a plurality of settable devices on and shiftable radially of the carrier; a detent for each of said settable devices for maintaining it in different radial positions; a projection on each settable device; a coöperative member with which the said projection of a set device is adapted to cooperate adjacent to one extremity of travel of the carrier and thereby return the set device to its unset position key mechanism; transmitting mechanism interposed between the levers of said key mechanism and said settable devices for transmitting motion from an actuated key lever to its corresponding settable device when said carrier is a

the opposite extremity of its travel; a driving shaft connected with said carrier; a clutch for normally preventing the actuation of said carrier from said driving shaft; means operable upon the actuation of the key mechanism for coöperating with said clutch to thereby release said driving shaft; and a cam actuated locking detent for temporarily holding the adjustable member in its adjusted position.

15. A mechanical movement embodying in combination, a movable member, a power driven carrier; a plurality of settable devices on the carrier for shifting the movable member to various predetermined positions; key mechanism for setting the settable devices; a power driven element; and means actuated upon the operation of the key mechanism for releasing said power driven element and thereby permitting such element to actuate said carrier.

16. A mechanical movement embodying in combination a rotatable member; shiftable carrier; a series of settable devices mounted on the carrier and each coöperative with said rotatable member when set; means for setting the settable devices; and a locking mechanism for maintaining the rotatable member in the rotary position to which it may be adjusted.

17. A mechanical movement embodying a pair of pivotally mounted oppositely disposed helical ribs in combination with a series of settable devices shiftable as a series, and means to shift the series of settable devices relative to the helical ribs.

18. A mechanical movement embodying a pair of pivotally mounted oppositely disposed helical ribs in conjunction with a series of settable devices shiftable as a series, means for selectively setting the settable devices and means for shifting the series of devices and operating the helical ribs from the selected device.

19. A mechanical movement embodying an angularly adjustable member provided with a pair of oppositely inclined helical cam faces, a series of actuators respectively for engaging when set said cam faces and for adjusting when moved transversely of said cam face said member to different angular positions, means for shifting a set actuator transversely of one of said cams, and means controlled by the selector means for releasing the actuator shifting means.

20. A mechanical movement embodying an angularly adjustable member provided with a pair of oppositely inclined helical cam faces, a series of actuators respectively for engaging when set said cam faces and for adjusting when moved transversely of said cam faces said member to different angular positions, means for selectively setting said actuators, means for shifting a set actuator transversely of one of said cams, means controlled by the selector means for releasing the actuator shifting means, and means for returning the set actuator to idle position.

21. A mechanical movement embodying an angularly adjustable member provided with a pair of oppositely inclined helical cam faces, a series of actuators respectively for engaging when set said cam faces and adjusting said member to different angular positions, means for selectively setting said actuators, means for shifting said series of actuators including a set actuator transversely of one of said cams, and means controlled by the selector means for releasing the actuator shifting means.

22. A mechanical movement embodying an angularly adjustable member provided with a pair of oppositely inclined helical cam faces, a series of actuators respectively for engaging when set said cam faces and for adjusting when moved transversely of said cam faces said member to different angular positions, means for selectively setting said actuators, means for shifting said series of actuators including a set actuator transversely of one of said cams, means controlled by the selector means for releasing the actuator shifting means, means for returning the set actuator to idle position, and means for then returning the series of actuators to their initial idle position.

23. A series of settable devices, a rotatable member provided with a cam face coöperative with a transversely moving set actuator for angularly shifting said member into a predetermined relative position to the position occupied by said device at the completion of its movement, means for selectively setting the said devices, means for shifting the set device, and means controlled by the selector means for controlling the settable device shifting means.

24. A mechanical movement embodying an angularly adjustable member provided with a pair of oppositely inclined helical cam faces, a series of actuators respectively for engaging when set said cam faces and for adjusting when moved transversely of said cam faces said member to different angular positions, means for selectively setting said actuators, means for shifting said series of actuators including a set actuator transversely of one of said cams, means controlled by the selector means for releasing the actuator shifting means, means for returning the set actuator to idle position, and means for then returning the series of actuators to their initial idle position.

25. The combination with a rotary member, of a series of settable devices for imparting a series of angular movements to said rotatable member, actuators for setting said devices, means for shifting said series away from the actuators, and the set device to its work, and means actuated by the actuators for controlling the shifting means.

26. A mechanical movement embodying an angularly adjustable member provided with a pair of oppositely inclined helical cam faces, a series of settable devices, each for engaging when set and shifted transversely of said cam faces one of these for engaging the cam and angularly shifting the member from any position into a selected position, and means for shifting the series of settable devices and causing the set device to perform its work.

27. A mechanical movement embodying an angularly adjustable member provided with a cam face for bringing said member from any position into a particular position, a series of settable devices each coöperative with said cam face, actuators for setting the settable devices, means for shifting said series away from the actuators and the set device to its work and for returning the series to the actuators, means controlled by the several actuators for releasing the shifting means, and means for returning the settable devices to idle position.

28. A mechanical movement embodying an angularly adjustable member provided with a pair of oppositely inclined helical cam faces these leading into a straight channel, a series of settable devices each capable when set and moved transversely of said cams for engaging either of these and angularly adjusting said member and traversing the straight channel between the cam faces and thereby bringing said member from any position into a particular position relative to the set device, a series of actuators for setting the settable devices, means for shifting the said series of settable devices away from the actuators and the set device to its work, means controlled by the actuators for operating the shifting means, means for engaging the set device and returning this to idle position and for so engaging while the set device is traversing the straight channel between the cams and while said set device is positively holding the angularly adjustable member from movement in either direction, the series of settable devices being returned to idle position before the said series is returned to the working position of the actuators.

29. In a mechanical movement, the combination with a rotary shaft, of a cylinder mounted thereon, cam wings carried by said cylinder and disposed in oppositely directed helical lines, said wings being jointed together at one end of the cylinder and at the other approaching each other and then deflected, thereby forming a narrow vertical channel, ways disposed parallel with said shaft, a carrier guided upon said ways, means for reciprocating said carrier, a series of pins mounted upon said carrier and radially disposed relative to said cylinder, means for holding said pins in retracted positions, and in forward positions wherein they will engage the cams when the carrier is reciprocated and traverse one or the other of these until it traverses said narrow channel, means for selectively setting the several pins, means controlled by the setting means for releasing the carrier shifting device, means for returning the pins to idle position during the time the pin is in said narrow channel.

30. In a mechanical movement, the combination with a shaft and cam faces carried thereby, of a member fast on the shaft, guide-rods disposed parallel with said shaft, a

carrier shiftable upon said guide-rods, settable devices carried by said carrier and adapted when set to engage one or the other of said cam faces, a series of actuators for said settable devices and adapted for actuating the same when the carrier is at one limit of its path of movement, power driven means for shifting said carrier, a detent for restraining said means, selectors for said actuators, and means operable by an actuated selector for releasing said detent.

31. In a mechanical movement, the combination with a rotary shaft having cam faces disposed in oppositely directed helical lines, said faces meeting at a point and converging from and then toward each other and then being deflected thereby forming a channel parallel with said shaft, ways parallel with said shaft, a carrier guided thereon, power driven means for reciprocating the said carrier, a series of settable devices disposed upon said carrier for radial movement, means for detaining the carrier, reciprocating means for holding the carrier at one limit of its stroke, actuators for engaging said settable devices while the carrier is in its normal position, selector means for controlling said actuators, and means controlled by the selectors for releasing the detent.

32. In a mechanical movement, the combination with a rotary shaft having cam faces disposed in oppositely directed helical lines, said faces meeting at a point and converging from and then toward each other and then being deflected, thereby forming a channel parallel with said shaft, ways parallel with said shaft, a carrier guided thereon, power driven means for reciprocating the said carrier, a detent therefor for holding said carrier at its normal position of rest, a series of pins radially reciprocable upon said carrier and each adapted when moved inward and the carrier shifted for engaging one or the other of said cam faces, angularly adjusting the shaft and traversing said channel between the cam faces, an abutment carried by each of said pins, and a cam face at the extreme limit of working movement for engaging said abutments and returning the set pin to idle position, a series of bell crank levers for actuating said pins and disposed for engaging the same when the carrier is in its normal position of rest, key levers for rocking said bell crank levers, means for releasing the detent and controlled by said key levers, and means controlled by the power driven means for locking the shaft in its adjusted position before the return of the pin to idle position.

FRANCIS H. RICHARDS.

Witnesses:
FRED. J. DOLE,
JOHN O. SEIFERT.