

F. H. RICHARDS.
MECHANICAL MOVEMENT.

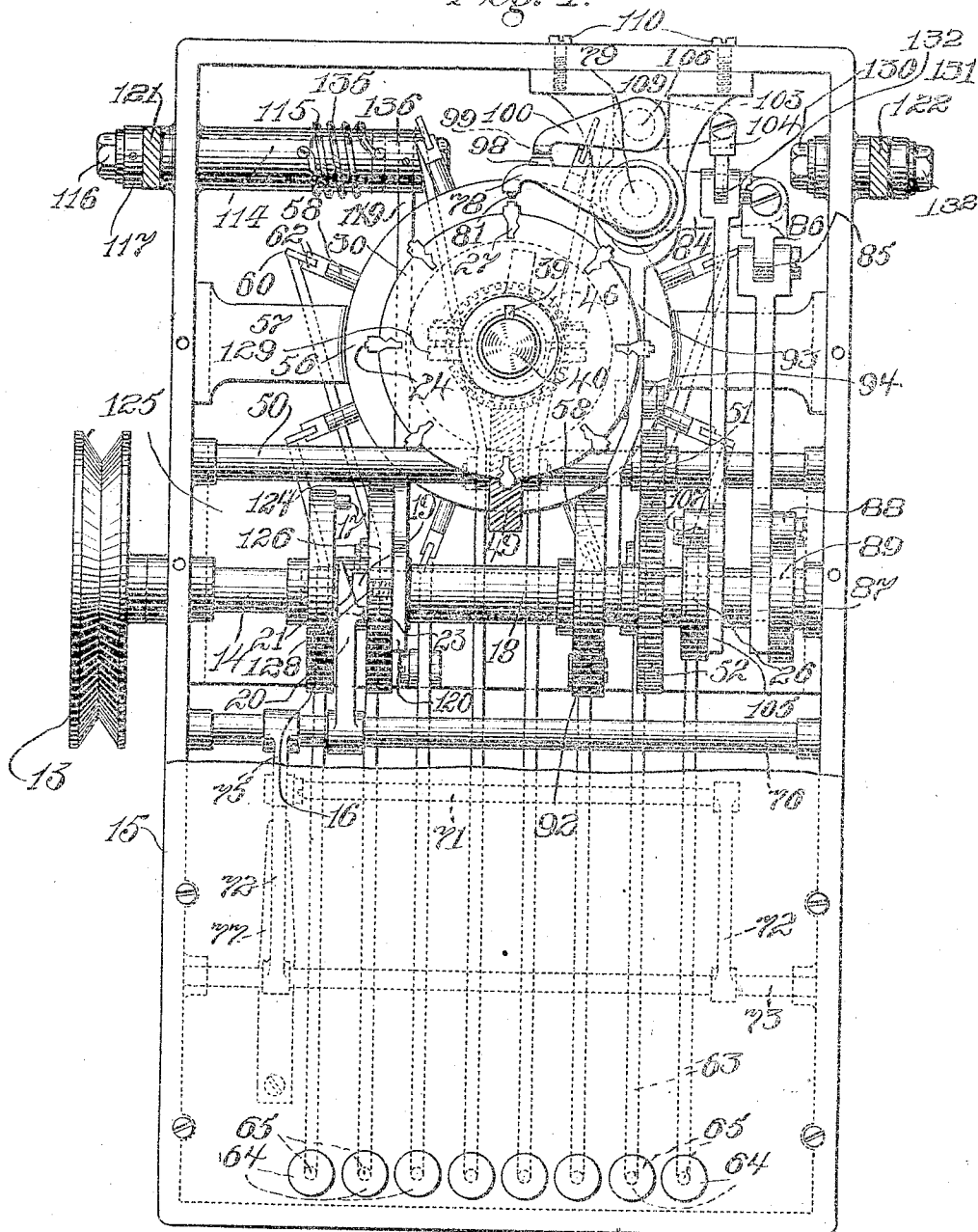
APPLICATION FILED APR. 23, 1903. RENEWED SEPT. 28, 1908.

902,329.

Patented Oct. 27, 1908.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

Robert Head

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Inventor:

F. H. Richards

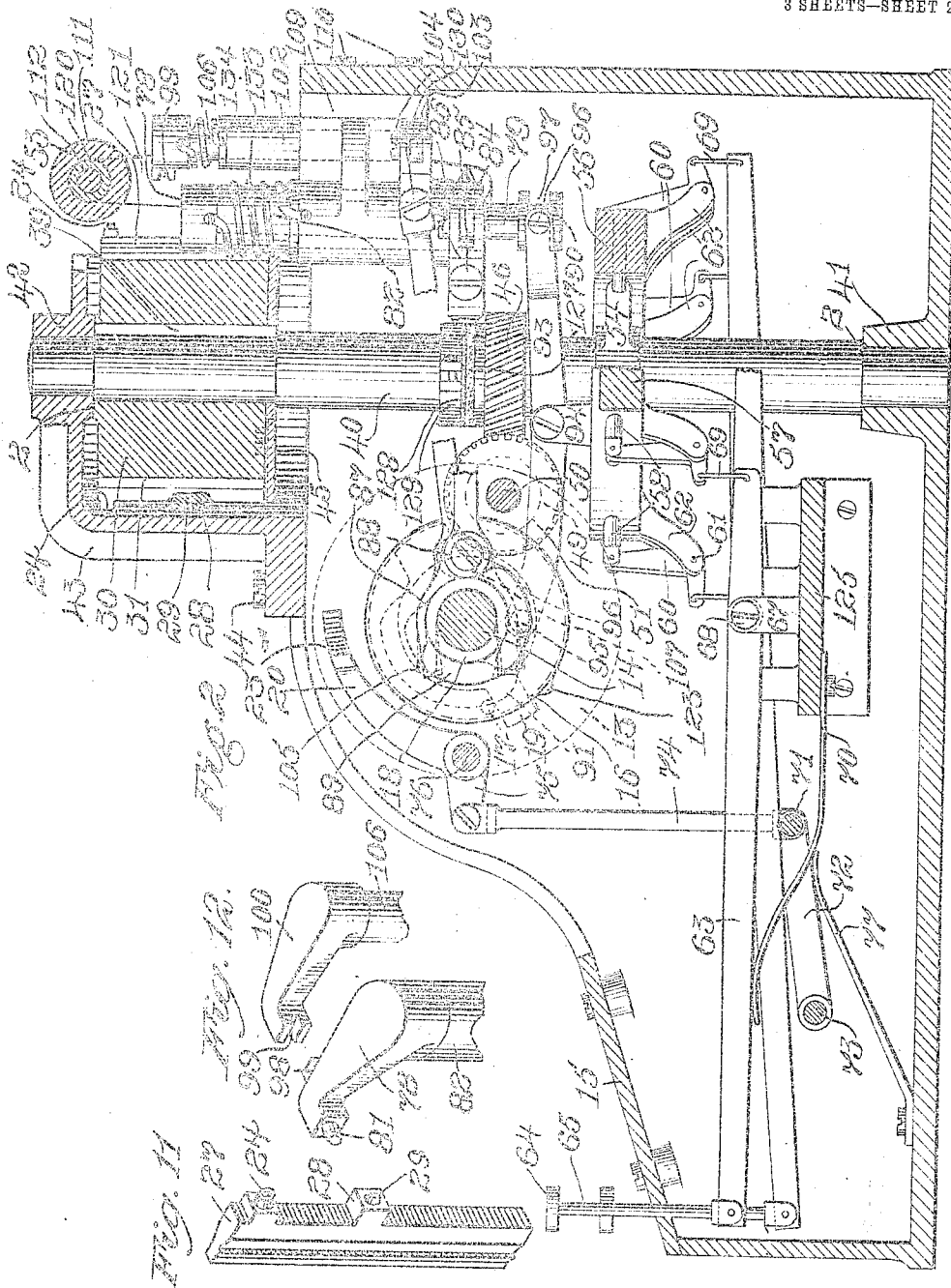
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3 SHEETS—SHEET 2.



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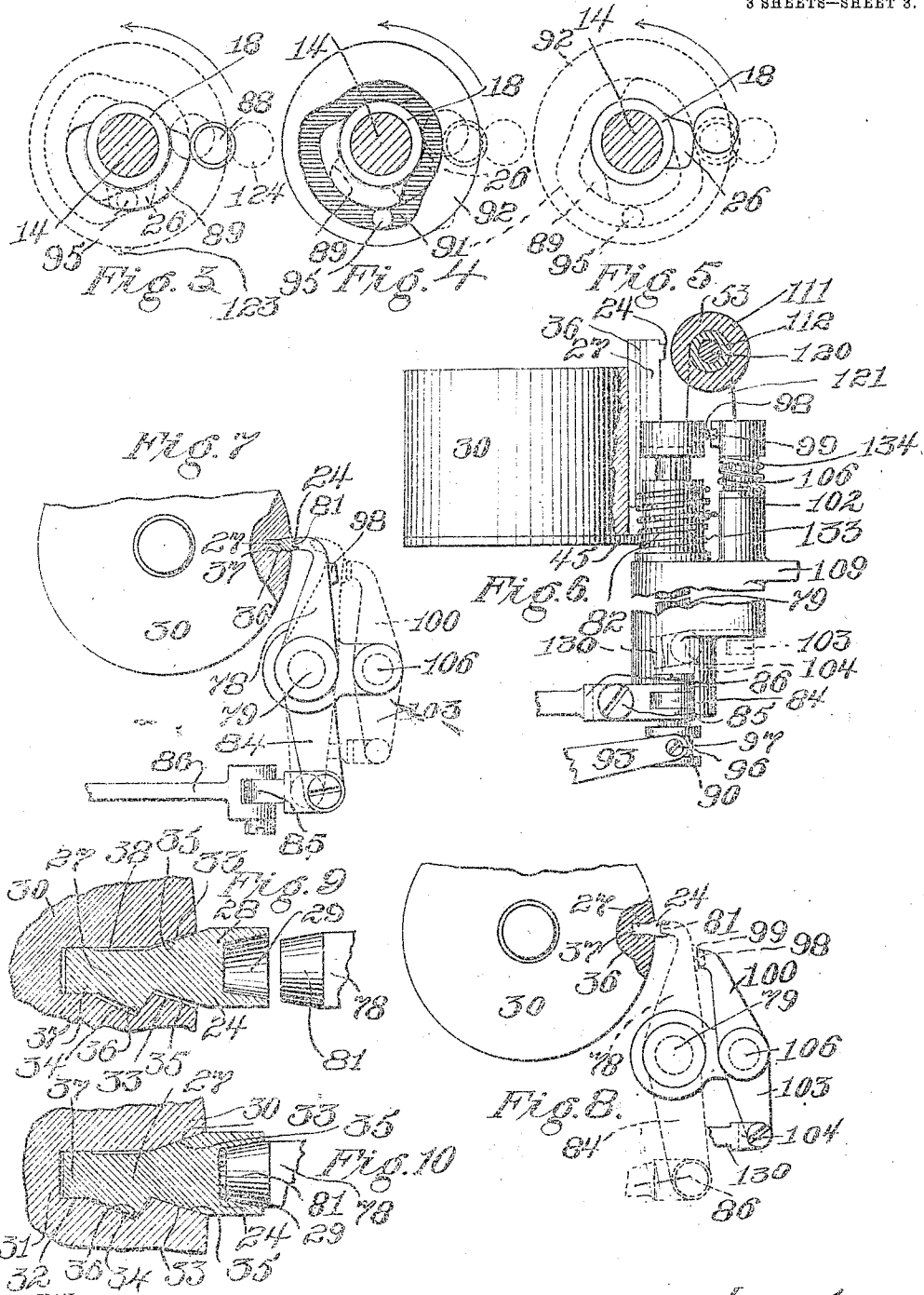
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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TO AMERICAN TYPOGRAPHIC CORPORATION, A CORPORATION OF NEW JERSEY.

MECHANICAL MOVEMENT.

No. 902,328.

Specification of Letters Patent.

Patented Oct. 27, 1908.

Application filed April 23, 1903, Serial No. 153,953. Renewed September 28, 1906. Serial No. 455,958.

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 pertains to the relationship and organization of various cooperative mechanisms and mechanical devices designed to effect the selective transfer and definite location of any one of a series of work performing members or devices to and at a given or fixed point, such members in general being variously disposed with respect to such given point.

In many classes of machines embodying members such as have just been referred to, it is material to the performance of the functions for which such mechanisms or machines are designed, that each of the adjustable members should, upon selection, be capable of being freely shifted and brought into a definite predetermined position in order that the selected member may properly cooperate with the object or surface upon which it is to act. It is moreover highly important in a practical working machine that such member when it shall have been adjusted and is in the act of performing its intended function should be accurately positionized as to working position and rigidly held so that looseness or freedom of fit that may exist in order to permit it to be freely shifted during adjustment, shall be suppressed or taken up, the continued operation of the mechanism or machine necessitating, of course, that each adjusted member be ultimately returned to its normal or inoperative position.

The mechanical movement embodying the present improvements therefore comprises ordinarily, a support or carrier capable of adjustment, with which support, there is combined mechanism for shifting the carrier to the proper position to bring the adjustable selected member into alinement with the fixed point. In cooperative relation with such support and the selective members thereon there is suitable and proper mechanism, whereby the selected device may be shifted relatively to the support. When the selected member shall have attained, approximately, the predetermined position requisite for it to perform the work for which it is de-

signed, and prior to the commencement thereof, means are brought into action which operate to give it its final precise position and to firmly and rigidly hold it in such precisionized position.

Although the aforesaid support or carrier is shown capable of a movement about an axis, I do not deem it essential that this movement shall be the only one for which it is adapted, since the organization may be such that there may be imparted to it a compound movement, that is, a bodily movement of the member along a predetermined path in addition to an angular movement.

There is set forth in the drawings attached to the present specification an embodiment of the present mechanical movement, and in these drawings, Figure 1 is a plan view of such embodiment, part of the upper portion of the inclosing casing being broken away. Fig. 2 is a vertical longitudinal section of the mechanism set forth in Fig. 1, parts however, being shown in elevation and the plane of the section passing through the axis of the support or carrier. Figs. 3, 4 and 5 are elevational views of various cams for effecting a proper sequential operation of various mechanisms embraced in the present mechanical movement. Fig. 6 is an elevation of a slide-shifting and precisionizing device operative to shift a slide when the latter is in alinement with the working point, to thereby locate the impressor on the slide in juxtaposition to the working point and thereafter to precisionize and lock the same in its working position. Fig. 7 is a plan view illustrating the parts in a position in which the slide locator has engaged with the slide. Fig. 8 is a view similar to Fig. 7 illustrating the slide precisionizer and locking device as engaged with the slide locator itself shown as engaged with the slide. Figs. 9 and 10 are cross-sectional detail views upon a somewhat enlarged scale illustrating the slide construction, the former figure illustrating the engaging part on the slide locator as disengaged from the slide, while the latter figure shows such part in its engaged position. Fig. 11 is a perspective view of one of the slides; and Fig. 12 is a perspective view of the slide locator arm and the slide precisionizer and locking arm.

Similar characters of reference designate corresponding parts in all figures.

The present invention is applicable to a

wide variety of machines and mechanisms which embody a plurality of members each capable of a shifting movement for the purpose of bringing it into predetermined position. In practice, moreover, each such member or part on which it is supported is usually required to be so related to the guide faces which determine the character of the shifting movement as to enable it to be freely moved therealong. To secure the best results, each selected member when so shifted to approximately its final or working position should be accurately precisionized as to position and rigidly held during such period as the member performs its work. Such conditions and requirements prevail in many classes of typographic machines, and I have therefore chosen so much of a typographic machine as includes a carrier, a plurality of adjustable impressors mounted thereon, and mechanism for effecting the adjustment of the carrier to bring a selected impressor into alinement with the working point, which impressor is then shifted toward the working point and finally there precisionized and held preparatory to the performance by it of the work for which it is designed.

The various operative parts comprised in the mechanism or machine in which the present mechanical movement is embodied are mounted upon a suitable support and supporting fixtures of such shape and proportion as are determined to a large extent by the particular machine or mechanism in whose construction and organization an embodiment of the present invention enters. In the present illustrated embodiment the support aforesaid is afforded by a frame or casing, which is designated in a general way by 15.

I mount the selective devices as a whole upon a part or support at least capable of rotation about an axis, and have combined with such support in proper cooperative relation therewith suitable mechanism whereby a particular device chosen from the plurality thereof may be brought into the vertical plane of the working point (assuming the axis of the support to be disposed vertically) and subsequently shifted relatively to the support until it reaches or is adjacent to the working point. In the present embodiment the carrier or support, designated in a general way by 30, is capable only of a movement of rotation, though as aforesaid the present invention is not limited in its scope of application to a support capable only of rotation about its own axis.

For the convenient mounting and impartation of angular or rotary movement to the carrier 30 it may be mounted as shown, this mounting comprising a shaft 40 which in this instance is disposed vertically and mounted adjacent to its lower end in a bearing 41 formed in the frame 15 and at its up-

per end in a bearing 42 in an overhanging bracket 43 fixedly secured as by screws 44 to the upper portion of such frame and constituting a shield or hood within which the carrier is located. Shoulder 2, 2 between the main portion of the shaft 40 and reduced journal portions thereof constitutes means for maintaining the shaft in its proper vertical position. The carrier 30 may be attached to its shaft in any proper manner, in this case a key 39 rigidly connects the two.

It may here be premised that the various devices which are capable of being located selectively at the given or fixed point are disposed circumferentially of the carrier 30 and hence the rotary movement of the carrier shaft will cause these circumferentially disposed devices to pass through the vertical plane of the given point.

The plurality of adjustable work performing devices in the nature of typographic impressors, are designated without discrimination by 24. These impressors are mounted upon slides such as 27, one to each slide. The slides are mounted in guideways in the circumferential portion of the carrier 30.

When a selected slide shall have taken its adjusted position through the operation of means, hereinafter described in detail, it is subjected to various forces in consequence of the working of the impressor located thereon, the line of application of these forces being more or less transverse to the line of length of the slide. For the purpose of best resisting the forces incident to the performance by the impressor of its work, the walls of each slideway in the carrier comprise a pair of thrust-receiving faces 33 located well toward the outer portion of the guideway and adapted to be contacted by correspondingly inclined faces 35 on opposite sides of the slide. Preferably the inclination of these faces to the longitudinal axis of the associated slide is equal in order to afford symmetry of action and reaction. The faces extend from end to end of the slideway in the carrier. In respect to their angle as seen in cross-section it is not contemplated that the same shall be an angle so acute as to result in the wedging of the slide under forcible compression in the slideway in which it is located, but that the angle shall be sufficiently obtuse to cause the elastic return of the metal to the sides of the slideway to release the slide after the impressor has performed its work, thereafter permitting the slide to be readily shifted longitudinally. In order that a leverage shall exist ample to adequately resist all side stress which may come upon the slide and which tend to tilt the same while the impressor is working, the shank or stem portion 37 on the slide is extended well toward the center of the carrier. It is this rear or shank portion of the slide that operates not only to steady the working impressor, but also to effectu-

ally guide the slide during its adjustment, since it is designed that the slide shall spring slightly outward from its slideway upon the cessation of the working of the impressor, thus freeing the slide from the thrust-receiving faces 33. The depth of the slideway is such that during the working of the impressor the rear edge of the slide does not contact with the bottom of the slideway.

Dislodgment of any slide laterally from the slideway in which it is seated is prevented by a projecting rib 36 on the slide disposed longitudinally thereof and extending into a recess 34 formed in the body of the carrier while the slides are prevented from dropping downward by a plate 45.

I have chosen to illustrate my present invention as embodied in a mechanism in which an intermittent movement is impartable to the slide carrier under the control of a key-controlled mechanism. In the form of carrier-driving means disclosed in the drawings, a main driving shaft 14 journaled in bearings in the frame 15 and driven from a pulley 13 actuated from a suitable source of power (not shown) is effective to rotate a sleeve 18 carrying various operative cams. Until a key of the key mechanism is depressed, no movement is imparted to the sleeve from the rotating shaft 14, but the two are operatively connected by the actuation of a key. The key mechanism illustrated embodies a series of key levers 63 each supporting at its outer end a key stem 65 surmounted by a key 64; the number of such keys corresponds to the number of impressors or slides mounted upon the carrier (there being, as before stated, one impressor on each slide) and the levers may be fulcrumed by pivot pins 68 to posts or brackets 67 erected upon a cross-plate or bar 125 extending from side to side of the inclosing casing.

The depression of a key lever serves not only to operatively connect the cam sleeve with the driving shaft as aforesaid, but to also set a corresponding stop pin 58 so positioned as to cause in conjunction with a stop arm on the shaft 40 the arrest of the shaft and the carrier in a position in which the slide carrying the impressor coördinated with the key of the depressed key lever is alined with the working point. The several stop pins are mounted radially of the shaft 40 in a supporting ring or annulus 56 held in a fixed position by brackets 57 attached to the casing 15. The intermediate transmitting mechanism interposed between each key lever and the stop pin with which it is associated, comprises an angle lever 60 fulcrumed between a pair of depending ears 62 extending from the annulus 56, one of the arms of the angle lever being pivoted to the stop pin and the other arm thereof connecting with the key lever by a link 69. The stop arm extending from the carrier shaft 40 is designed

by 54. A spring 70 is combined with each key lever tending to urge the forward end of the lever upward and withdrawing the stop pin projected into the path of the stop arm by the depression of the lever when the latter is released.

As has already been stated, the depression of a lever serves not only to set a stop pin but also causes the driving shaft 14 to impart motion to the sleeve 18. The construction disclosed in the drawings for accomplishing this result comprises a disk 16 from whose lateral face extends a pin 17 adapted to impinge against a pivoted arm 19 when the latter shall have taken a position in which it extends across the rotary path described by the pin. Normally, that is when no depression of a key lever shall have been made, the arm 19 is held out of the path of the pin 17 by a rock arm 20 against the tension of a throwing out spring 126 interposed between the arm 19 and the bottom of a recess in a disk 122 to which the clutch arm 19 is pivoted and which is also secured to the aforesaid sleeve 18. In this position of the parts the pin 17 can freely revolve without imparting motion to the sleeve but when a key lever is depressed, the depressed lever impinging against a universal bar 71 pivoted to a fulcrum bar 73 by means of arms 72, is thrown downward, such motion serving to rock the aforesaid rock arm 20 through a connecting link 74 pivoted at one end to the universal bar and at the other end to an arm 75 secured to a shaft 76 to which the rock arm is likewise attached. The relation of the parts is such that this rocking movement of the shaft 76 raises the end of the rock arm out of the path of the clutch arm 19, permitting the spring 126 to throw the latter into the path of the pin 17 which thereupon becomes effective to rotate the sleeve 18. Such rotation will continue as long as the key lever remains depressed, but upon the release of the latter the rock arm 20 moving backwards to its original or normal position (by the action of spring 77) interposes a cam face 21 thereon in the path of movement of the rotating clutch arm which upon coming into engagement with the cam face is forced back against the tension of spring 126 and withdrawn from engagement with the driving pin 17. The rock arm 20 is provided with a positive stop face 23, against which the clutch arm rests as long as the sleeve 18 remains stationary.

Motion from the rotating sleeve 18 is transmitted to the carrier shaft 40 by means of a gear 52 on the sleeve which meshes with a gear 51 attached to a shaft 50 mounted in the sides of the casing and carrying a spiral gear 49 meshing with a companion gear 46 mounted on the carrier shaft 40. It is contemplated that the sequential operations, including the arrest of the slide carrier with

the selected slide in alinement with the working point, the shifting of the slide to approximately locate the impressor thereat, the precisionizing of the impressor and the performance thereby of the work for which it is designed, shall all occur during at least one full rotation of the cam sleeve 18, that is, for a single vibration of the rock arm 20 sufficient to release the clutch arm 19 and again reengage therewith when it has nearly completed a single revolution. The ratio of movement of the shaft 40 relatively to the cam sleeve 18 is therefore greater than unity. In further explanation it should here be stated that the shifting movement of the selected slide in its slideway is not begun until the cam sleeve has moved sufficiently to at least impart approximately a full rotation to the slide carrier in order to assure the bringing of the selected slide, whatever its position on the carrier, into line with the working point.

A frictional driving device is interposed between the cam sleeve and the carrier shaft to permit the former to continue its rotary movement even though the latter is restrained from movement by a set stop pin. In this instance the spiral gear 46 is loosely mounted upon the carrier shaft, driving the same through a friction washer 127 in contact with the hub of the gear and a washer 128 while a split collar 129 is adjustably engaged with the shaft for regulating the friction.

Immediately upon the arrival of the selected slide in line with the working point and after the motion of the rotating carrier has been arrested by the engagement of the stop arm 54 with the projected stop pin in the manner hereinbefore described, means will engage with the slide to effect its longitudinal adjustment. The means for accomplishing such shifting movement is in this instance in the nature of an actuator arm 78 having a projecting pin 81 adapted to engage with a socket 29 formed in a projection 28 on the slide. The arm 78 is swung inward to cause its pin to engage with the socket on the slide through the instrumentality of a cam 89 affixed to the cam sleeve 18. The cam operates to actuate the arm through a link 87 upon which is mounted an antifriction roller 88 against which the cam is adapted to bear, this being assured by a return spring 133. That end of the link which is adjacent to the cam sleeve is bifurcated to embrace the sleeve while the other end of the link is connected to an arm 84 through a pivot connection 85, while a joint 86 whose axis is substantially at right angles to that of the pivot connection 85 may be interposed at some point in the link to preclude the cramping of the parts.

The longitudinal movement of the link is transmitted from the arm 84 to the actuator arm 78 to cause the pin on the latter to en-

gage or be disengaged from the socket on the slide, although leaving the actuator arm free to shift the slide in its guideway. The construction disclosed for this purpose comprises a rotatable longitudinally movable shaft 79 to one end of which the actuator arm is attached, while the arm 84 is secured to a sleeve 82 splined to the shaft 79 and rotatable but longitudinally immovable in a bracket 109 secured at the rear of the inclosing casing, as by screws 110. Assuming now that the actuator arm is engaged with the slide, the latter is now ready to be shifted in its guideway to bring the impression device thereon to the working point. This is accomplished in the organization disclosed by lifting the shaft 79 and with it the actuator arm. This lifting of the arm is accomplished through a suitable cam device. In the present instance the reciprocation of the shaft is accomplished by a cam slot 91 in a cam disk 92 and of such configuration as to not only positively move the slide in each direction but also, while the slide remains at rest in its two extreme positions, to lock the slide movement. The cam slot serves to actuate a lever 93 fulcrumed to an upright 94 on the stop pin annulus 56 and having at one end a pin 95 entering the cam slot, the opposite end of the lever being bifurcated and having pins 96 extending inwardly from the side portions of the bifurcated part into an annular groove 97 between separated collars 90 on the shaft 79. Such being the construction, it is plain, assuming the cam slot to be of the proper contour, that a single rotation of the cam sleeve is effective to cause an upward movement of the shaft 79 and subsequently a return thereof to its normal or lowermost position. The cam slot is moreover of such configuration as to cause a dwell during portions of the time consumed in each single rotation of the cam sleeve, a dwell occurring when the shaft 79 is at each extreme position of its reciprocatory movement. During one of these temporary periods of rest, to wit, the one corresponding to that position of the shaft in which the same is in its lowermost position the engagement of the pin on the arm 78 with the socket on the aligned slide will be effected and during the other temporary cessation of longitudinal movement of the slide, the adjustable member, that is, the impressor on the slide, will be positioned by the actuator arm approximately at the working point preceding the performance of the work which it is contemplated that it shall do. Prior to the execution of such work, however, it is desirable in practice in order that satisfactory results shall be obtained, that an adjustable work performing member (impressor) should be more precisely located or precisionized in its definite working position than by the mere shifting of a slide which must necessarily be slidably fitted to its ways to permit it to be

readily shifted therealong and hence is liable to change its position when pressure is brought to bear on the slide; when working, the impressor should, moreover, be as rigid in its working position as may be, in order to eliminate the ill-effects incident to any looseness that the slide might have by reason of the fact that it must be so constructed and related to its guideway as to permit it to be freely slid therealong.

In order to accurately precisionize and fixedly maintain the adjustable member in its working position, means are provided for accurately positioning the slide and firmly pressing the same against its guide faces. This pressure is exerted in the particular construction set forth against the arm 78 at the time when the same shall have been elevated and shall have brought the impressor to the working point. I utilize for exerting such pressure a combined precisionizer and presser arm, such as 100, secured to a shaft 106 journaled in a bearing 102 on the aforesaid bracket 109. The arm 100 during the movement which effects its engagement with the actuator arm 78 operates to precisionize the longitudinal position of the slide in its guideway, and the illustrated construction for effecting this comprises a socket 99 on the arm whose upper and lower walls are inclined toward each other, and a correspondingly inclined projection 98 on the rear edge of the arm 78.

The arm 100 is swung about the axis of the shaft 106 through the instrumentality of a cam 26 on the cam sleeve adapted to cooperate with an antifriction roll 107 mounted on a link 105 bifurcated to embrace and be thereby guided by the cam sleeve and adjacent to the opposite end having a connection through the pivotal joint 104 with a rock arm 103 secured to the shaft 106. A joint 130 similar to the joint 86 may be interposed in the link for the purpose of permitting freedom of action as the angle between the connected parts changes with their movement, and a returning spring 134 is provided for pressing the roll against the cam. The angular movement of the shaft 106 takes place after the shaft 79 has been raised to bring the impressor substantially into its ultimate working position.

So far as the construction, organization and operation of the selecting, locating, precisionizing and locking mechanism is concerned, it is obviously not restricted in its use or application to any particular mode or character of working which the adjustable member performs. I have by way of illustration, however (such representation not therefore being in any sense a limitation), indicated a platen for cooperating in succession with the successively selected, located, precisionized and locked impressors. In the conventional representation thereof set forth

the platen is designated by 53. The platen comprises an impression face 111 of yielding material secured to a sleeve 112 mounted upon a shaft 120 extending between arms 121, 122; the former arm is secured to a shaft 114, mounted in a bearing 115 extending from the side of the inclosing casing. The shaft 114 is held from longitudinal displacement in one direction by a collar 117 and a nut 116 secured to a shaft, and in the opposite direction by the hub of an arm 130 by which latter a to-and-fro or vibratory movement is imparted to the platen from a cam projection 123 on the clutch disk 122 adapted to contact with a cam roll 124 on the connecting link 119. The arm 122 comprised in the platen-carrying frame is secured to a short shaft mounted in bearing 131 on the opposite side of the inclosing casing, this arm being held from displacement by suitable nuts 132, 132. A spring 135 insures the proper cooperation of the cam with the cam roll, and the operation of the cam is so timed with relation to the operation of the other cams already described, that the platen is caused to cooperate with each impressor when the same shall have been precisionized as to position and the slide upon which the impressor is mounted is pressed against the faces of its guideway. The configurations of the cams and their relative timing are so coördinated as to cause the return of the parts after actuation in proper order to their normal positions following which a recurrence of the operations as hereinbefore described takes place upon another depression of a key lever.

The operation of a mechanism such as has been described is as follows: Assuming the driving shaft 14 to be in rotation and that a key lever is depressed, two effects concur with such depression, namely, the setting of the stop pin 58 connected to the lever and the swinging of the rock arm 20 out of the path of the clutch lever 19. The latter concurrently with this latter movement takes a position in the path of the revolving pin 17 and rotary movement is imparted to the cam sleeve 18. Thereupon the slide carrier is rotated through the intermediate transmitting gears until the stop arm 54 on the carrier shaft 40 contacts the set stop pin. The organization, as already adverted to, is such that an amount of movement is given to the shaft 40 before any of the cams come into action, sufficient to bring any slide on the slide carrier into alignment with the working point. When the selected slide shall have aligned with the working point and the movement of the carrier shaft has been arrested, the movement of the actuator arm 78 inward to engage its pin 81 with the socket on the selected slide follows in response to the action of the cam 89. Thereupon the shaft 79 is shifted longitudinally in its bearings by

the cam slot 91 and the impressor on the slide brought substantially to the working point. The cam 26 now comes into action rocking the combined precisionizing and presser arm 100 until the socket 99 thereon engaging with the projection 98 on the edge of the actuator arm, the latter is thereupon forced inward, and as a result precisionizes and rigidly holds the slide with the impressor in its exact working position. The working of the adjustable device or member (impressor) now takes place; that is to say, in this case the platen 53 is rocked against the same by the action of the cam projection 123 against the cam roll 124. The parts now return to their former position as the cam sleeve 18 approaches the completion of its full rotation, the presser arm first releasing the actuator arm through the action of spring 134. After this the shaft 79 is caused to descend, the slide drawn downward (assuming that the actuating pressure on the key lever is released) and the cam face 21 on the rock arm 22 contacting with the clutch arm 19, withdraws the same from engagement with the actuating pin 17. The parts are now ready for passing through another cycle of movements as before.

Having thus described my invention, I claim—

1. The combination with a plurality of adjustable work-performing members, of a carrier, a plurality of slides supporting said work-performing members and mounted on said carrier, means for selecting a slide to the exclusion of the others, means for shifting the said slide and locating the selected member thereon in the approximate working position of the said member, and a device for engaging the shifting means for accurately precisionizing the position of the slide and the work performing member and for rigidly holding the same during the working thereof.

2. The combination with a carrier, of a plurality of slides mounted to be freely shiftable thereon, a selective mechanism, a locator for shifting the selected slide to approximately a predetermined position, and a precisionizing device operative upon the shifting device for compelling the same to give to the selected slide its final position.

3. The combination with a carrier provided with a plurality of guideways each having convergent faces adjacent to its mouth, of a slide fitted to each guideway to be freely shiftable therethrough, a selective mechanism, a locator for shifting the selected slide to approximately its predetermined position, and a precisionizing device for then engaging said locator for giving to the slide its final position and wedging it in the guideway.

4. The combination with an adjustable carrier provided with a plurality of guideways each having convergent faces adjacent

to its mouth, of a slide fitted to each guideway to be freely shiftable therethrough, a selective mechanism, a locator for shifting the selected slide to approximately its predetermined position, and a precisionizing device for then engaging said locator for giving the slide its final position and wedging it in the guideway.

5. The combination with an adjustable carrier, of a plurality of slides mounted to be freely shiftable thereon, work performing members on the slides, a selective mechanism, locating means adapted to engage with a selected slide and shift the work performing member thereon to its approximate working position, a combined precisionizer and locker for then engaging the locating means and accurately positioning and rigidly holding the precisionized slide means and means for operating the locating means and the precisionizer in proper sequence.

6. The combination with a plurality of slides, of ways on which the slides are shiftable, work performing members mounted on the slides, selective mechanism, a locator for shifting a selected slide for thereby locating the work-performing member thereon in its approximate working position, a slide precisionizer for engaging the locator and pressing the slide in its ways, a driving shaft and cams operative therefrom for effecting a sequential operation of the locator and precisionizer.

7. The combination with a plurality of slides supporting work-performing members, of a selective mechanism, an actuator arm adapted to engage with a selected slide, means for then shifting the actuator arm and with it the engaged slide, and a precisionizer arm for finally precisionizing the position of the adjusted slide and for engaging the actuator arm.

8. The combination with a plurality of slides supporting work-performing members and shiftable in ways, of a selective mechanism, an actuator arm adapted to engage with a selected slide, means for then shifting the actuator arm and with it the engaged slide, and a precisionizing arm adapted to exert a pressure upon the actuator arm and press the slide to its ways.

9. The combination with a plurality of slides supporting work-performing members, of a selective mechanism, an actuator arm common to all the slides and adapted to engage with a selected slide, means for then shifting the actuator arm and with it the engaged slide, a precisionizing arm oscillatory to engage the actuator arm and coöperative therewith, and a projection on one arm having inclined walls adapted to enter a socket on the other arm.

10. The combination with a plurality of slides supporting work-performing members, of a selective mechanism comprising a plu-

5 rality of settable stop pins, an actuator arm adapted to engage with a selected slide, means for then shifting the actuator arm and with it the engaged slide, a precisionizing arm provided with precisionizing faces, and means for actuating the precisionizing arm.

10 11. The combination with a plurality of slides supporting work-performing members, of a selective mechanism comprising a plurality of settable stop pins, an actuator arm adapted to engage with a selected slide, cam controlled means for then shifting the actuator arm and with it the engaged slide, a precisionizing arm provided with precisionizing faces, and cam controlled means for actuating the precisionizing arm.

15 12. The combination with a carrier and a plurality of slides mounted thereon and supporting work-performing members, of a selective mechanism comprising a plurality of settable stop pins, an actuator arm adapted to engage with a selected slide, means for then shifting the actuator arm and with it the engaged slide, a precisionizing arm provided with precisionizing faces, and means for actuating the precisionizing arm.

20 13. The combination with a carrier and a plurality of slides mounted thereon and supporting work-performing members, of a selective mechanism comprising a plurality of settable stop pins, an actuator arm adapted to engage with a selected slide, cam controlled means for then shifting the actuator arm and with it the engaged slide, a precisionizing arm provided with precisionizing faces, and cam controlled means for actuating the precisionizing arm.

25 14. The combination with means cooperative with a member carried upon a slide shiftable in ways, of a slide-gripper; means for causing the same to grip a slide without jamming the same in the ways; means for shifting the gripper for shifting the member upon the slide into the region of activity of the cooperative means and means for engaging the gripper for jamming the slide in the ways.

30 15. The combination with means cooperative at a fixed point with a member carried upon a slide shiftable in ways, of a slide-gripper; means for causing the same to grip the slide without jamming the slide in the ways; means for shifting the gripper to shift the slide into the region of activity of the cooperative means; means to engage the gripper to jam the slide in the ways; means for actuating the cooperative member; means for releasing the jamming means; means for returning the gripper; and means for releasing the gripper from the slide.

35 16. The combination with an arm, of means for causing the arm to loosely engage a slide; means for causing the arm to shift the slide while loosely engaging it; means for causing the arm to tightly engage the

slide; means for releasing the tight engagement; means for returning the gripping arm while in loose engagement; and means for releasing the slide.

17. The combination with a machine element organized to engage a member shiftable upon the guides, of a plurality of drivers; means controlled by one of the drivers to actuate the element to engage the member loosely; means controlled by one of the drivers to shift the element while under the control of its driver to bring the member from its idle to its working position, to hold it at its working position and to return it to its idle position; a machine element controlled by one of the driver to engage the member-engaging element, precisionize the same and jam it against the member and the member upon its guides while held at its working position and to release the member to the hold of the element.

18. The combination with a machine element organized to engage a member shiftable upon guides from an idle to a working position and return, of a plurality of drivers; means controlled by one of the drivers to actuate the element to engage the member loosely; means controlled by one of the drivers to shift the element while under the control of its driver to bring the member from its idle to its working position; means controlled by one of the drivers to jam the element against the member and the member upon its guides while held in its working position by the driver controlling the shifting means, and to release the member to the loose hold of the element and the element to the control of its driver and return the member to its initial or idle position.

19. The combination with a machine element organized to engage a member shiftable in ways to bring a position thereof to a predetermined point, of a plurality of drivers; means controlled by one of the drivers to actuate the element to engage the member loosely; means controlled by one of the drivers for shifting the element while under control of its driver and loosely holding the member; means controlled by one of the drivers for jamming the element against the member and the member in its ways, while held in the shifted position by the driver controlling the shifting means, and to release the member to the loose hold of the element.

20. The combination with an arm organized to grip a slide mounted in ways to bring a member carried thereby to a fixed point, of means for actuating the arm to grip the slide loosely; means for shifting the gripping arm while loosely holding the slide; means for jamming the arm against the slide and the slide in its ways, the initial arm actuator and the arm shifter nevertheless retaining their positions during the jamming, whereby upon its release by the jamming means they will

receive the slide where taken from them; and means for returning the arm to its initial position.

21. The combination with an arm organized to engage a slide shiftable in ways, of a plurality of drivers; means controlled by one of the drivers to actuate the arm to engage the slide loosely; means controlled by one of the drivers to shift the arm while under the control of its driver to bring a tool upon the slide from an idle to a working position and return it to idle position, and to hold it at working position; a member controlled by one of the drivers to engage the arm, after it has shifted the slide to working position, precisionize the arm and cause the same to precisionize the slide and jam the arm against the slide and the slide into its ways while held at working position by the control of the shifting means driver and to release the slide to the hold of the arm before the return shift.

22. The combination with a reciprocatory rock-shaft, of an arm mounted upon the rock-shaft and organized to engage a slide shiftable in ways; a plurality of connected drivers; means controlled by one of the drivers to rock the shaft and cause the arm to engage the slide loosely; means controlled by one of the drivers to impart an excursion to the rock-shaft while held in its rocked position by its driver; a rock-shaft; an arm thereon to engage the slide-engaging arm; and means controlled by one of the drivers to rock the shaft and cause the arm to engage the slide-engaging arm after the excursion to the reciprocatory rock-shaft and while so held by its driver to precisionize the slide.

23. The combination with a reciprocatory rock-shaft, of an arm mounted upon the rock-shaft and organized to engage a slide shiftable in ways; a cam-shaft; a plurality of cam-wheels upon the shaft; means controlled by a cam face on one of the wheels to rock the shaft and cause the arm to engage the slide loosely; means controlled by a cam face on one of the wheels to impart an excursion to the rock-shaft while held in its locked position by an idle face of its cam-wheel; a rock-shaft; an arm thereon to engage the slide-engaging arm; and means controlled by a cam face of one of the wheels to rock the shaft and cause the arm to engage the slide-engaging arm after the excursion to the rock-shaft and while so held, by an idle face of its cam wheel, to precisionize the arm and cause the same to precisionize the slide.

24. The combination with a shaft, of an actuator mounted upon the shaft; a sleeve splined upon the shaft and incasing a considerable portion thereof; a casing surrounding the sleeve acting as a bearing and the

sleeve as a bushing for the shaft; a stationary sleeve surrounding the shaft between the splined sleeve and the actuator; means for reciprocating the shaft through both sleeves; and means for oscillating the splined sleeve.

25. The combination with an arm, of a slide, means for causing the arm to loosely engage said slide, means for causing the arm to shift the slide while loosely engaging it, and means for causing the arm to tightly engage the said slide.

26. The combination with an arm, of a slide, means for causing the arm to loosely engage said slide, means for causing the arm to shift the slide while loosely engaging it, means for causing the arm to tightly engage the said slide, and means for returning the gripping arm while in loose engagement with the slide.

27. The combination with a plurality of adjustable work-performing members, of a carrier, a number of slides supporting said work-performing members and shiftable mounted upon said carrier, means for selecting a slide to the exclusion of the others, means for shifting the said slide and locating a selected member thereon in approximately the working position of said member, and a device for accurately precisioning the position of the slide and the selected work-performing member thereon for rigidly holding the same during the working thereof.

28. The combination with a carrier, of a plurality of slides mounted to be freely shiftable thereon, selective mechanism, a locator for shifting the selected slide to approximately a predetermined position, and a precisioner operative for bringing the same to its final position.

29. The combination with a carrier, of a plurality of slides mounted to be freely shiftable thereon, a plurality of selective devices carried by each slide, selectors for said devices, means controlled by the selectors for shifting the carrier, a locator for shifting a selected slide to approximately a predetermined position, a precisionizer for bringing said slide to its final position, and means controlled by the selector for sequentially actuating said locator and precisionizer.

30. The combination with a plurality of shiftable slides, of selective mechanism, means controlled by the selective mechanism for shifting a selected slide to approximately its working position, and means for bringing said slide to its precise working position.

Signed at Nos. 9-15 Murray St., New York, N. Y., this 21st day of April, 1903.

FRANCIS H. RICHARDS.

Witnesses:

FRED. J. DOLE,

JOHN O. SEIFERT.