May 10, 1927. 1,628,043

J. J. GROBE

X-RAY OPERATING TABLE

Filed Sept. 11, 1922 3 Sheets-Sheet 1

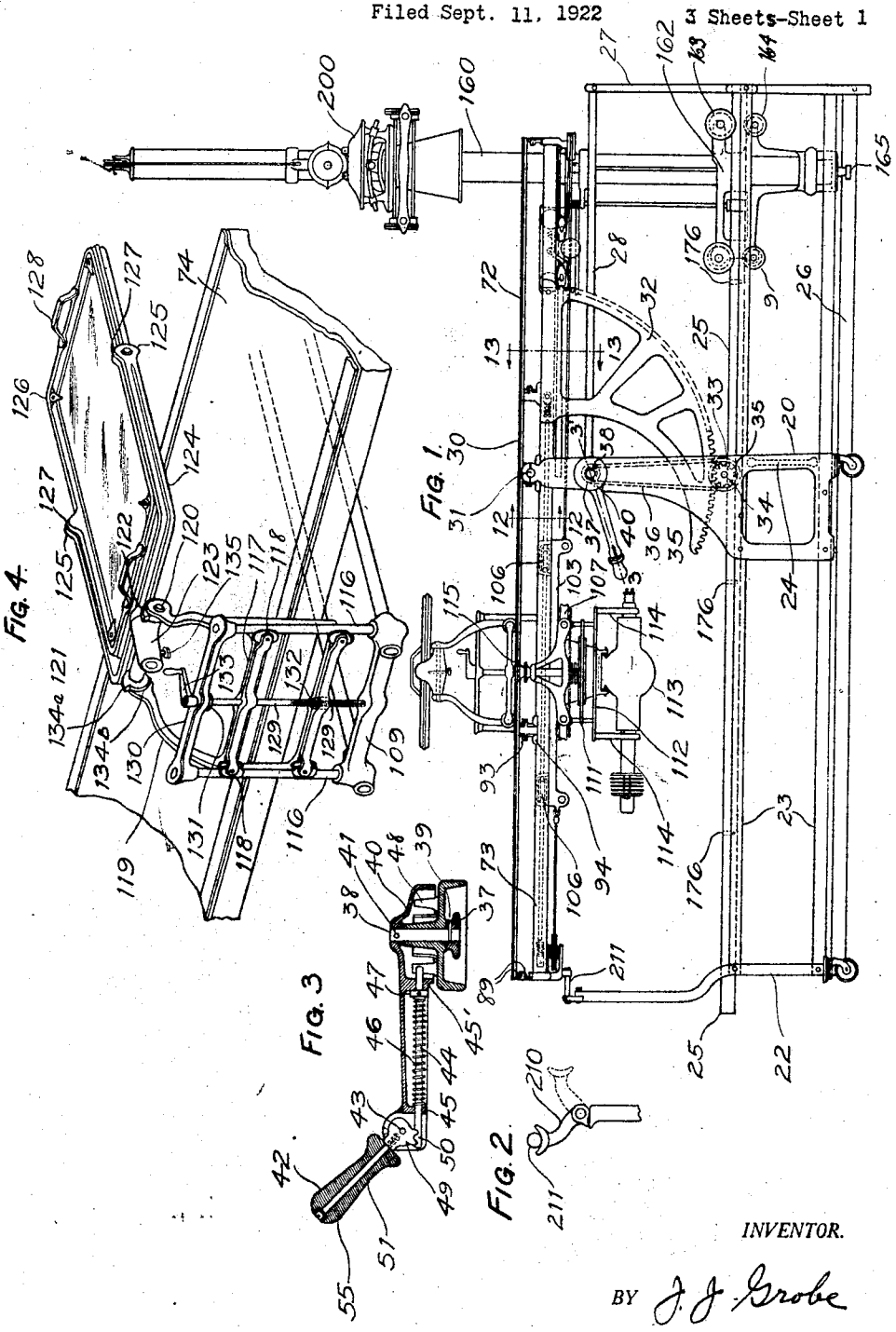


FIG. 1.

FIG. 2.

FIG. 3

FIG. 4.

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X-RAY OPERATING TABLE

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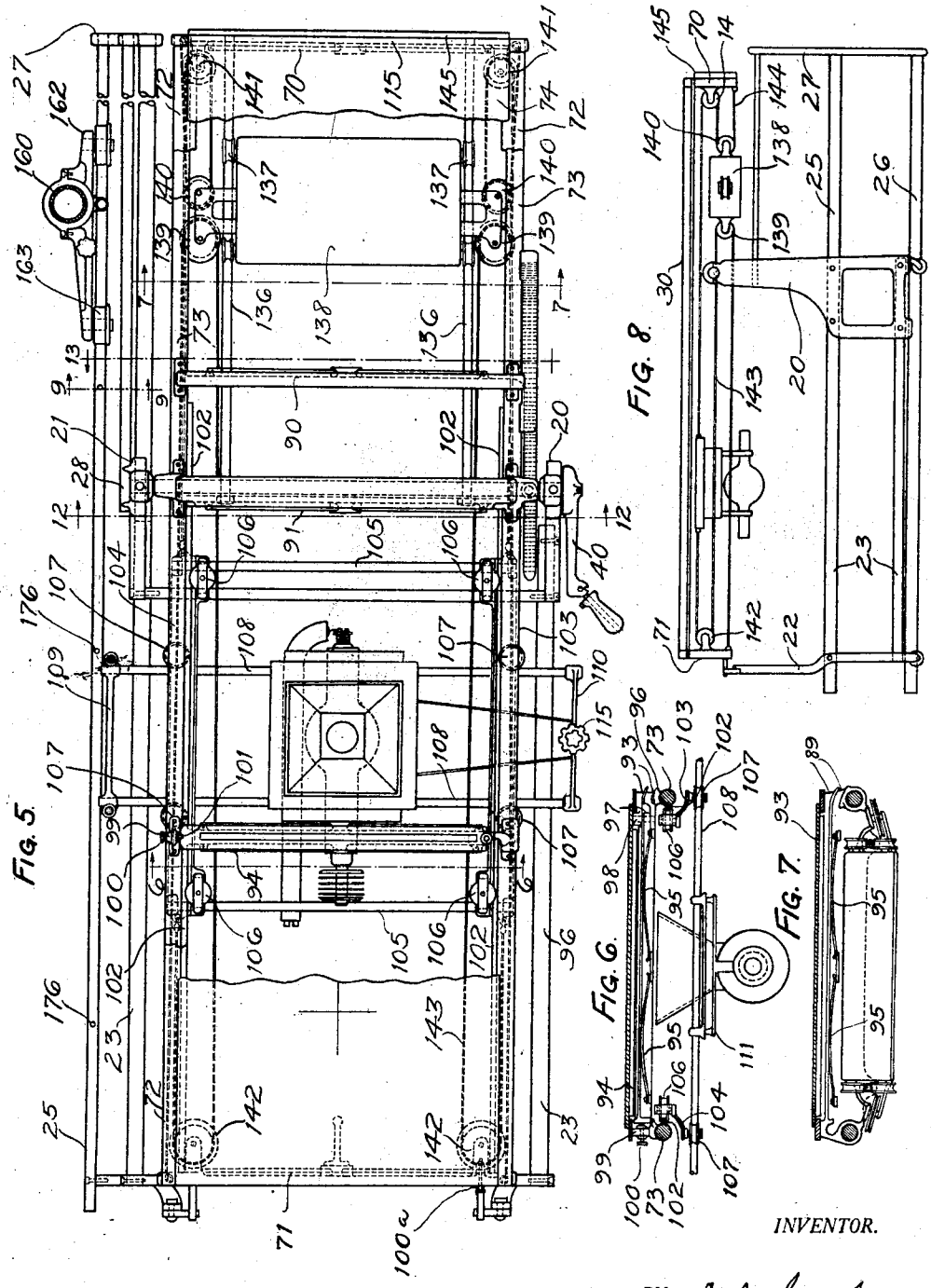


FIG. 5.

FIG. 8.

FIG. 6.

FIG. 7.

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X-RAY OPERATING TABLE

Filed Sept. 11, 1922

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FIG. 9.

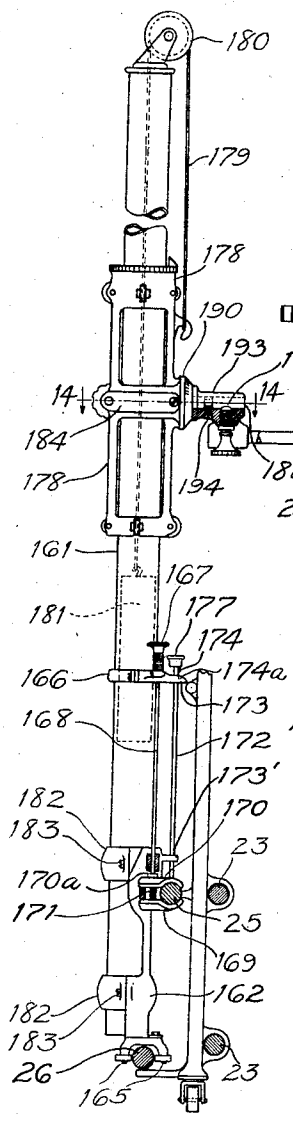


FIG. 11.

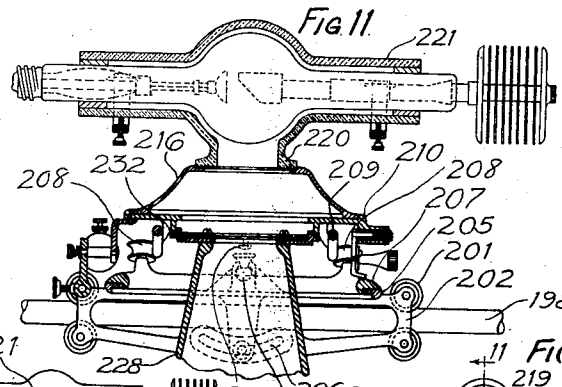


FIG. 10.

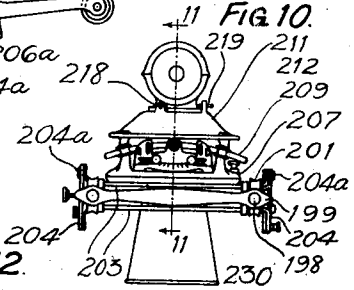


FIG. 12.



FIG. 14.

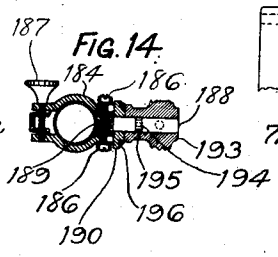


FIG. 13.

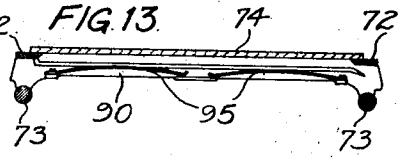


FIG. 15.

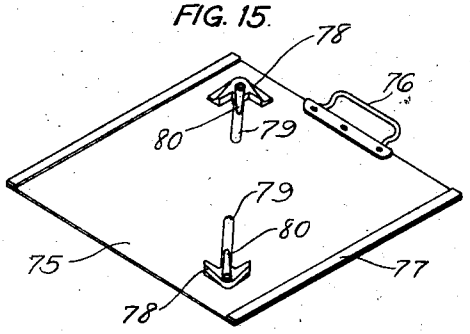
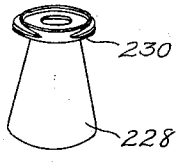


FIG. 16.



INVENTOR.

BY J. J. Grobe

1,628,043

Patented May 10, 1927.

UNITED STATES PATENT OFFICE.

JULIUS J. GROBE, OF CHICAGO, ILLINOIS.

X-RAY OPERATING TABLE.

Application filed September 11, 1922. Serial No. 587,426.

My invention relates to improvements in X-ray operating tables, and the principal objects thereof are to provide an X-ray operating table capable of doing both radiographic and fluoroscopic work in all positions from vertical to horizontal and below horizontal in the so-called "Trendelenberg" position; to provide in an X-ray table of the above type a system of counterweights for the fluoroscopic screen and tube holder so arranged that the counterweight and the other mechanism are counterbalanced about the pivotal center of the table in all positions of the table top and of the counterweight; to provide means for positively locking the above table top in all positions of angular adjustment; to provide a plate, film or cassette holding means on said table top with arrangements so that these means can be cleared away for fluoroscopic work; to provide means for rapidly and accurately centering the tube holder relatively to the plates, films or cassettes; to provide a structure which can be readily knocked down for shipment, and packed in small compass, to provide a tube stand and screen holder structure whereby the manipulation of these parts is considerably simplified; to provide a neat and rugged construction which shall be relatively simple in design and economical to manufacture, and in general to provide an improved and efficient table structure of the character referred to.

In the accompanying drawings which illustrate a table constructed in accordance with my invention,

Fig. 1 is a side elevation of the entire table structure.

Fig. 2 is an enlarged fragmentary end elevation of one of the adjustable table-stops or supports.

Fig. 3 is an enlarged section taken on the line 3—3 of Fig. 1.

Fig. 4 is a fragmentary perspective of the screen holder and associated parts.

Fig. 5 is a plan view of the table structure shown in Fig. 1, with certain parts broken away to show the construction of other parts.

Fig. 6 is a partial section taken on the line 6—6 of Fig. 5.

Fig. 7 is a section taken on the line 7—7 of Fig. 5.

Fig. 8 is a diagrammatic side elevation of the table, showing the operation of the counter-weighting mechanism.

Fig. 9 is a section taken on line 9—9 of Fig. 5 of the tube stand portion of the table.

Fig. 10 is an elevation of the tube holder carriage looking in the direction of arrow 10 of Fig. 9.

Fig. 11 is a section taken on the line 11—11 of Fig. 10 with the lower portion of the compression cylinder and the supporting rails broken away.

Fig. 12 is a section taken on the line 12—12 of Fig. 1.

Fig. 13 is a section taken on the line 13—13 of Fig. 1.

Fig. 14 is a section taken on the line 14—14 of Fig. 9.

Fig. 15 is a perspective view of the plate holder slide.

Fig. 16 is a perspective view of the compression cylinder.

Referring more particularly to Figs. 1 and 5, the numerals 20 and 21 represent uprights on the left and right hand sides of the table respectively and 22 is a U-shaped frame at the rear of the table connected with the uprights 20 and 21 by means of the round side-rails 23. A cross girder indicated at 24 fastens the uprights 20 and 21 rigidly together. Attached to the abutments on the frame 22 are two tube-stand rails 25 and 26. These rails 25 and 26 extend the entire length of the table and are joined together by the cast iron end frame 27. Attached to this casting 27 are extensions of the rods 23 and also the guard rail 28. It is understood, of course, that all of the members just described are readily demountable.

The table top 30 is pivoted at 31 on the upper ends of the two uprights 20 and 21. A gear sector 32 is rigidly attached to the side of the table top and co-operates with the pinion 33. A pinion 33 is journaled on a stud 34 mounted in the upright 20 and is integrally united to sprocket 35 also journaled on stud 34. A chain 36 is trained around sprocket 35 and a smaller sprocket 37 pinned to shaft 38 by a pin 39, as shown in Fig. 3. The crank handle 40 is keyed to shaft 38 by means of a pin 41 and carries at its outer end a handle 42 which is pivoted at 43 on the crank handle 40. The locking plunger 44 is slidably mounted in guides 45 and 45′ in crank 40 and is normally forced inwardly by spring 46 acting against stop collar 47 pinned to rod 44.

thereby tending to engage the end of said plunger with a series of lugs 48 on the upright 20.

Handle 42 has at its lower end a gear sector 49 cooperating with rack teeth 50 cut into the plunger 44. Handle stud 51 screws into gear sector 49 and supports a handle grip 55. This grip is rotatable on the stud 51 and is held in position on the latter by means of a screw and washer as shown. It will be readily understood that upon rotation of the handle the table can be adjusted to any angular position and when released will remain in this position because of the action of the mechanism just described. This takes place as follows:

When the table top is to be rocked on its axis, the handle section 42 is swung in a position in which it is at right angles to the crank handle 40. When this position is reached the locking plunger 44 will be withdrawn from out of engagement with the lugs 48. The crank can thereupon be rotated in either direction and the table correspondingly rocked about its axis.

Immediately upon letting go of the handle, the spring 46 which was compressed when the pin 44 was withdrawn from engagement with the studs 48 is now operative to force the plunger 44 back into engagement with said studs 48 simultaneously throwing the handle 42 back into line with the crank 40 by the interaction of the rack teeth 50 with the gear sector 49. This action locks the table top in the adjusted angular position on account of the engagement of the plunger 44 with the studs 48 preventing further rotation of the crank and hence locking the pinion 33 which operates gear sector 32.

The table top 30, as to its frame, comprises a pair of end frames 70 and 71 connected together by means of side bars or strips 72 and binding rods 73. The panel 74 made of material transparent to X-rays covers the top of the table and is held in position thereon by any suitable means.

Attached to the end frames 70 and 71 are structures arranged to receive plates, films or cassettes. These are attached to a plate holder shown at Fig. 15. This consists of a plate 75 preferably of steel and having a handle 76. The steel slide 75 is reenforced along the side by the strips 77 to serve as additional guiding means when the slide is telescoped with the guideways in the table top. The cassette, plate or film is held in position on the top of the plate holder slide 75 by means of the clamps 78. These are W shaped castings adapted to be secured in the various positions on the slide in any suitable manner as for instance by means of thumb screws engaging slots 79. The corners of the plates or cassettes engage with the corner recesses in the brackets 78 to hold the plate in position laterally on the slide. The plate springs 80 are provided to hold the plate, film or cassette down against the surface of the slide 75.

The plate holder 75 is adapted to be slidably inserted under the table top, being guided by the slots 89 in the end plates 70 and 71, by grooves in cross-ties 90 and 91 and by grooves 93 in swinging cross-tie 94. These plates can be put in three different positions on the table top. The plate in its head end position is guided by grooves in end-bar 71 and in one side of the cross tie 94. The plate in its center position is guided by the groove on the other side of the cross tie 94 and on the cross tie 91. The plate holder in its foot-end position is guided by the groove in cross tie 90 and end plate 70. When a cassette is mounted on the plate holder slide 75, the lower sets of guides are used. The springs 95 force the top of the cassette in contact with the under side of the table.

The cross bar 94 is arranged to swivel at one end so as to clear the top of the table for fluoroscopic work. To this end the casting 96 which is carried by rod 102 is bifurcated to form one part of a hinge joint, the other part of which is formed by a lug 97 on the cross tie 94 in which lug is fixed the pintle 98. By this means the cross bar 94 can be swung in an arc of 180°. A spring stop means is provided on bracket 99 so that the cross tie can be held locked in its across-the-table-position. This consists of a spring plunger 100 made up in accordance with the usual practice and co-operating with a slot 101 in the end of the cross tie 94. A similar spring plunger 100^a at the head end of the table serves to lock the bar 94 in its longitudinal or cleared position.

Supported on rails 73 are two tube carriage supporting rods 102. A carriage made up of two castings 103 and 104 joined together by rods 105 is carried on these rods through the medium of rollers 106 and is thus capable of traveling lengthwise of the table. Four other rollers 107 mounted on the castings 103 and 104 support a cross trolley consisting of two rods 108 tied at one end by means of screen supporting yoke 109, and at the other end by the yoke 110.

A tube holding member comprising shutter mechanism 111 of conventional pattern carries on its lower surface a tube holder plate 112, which is provided with a lead glass bowl 113 and tube supporting means 114. A shutter controlling handle 115 is mounted in yoke 110 for the purpose of controlling the shutter opening in a manner well known in the art.

Yoke 109 supports two upright rods 116. A skeleton frame 117 is supported on the uprights 116 by means of rollers 118 and carries at the end of two projecting arms 119 friction discs 120. A trunnion member

121 having friction surfaces 122 co-operating with the friction surfaces 120 is interposed between the two arms 119. The two friction surfaces 120 and 122 co-operate together to form a friction joint in a manner well known in the art. The trunnion member 121 is formed with a socket 123 which pivotally supports the stem of a screen supporting fork 124. The extremities of said fork 124 consist of friction discs 125 and having interposed between them screen holding frame 126, which has friction surfaces 127 co-operating with the friction surface 125 to form a friction joint in a manner well known in the art.

Handle 128 is attached to the screen holding frame to allow the latter to be readily moved and handled. A vertically disposed feed screw 129 is journaled at its upper end in a cross yoke 130 joining the upper ends of the two rods 116 together and at its lower end in the yoke 109. A thrust collar 131 forms a shoulder which holds this screw in the position designated. A nut 132, preferably self-aligning, is mounted in one of the cross bars of the frame 117 and co-operates with the screw 129 which is actuated by a crank handle 133 fixed on the upper extremity of said screw. It can be readily understood that upon rotation of this handle 133 the entire screen holding mechanism can be moved toward and away from the table top.

Also the entire screen frame support can be swiveled upon the friction joint formed by the friction surfaces 120 and 122. Complete rotation is, however, prevented by means of the stop 134^a which co-operates with the projection 134^b to limit the movement at this point from a position in which the screen holder is parallel to the table top to one in which it is at an angle of approximately 105°.

The stem of the screen holder frame is secured in socket 123 by means of an adjustable screw 135. The screen holder frame can be adjusted at various angular positions with respect to the table top by rotating same relative to the screen holder fork through the medium of the friction joint formed by the discs 125 and 127. It will be readily understood that the tube holder and with it the screen mechanism can be adjusted lengthwise and crosswise of the table top. The shutter can be adjusted at any desired position and the screen can be made to assume any angular position relative to the table top and can be moved toward and away from the latter for a purpose later to be described.

Supported on end casting 70 and cross brace 91 are the rods 136 supporting by means of rollers 137 the movable counterweight 138. By means of pulleys 139, 140, 141 and 142 and cables 143 and 144 the counterweight 138 is connected to the tube holder screen supporting mechanism in such a fashion that the ratio of movement of the counterweight to the tube holder and screen holding mechanism is as one is to two.

The counterweight weighs twice as much as the sum of the weights of the screen holder and tube holder, hence increments or decrements in the respective moments of inertia of the counterweights and parts balanced thereby with respect to the pivotal point or axis of the table would always be equal. It follows, therefore, that whatever may be the position of angular adjustment of the table, the tube holder and screen may be moved into any location, within their range of movement, without affecting the equilibrium of the table. The arrangement has the further advantage that in placing the counterweight at the end of the table remote from the tube holder, the counterweight also serves as a partial counterpoise for the table, which, as shown, is pivoted at a point nearer to the foot than to the head end of the table.

In order to compensate for the difference in weights between the parts of the table at opposite sides of the pivot 31 and also for the unequal distribution of weight of the average patient on either side of the pivot, I prefer to secure to the lower end of the table an additional counterpoise 145. In this way the entire table structure is counterbalanced even when occupied by a patient, and can be easily moved into the various angular positions about the pivot point and held in any desired position without the necessity of building a moving element to withstand great weight. It is, of course, understood that although the structure shows this additional counterpoise as being stationary and fastened at the foot of the table it could be fastened at any point providing it is of the proper proportion to obtain the effects desired.

A tube stand 160 comprising a column 161 is slidably mounted on the rails 25 and 26 by means of a mechanism 162. The mechanism 162 is attached to the tube column 161 by means of two clamps 182 held in any suitable manner as for instance by screws 183. The mechanism 162 is supported on rail 25 by means of two sets of opposing rollers 163 and 164 which prevent it from swinging longitudinally, and is held upright against tipping transversely by means of the set of opposing rollers 165 co-operating with rail 26 as shown.

A control standard 166 formed as a collar of the tube 161 is arranged so as to be at a convenient height for manipulation and has at its upper end a lock knob 167 which is fastened to a tubular shaft 168 engaging a lower clamp 169 at its threaded end, and an upper clamp 170 by means of the shoul-

der 170ª. Upon rotation of the handle the lower clamp is drawn up pivoting upon the edge 170ª and locks against rod 25 as shown against the action of coil spring 171. A second control rod 172 is mounted in the guides 173 and 173′ and ends in a handle 177. This is adapted to be raised and lowered and is held in adjusted position by its weight acting against the pins 174. Upon rotation of the handle 177 so that the pins 174 align themselves with the sockets 174ª the rod 172 can be dropped so as to engage the sockets 176 provided for it on rod 25 for a purpose later to be described.

Mounted so as to be vertically adjustable up and down on the tube column 161 is a movable sleeve 178. Attached to a hook at the upper end of the sleeve is one end of the cable 179 which passes over pulley 180 and has its other end connected to the usual counterweight 181, said counterweight preferably being located within the hollow column 161.

Clamping mechanism shown in Figure 14 is provided to lock the sleeve 178 in any position of vertical or angular adjustment on the tube column 161. This consists of two half-clamps 184 and 185 pivoted at one end as shown at 186 and adapted to be drawn together at their other ends by means of hand screw 187 as shown, thus clamping the two pieces 184 and 185 about the tube column 161 and holding the sliding sleeve 178 in position. Friction disc 190 projects from one side of the column surrounding the stud 188. The stud is held in position by its having threaded end 189 screwed into a hole in the sleeve 178, and is further locked up by means of the pin or screw 186. A sleeve 191 surrounds the stud 188 for a short distance beyond the face of the friction disc 190. A graduated ring 196 is journaled on the sleeve so as to read the angular position of the tube holding member 200.

Guide rail supporting arms 193 are pivotally mounted on the stud 188 and held against lateral displacement by means of the screw 194 passing through part 193 and engaging a circumferential groove 195 in the stud 188. The arms 193 can be rotated on the stud 188 and remain in adjusted position through the medium of the friction plunger 195ª, which is forced against stud 188 by means of a spring washer backed up by screw 197. The arm 193 carries at either end guide rails 198, which are joined together at their outside ends by means of tie bar 199. Slidably mounted on guide rails 198 is the tube holder 200. Rollers 201 engaging the rail 198 are held in position on the side members 202 by means of tie bars 203, which also serve to hold the two side members 202 together to form a quadrangular frame.

Pivotally mounted on pins 204ª in the side frames 204 is an annular frame 205 held in adjusted position by a friction clamping screw, which passes through an arcuate slot 206ª in member 204. Mounted on the plate 205 to be axially adjustable on a vertical axis is an annular member 207 which carries the stereoscopic rollers 208 which engage the stereoscopic rails 209. The rails 209 are mounted on sub-base 210.

A bowl base 216 is mounted on sub-base 210 by means of screws and washers 217 so as to be adjustable about an axis perpendicular to the guide rails 198. Three lugs 218 project beyond the plate 216 as shown and carry locking screws 219 which co-operate with a collar 220 on the tube shield 221 for the purpose of holding the latter down against plate 216.

It will be readily understood from the foregoing that the sliding sleeve 178 can be adjusted up and down on the column and also about the column 161 and held in any adjusted position by means of the clamping device. Guide rails 198 and with them the tube holder device 220 can be adjusted about a horizontal axis on the stud 188 and held in adjusted position by means of the friction device at 195. Tube carriage 220 can be moved horizontally on the guide rails 198 and locked in position in any desired manner, for instance by means of the set screw 222. The tube holder can be adjusted on a vertical axis at two points, namely: on plate 216 and on turret 207. This allows stereoscopic work both crosswise and lengthwise of the guide rails and hence of the table top, and at the same time allows the tube to be rotated so as to give proper clearance for the high tension wires. The entire tube holder can be swung pivotally about the axis 204 through an angle of approximately 30° on each side of the central position.

Means are provided for fastening a compression cylinder 228 consisting of buttons 229 fastened on to the plate 210 and engaging the tapered cam surfaces 230 (see Fig. 16) when the raised section 231 at the top of the compression cylinder engages the hole 232 as shown. It will be noted in this connection that the cam surfaces are so arranged that the compression cylinder can be inserted by rotation in either direction.

It will be understood from the description that the table top can be swung from a horizontal to a vertical position and in reverse direction from a horizontal position to a position approximately 25° below horizontal and is positively held in any adjusted position by means of the raising mechanism described. In a horizontal position an auxiliary support for the table is provided at its head end and consists of the two adjustable fingers 210, which co-operate with extensions 211 on the table top. When it is desired to drop the table below the horizontal these fingers are thrown to one side

as shown by the dotted line of Figure 2 allowing the extensions 211 to clear them and drop below the table top.

Because of the fact that the table top itself is counter-balanced and the screen and tube holding mechanism are also counterbalanced both as to mutual relative movement, and as to pivotal movement about the pivot 31, the table top can be readily raised and lowered with the expenditure of very little energy. The screen holder and with it the tube holder can be moved up and down and crosswise of the table and the screen holder itself can be moved toward and away from the table top and in any angular position with respect to the table top and will remain in adjusted position. The plates and cassettes can be introduced into three places in the table top as described before and the tube stand can be centered relative to these places by dropping the knob 173 and allowing the lower end of the rod to drop into sockets 178.

While I have illustrated and described a particular embodiment of my invention, I do not wish it to be understood as intending it to be limited thereto, as the same may be variously modified and altered without departing from the spirit of my invention, it being my desire to claim my invention as broadly and completely as the prior state of the art will permit.

What I claim as new and desire to secure by Letters Patent, is:

1. In an X-ray operating table, the combination of a support, a table top pivotally mounted on said support, an X-ray tube element support, a counterweight whose weight is unequal to that of said X-ray tube element support movably supported on said table top, and connections between said counterweight and tube support adapted to move said counterweight and tube support for increments of distance substantially in inverse ratio relative to the respective weights of the said X-ray tube element support and said counterweight.

2. In an X-ray operating table, the combination of a support, a table top, a pivotal connection between said support and said table top, an X-ray tube element support on said table top, a counterweight whose weight is unequal to that of said X-ray tube element support on said table top, and means for connecting said X-ray tube element support and said counterweight together for simultaneous movement, said connecting means being constructed and arranged so that the moments of inertia of said X-ray tube element support and said counterweight about said pivotal connection are kept substantially equal in all positions of adjustment of said X-ray tube element support and said counterweight on said table top.

3. In an X-ray operating table, the combination of a support, a table top, a pivotal connection between said table top and said support, an X-ray tube element support on said table top, a counterweight whose weight is unequal to that of said X-ray tube element support on said table top, connections between said tube support and counterweight adapted to move said tube support and counterweight for increments of distance substantially in inverse ratio relative to the respective weights of said X-ray tube element support and said counterweight; said X-ray tube element support and counterweight being so disposed relative to said point of pivotal connection that their moments of inertia about said point are substantially equal.

4. In an X-ray operating table, the combination of a support, a table top pivotally mounted on said support, an X-ray tube element support, a counterweight whose weight is unequal to that of said X-ray tube element support, means for connecting the X-ray tube element support and counterweight together for simultaneous movement, said connecting means being arranged and constructed so that the product of the weight of the X-ray tube element support times the distance from the center of weight of said support to the axis on which the table top pivots is substantially equal to the product of the weight of the counterweight times the distance from the center of weight of said counterweight to said axis in all positions of adjustment of said X-ray tube element support and said counterweight on said table top.

5. In an X-ray operating table, the combination of a support, a table top pivotally mounted on said support, an X-ray tube element support, a counterweight whose weight is unequal to that of said X-ray tube element support movably supported on said table top, connections between said counterweight and tube support, for moving said counterweight and tube support simultaneously, said connections being constructed so that the relative distances from the center of weight of said counterweight and tube support to the axis on which the table top pivots are kept substantially in inverse ratio to their relative weights in all positions of adjustment of said counterweight and tube support on said table top.

6. In an X-ray operating table, the combination of a support, a table top pivotally mounted on said support, an X-ray tube element support, a counterweight substantially twice as heavy as said X-ray tube element support and connections between said counterweight and tube support whereby said tube support is moved at double the speed of the said counterweight.

7. In an X-ray operating table, the combination of a support, a table top pivotally

mounted on said support, an X-ray tube element support, a counterweight substantially twice as heavy as said X-ray tube element support and connections between said counterweight and tube support whereby said tube support is moved at double the speed of the said counterweight; said last named two elements being so located that their moments of inertia about said point of pivotal support are substantially equal.

8. In an X-ray operating table, the combination of a support, a pivot on said support, a table top mounted on said pivot, and arranged for adjustment about said pivot, tube supporting means and a counterweight whose weight is unequal to that of said X-ray tube element support on said table top on opposite sides of said pivot, and means for moving said tube supporting means and said counterweight for increments of distance substantially in inverse ratio to their respective weights.

9. In an X-ray operating table, the combination of a support, a pivot on said support, a table top mounted on said pivot, and arranged for adjustment about said pivot, and tube supporting means, and a counterweight whose weight is unequal to that of said X-ray tube element support on said table top on opposite sides of said pivot, means for connecting said tube supporting means and counterweight together for simultaneous movement, said connecting means being arranged and constructed so that the moments of inertia of said tube supporting means and counterweight about said pivot are substantially equal in all positions of said tube supporting means and counterweight on said table top.

10. In an X-ray operating table, the combination of a support, a pivot on said support, a table top mounted on said pivot, and arranged for adjustment about said pivot, tube supporting means and a counterweight whose weight is unequal to that of said X-ray tube element support on said table top on opposite sides of said pivot, means for moving said tube supporting means and said counterweight for increments of distance substantially in inverse ratio to their respective weights; said supporting means and counterweight being so proportioned and disposed that their moments of inertia about said pivot are substantially equal.

11. In an X-ray operating table, the combination of a support, a table top pivotally mounted on said support, an X-ray tube element support movable along and carried by said table, a counterweight whose weight is unequal to that of said X-ray tube element support connected to said tube support carried by said tube and movable parallel with the direction of movement of said tube support and connections between said counterweight and tube support adapted to move said counterweight and said tube support in opposite directions and respectively for increments of distance substantially in inverse ratio relative to the respective weights of said oppositely moving parts.

12. In an X-ray operating table, the combination of a support, a table top pivotally mounted on said support, an X-ray tube element support movable along and carried by said table, a counterweight whose weight is unequal to that of said X-ray tube element support connected to said tube support carried by and movable parallel with the direction of movement of said tube support and connections between said counterweight and tube support adapted to move said counterweight and said tube support in opposite directions and respectively for increments of distance substantially in inverse ratio relative to the respective weights of said oppositely moving parts, said pair of parts being normally located on opposite sides of the table axis.

13. In an X-ray apparatus, the combination of an operating table top mounted to swing on a horizontal axis extending across the table top, a carriage, X-ray instrumentalities on said carriage, a counterweight whose weight is unequal to that of said X-ray tube element support, means connecting said counterweight and carriage and adapted to move said counterweight and carriage in opposite directions, and respectively for increments of distance substantially in inverse ratio relative to the respective weights of said counterweight and carriage, said counterweight and carriage being located on opposite sides of the table axis.

14. In an X-ray apparatus, the combination of an operating table top mounted to swing on a horizontal axis extending across the table top, a carriage, X-ray instrumentalities on said carriage, said carriage being movable longitudinally of and carried by said table top, a counterweight whose weight is unequal to that of said X-ray tube element support carried by and movable parallel with the direction of said carriage, means connecting said counterweight and carriage and adapted to move said counterweight and carriage in opposite directions, and respectively for increments of distance substantially in inverse ratio relative to the respective weights of said counterweight and carriage, said counterweight and carriage being located on opposite sides of the table axis, the axis of the table top being located nearer one end of the table top than the other end, and said counterweight being of greater weight than the carriage and parts carried thereby, and normally located between the table axis and said end.

15. In an X-ray apparatus, the combina-

tion of an operating table top mounted to swing on a horizontal axis extending across the table top, a carriage, X-ray instrumentalities on said carriage, said carriage being carried by said table top, a counterweight whose weight is unequal to that of said X-ray tube element support carried by said table top, means connecting said counterweight and carriage and adapted to move said counterweight and carriage in opposite directions, said counterweight and carriage being normally located on opposite sides of the table axis, the axis of the table top being located nearer one end of the table top than the other end, and said counterweight being of greater weight than the carriage and parts carried thereby, and normally located between the table axis and said end, said connections being adapted to move the counterweight and carriage in opposite directions and at speeds oppositely proportionate to the weights of said parts.

16. The combination of a table frame, a table top provided with means nearer one end of the table than the other for permitting said table top to swing on a horizontal axis on said frame, a carriage, X-ray apparatus mounted on said carriage, a counterweight whose weight is unequal to that of said X-ray tube element support, means for connecting said carriage to said counterweight, so arranged as to provide for movement of the carriage a plurality of times as great as the movement of the counterweight, the counterweight and carriage being located normally at opposite sides of the table top axis and means additional to said counterweight for balancing excess weight on the opposite end of the table.

17. In an X-ray apparatus, the combination of an operating table top mounted to swing on a horizontal axis extending across the table top, a carriage, X-ray instrumentalities on said carriage, said carriage being carried by said table top, a counterweight whose weight is unequal to that of said X-ray tube element support carried by said table top, means connecting said counterweight and carriage and adapted to move said counterweight and carriage in opposite directions and respectively for increments of distance substantially in inverse ratio relative to the respective weights of said counterweight and carriage, said counterweight and carriage being normally located on opposite sides of the table axis, the arrangement providing for swinging said table top above and below horizontal.

18. In an X-ray table, a supporting frame, a table top mounted to swing on said frame, a handle, gearing operated by said handle for swinging said table top, said handle being movable into operative or inoperative positions, means automatically tending to move said handle into inoperative position and locking mechanism associated with said handle serving to lock the table top against movement when the handle is moved into inoperative position.

19. In an X-ray table, a supporting frame, a table top pivoted to swing on said frame, gearing for swinging said table top, a crank for operating said gearing and provided with a handle movably mounted on said crank to occupy operative and inoperative positions respectively, and means associated with said handle automatically tending to lock said crank against movement and to throw said handle into its inoperative position, said means being adapted to be rendered inoperative when the handle is moved into operative position.

20. In an X-ray table, a supporting frame, a table top pivotally mounted to swing on said frame, a crank rotatably mounted on said frame, gearing connecting said crank with the table top for swinging the latter on its axis, a handle on said crank movable into an angular position relative to said crank to operate the latter for swinging said table top, a spring associated with said crank, a locking member associated with said handle and operated by said spring for preventing movement of said crank and for swinging said handle into a position in alignment with said crank, the arrangement being such that when said handle is moved into said angular position, said locking member is withdrawn permitting the table top to be swung.

21. In an X-ray table, a supporting frame, a table top pivotally mounted to swing on said frame, a crank rotatably mounted on said frame, gearing connecting said crank with the table top for swinging the latter on its axis, a handle on said crank movable into an angular position relative to said crank to occupy the latter for swinging said table top, a spring associated with said crank, a locking member associated with said handle and operated by said spring for preventing movement of said crank and for swinging said handle into a position in alignment with said crank, the arrangement being such that when said handle is moved into said angular position, said locking member is withdrawn permitting the table top to be swung, and also providing for locking said crank in a plurality of circumferentially spaced positions.

22. In X-ray apparatus, the combination of a table top, a pair of guideways extending laterally across and under the table in spaced relation for receiving a sensitized sheet slidably inserted there-between, and means for automatically forcing said sheet toward the tops of said guideways and upwardly toward said table top, said means comprising plate springs adjacent said guideways.

23. In an X-ray apparatus, the combination of a table top, a pair of guideways extending laterally across and under the table in spaced relation for receiving a sensitized sheet slidably inserted there-between, and means automatically tending to force said sheet toward the tops of said guideways and upwardly toward said table top, said means comprising two pairs of oppositely disposed plate springs respectively adjacent the guideways and adapted to press upwardly toward said sheet.

24. In X-ray apparatus, the combination of a table top, a member extending under and laterally across the table top and provided with means for supporting and guiding a sensitized sheet insertable laterally under said table top and means permitting swinging movement of said member out of path of X-rays emanating from the under side of said table, said member being provided with springs for automatically forcing said sheet toward the table top when said member is in across-the-table position.

25. In X-ray apparatus, the combination of an X-ray table, a tie member under said table top extending laterally across the latter and pivoted at one side of said table top whereby said member can be swung through an angle of substantially 90° to occupy an across-the-table, or an alongside-the-table position, and means for locking said member in adjusted position, said member being provided with a spring tending to force upwardly a sensitized sheet guided by said member.

26. In X-ray apparatus, the combination of an X-ray table, a tie member under said table top extending laterally across the latter and pivoted at one side of said table top whereby said member can be swung through an angle of substantially 90° to occupy an across-the-table, or an alongside-the-table, position, and means for locking said member in adjusted position, said member being provided with a guideway for a sensitized sheet and a pair of opposed plate springs parallel with and adjacent said guideway for forcing said sheet toward the table.

27. In combination, an X-ray table top, means for locating a sensitized sheet under said table top, a tube support movable along said table, and means for automatically and positively locating said tube support in proper operative position relative to said sensitized sheet, when the tube support is moved along said table, said means comprising a stationary member and a vertically movable plunger movable with the tube support for engaging said stationary member.

28. In X-ray apparatus, a pair of spaced parallel supporting rods, a carriage mounted to move along said rods, a member rockingly supported on said carriage to swing about an axis transverse of the length of said rods, a plate slidable a limited distance on said member in a direction substantially parallel with said last named axis but in an upwardly convex arc.

29. In combination, a pair of spaced parallel supporting rods, a carriage mounted to move along said rods, a member rockingly supported on said carriage to swing about an axis transverse of the length of said rods, a plate slidable a limited distance on said member in a direction substantially parallel with said last named axis but in an upwardly convex arc, and means for rotating the tube on said plate about a normally vertical axis.

30. In combination, a tube support member provided with an aperture, and with a plurality of retaining members projecting inwardly toward each other and a circumferentially flanged compression member attachable to said support by a rotary movement of said compression element, said element having projections adapted to register and interlock with said retaining members or be disengaged therefrom by said rotary movement.

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