Nov. 1, 1932. D. V. MAZZOCCO 1,885,532

PHOTOMECHANICAL MACHINE

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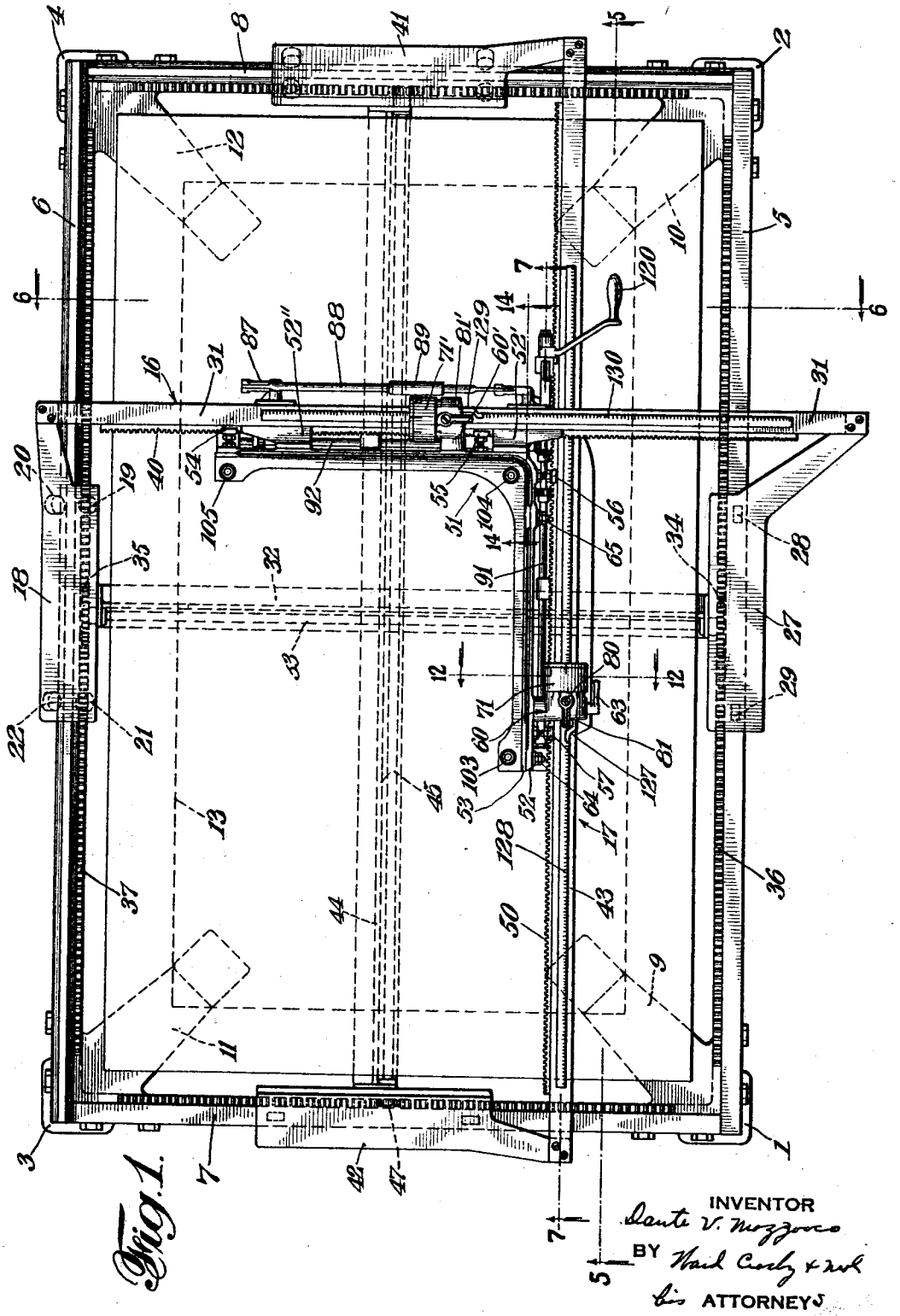


Fig. 1.

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PHOTOMECHANICAL MACHINE

Filed Aug. 2, 1930 7 Sheets-Sheet 2

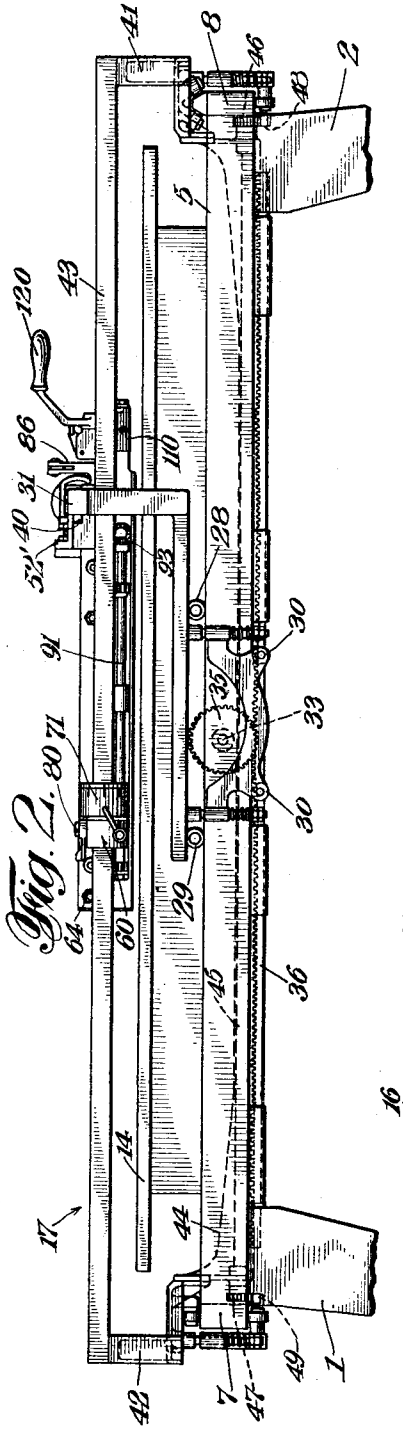


Fig. 2.

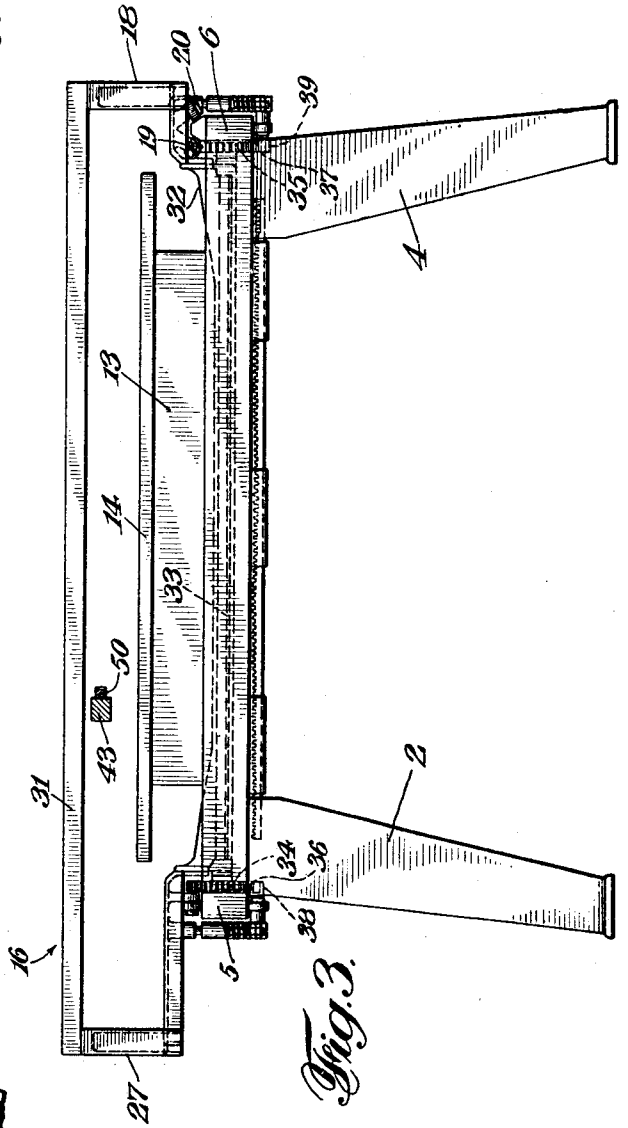


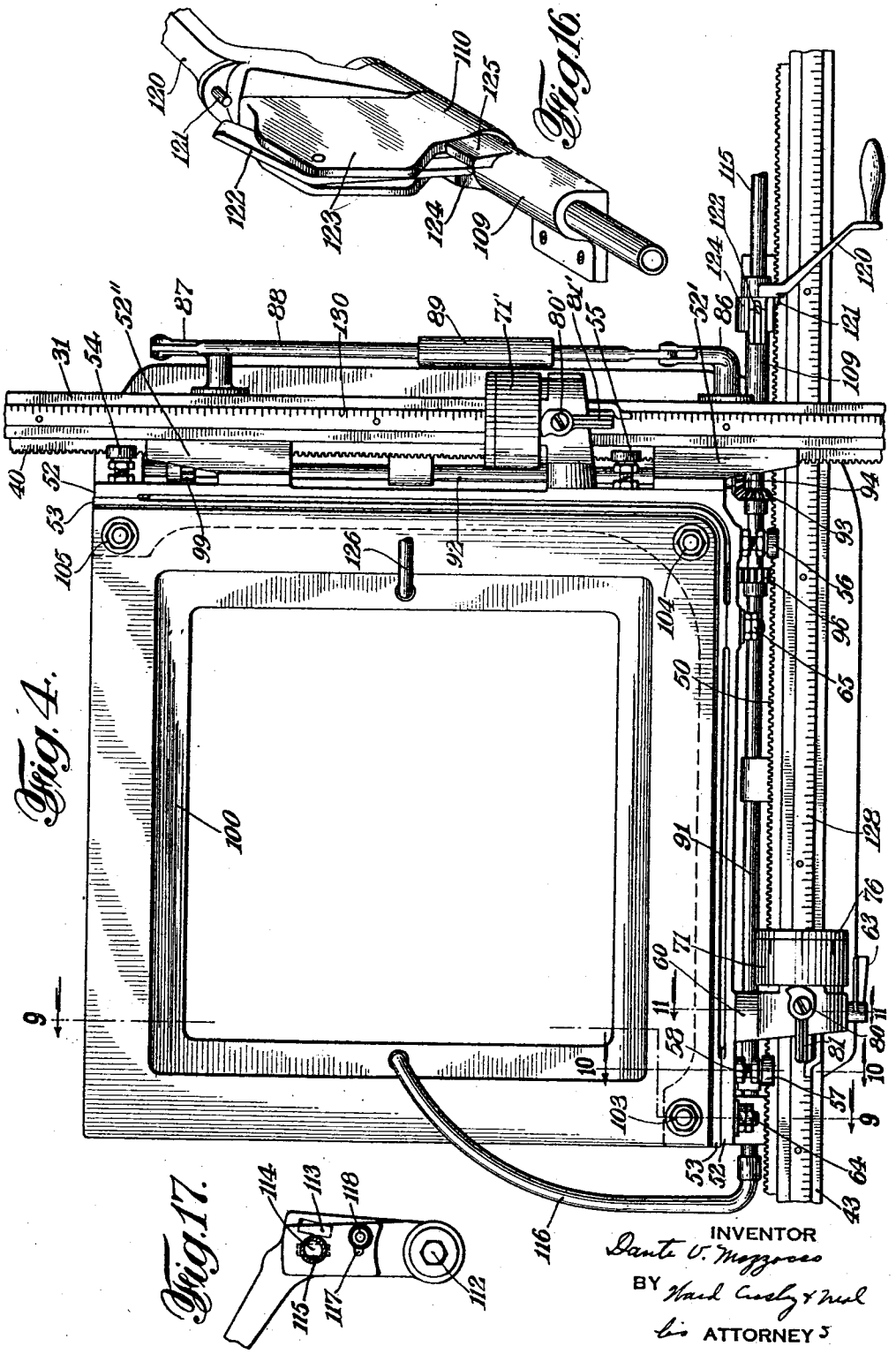
Fig. 3.

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PHOTOMECHANICAL MACHINE

Filed Aug. 2, 1930 7 Sheets-Sheet 3



Nov. 1, 1932. D. V. MAZZOCCO 1,885,532

PHOTOMECHANICAL MACHINE

Filed Aug. 2, 1930 7 Sheets-Sheet 4

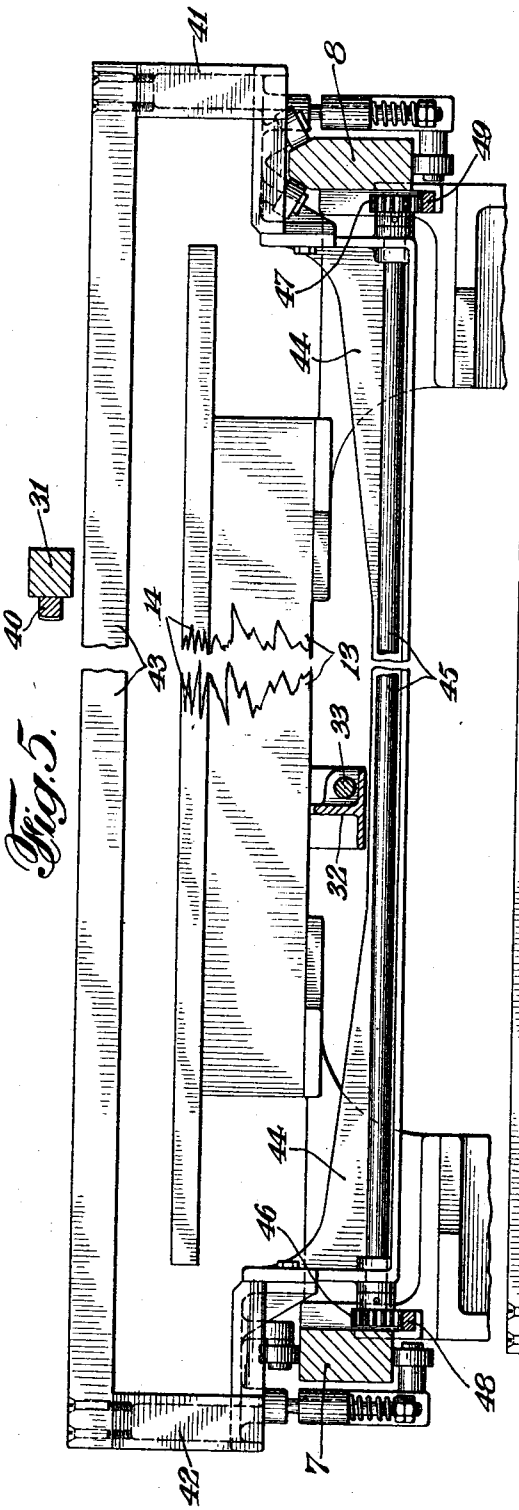


Fig. 5.

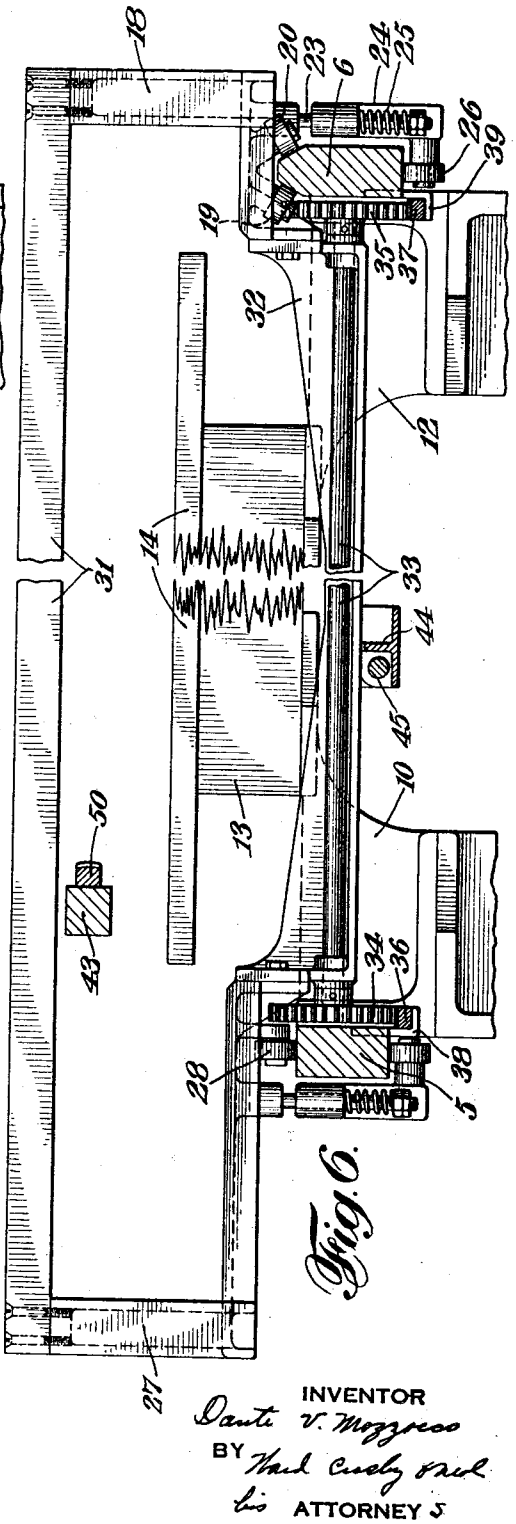


Fig. 6.

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Nov. 1, 1932. D. V. MAZZOCCO 1,885,532

PHOTOMECHANICAL MACHINE

Filed Aug. 2, 1930 7 Sheets-Sheet 5

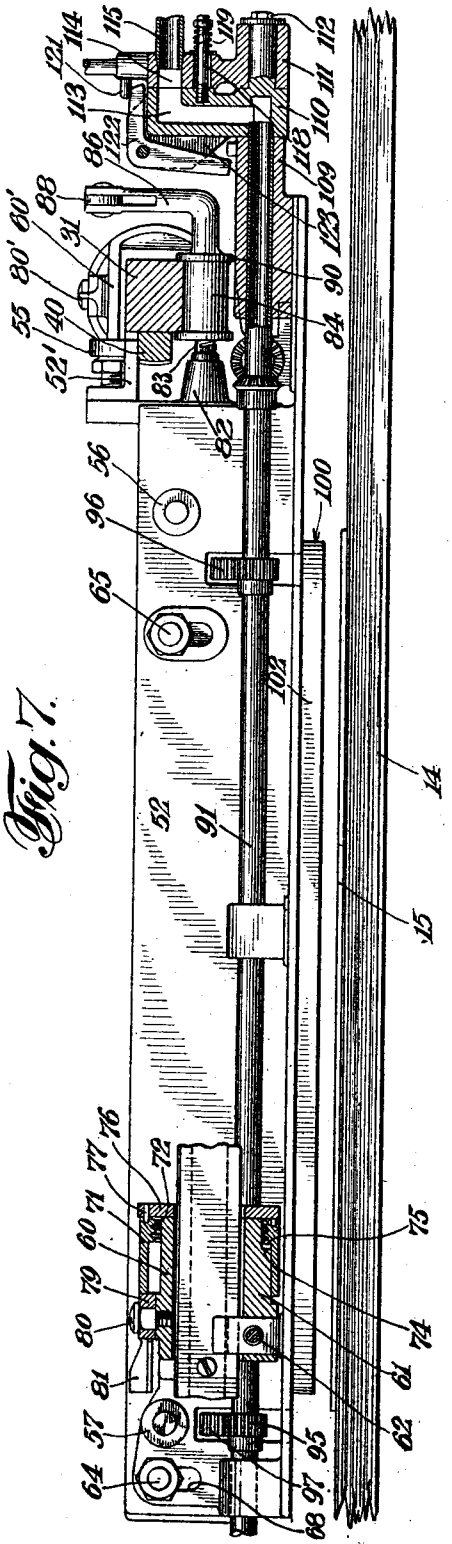


Fig. 7.

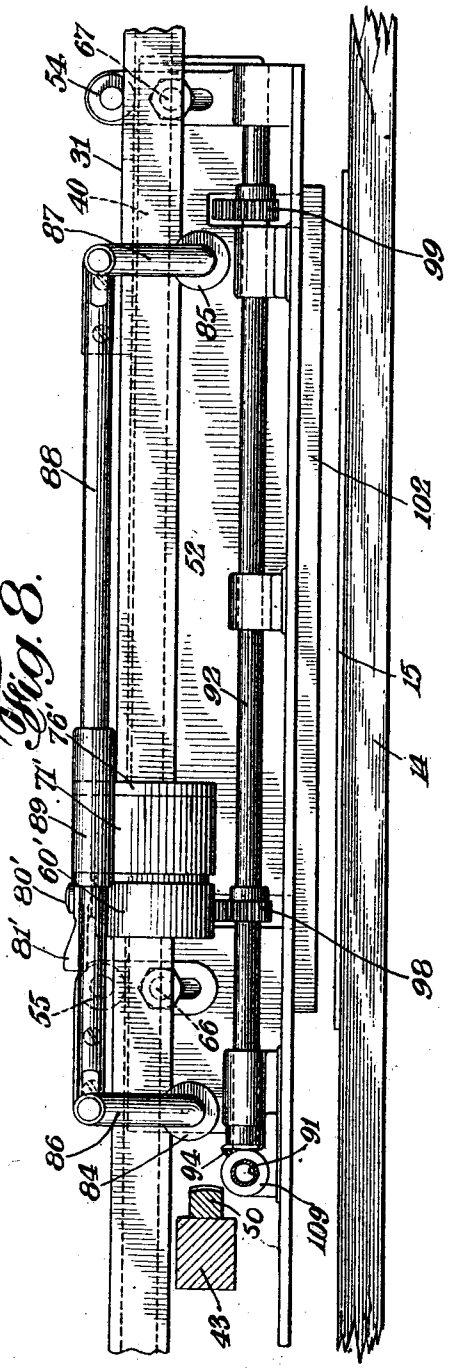


Fig. 8.

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PHOTOMECHANICAL MACHINE

Filed Aug. 2, 1930 7 Sheets-Sheet 6

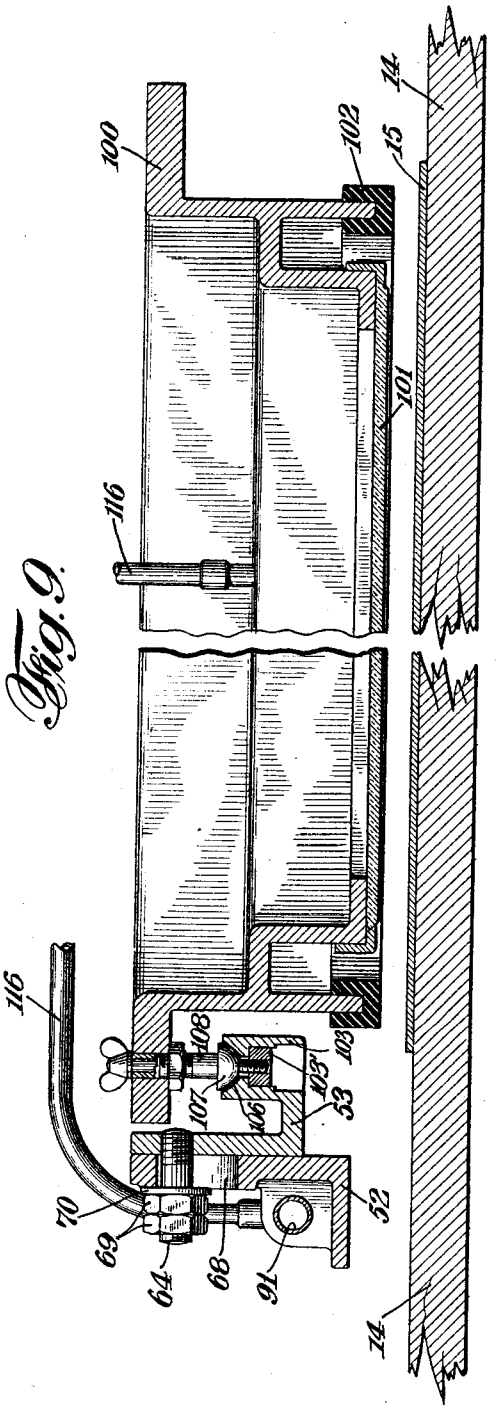


Fig. 9.

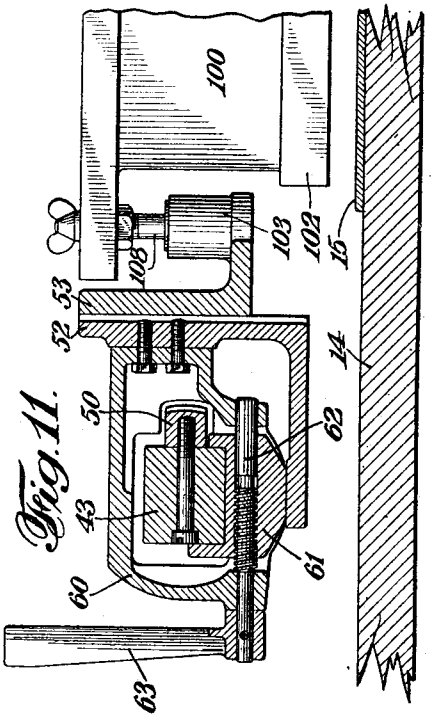


Fig. 11.

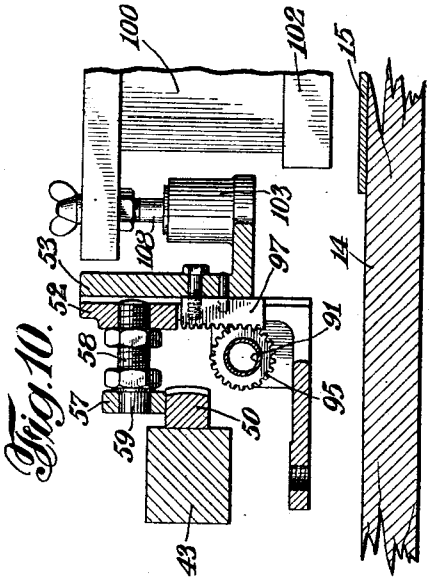


Fig. 10.

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PHOTOMECHANICAL MACHINE

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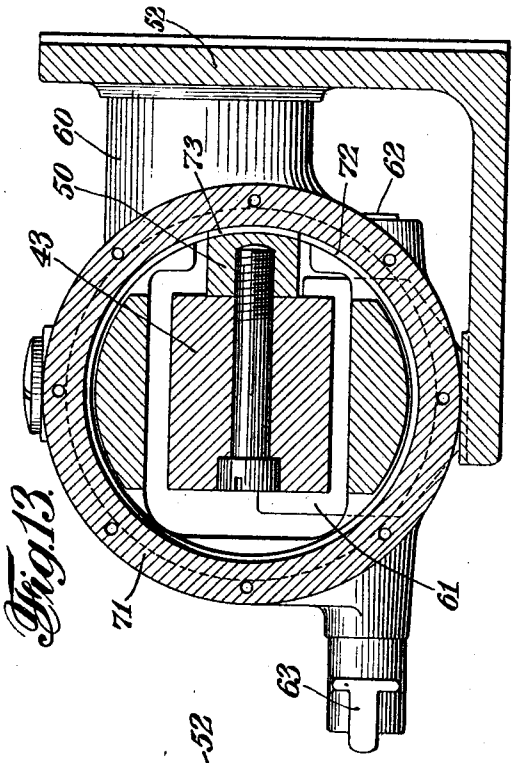


Fig. 13.

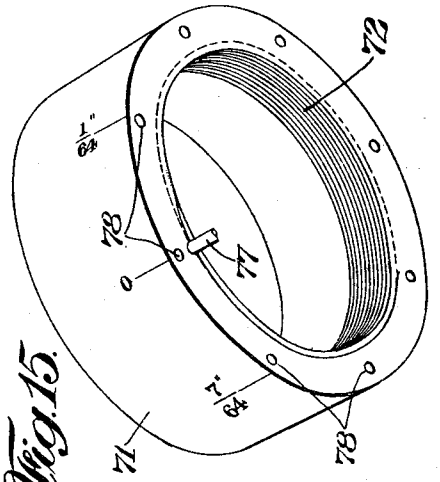


Fig. 15.

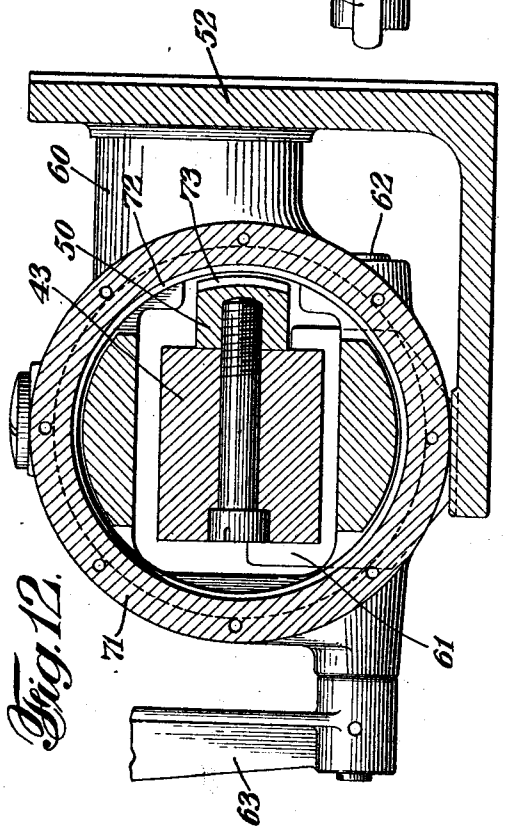


Fig. 12.

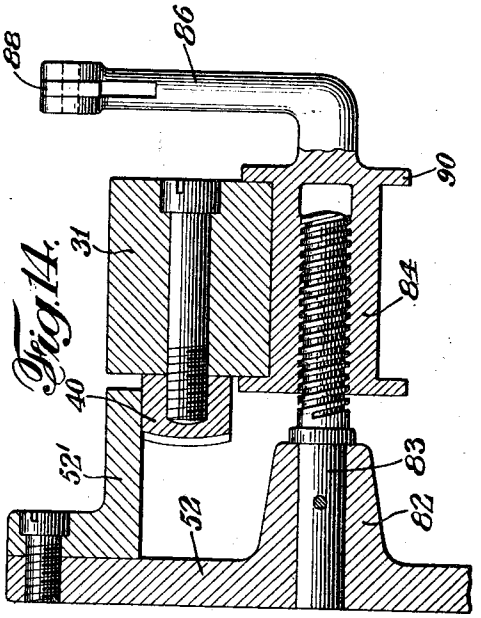


Fig. 14.

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UNITED STATES PATENT OFFICE

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PHOTOMECHANICAL MACHINE

Application filed August 2, 1930. Serial No. 472,598.

This invention relates to photo-mechanical machines, i. e. machines for reproducing a design or image from a photographic plate onto a sensitized surface, and more particularly to a machine for repeating and properly spacing a design or image to be reproduced from a photographic plate onto a sensitized surface.

In the present form of the invention a machine of the form of a photo-composing machine is shown.

An object of the invention is to produce a comparatively simple, efficient and accurate machine of the character described in which the relative movement and setting of the photographic plate with respect to the sensitized surface may be effected without the necessity of motive means, and in which the machine may be easily operated for rapidly and reliably producing the image from the photographic plate onto the sensitized surface.

Another object of the invention is to produce a machine of accurate and efficient operation and which may be produced at a relatively small cost as compared to present machines capable of handling the same class of work.

The invention consists in the novel features, arrangements and combinations of parts embodied by way of example, in the apparatus hereinafter described, as illustrating a preferred form of the invention, and the invention will be more particularly pointed out in the appended claims.

Further and more specific objects, features and advantages will more clearly appear from the detailed description give below taken in connection with the accompanying drawings which form a part of this specification.

In the drawings:

Fig. 1 is a plan view of the apparatus illustrating the present preferred form of the invention, and from which the vacuum frame has been omitted for purposes of clarity,

Fig. 2 is a front elevation of the major portion of the same shown in Fig. 1,

Fig. 3 is an end elevation of the same with certain parts removed for purposes of clarity,

Fig. 4 is an enlarged fragmentary view showing certain features of the apparatus in greater detail including the vacuum frame,

Fig. 5 is a sectional view taken at 5—5 of Fig. 1 with the parts on a somewhat larger scale,

Fig. 6 is a sectional view taken at 6—6 of Fig. 1 and similarly enlarged,

Fig. 7 is a sectional view taken at 7—7 of Fig. 1 and similarly enlarged,

Fig. 8 is a side elevation of certain features of Fig. 4 as viewed from the right-hand side.

Fig. 9 is a sectional view taken at 9—9 of Fig. 4 on a similar enlarged scale, and serves to illustrate the relative position of the vacuum frame and photographic plate carried thereby relative to the sensitized surface carried by the table, in one of the relative positions of the parts,

Fig. 10 is a sectional view taken at 10—10 of Fig. 4 on a somewhat enlarged scale,

Fig. 11 is a sectional view taken at 11—11 of Fig. 4 on a similar scale,

Fig. 12 is a sectional view taken at 12—12 of Fig. 1 on an enlarged scale,

Fig. 13 is a similar view with the parts in a different position of illustration,

Fig. 14 is a sectional view taken at 14—14 of Fig. 1 with the parts similarly enlarged,

Fig. 15 is an enlarged view showing the interiorly threaded sleeve member of Figs. 12 and 13 in perspective and illustrating the means of calibrating the same for finer adjustments,

Fig. 16 is a detail perspective view, and

Fig. 17 is a detail sectional view.

Referring to the drawings and more particularly to Figs. 1 and 2, the apparatus is suitably supported on legs 1, 2, 3 and 4. To these legs are rigidly attached by suitable means longitudinal rails 5, 6, and transverse rails 7 and 8; the rails 5 and 6 providing a track for supporting a longitudinally movable carriage and the rails 7 and 8 providing a track for supporting a transversely movable carriage; the rails 6 and 8 each being provided with upwardly and inwardly converging guide surfaces and the rails 5 and 7 in the present embodiment being provided with flat

upper surfaces. In the present embodiment the legs 1, 2, 3 and 4 together with the rails 5, 6, 7 and 8 form what might be termed the supporting structure of the apparatus.

Sensitized surface support

A sensitized surface, such for example as a zinc plate suitable coated for photographic purposes is adapted to be supported on the apparatus in the following manner. Arms 9, 10, 11 and 12 (Fig. 1) are suitably rigidly attached to the respective corners of the supporting structure above described and extend inwardly rigidly supporting from their inner ends a rigid table base 13 carrying a sensitized surface table 14 which is provided with a substantially flat horizontal upper surface which is adapted to support (Fig. 9) a member 15 which will be referred to for purposes of convenience as a sensitized surface. The table 14 is so positioned vertically that it lies substantially above the upper surfaces of the rails 5, 6, 7 and 8 and is spaced substantially inwardly thereof (Figs. 2 and 3), the purposes of which will be more apparent following.

Carriages

Carriages which will be designated in their entirety as 16 and 17 are supported respectively from the longitudinal and transverse tracks above described and are adapted to be freely moved in respectively longitudinal and transverse directions.

The carriage 16 is constructed and arranged as follows. An end member 18 of the carriage is provided with a wheel support formed with downwardly extending portions rotatably supporting thereon pairs of wheels 19, 20 and 21, 22, which are provided with frictionless bearings such for example as ball bearings to facilitate free movement of the carriage. The pairs of wheels are positioned in bifurcated arrangement so that the inner surfaces of respective pairs of wheels are positioned in true rolling engagement with the inclined guide surfaces of the rail 6. Studs 23 (only one of which is shown in Fig. 6) project downwardly from the end 18 and a wheel carrier 24 is slidably positioned thereon and is resiliently held upwardly by means of compression springs such as 25. Wheels such as 26 are suitably supported on spindles formed integral with the member 24, are preferably journaled on ball bearings and are in resilient engagement with the under side of the rail 6. The wheels such as 26 are each in vertical alignment with the pairs of wheels 19 and 20 and 21 and 22. It will therefore be seen that the end 18 of the carriage is thus held in such engagement with the rail 7 that while free sliding movement along the rail is provided the member is nevertheless restricted to a straight line movement parallel to the axis of the rail 6.

The end member 27 is provided with downwardly extending portions for supporting the wheels 28 and 29 which are also of the frictionless type and which are supported on the top surface of the rail 5; and wheels such as 30 of a character similar to the wheels 26 are similarly resiliently held against the under surface of the rails 5, thereby serving to yieldably hold the wheels 28 against the upper surface of the rail. A cross bar 31 is rigidly attached at its respective ends to the end members 18 and 27. It is to be particularly noted that the end members 18 and 27 are offset outwardly with respect to the rails 5 and 6 for the purpose of providing proper clearance for movement of the photographic plate and in order that the same might be positioned along the marginal edges of the table 14. A transverse shaft hanger 32 is rigidly secured at its respectively opposite ends to the inner sides of the end members 18 and 27 and carries journaled therein a torque shaft 33 provided at its respectively opposite ends with pinion gears 34 and 35 which are in respective mesh with the rack bars 36 and 37 supported respectively by brackets 38 and 39 attached to the rails 5 and 6. This arrangement provides for equalization of the ends 18 and 27 of the carriage 16 in their movement along their respective rails. It will therefore be seen that the carriage 16 is provided for free sliding movement along its track in a direction parallel thereto, and by so doing the cross bar 31 always extends in a direction normal to its path of movement. The cross bar 31 (Figs. 1 and 5) carries rigidly secured to its inner face the rack bar 40, whose purposes will be more fully described in connection with the support of the vacuum frame carrier.

The other carriage 17 is constructed in a manner substantially identical with the carriage 16, and accordingly will only be referred to briefly in order to designate its respective parts. The end member 41 is supported on its rail 8 in the same manner as above described in connection with the end member 18 and its rail 6. The other end member of the carriage 17 is designated as 42 and is supported on its rail 7 in the same manner as above described in connection with the end 27 and its rail 5. A cross member 43 similarly serves to connect the end members 41 and 42. Similarly a shaft hanger 44 provides for the support of the torque shaft 45 which carries at its respectively opposite ends spur gears 46 and 47 in engagement with respective rack bars 48 and 49 supported from the rails 7 and 8 in a manner similar to that heretofore described with respect to the rack bars 36 and 37. Accordingly, it will be seen that the carriage 17 is adapted for free sliding movement along its track in a direction parallel to the axis thereof and so held in position that the cross bar 43 will always extend

at right angles to its direction of movement. The cross member 43 (Fig. 6) carries attached to its inner face a rack bar 50 which corresponds to the rack bar 40 above described and which in conjunction therewith serves to support the vacuum frame carrier as will be apparent following.

From the foregoing it will be seen that the respective carriages are adapted for free lineal movement in directions always at 90° one to the other. By the construction and disposition of the parts heretofore described the carriages are adapted to be moved back and forth freely by hand and without any undue effort. This is a feature of importance in the present invention where provision is made for moving the photographic plate into approximately its exact predetermined position by hand and without the necessity of the usual motive means heretofore usually employed. Furthermore it is to be noted at this time that the end member 27 (Fig. 1) is offset to such an extent that the cross bar 43 may be moved outwardly beyond the rail 5 (Fig. 6); and that the other end members of the carriages are offset to such an extent that the cross bar 31 may be moved into a position substantially over the rail 6.

Negative frame carrier

Referring more particularly to Figs. 1, 4 and 9, a negative frame carrier will be designated in its entirety as 51 (Fig. 1). This carrier, as will be seen more clearly with reference to Figs. 4, 9, 10 and 11, comprises two main parts which will be designated as 52 and 53. The part 52 is supported jointly from the carriages 16 and 17 by means of the wheels 54, 55, 56 and 57; it being noted that the wheels 54—55 and 56—57 are supported in rolling engagement on the respective rack bars 40 and 50 which are carried respectively by the carriage cross members 31 and 43 (Fig. 1). Each of the wheels 54, 55, 56 and 57 is supported from (Fig. 10) a spindle stud such as 58 which is screw threaded into the member 53 and which is provided with a lock nut to lock the stud in the desired radial adjustment. Each stud is provided with an eccentrically formed axle 59 for supporting its respective wheel; the provision of eccentrics on the studs providing for adjusting the carrier 51 with respect to the sensitized surface. The member 52 is provided with a housing 60 which is rigidly attached thereto and which partially surrounds the cross bar 43 and rack bar 50 carried thereby. This housing supports a grooved block 61 which is normally freely slidable with respect to the bar 43 and which is supported by a threaded screw jack 62 freely rotatably mounted in the housing 60 and in threaded engagement with the block 61. Jack screw 62 is provided with a hand lever 63. Provision is thus made for normally permitting free sliding movement of the frame 52 longitudinally of the bar 43 while attaching the frame 52 to the bar 43 for movement therewith in a direction transverse to its axis. The jack screw 62 and its cooperating block 61 are adapted for moving the frame 52 and cross bar 43 toward and away from each other for the purposes to be hereafter more fully referred to.

As will be seen more clearly from Figs. 7, 8 and 9, the frames 52 and 53 are held together by a plurality of studs 64, 65, 66 and 67, the arrangement and mode of operation of which will be best understood by reference to Fig. 9, which shows one of these studs as illustrative of the arrangement of each. The stud 64 is rigidly attached to the frame 53, as by threaded engagement, and passes through a vertical slot 68 arranged in the frame member 52 and the other end of the stud is threaded for lock nuts designated as 69, between the under face of which and the outer face of the member 52 is interposed a washer 70; the parts being so positioned and adjusted that vertical sliding movement is permitted between the members 52 and 53 while preventing movement in a horizontal direction.

From an understanding of the above and by reference to Fig. 1 it will be seen that the carrier 51 is free to be moved in a horizontal direction over the table 14 with reference to the sensitized surface which the table is adapted to support. When the carrier is moved in a longitudinal direction the carriage 16 is movable therewith and the carrier and carriage are movable with respect to the carriage 17; and conversely when the carrier 51 is moved in a transverse direction the carriage 17 is movable therewith and the carrier and carriage 17 thus move relative to the carriage 16. Furthermore, when the carrier 51 is moved in a direction intermediate the longitudinal and transverse directions, such as in a diagonal direction, and when the carrier is adjusted for free movement with respect to both carriages, both carriages are moved and simultaneously there is a relative movement of the carrier relative to the carriages longitudinally of the bars 31 and 43 thereof. Furthermore, the inner frame member 53 of the carrier 51 is movable vertically with respect to the table 14 and sensitized surface adapted to be carried thereon. The mechanism for determining the proper adjustment of the parts and for suitably controlling the predetermined registration between the sensitized surface and photographic plate will now be fully described.

Adjustment means and registration locking mechanism

It will be understood that in the normal operation of the machine it is desired to move the photographic plate into a definite predetermined position, and that upon the preci-

sion with which this positioning takes place depends the accuracy of the machine. This position is determined with respect to directions which extend at 90° to each other, and accordingly it is usually the custom to move the plate in different successive positions in one direction and then in a direction exactly 90° thereto. Accordingly, it is customary in operating the mechanism described herein to adjust the plate carrier first rigidly in one of these directions and then move it in the other direction at 90° thereto into its proper position. Accordingly the means now to be described is provided for locking the carrier 51 to one of the cross bars 31 and 43 while permitting its movement relatively along the other of the bars 31 and 43, and when the desired position in that direction has been reached to accurately lock the carrier in registration position.

Referring more particularly to Figs. 1 and 12, it will be seen that an internally screw threaded sleeve 71 surrounds the bar 43 and rack bar 50 secured thereto; the threads of the sleeve 71 being designated as 72 (Fig. 15). The threads 72 are formed for cooperative meshing engagement with the threads 73 formed on the rack bar 50, which are of screw threaded formation in the present embodiment of the invention. In order to fulfill their desired functions the threads 72 and 73 preferably have gradually sloping sides such for example as the Acme type thread. The sleeve 71 is supported from the member 52 by means of the housing 60 heretofore referred to and is so supported therefrom as to permit rotation of the sleeve 71 while restricting it against axial movement in the direction of the bar 43 and gear rack 50. This construction is somewhat further detailed in Fig. 7, from which it will be seen that the housing 60 is provided with a shoulder 74 adapted for engagement with a cooperating shoulder 75 formed on the interior of the sleeve 71; and further the plate 76 is attached to one end face of the housing 60, which together with the shoulder 74 limits the movement of the sleeve 71 in an axial direction; the plate 76 being provided with (Fig. 15) a pin 77 adapted for cooperative registration in one of a series of holes such as 78 spaced equally in the adjacent end face of the sleeve 71. In the present embodiment there are eight of these holes spaced equidistant around the sleeve, and since the pitch of the screw teeth in the present embodiment is ⅛″ when the sleeve is rotated a radial distance equal to the distance between the holes 78 a point on any given tooth will advance 1/64″, which latter increment of distance represents the finest adjustment provided in the mechanism herein illustrated; it being distinctly understood however that it is in the contemplation of the invention that by varying the pitch of the threads and the distance between holes any desired common fraction or decimal fraction of increments of movement may be provided, as will be obvious to those skilled in the art.

Referring to Fig. 7, a cam latch 79 is pivotally supported from the housing 60 by means of a screw 80; and this latch is provided with a handle 81. The latch is so constructed and positioned that when moved into the position shown in Fig. 7 its inner face engages the adjacent end face of the sleeve 71 and forces it into positive locking engagement effected between one of the holes 78 then in register with the dowel pin 77, thereby serving to rigidly fix the sleeve 71 in its respective radial and axial positions.

Referring to Figs. 1, 7 and 12 it will be seen that a device in general similar to that heretofore described is provided in cooperative relation with the cross bar of the carriage 16, and in order to avoid undue duplication, some of the major parts of this device are designated with the same numerals employed with reference to that heretofore described and the suffix prime (′) has been added to differentiate between the parts of the respective devices. For example a housing 60′ is attached to the member 52 of the carrier 51 and carries a sleeve 71′ similar to the sleeve 71, and constructed and disposed identically with that heretofore described.

Instead of a single jack screw 62 operated by the handle 63 (Fig. 12) which together with its cooperating parts is provided for causing relative movement of the frame 52 and bar 43 toward and away from each other, dual jack screw means are provided for moving the frame 52 toward and away from the cross bar 31; and accordingly this means will now be described with particular reference to Figs. 1, 7, 8 and 14. Bosses such for example as 82 (Figs. 7 and 14) are formed integral with the frame 52 and rigidly supported therein are jack screws such as 83. Cooperatively threaded jack screw heads 84 and 85 are in threaded engagement with said jack screws and adapted to be rotated thereon to cause the said heads to move inwardly and outwardly upon rotation. These heads are provided respectively with arms 86 and 87 and said arms are attached together by a link 88 (Figs. 1 and 8) which is provided with an adjustment 89 to vary the length of said link so as to adjust said jack screw heads into proper alignment. Each of said jack screws is provided with flanged portions such as 90 positioned on opposite sides of the carriage cross bar 31. It will therefore be seen that by moving the bar 88, the two jack screw heads 84 and 85 are rotated to cause said bar 31 to be moved inwardly and outwardly with respect to said frame member 52 (Fig. 14). Aligning clamps 52′ and 52″ are rigidly secured to the frame 52 and are provided with

accurately formed faces in alignment one with the other and parallel to the adjacent face of the bar 31 (see Figs. 1, 4 and 7). The two jack screws and cooperating clamps 52′ and 52″ are provided on one side of the frame 51 to prevent the frame from moving out of parallel alignment in its proper registration position; while only a single jack screw is necessary on one side of the frame since its function is to merely prevent the frame from the movement lengthwise of the bar such as 43.

Mechanism for vertical movement of the inner carrier member

Referring more particularly to Figs. 4, 7, 8 and 10, it will be seen that pinion gear shafts 91 and 92 are journaled on the sides of the carrier frame member 52 respectively adjacent the cross bars 43 and 31. These shafts (Fig. 8) are geared together by bevel gears 93 and 94 so that they may be rotated simultaneously. The shaft 91 carries rigidly connected thereto the spur gears 95 and 96 which are in cooperative mesh with gear rack segments (Fig. 10) such as 97, which are rigidly fixed to the frame 53 of the carrier. Similarly the shaft 92 carries gears 98 and 99 in mesh with similar gear segments rigidly attached to the frame 53. It will therefore be seen that by rotation of the shafts 91 and 92 the carrier member 53 is moved vertically.

Photographic plate holder

The photographic plate suction frame is diagrammatically illustrated as 100 (Fig. 9) and is adapted to carry a photographic plate designated as 101. The frame 100 is provided with a pneumatic sealing means such as the rubber strip 102 which is adapted for engagement with the sensitized surface to form a pneumatic seal, as is well understood in the art. Means is provided for the three-point ball socket suspension of the frame 100 from the carrier 51 in order that frames of different sizes and conditions may be properly positioned with respect to the apparatus. This means of support may take the form of three lugs (Fig. 1) such as 103, 104 and 105 which are provided with (Fig. 9) socket portions such as 106 adapted to provide a seat for a ball end portion 107 carried on a bolt 108 secured in the frame 100 in such manner that the bolt 108 is adapted to turn to effect threaded engagement with a cooperating nut member 103′ carried by the lugs such as 103. The three-point ball and socket suspension provides efficient means of supporting the suction frame and securely holding it to the carrier 51.

Suction and vertical movement interlocking control

Referring to Figs. 7, 8 and 9, it will be seen that the shaft 91 is hollow and extends outwardly through a fixed journal 109 (Fig. 7). The outer end of the shaft 91 is suitably secured to a valve head 110 in such manner as to be rotated thereby and therewith. A cooperating valve member 111 is pivotally supported on the valve head, being held in operative relation thereto by suitable means such as the screw 112. Valve head 110 has a passage 113 which is adapted to be placed in register with a cooperating opening 114 formed in the valve head 111 and a suitable suction means is connected thereto by means of a flexible tube 115. It will therefore be seen that when the parts are in register as shown in Fig. 7 the tube 115 and openings 114, 113 and hollow shaft 91 form a continuous conduit. The shaft 91 is connected at its outer end to the flexible tube 116 (Fig. 9) which is in operative communication with the vacuum frame 100; and accordingly when the parts are in the position shown in Fig. 7 the vacuum frame 100 is connected to a suitable source of suction. Referring to Figs. 7, 16 and 17 it will be seen that the valve part 111 is provided with an arcuate slot 117 to provide for a limited movement of a stud 118 which is rigidly attached to the valve head 110; a compression spring 119 being provided to hold the adjacent faces of the valve head and its cooperating member in intimate and substantially air-tight contact. The openings 113 and 114 are so formed and positioned (Fig. 17) that when the parts are moved as indicated in Fig. 17 said openings are out of register and accordingly communication is prevented between the tube 115 and the opening 113; while with the valve in the position shown in Fig. 7 communication is open between the said suction conduit means. The valve member 111 is provided with a handle 120 and carries an engaging pin 121 which is adapted for engagement with a bell crank 122 (Fig. 16) pivotally attached to bifurcated flanges 123 formed integral with the valve head 110. The lower end of the bell crank 122 is adapted to be brought into and out of engagement with abutments 124 and 125 formed integrally on the fixed journal 109. The construction of the parts just described is such that with the handle 120 in position shown in Fig. 16 bell crank 122 locks the valve head 113 from movement with respect to the journal 119 and thereby prevents rotation of the shaft 91 or vertical movement of the carrier 51 which is connected to the shaft 91 by means of the gears and racks hertofore described. When the handle 120 is moved in a clockwise direction, however, which limited movement is permitted by the arcuate slot 117 and cooperating stud 118, the pin 121 engages the cam surface of the bell crank 122 thereby rotating the bell crank in a clockwise direction and withdrawing the lower end of the bell crank from the abutments 124 and 125. During this move-

ment of the handle 120, however, and before the bell crank has become disengaged from its cooperating abutments, the ports 113 and 114 have been moved into engagement, as shown in Fig. 7. It will therefore be seen that while suction is applied to the vacuum frame the vacuum frame may not be moved from its predetermined position of engagement with the sensitized surface. Furthermore the means for opening and closing the suction supplied to the suction frame is by means of a sliding valve, the operation of which provides an easy means of breaking the suction, since in this particular type of valve it is much easier to open and close with suction applied than is the usual type of valve. It will be readily appreciated that by providing an interlocking means of this nature various advantages are procured, among which is the impossibility of accidentally moving the suction frame vertically by means of the handle 120 before such movement of the handle first shuts off the vacuum supply, insuring that when the movement of the suction frame is desired and before such movement is actually effected, the vacuum will always be shut off, a unitary control means thus being provided for the control of the vacuum or suction supply and for effecting the vertical movement of the vacuum frame. This feature of the invention has been found to be of considerable advantage over mechanisms heretofore employed.

As is usually customary in the operation of vacuum frames, provision is made for attaching thereto a vacuum gauge (not shown) and in order to interconnect such a gauge to the suction frame (Fig. 4) a tube 126 is provided.

Operation

The operation of the apparatus heretofore described will now be given with reference to one manner of its use; and from this it will be clearly understood and appreciated by those skilled in the art how the invention may be employed in all of its useful aspects. It will be assumed in this operation that a sensitized surface such as 15 (Fig. 9) has been placed on the table 14 and that a photographic plate holder or frame, which may be of the character described or otherwise, is supported on the carrier 51 and that it is desired to step the photographic plate, which may be a negative, to various predetermined positions over the sensitized surface to thereby successfully produce photographic reproductions of an image or unitary design carried on said plate on the sensitized surface. It will be understood in this connection that in accordance with usual customs in machines of this character protecting curtains or screens are provided, which have been omitted from the presently described apparatus for purposes of clarity, and since their use is well understood by those skilled in the art, which are suitably attached to the mechanism so as to protect the sensitized surface from extraneous light on portions of the sensitized surface other than that in register with the plate. It will be assumed that the plate is of such size and the image carried thereon of such a character that the predetermined registration positions are 15 1/64", 30 1/64", and 45 1/64" in a direction longitudinally of the apparatus and that the predetermined positions of registration in the transverse direction are 6 3/64", 12 3/64" and 18 3/64".

The handle 120 is moved to the position shown (Fig. 1) in which position the carrier 51 is in its upper position and is locked in such position by means of the bell crank 122 and its cooperating locking abutments and in which position the vacuum or suction source is shut off. The photographic plate holder is then in suitable position on the carrier 51 and the handles 81 and 81' are moved so as to unlock the sleeves 71 and 71' and also the handle 63 and the link 88 are moved in an anti-clockwise direction to free the rack bars 40 and 50 from engagement with the internal screw threads of the sleeves 71 and 71', and at the same time to release the carrier 51 for free movement relative to the cross bars 31 and 43 of the two carriages. This relative position of the members will be best understood from reference to Figs. 11 and 12. The carrier 51 is now moved to such a position that the index finger 129 is brought into approximate register with the 6" mark on the scale 130, which is rigidly secured to the cross bar 31 of the carriage 16. The sleeve 71' is now rotated until its properly calibrated index mark 3/64 is in register with a suitable index mark carried on the plate adjacent thereto, or in any other suitable manner. The lever 81' is then rotated in a clockwise direction to rigidly lock the sleeve 71 against axial rotation. The link 88 is then moved in a direction such that the jack screw heads (Figs. 8 and 14) 84 and 85 will be rotated in a clockwise direction which will cause the said heads to move inwardly on their respective jack screws and will thereby move the screw threaded rack bar 40 into intimate engagement with the cooperating internal screw threads of the sleeve 71', which will effect the relative movement between the carrier 51 and carriage 16 in a direction lengthwise of the cross bar 31, to thereby move the carriage 31 into its accurate predetermined position of registration and thereafter lock it rigidly in such position. The parallel clamps 52' and 52" preferably simultaneously come into intimate clamping contact with the bar 31 to insure a parallel position between the carrier 51 and carriage 16. The slight flexibility of the bar 31 provides for a slight flexure and therefore the screw threads should seat a minute time interval

before the clamps come into their final locking position. The carrier 51 is now rigidly locked in definite parallel alignment with the carriage 16 in its first position with respect to said carriage and is now adapted to be moved with respect to the carriage 17 into the first position on carriage 17.

The sleeve 71 is now rotated so that the calibrated mark thereon corresponding to 1/64" is adjacent a suitable index pointer and the sleeve is locked in that position by means of the handle 81 (Fig. 1). The carrier 51 together with the carriage 16 to which it is locked are then moved to the left until a suitable index pointer such as 127 comes into approximate register with the numeral 15 on the scale 128 which is rigidly secured to the cross bar 43. At this time the coarse adjustment for this position has been completed and there now remains to be made the fine adjustment representing the last increment of distance. For this last increment of movement representing the fine adjustment the cooperating engagement of the screw threaded rack bar 50 and the internal screw threads of the sleeves 71 are utilized. To effect this the handle 63 is rotated in clockwise direction from the position shown in Fig. 12 to that shown in Fig. 13 thereby causing the sleeve 71 and the rack bar 50 to move into such intimate engagement that the respective teeth of the two members are drawn into meshing engagement. Due to the wide angle of the teeth, the teeth of one of the members will be interposed between the teeth of the other member and the inclines on the side of the teeth will cause a relative axial movement between the two members to thereby effect the last increment of movement, and at the end of said movement to lock the two members into an absolute and accurate position of predetermined registration. It will be recalled in this connection that the sleeve is locked against angular movement, as heretofore provided. The registration position of 15 1/64" relative to the carriage 17 is now effected and the carrier 51 is rigidly locked to the cross bar 43 of the carriage 17.

At this time the photographic plate has been brought into its first desired position of registration with respect to the sensitized surface in which it is rigidly locked and through the intermediary of the carrier 51 the carriages 16 and 17 have also been positively locked against movement. The first exposure is now made, and thereafter the carrier 51 is unlocked from one or the other of the carriages, preferably the carriage 17, and carrier 51 is moved lengthwise of the cross bar 43 in the manner described above into the successive positions of registration 30 1/64 and 45 1/64, in each of which positions the carrier is locked and the desired exposures are made. Thereafter the carrier 51 is left in locked engagement with the carriage 17 and is released from the carriage 16 and the carrier is likewise stepped into position for its next series of exposures by being brought into desired registration position with the mark 12 3/64 on the scale 128; and the process is repeated in a manner well understood by those skilled in the art until all of the desired predetermined positions of registration have been effected and the desired exposures have been made.

The carriages 16 and 17 are movable along their respective tracks with the greatest of ease and it has been found that the placing of the photographic plate in its registration positions in the manner above described is attained with the greatest ease and rapidity. The desired functioning of the machine is attained by mechanism which is extremely simple in its construction and operation and yet provides a high degree of accuracy and speed of operation.

Having thus described my invention with particularity with reference to its preferred form, it will be obvious to those skilled in the art, after understanding my invention, that other changes and modifications may be made therein without departing from the spirit and scope of my invention, and I aim in the appended claims to cover such changes and modifications as are within the scope of the invention.

What I claim is:

1. In a machine of the character described the combination of a bed frame comprising a longitudinal rail and a transverse rail formed on two sides thereof, each of said rails having inclined guide surfaces and a second longitudinal rail and a second transverse rail formed respectively on the other two sides of said bed frame, a first carriage supported on said longitudinal rails as a track and having a cross bar, a second carriage supported on said transverse rails as a track and having a cross bar, said carriage being provided respectively with roller means adjacent the outer ends thereof adapted for rolling engagement on said rails with the roller means engaging said inclined guide surfaces being of bifurcated arrangement and serving to maintain the respective paths of movement of said bars 90° one with respect to the other and to hold said bars in such relation to each other, and means for carrying a photographic plate freely movable longitudinally of either of said bars while rigidly secured to and movable with the other of said bars.

2. In a machine of the character described the combination of a bed frame comprising a longitudinal rail and a transverse rail formed on two sides thereof, each of said rails having inclined guide surfaces, and a second longitudinal rail and a second transverse rail formed respectively on the other two sides of said bed frame, a first carriage supported on

said longitudinal rails as a track and having a cross bar, a second carriage supported on said transverse rails as a track and having a cross bar, said carriage being provided respectively with roller means adjacent the outer ends thereof adapted for rolling engagement on said rails with the roller means engaging said inclined guide surfaces being of bifurcated arrangement and serving to maintain the respective paths of movement of said bars 90° one with respect to the other and to hold said bars in such relation to each other, and means for carrying a photographic plate supported jointly by said bars and freely movable longitudinally of either of said bars while rigidly secured to and movable with the other of said bars.

3. In a machine of the character described the combination of a bed frame comprising longitudinal track means and transverse track means, a first carriage and a second carriage supported in cross wise relationship on said respective track means and adapted respectively for relative longitudinal and transverse movement, said carriages being provided respectively with track means for supporting a photographic plate carrier. said carrier, roller means in rolling engagement with said carrier track means for permitting free sliding movement between said carrier and carriages.

4. In a machine of the character described the combination of longitudinal and transverse tracks. a transverse carriage and a longitudinal carriage supported respectively by said tracks and located in different planes substantially parallel one to the other, said carriages being positioned in cross wise relation one to the other and being adapted for free relative independent longitudinal and transverse movement respectively, a photographic plate carrier having two adjacent sides lying adjacent the portions of said carriages forming an included angle between said carriages and supported jointly from said carriages for free movement selectively relative to said carriages, and means for selectively rigidly securing said carrier to respective carriages in definite predetermined position.

5. In a machine of the character described the combination of longitudinal and transverse tracks, a table for supporting a sensitized surface, a transverse carriage and a longitudinal carriage supported respectively by said tracks and located in different planes substantially parallel one to the other and in different planes from but substantially parallel to said table, said carriages being positioned in cross wise relation one to the other and being adapted for free relative independent longitudinal and transverse movement respectively, a photographic plate carrier having two adjacent sides lying adjacent the portions of said carriages forming an included angle between said carriages and supported jointly from said carriages for free movement selectively relative to respective carriages, and means for selectively rigidly securing said carrier to respective carriages in definite predetermined position.

6. In a machine of the character described the combination of longitudinal and transverse tracks, a transverse carriage and a longitudinal carriage suppported respectively by said tracks, said carriages being adapted for free relatively independent longitudinal and transverse movement respectively, a photographic plate carrier supported jointly by said carriages and in the form of an open sided frame comprising portions extending respectively in close proximity to adjacent portions of said carriages and supported thereby, said open sided carrier providing means for accommodating photographic plates of varying sizes and said carrier being adapted for free movement selectively relative to respective carriages, and means for selectively rigidly securing said carrier to said carriages in different predetermined positions.

7. In a machine of the character described the combination of carriage means comprising two carriages extending transversely one to the other and each freely movable independently of the other, means supported from said carriage means in guided and guiding engagement with and movable with respect to each of said carriages and adapted to be selectively rigidly secured to respective of said carriages independently in predetermined position relative to said respective carriages, and adapted when secured to one carriage to be moved therewith and relative to the other of said carriages while preventing movement of the said other carriages.

8. In a machine of the character described the combination of two carriages movable respectively in relative transverse directions independently one of the other, a photographic plate carrier supported jointly by said carriages and adapted to be freely slidably moved along each respective carriage in paths of right angles to each other for effecting coarse adjustments of said carrier, combined registration locking and fine adjustment means comprising two engageable toothed members one of which is in the form of a rack and the other of which is rotatable and is adapted at various angle settings to provide a fine adjustment of movement and a positive registration lock, one of said toothed members being carried by and secured to one of said carriages and the other being carried by and secured to said carrier.

9. In a machine of the character described the combination of two carriages movable respectively in relative transverse directions independently one of the other, said carriages each being provided with a track for supporting a photographic plate carrier, a pho-

tographic plate carrier supported jointly by said carriages on said tracks and adapted to be freely slidably moved along each respective carriage in paths of right angles to each other for effecting coarse adjustments of said carrier, combined registration locking and fine adjustment means comprising two engageable toothed members one of which is in the form of a rack and the other of which is rotatable and is adapted at various angle setting to provide a fine adjustment of movement and a positive registration lock, one of said toothed members being carried by and secured to one of said carriages and the other being carried by and secured to said carrier.

10. In a machine of the character described the combination of a photographic plate carrier, a carriage for said carrier, said carriage being adapted for movement together with said carrier and said carrier and carriage being adapted for relative movement one with respect to the other, an elongated toothed member of rack formation attached to and carried by and extending in a direction transverse to the direction of movement of said carriage, a rotatable adjustable toothed member attached to and carried by said carrier and adapted for relative movement into and out of mesh with said elongated toothed member, means for locking said rotatable member in any predetermined position of angular setting, and means for causing said relative movement between said two toothed members for bringing them into registrable mesh, the toothed formation of said cooperating rotatable and longitudinal members being such that said relative movement will move said carrier the last increment of movement and into predetermined position and simultaneously lock said carrier in a desired registration position.

11. In a machine of the character described the combination of a photographic plate carrier, a carriage for said carrier, said carriage being adapted for movement together with said carrier and said carrier and carriage being adapted for relative movement one with respect to the other, an elongated screw thread rack attached to and carried by and extending in a direction transverse to the direction of movement of said carriage, a rotatable adjustable sleeve attached to said carrier and having internal screw threads cooperatively formed to mesh with the threads of said rack surrounding said rack and movable into and out of mesh therewith, means for locking said rotatable member in any predetermined position of angular setting, and means for causing said relative movement between said rack and sleeve, the thread formation of said cooperating rack and sleeve being such that said relative movement will move said carrier the last increment of movement and into predetermined position and simultaneously lock said carrier in a desired registration position.

12. In a machine of the character described the combination of a support for a photographic plate carrier, means for providing free slidable movement of said carrier with respect to said support, a rack bar attached to said support and a sleeve surrounding said bar and rotatably supported from said carrier, said bar and sleeve being provided respectively with cooperating screw thread means and the screw threads of said sleeve being movable into and out of mesh with the screw threads of said bar, indicia means for indicating the coarse relative adjustment between said carrier and support, and indicia means comprising calibrations on said sleeve and cooperating indicator means relatively fixed with respect thereto for indicating the fine adjustment of movement between said carrier and support.

13. In a machine of the character described the combination of two carriages adapted for respective longitudinal and transverse movement in horizontal planes, a frame supporting each of said carriages independently therefrom, a photographic plate carrier mounted on said two carriages and movable relative to said carriages longitudinally and transversely in a horizontal plane and serving to support a photographic plate frame, and means for vertically adjusting said carrier relative to said carriages.

14. In a machine of the character described the combination of two carriages adapted for respective longitudinal and transverse movement in horizontal planes, a photographic plate carrier mounted on said two carriages and movable longitudinally and transversely in a horizontal plane, rollers supporting said carrier upon said carriages, adjustable eccentric means for setting said rollers to adjust the plane of said carrier with respect to said carriages, a photographic plate frame, and means for vertically adjusting said carrier relative to said carriages.

15. In a machine of the character described the combination of a supporting structure, a sensitized surface table, a first and a second carriage supported from said structure for respective movement in relatively transverse directions, a photographic plate carrier supported by said carriages jointly and adapted to be manually freely slidably moved in relatively transverse directions, a photographic plate frame supported from said carrier and means for moving said frame vertically with respect to said table in planes substantially parallel thereto.

16. In a machine of the character described the combination of a table for supporting a sensitized surface, a carrier, a photographic plate, means for moving said carrier in longitudinal and transverse directions respectively and for positioning said carrier at a desired

predetermined point of registration relative to said sensitized surface, a photographic plate vacuum frame supported on said carrier, means for moving said suction frame vertically away from and into contact with said sensitized surface, suction means for said suction frame, means for controlling the suction to said suction frame and means for interconnecting said suction control means and said vertical movement means to prevent the vertical movement of said suction frame while suction is applied to said frame.

17. In a machine of the character described the combination of a table for supporting a sensitized surface, a carrier, a photographic plate, means for moving said carrier in longitudinal and transverse directions respectively and for positioning said carrier at a desired predetermined point of registration relative to said sensitized surface, a photographic plate vacuum frame supported on said carrier, means for moving said suction frame away from and into contact with said sensitized surface, suction means for said suction frame, means for controlling the suction to said suction frame and means for interconnecting said suction control means and said vertical movement means to prevent the vertical movement of said suction frame while suction is applied to said frame, said means for controlling the suction to said suction frame comprising a sliding valve adapted to open and close suction to said vacuum frame in predetermined timed relation with the vertical movement of said frame.

18. In a machine of the character described the combination of an open sided photographic plate carrier adapted to support photographic plate frames of varying sizes, a photographic plate frame, a sensitized surface table adapted to support a sensitized surface with respect to which a photographic plate is adapted to be moved in accurate parallel relation, three point suspension means carried jointly by said photographic plate frame and said carrier and adapted to provide for aligning photographic plates of varying sizes in proper parallel relation with respect to said sensitized surface.

19. In a machine of the character described having a carrier for a photographic plate adapted for free sliding movement relative to a sensitized surface the combination of, a rail having inclined guide surfaces, bifurcated roller means engaging said guide surfaces and serving to support a movable carriage therefrom, resilient means for holding said roller means in intimate engagement with said inclined surfaces to thereby prevent said carriage from moving out of alignment relative to its predetermined path of movement.

In testimony whereof I have signed my name to this specification.

DANTE V. MAZZOCCO.