Sept. 14, 1926. 1,599,434

J. S. ROSE

X-RAY APPARATUS

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Fig. 8

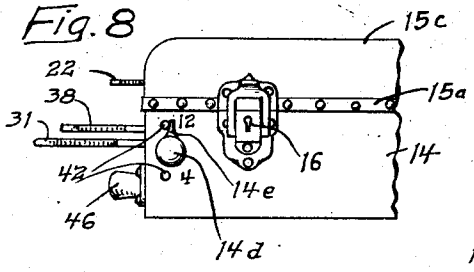


Fig. 1

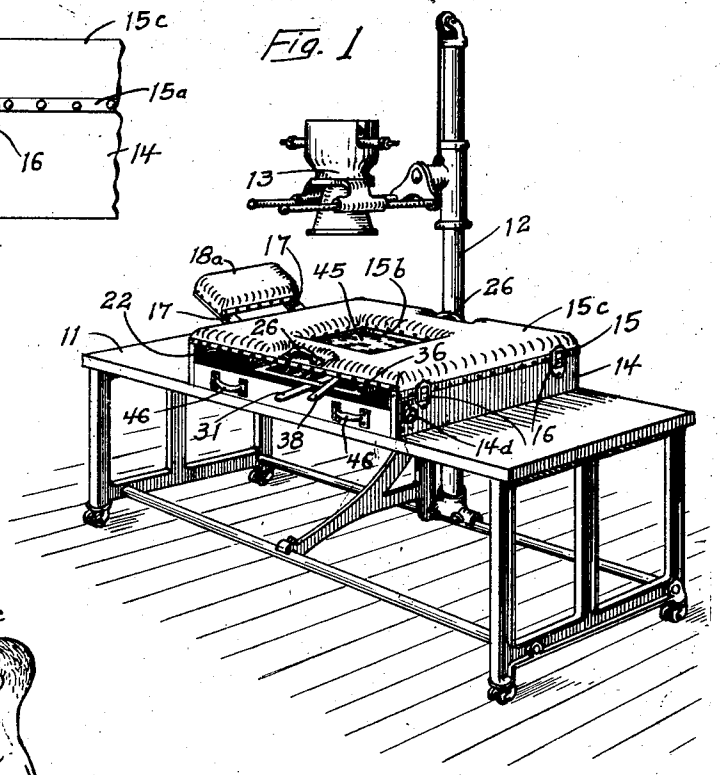
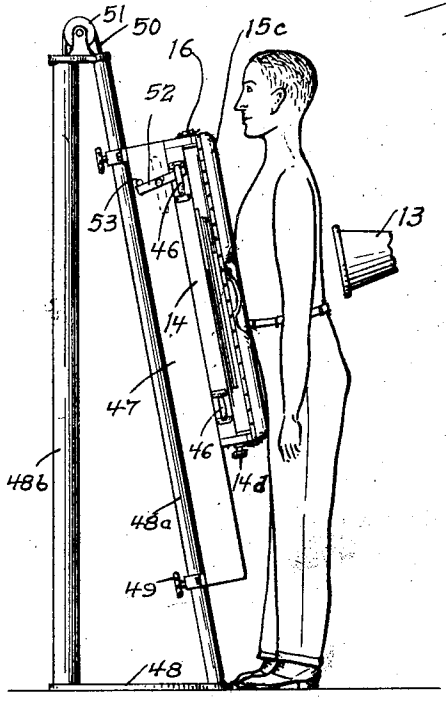


Fig. 2



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Fig. 3

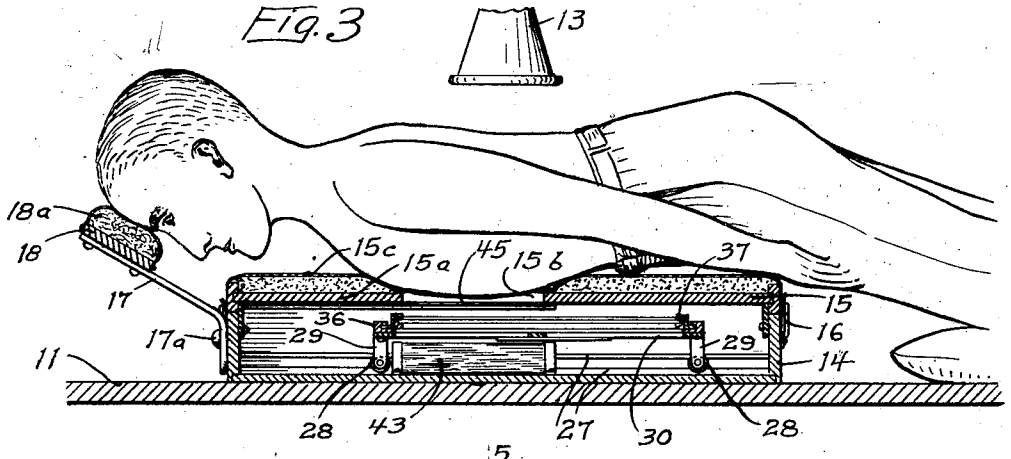
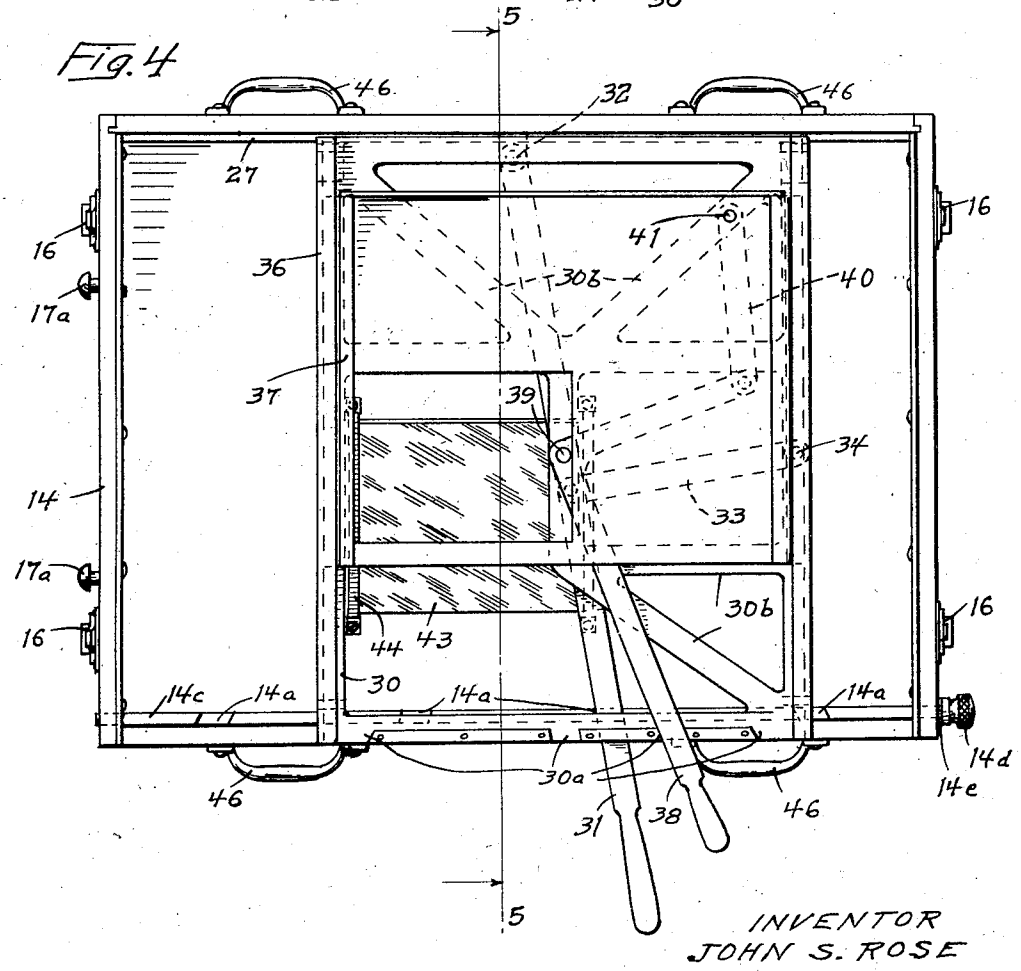


Fig. 4



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Fig. 7

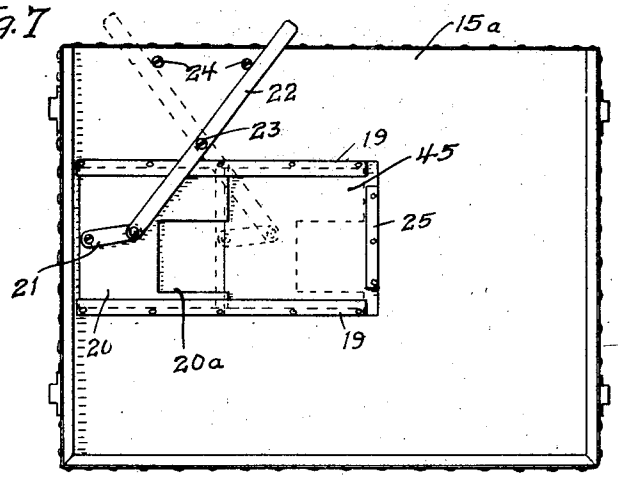


Fig. 9

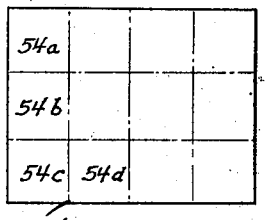


Fig. 10

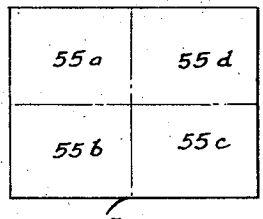


Fig. 5

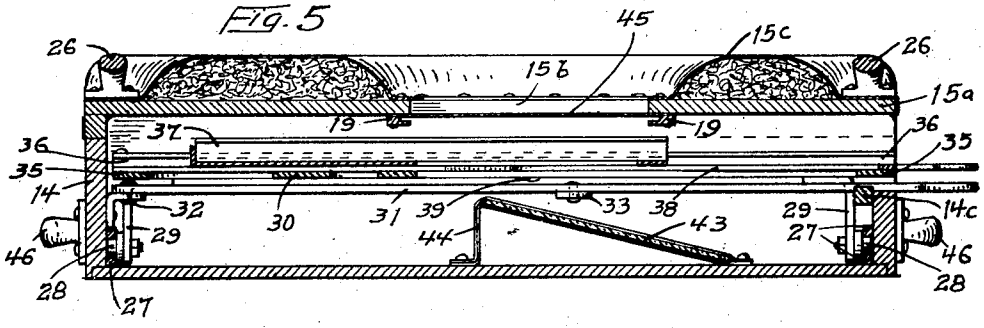
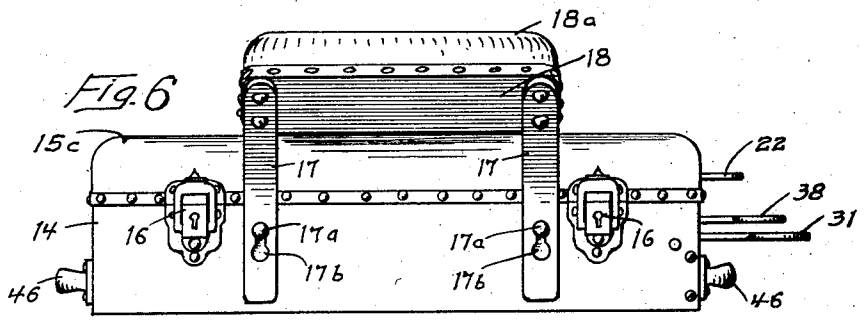


Fig. 6



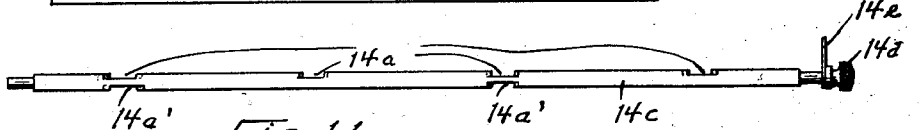


Fig. 11

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UNITED STATES PATENT OFFICE.

JOHN S. ROSE, OF ST. PAUL, MINNESOTA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO R.-B. COMPANY, INCORPORATED, OF MINNEAPOLIS, MINNESOTA, A CORPORATION OF MINNESOTA.

X-RAY APPARATUS.

Application filed September 5, 1925. Serial No. 54,684.

This invention relates to an X-ray or radiographic apparatus and particularly to such an apparatus comprising a support for a patient while X-ray pictures are being taken of such patient. As is well known, it is now a very common practice to take X-ray pictures for the purpose of diagnosing ailments. It is also a common practice to take a series of X-ray pictures of certain organs in the body, particularly the stomach. At such times, certain chemicals are administered internally to the patient which assist in obtaining the X-ray images. While such pictures are being taken it is desirable that the body of the patient be in normal condition or position so that the organs observed, such as the stomach, will function in their normal manner.

It is also desirable that an apparatus be provided in which the cassette or plate holding member may be quickly set in a plurality of different positions so that a series of pictures may be easily and quickly obtained. It is also desirable to have a portable apparatus of the character referred to which can be readily mounted in different positions and supported in different places.

It is an object of this invention, therefore, to provide an X-ray apparatus comprising a casing adapted to hold the cassette, which casing has a top portion for supporting the body of the patient having a recess therein adapted to receive the convex portion of the body so that the body will not be compressed and the normal action of the organs therein affected.

It is a further object of the invention to provide an X-ray apparatus comprising a casing having a top portion with an opening therethrough, a top portion having a cushioning member surrounding said opening and projecting above the same, said casing having means therein for receiving a cassette and means for moving said cassette and holding the same in a plurality of different positions beneath said exposure opening.

It is still another object of the invention to provide an X-ray apparatus comprising a casing forming a support for the body of a patient and having an exposure opening therethrough, a fluoroscopic screen beneath said opening and also having a mirror disposed below said screen at an angle, said casing being open at one side whereby an image on said screen is reflected by said mirror through said open side and may be observed.

It is also an object of the invention to provide a portable X-ray apparatus comprising a portable casing having a top supporting portion for the body of the patient and an exposure opening through said top portion, together with a plate non-permeable to the X-rays adapted to be moved into alinement with said opening, said plate having a recess cut therein to permit the passage of the X-ray through a limited portion thereof.

These and other objects and advantages of the invention will be fully set forth in the following description made in connection with the accompanying drawings in which like reference characters refer to the same parts throughout the different views, and in which,

Fig. 1 is a perspective view of an X-ray or radiographic apparatus including the present invention;

Fig. 2 is a view in side elevation of a modified form of the apparatus;

Fig. 3 is a longitudinal vertical section of a portion of the apparatus showing the position of the patient thereon;

Fig. 4 is a top plan view of the supporting casing used with the cover removed;

Fig. 5 is a vertical section taken on the line 5—5 of Fig. 4, as indicated by the arrows;

Fig. 6 is an end view in end elevation of the supporting device, as seen from the left of Fig. 3;

Fig. 7 is a bottom plan view of the cover used on the supporting device;

Fig. 8 is a partial view in side elevation of the device as seen from the right of Fig. 4.

Figs. 9 and 10 are diagram views representing the number of exposures taken on the plate; and

Fig. 11 is a side view of the stop bar used.

Referring to the drawings, an X-ray apparatus is shown comprising a table 11, a standard 12 secured thereto on which is mounted the radiographic tube 13 from which the X-rays are projected. In accordance with the present invention, a supporting device comprising a casing 14 is used and while such casing may be supported in any convenient place it is shown as rest-

ing upon the surface of table 11. While the casing 14 may take various shapes, in the embodiment of the invention illustrated, it is shown as of rectangular form and the same is provided with a removable top portion 15. The top portion 15 fits the portion 14 and is detachably secured thereto by pairs of hasp latches 16, there being a pair of such latches at each end of the device adjacent the sides thereof. The latches 16 are similar to the well known trunk latches such as used on trunk lids and it is thought no further description of the same will be necessary, as any suitable and easily releasable latch might be used. The top portion 15 comprises a plate 15^a having an exposure opening 15^b therethrough adjacent its center, which opening is also illustrated as of rectangular shape. The top portion also has a cushioning member 15^c above plate 15^a and surrounding the opening 15^b, said cushioning member extending some distance above said plate so that a recess is formed above the opening 15^b for a purpose to be later described. The casing 14 may have a bracket 17 secured at one end carrying a plate 18 having a cushion 18^a secured thereto adapted to receive the head of a patient lying on the member 15^c. As shown, a pair of headed pins 17^a project from the side of the casing and the brackets or arms 17 are provided with slots 17^b adapted to be received over the shanks of member 17^a, the slot 17^b having enlarged portions adapted to pass over the heads of member 17^a so that the head rest may readily be removed. The casing 14 is provided at opposite sides with pairs of handles 46 by which the device may be transported from one support to another. The plate 15^a has a guideway secured to its underside comprising spaced rabbeted members 19 in which slide plate 20. This plate has pivotally secured to its outer end a link 21 pivotally secured at its other end to one end of a lever 22 pivoted to plate 15^a by the pivot member 23. The lever 22 projects through the side of top member 15 and stop or indicating members 24 are provided with which the lever 22 contacts when the plate 20 is in its extreme positions. The plate 20 will be covered with lead or other substance impermeable to the X-rays and said plate is shown as having a rectangular portion 20^a in the inner edge, which portion will be arranged to be permeable to the X-rays said plate thus forming a shutter. A slat or bar 25 forms a stop for the plate 20 when in its inner position, said plate being adapted to be moved into alinement with the exposure opening 15^b. The top member 15 has a pair of handles 26 at each side thereof by which it may be lifted from members 14 when latches 16 are released. The casing 14 is provided with a bottom, as shown, and has guide bars 27 disposed at said bottom and against the sides thereof, said guide bars being slotted to receive rollers 28 having flanges engaging the outer sides of said bars and being journaled in members 29 depending from a carriage 30. The carriage 30 is adapted to be moved from end to end of the casing 14 by means of a lever 31 pivoted at 32 to one side of casing 14 and having a link 33 pivotally connected thereto substantially midway of its ends, the other end of said link being pivotally connected at 34 to said carriage. The lever 31 projects through a slot at the front of casing 14 and is provided with a handle by which it is manipulated. Said lever is adapted to be received and held in a plurality of notches 14^a formed in a bar 14^c, which bar extends lengthwise of the casing 14 adjacent the front side thereof and is journaled in the ends of said casing, said bar being provided with an operating knob or handle 14^d at one end of said casing. The knob 14^d has an end or projection 14^e at one side adapted to engage successively stop members or pins 42 projecting from the end of casing 14. The bar 14^c is provided on the side opposite that having the notches 14^a, with a pair of similar spaced notches $14^{a'}$ in which lever 31 is adapted to seat. The carriage 30 comprises spaced bars 35 carrying oppositely disposed channel members 36, which channel members form a guideway in which is mounted for sliding movement a cassette holder 37. The member 37 is adapted to be moved by a bell crank lever 38 pivoted at 39 to the carriage 30, one arm of said lever 33 being pivotally connected to a link 40, the other end of which is pivotally connected at 41 to the holder 37. The lever 38 also projects through the front of casing 14 and is provided with an operating handle, said lever being adapted to be received and held in notches 30^a formed at the front side of carriage 30. It will be seen that the carriage 30 comprises arms or ribs 30^b but that these ribs are omitted at one corner of the carriage thus forming an open space therethrough and the holder 37 is also provided with an open space at its lower left hand corner, as seen in Fig. 4, registering with said space through said carriage. The casing 14, it will be noted, is open at its front end above the front bar 35 and said casing has a mirror 43 secured to its bottom by suitable spaced holders 44, which mirror is inclined downwardly toward the front of said casing and is substantially beneath the opening 15^b of the top member 15. A fluoroscopic screen 45 is disposed beneath the opening 15^b and above the mirror 43 so that an image formed on said screen will be reflected from said mirror and may be observed by the operator through the open front part of the casing

14. In Fig. 2 the casing 14 is illustrated as hung upon an adjustable support or table 47 slidable upon spaced rods 48[a] of a standard adapted to be secured in adjusted position thereon by clamping wheels 49. The table 47 may be attached to one or more flexible members 50 adapted to run over sheaves 51 and to be attached to a suitable counterweight in or between the standards 48[b] which, together with the rods 48[a] are secured to the base member 48. The casing 14 is attached to table 47 by having a pair of handles 46 hung on small levers 52 pivoted at the side of table 47 and having their ends engaging stop pins 53 on said table.

In operation, the device of this invention comprising casing 14 and attached parts, will be disposed on the desired support which, as shown, may be a horizontal table or a vertically inclined table. The device is portable and easily moved from one place to another. It is, therefore, an easy matter to transport the same from one part of the hospital or other institution, to the other part thereof. The position of the patient when supported on the device is illustrated in Figs. 2 and 3. If the patient lies flat on his stomach on a flat support the body is pressed upwardly and the stomach and other organs are pressed against the spine. This places the stomach, or other organs in an abnormal position and this abnormal position will affect the normal functioning of the organs. In order to relieve this upward pressure and to have the body and the internal organs, such as the stomach, in perfectly normal position, the recess is provided in the top portion or cushion 15[c] about the opening 15[b]. The front or convex portion of the body can thus enter this recess, as shown in Fig. 3 and will not be pressed upwardly to cause the internal organs to assume abnormal positions. If a radiographic examination is to be made of the patient by the use of a fluoroscopic screen the tube 13 will be disposed above the patient and the X-rays projected onto the fluoroscopic screen beneath the opening 15[b]. The image made by the X-rays will be formed on said screen and this image may be observed by the operator from the front of the device by looking in the mirror 43.

As previously stated, it is common practice to make a series of X-ray pictures showing the functioning of an internal organ, such as the stomach. The present apparatus is conveniently arranged to expose the plate in such a series of pictures. If twelve exposures are to be made on the plate the lever 22 will be moved to its dotted position so that plate 20 is disposed across opening 15[b] and only the portion 20[a] is capable of transmitting the X-rays. The cassette with the plate therein is now placed in the holder 37 from the front of the device and the lever 31 is moved into one of the end notches 14[a]. The lever 38 is also moved into one of its end notches 30[a]. The plate 54 is now in position with its corner zone 54[a] beneath the tube 13 and beneath the exposure recess 20[a]. An exposure is now made and the lever 38 is then moved to the middle notch 30[a]. This brings the zone 54[b] under the exposure opening and another exposure is made. The lever 38 is then moved to the other end notch 30[a] and the zone 55[c] is brought under the exposure opening and an exposure made on this part of the plate. The lever 31 is now moved into the next adjacent notch 14[a] and the zone 54[d] of the plate 54 is brought under the exposure opening. The lever 38 is now again successively moved into its notches 30[a] again to move the plate 54 transversely across the exposure opening. When the plate has had the three exposures transversely thereof the lever 31 will again be moved and these operations will continue until the twelve exposures have been made on the plate. The successive exposures can thus be very quickly and accurately made.

If it is desired to make four exposures, the bar 14[c] will be rotated on its trunnions 180 degrees by turning knob 14[b] to the right until it engages the lower stop 42. The lever 31 will be placed in one of the notches 14[a'] and the lever 38 will be engaged in one of its end notches. The plate 55 will now have its zone 55[a] at one corner thereof under the exposure opening and an exposure will now be made in this portion of the plate. At this time the plate 20 and lever 22 will be moved to full line position shown in Fig. 7. The lever 38 will now be swung to its other end position and the zone 55[b] of the plate will be brought under the exposure opening. The lever 31 will then be moved to its other notch 14[a'] and zone 55[c] will be brought under the exposure opening, it being understood that the exposure is made on each zone. By again moving lever 38 the zone 55[d] may be exposed so that the series of four exposures will be obtained on the plate. If the device is supported, as shown in Fig. 2, the operation of the exposures will be just the same as above described. It will thus be seen that the plate 20 may be disposed in a plurality of positions and forms, in effect, a shutter controlling the opening which is permeable to the X-rays. This plate is, as described, positioned in accordance with the number of pictures it is desired to take upon one film or plate, and, as above described, the device can be used to make the standard size picture on a standard size plate or film or a series of smaller pictures may be taken on the plate or film. Also, as above set forth,

the device is portable and may be disposed in various positions and on various supports.

From the above description it is seen that applicant has provided an extremely simple and efficient X-ray apparatus and one having a high degree of utility in making radiographic examinations and radiographic pictures. The device is simple and compact and, as stated, can readily be transported and conveniently supported in various positions. The device is arranged to support the patient with the body and the organs thereof in normal position so that the various positions of these organs in their operation may be accurately photographed. The device has been amply demonstrated in actual practice and found to be very successful and efficient.

It will, of course, be understood, that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of applicant's invention, which, generally stated, consists in a device capable of carrying out the objects above set forth, in the novel parts and combinations of parts disclosed and defined in the appended claims.

What is claimed is:

1. An X-ray apparatus having in combination, a casing adapted to be mounted on a support, a top portion on said casing forming a support for the body of the patient, said portion having a recess therein adapted to receive the convex portion of said body whereby the organs in said body will not be pushed out of normal position.

2. An X-ray apparatus having in combination, a casing adapted to be mounted on a support, a cushioned top portion on said casing forming a support for the body of the patient, said portion having a recess therein adapted to be alined with the radiograph tube and to receive the convex portion of said body, said top portion having an opening alined with said recess, and means in said casing for holding a cassette and moving the same to a plurality of positions beneath said opening.

3. An X-ray apparatus having in combination, a casing adapted to be mounted on a support, a top portion on said casing forming a support for the body of the patient, said portion having an opening therein and a cushioning covering extending about said opening, a plate impervious to X-rays movable into alinement with said opening, said plate having an exposure portion permeable to X-rays, means for supporting a sensitive plate in said casing, and means for moving said sensitive plate to a plurality of positions beneath said exposure portion to obtain a plurality of exposures on said plate.

4. An X-ray apparatus having in combination, a casing, a top portion on said casing forming a support for the patient and having an exposure opening therethrough, a carriage in said casing movable from side to side thereof, a lever for moving said carriage and moving the same into a plurality of positions, a holder movable transversely of said carriage, a lever for moving said holder and holding the same in various positions whereby a cassette can be placed in said holder and a plate quickly brought into a series of positions beneath said exposure opening.

5. The structure set forth in claim 4, a plate impermeable to X-rays adapted to be moved over said exposure opening and having a recess therein permeable to X-rays through which exposures may be made when a greater number of smaller pictures are desired.

6. An X-ray apparatus having in combination, a casing adapted to be mounted on a support, a top portion on said casing forming a support for the body of the patient, said portion having an exposure opening thereon, means in said casing for holding a cassette, and means for moving said cassette to bring a plate therein into a multiplicity of positions beneath said exposure opening and for holding said cassette fixed for each of said positions.

7. A portable X-ray apparatus for making a multiplicity of pictures on a single plate comprising a casing having an exposure opening therethrough, and means for varying the effective size of said opening to correspond to the number of pictures to be taken on said plate.

8. The structure set forth in claim 7, said first mentioned means comprising a movable shutter co-operating with said exposure opening and movable to a plurality of positions.

In testimony whereof I affix my signature.

JOHN S. ROSE.