J. D. STIRCKLER.

X-RAY APPARATUS.

APPLICATION FILED AUG. 25, 1916.

1,333,349.

Patented Mar. 9, 1920.

3 SHEETS—SHEET 1.

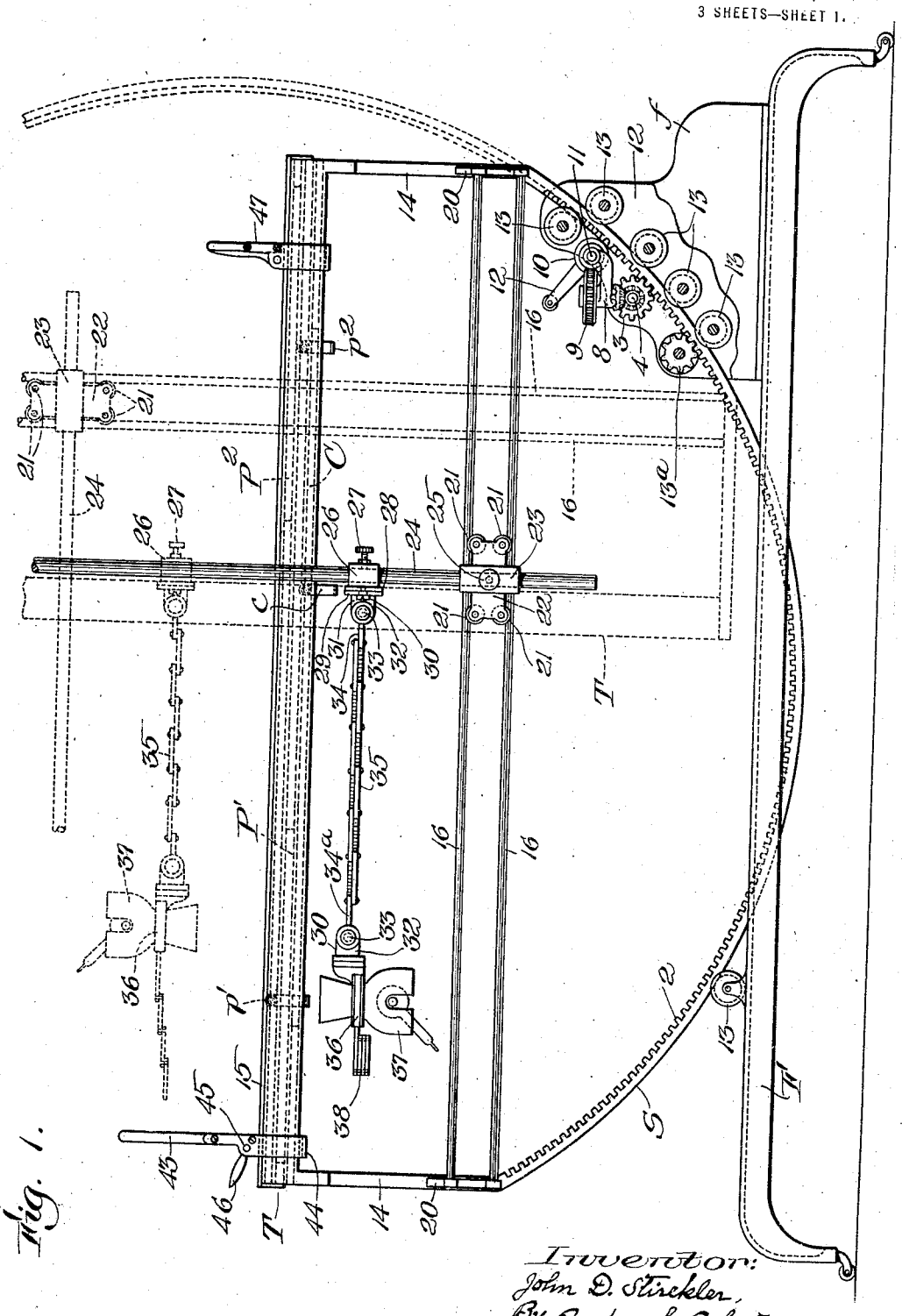

Fig. 1.

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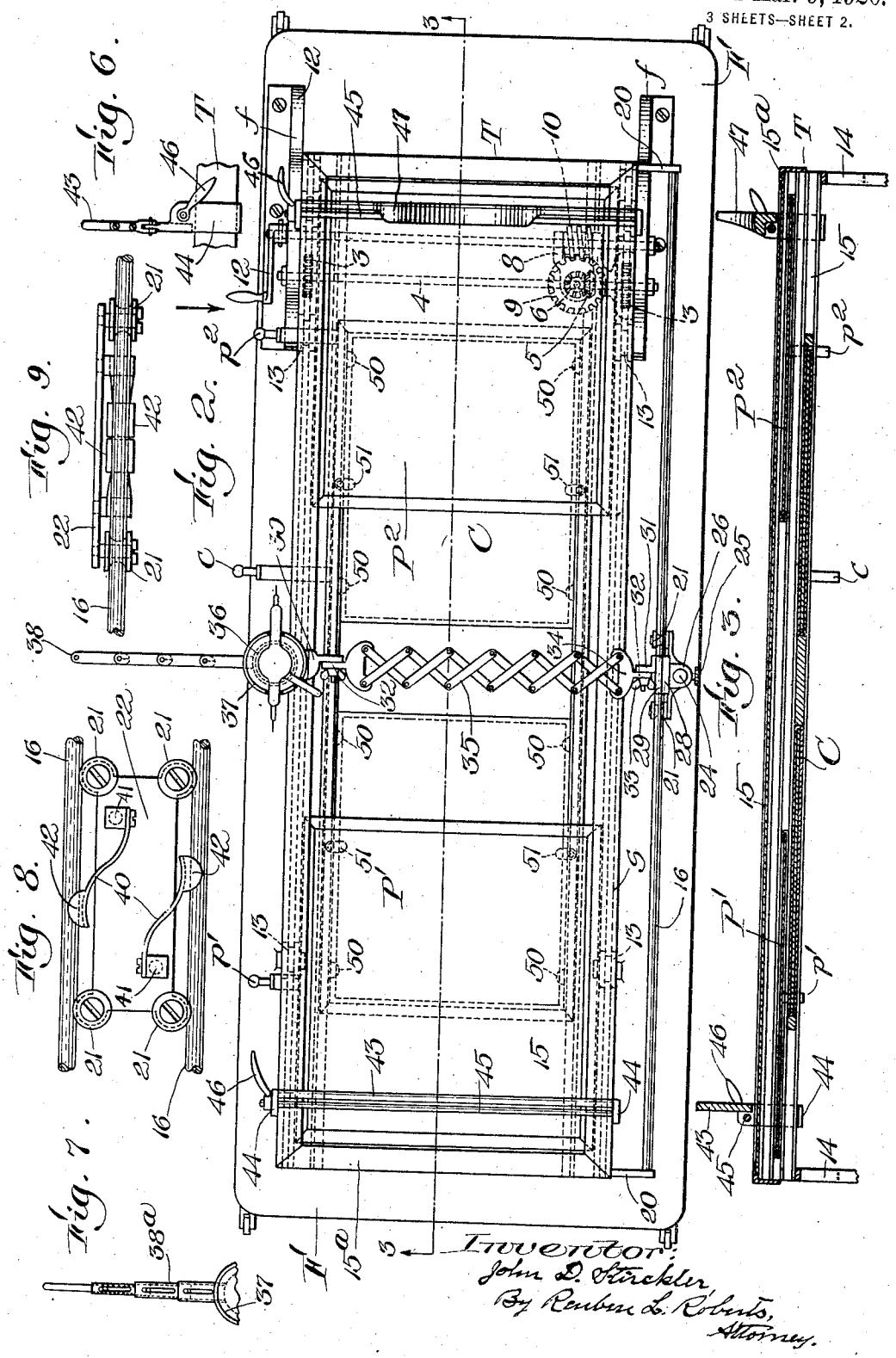

Fig. 6.

Fig. 9.

Fig. 2.

Fig. 8.

Fig. 3.

Fig. 7.

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3 SHEETS—SHEET 3.

Fig. 4.

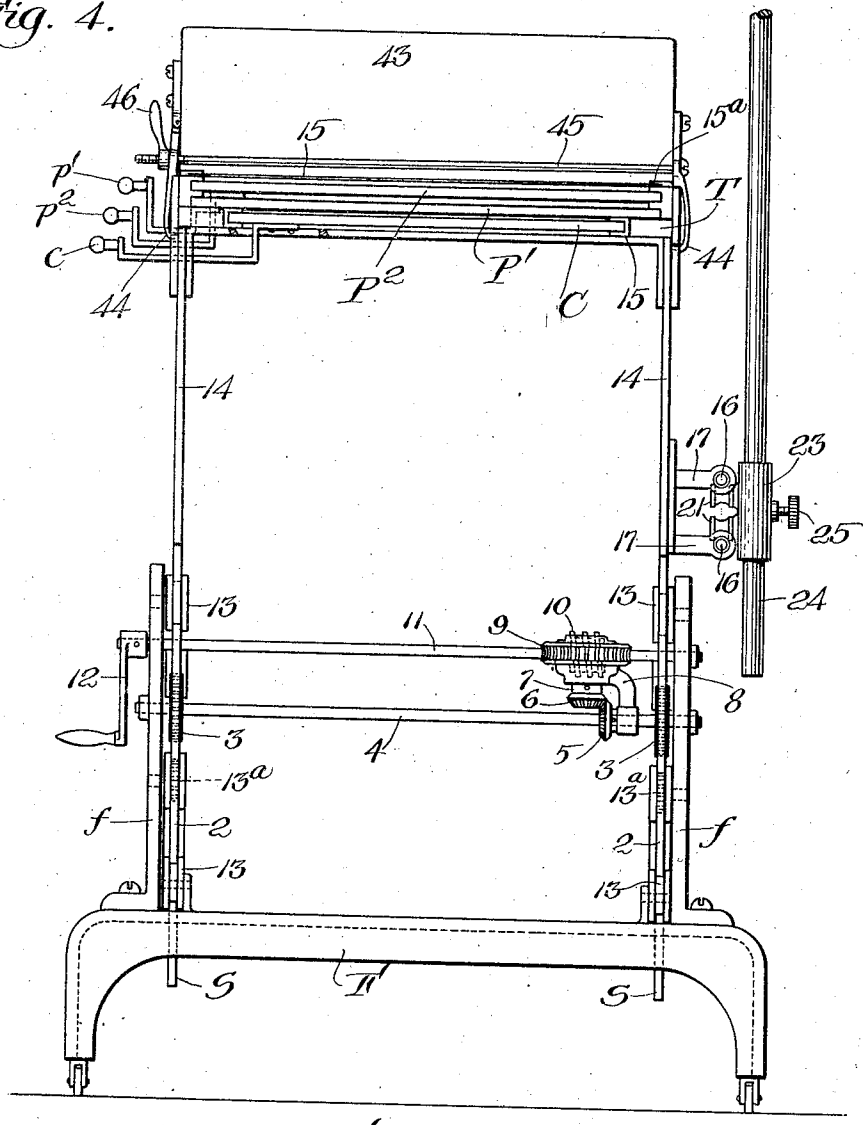
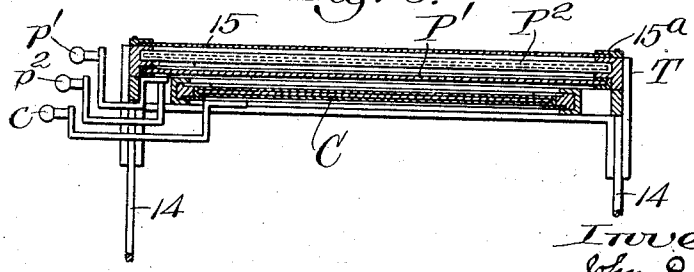


Fig. 5.



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UNITED STATES PATENT OFFICE.

JOHN D. STIRCKLER, OF CHELSEA, MASSACHUSETTS.

X-RAY APPARATUS.

1,333,349. Specification of Letters Patent. **Patented Mar. 9, 1920.**

Application filed August 25, 1916. Serial No. 116,802.

To all whom it may concern:

Be it known that I, JOHN D. STIRCKLER, a citizen of the United States of America, and resident of Chelsea, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in X-Ray Apparatus, of which the following is a specification.

The invention relates to X-ray apparatus, particularly to the construction of the table upon which the patient is supported and of the means for operating the table, and other details relating thereto, more particularly hereinafter described and specified in the accompanying claims.

In such apparatus which has been heretofore in use, the table, which is usually six feet or more in length, and as it is undesirable to have the top of the table, when in horizontal position, more than three feet from the floor, it has been pivoted upon a frame with one end of the table extending much farther from the pivot than the other end and in order to prevent the end of the table from striking the floor, the shorter end was tilted down, so that it became necessary, for ease of operation when tilting the table, to have the longer end counterbalanced; also, heretofore, the X-ray tube-box, of very considerable weight, has been hung upon the under side of the table, and it has been necessary to provide an automatically adjustable counterweight for that, also. My improved table is supported and moved as though it were hung upon and swung from the center of a circle concentric with the curve of the frame which supports it, but with such center outside of the cord of an arc less than 180°, which cord is coincident with the top of the table, and in its operation is the same as a swinging table, which is thus given a longitudinal progressive movement and at the same time is swung to the desired angle, and by the use of a worm-gear to operate the table, no jolt or shock is possible, and the table is automatically locked in every position which it assumes, however small the amount of movement. In my improved construction also, there are no obstructing parts of the frame to interfere with the movements of the operating physician. Further, the top of the table is constructed with the field of observation, for all purposes, extending throughout its entire surface and is provided with protective plates, such as lead, with guides for each, extending throughout the length of the table, so that they may be moved to any position in relation to the length of the table and in relation to each other, by which means a field of operation, or observation, may be obtained at any desired position in the top of the table without changing the position of the patient thereon. The heavy tube-box which is usually attached beneath the table, is dispensed with and the tube is supported upon a bracket attached to the swinging frame of the table. This bracket itself is supported on a small carriage adapted to be moved longitudinally of the table upon ways secured to the lower part of its swinging frame; the tube-holder is attached to the bracket by a universal joint, by which it may be turned to any angle in relation to the surface of the table whether above or below it, and can be adjusted vertically upon the bracket standard, so as to place the tube in any desired plane above or below the surface of the table. The tube-holder is also supported by self-sustaining extensible connections between it and the universal joint, by which the holder may be adjusted to any position transversely of the table, irrespective of its other positions in relation thereto; these connections being preferably arranged so as to be contracted or shortened when the holder is moved into the area of the table and extended in length when the holder is moved in a direction to withdraw it from such area in relation to the working side, or that next to the operator.

In the drawings forming a part of this specification, Figure 1 is a side elevation of the apparatus, showing the segmental rack upon which the table swings, the gear by which it is operated and the bracket and X-ray tube attached thereto shown in two positions thereon, one below and one above the table; Fig. 2, is a plan view of the table, showing the plate-holder, or cassette, and the lead protective plates, also the self-sustaining extensible connections between the bracket and X-ray tube-holder; Fig. 3, is a vertical longitudinal section of the table on line 3—3, Fig. 2; Fig. 4, is an end elevation of the table, showing the worm-gear and connections by which the table is operated, and the handles by which the cassette and protective plates are moved; Fig. 5, is a transverse vertical section of the table, through the protective plates when in a position by which

they overlap; Fig. 6, is an end elevation of a foot-rest, viewed from the upper side of Fig. 2, or in the direction indicated by the arrow; Fig. 7, is a detail plan view of a telescoping modification of the extensible self-sustaining support for the tube-holder and also for the handle shown jointed in Fig. 2; Fig. 8, is a side elevation of the carriage which supports the socket for the bar on which the tube-holder is sustained and adjusted, viewed as from the inside, or from the top of Fig. 2, showing friction springs which bear upon the carriage supports and retard the movement of the carriage on its tracks, and Fig. 9 is a plan view of the same parts.

Referring to the drawings and indicating the several parts by reference characters: S, is the segmental portion of the frame of the table, T; on the inner edge of the segment S, is a rack 2, with which engages a pinion 3, on a shaft 4, which has a bearing at either end in standards *f*, secured to the stand F. Upon this shaft 4, a beveled gear 5, is keyed, with which meshes another beveled gear 6, upon a short upright shaft 7, supported in a yoke bearing 8; on the upper end of the shaft 7, a worm gear 9, is keyed and this is engaged by a worm 10, on the shaft 11, which also has bearings in the standards *f*, and upon the end of the shaft 11, a crank 12, is secured, by which the worm is operated and through it the worm gear 9, the gears 6 and 5, the shaft 4 and pinion 3, which latter, engaging the rack 2 on the segment S, causes that to swing in the arc of a circle. The segment is supported and guided by rolls 13, at either side of the stand F, the inner ones of which may be toothed pinions, as 13^a, to engage the rack 2, the teeth of which may be extended throughout the length of the segment S, so that, if desired the foot end of the table may be raised. The table, or patient supporting surface T, is supported on the segment S, by standards 14. The table is open throughout its entire length, so that a field of observation, or for operation, may be obtained at any part thereof and without moving the patient longitudinally thereon. This is accomplished by providing guides throughout the length of the inner edges of the frame of the table, for the plate-holder, or cassette, as it is termed in this art, and for the protective plates P′, P^2. The several guides being in different horizontal planes, so that the cassette and the several plates may be moved into any position relative to each other and to the length of the table, by which a field may be obtained at any part thereof. The movement of these parts is accomplished by handles *c*, p^2, p^1, respectively attached thereto, (Fig. 4). Over the top of the table, the usual covering plate 15, of celluloid, or other suitable material, may be secured by strips of thin metal bent over the edge of the covering plate and the edge of the table, as at 15^a, (Fig. 3). Extending between the standards 14, upon one side of the table, preferably that opposite to the crank 12, or what may be called the working side of the table, two rods 16, are secured by brackets 17, which rods serve as tracks for the wheels 21, of a small carriage 22, carrying a socket 23, in which a bar 24, is supported and secured in any desired position vertically therein, by a set-screw 25; also, upon the bar 24, is another socket 26, secured in position as desired, by a set screw 27. The socket 26, is provided with a plate 28, the surface of which is parallel with the length of the bar 24; another plate 29, is held against the plate 28, by a screw 30, by which the two are frictionally held together and the plate 29 may be turned upon 28 with little effort. Projecting out at a right angle from the plate 29, is an ear 31, with a bearing face at right angles to the bearing faces of 28 and 29. Against the bearing face of the ear 31, the face of an ear 32, is frictionally held by a thumbnut 33 working upon a screw threaded stud projecting from the ear 31. From the ear 32, a yoke-piece 34 projects, the plane of its surface being at right angles to the plane of the bearing surfaces of the ears 31 and 32. To either arm of this yoke-piece is pivoted one end of a link of a series of lazy-tongs levers 35, and to the opposite end of the lazy-tongs a yoke 34^a, similar to 34, is pivoted, and also a series of friction joints like 31—32 and 28—29, are employed and secured to a ring, or support 36 for the X-ray tube-holder and leadglass bell 37, for protecting the tube. An extensible handle 38, shown in Fig. 2 with jointed sections, which may have the usual spring washers at the joints, or telescoping sections, may be used, similar to those shown in Fig. 7, to enable the operator to control the X-ray tube when it is pushed in over, or beneath the area of the table, which operation will close up the lazy-tongs and place the tube remote from the operator.

As shown in Fig. 1, the tube-holder with the tube, may be adjusted to any position upon the bar 24. In full lines they are in a plane below the surface of the table and in dotted lines in a plane above the table, and it is evident that it may be swung around said bar to any desired position; in addition, the holder 36, may be swung into any position across the table, and by means of the said joints 28—29 and 31—32, at each end of the lazy-tongs, the tube-holder may be turned entirely over, or to any desired angle in relation to the surface of the table.

To prevent the bar 24, with the tube-holder, from moving along the tracks 16, by gravity or unintentionally, friction springs 40, are attached to the inner face of the

frame of the carriage 22, by means of projecting studs 41, in such position that the curved ends 42, of the springs will bear upon the rails 16, and hold the carriage and its attachments against any unintentional movement. At the left end of the table (Fig. 1) a foot-rest 43, is shown; this is held upon the table by means of hooked clamps 44, at either side which are hooked under the table top and drawn together by means of a rod 45 which extends across the table and has a hand-lever nut 46 on the screw threaded end of the rod. At the opposite end of the table, which may be called the head, a shoulder-rest 47, may be attached by the same means as that used for the foot-rest. The shoulder rest is used when the patient is placed in the so-called Trendelenburg position, that is, with the feet raised and the upper part of the body depressed. In Fig. 3, the cassette frame C, is shown in a middle position in the table, but it will be understood that it may be moved to any other position, that is, to either end, and the projecting plates P′, P², be adjusted so as to bring the field of observation outside of the plates. In Fig. 2, projections 50, extending from the inside of the cassette frame support the plates and they are held in place by buttons 51, in the usual manner.

I claim:

1. In X-ray apparatus, a table normally balanced in all positions having its patient-supporting surface substantially below its center of motion, which is located midway of the length of the table and means to give the table a swinging and longitudinal movement from a horizontal to a perpendicular position.

2. In X-ray apparatus, a swinging table support for the patient, an X-ray tube-holder attached to and carried by said table and adapted to be adjusted into desired planes, either above or below its patient supporting surface and longitudinally thereof, and a universally adjustable connection between the tube-holder and its attachment to the table.

3. In X-ray apparatus, a swinging table support for the patient, means to gradually adjust such table to any angle between a horizontal and a perpendicular position, an X-ray tube-holder attached to and carried by said table, universally adjustable connections between said holder and table, which connections are adapted to be reduced in length when the said holder is moved into the area of the table from the operating side and increased in length when the holder is moved toward said operating side and out of said area from said side.

4. In X-ray apparatus, a table support for the patient, means to gradually adjust the table to any desired angle between a horizontal and a perpendicular position, an X-ray tube-holder provided with a self-sustaining extensible support, by which the holder may be adjusted across the area of the table above and below its surface as desired and the obstructing parts of the support removed from such area when the holder is withdrawn.

5. In X-ray apparatus having self-sustaining extensible means to support the tube-holder and adjust it over the surface of the table, and an extensible handle attached to said holder to facilitate its manipulation within the area of the table at points remote from the operator.

6. In X-ray apparatus, a table to support the patient and having an open top extending throughout its entire supporting surface, protective plates supported therein and adapted to be shifted to any position in relation to the length of the table and in relation to each other, whereby a field of observation may be obtained at any desired location on the table without moving the patient thereon.

7. In X-ray apparatus, a table supported upon a frame having bearing surfaces formed in the arc of a circle whose center is substantially outside of the upper surface of the table, a stand beneath said frame having an open unobstructed space between the vertical position which the table may assume and the front or operating end thereof, antifriction bearings between the frame and the stand, and a worm and gear near one end of the stand which engages a rack upon the frame, and by the operation thereof gives the frame an even swinging and longitudinal motion upon said bearings and adjusts the upper surface of the table to any desired angle between a horizontal and a vertical plane.

8. In X-ray apparatus, a support for the X-ray tube-holder, consisting of a carriage provided with means to receive and clamp the support thereon; a pair of tracks extending lengthwise of the table frame and secured thereto, bearings upon the carriage which engage said tracks, and automatic brakes upon the carriage which produce friction upon the tracks and prevent unintentional movement of the carriage thereon.

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