Dec. 8, 1936. H. LINKE ET AL 2,063,878

X-RAY APPARATUS

Filed April 28, 1934 2 Sheets-Sheet 1

FIG. 1.

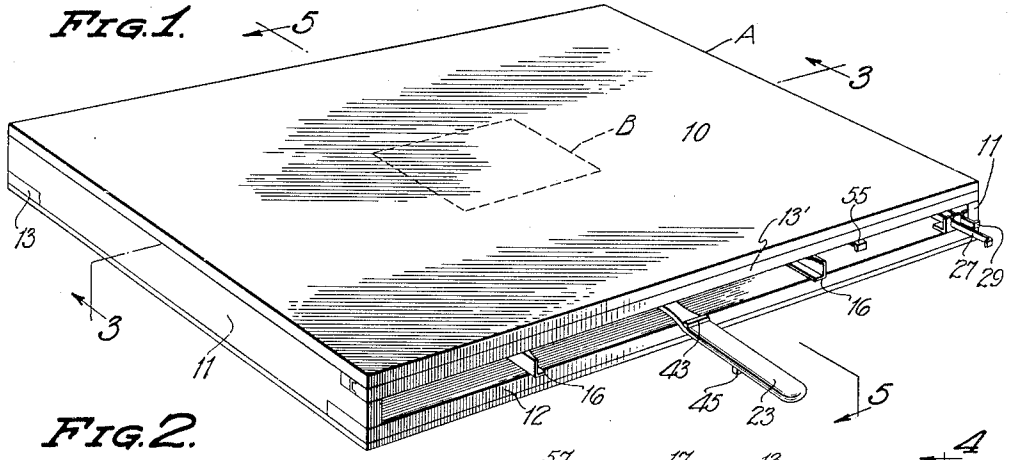
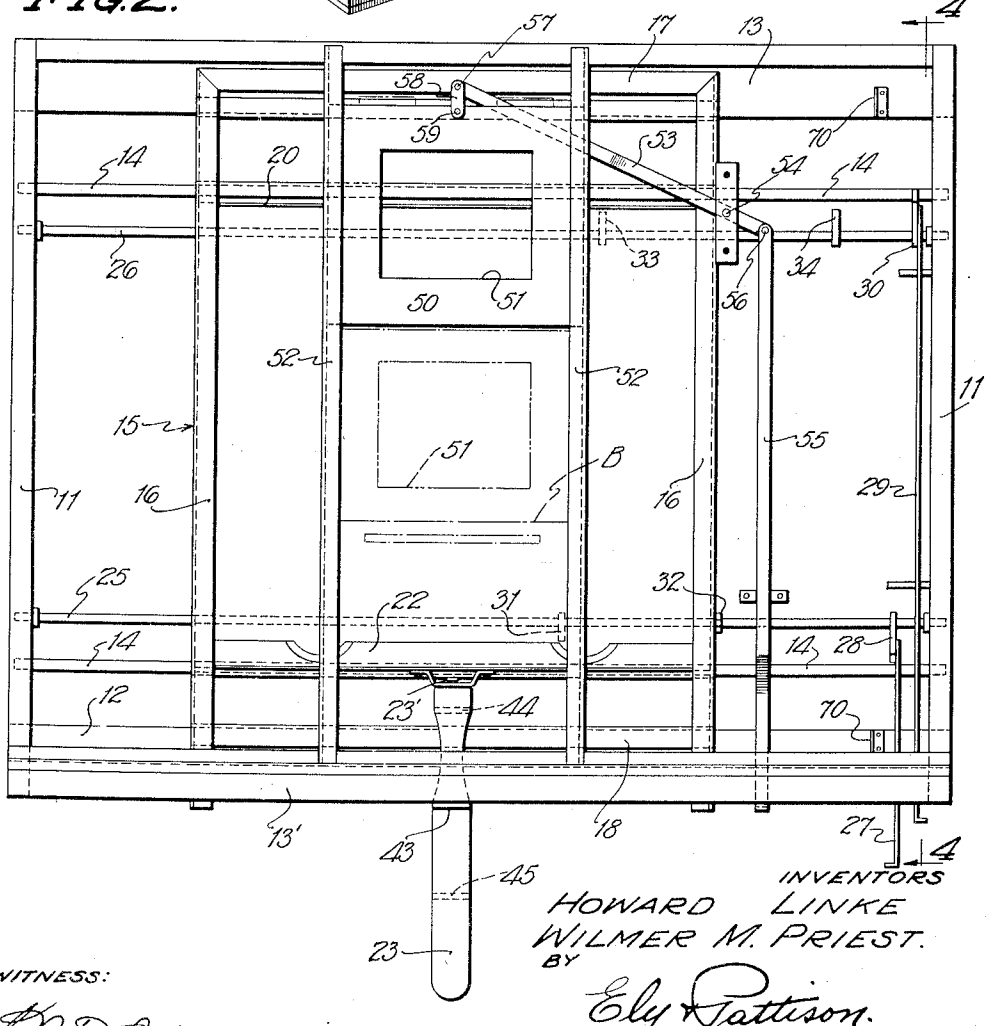


FIG. 2.



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X-RAY APPARATUS

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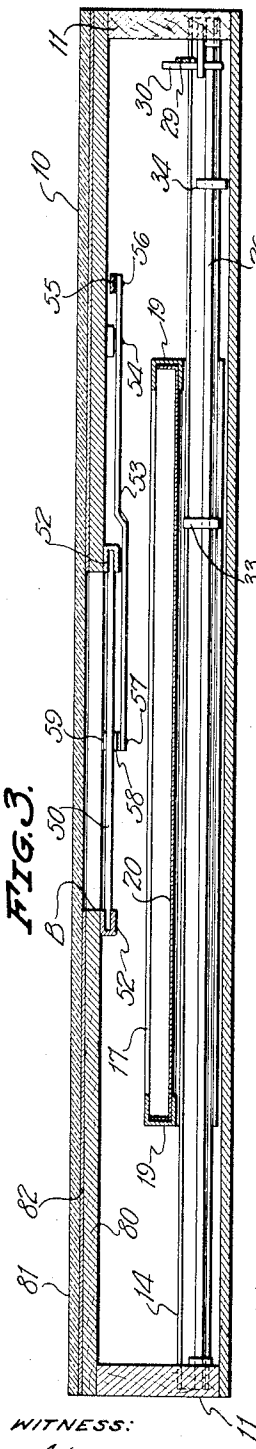


FIG. 3.

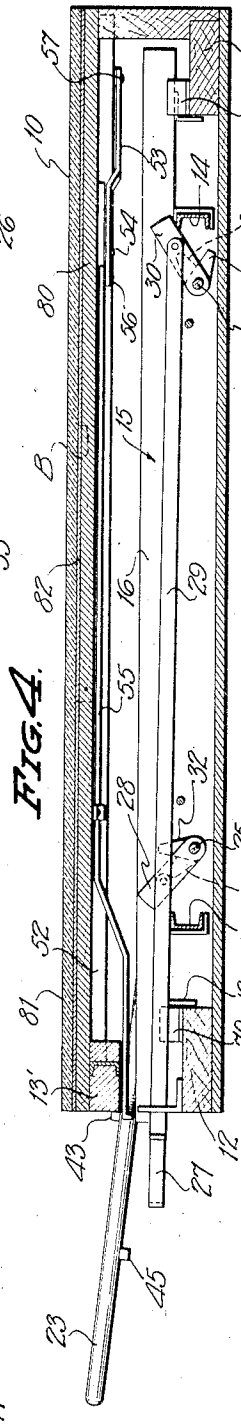


FIG. 4.

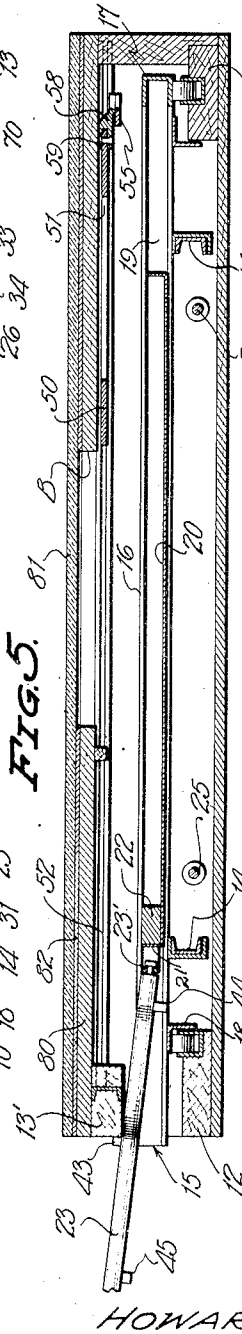


FIG. 5.

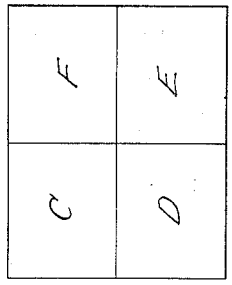


FIG. 7.

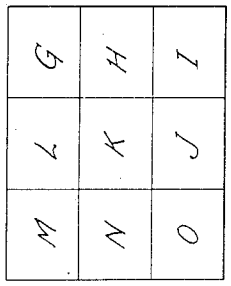


FIG. 6.

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Patented Dec. 8, 1936 2,063,878

UNITED STATES PATENT OFFICE

2,063,878

X-RAY APPARATUS

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Application April 28, 1934, Serial No. 722,874

5 Claims. (Cl. 250—34)

The present invention relates to apparatus for taking X-ray and similar pictures.

It is the object of the invention to provide apparatus by means of which a plurality of exposures may be taken merely by adjustment of the several parts.

It is a further object of the invention to provide means whereby the several adjustments may be conveniently and easily made by the operator without disturbance of the patient.

A still further object of the invention resides in a novel construction whereby a plurality of separate exposures may be made upon a single light sensitive element, merely by simple adjustment of the parts.

Still a further object of the invention resides in a novel construction and arrangement of parts whereby exposures of different sizes may be taken merely by a slight adjustment of the parts.

In the present embodiment of the invention, it has been illustrated as embodied in a panel adapted to be disposed on one edge. It is to be understood, however, that it is not limited to use in this connection alone and that all of its advantages may as well be embodied in a table top or slab.

With the above and other objects in view, the nature of which will be readily understood as the description of the invention proceeds, reference is to be had to the accompanying drawings, in which,

Figure 1 is a perspective view of a device constructed in accordance with the present invention,

Figure 2 is a top plan view illustrating those parts immediately beneath the member which forms the outer wall of the panel,

Figure 3 is a sectional view taken on the line 3—3 of Figure 1,

Figure 4 is a sectional view taken on the line 4—4 of Figure 2,

Figure 5 is a sectional view taken substantially on the line 5—5 of Figure 1, and;

Figures 6 and 7 are diagrammatic views illustrating the arrangements of exposures in groups respectively of nine and four exposures each.

Referring specifically to the drawings, the reference character A designates a panel constructed in accordance with the present invention. In its present embodiment the panel comprises an outer wall member 10, end walls 11, which end walls 11, are connected at the front by a longitudinally extending stringer or the like 12, a similar stringer 13, being arranged at the rear of the panel, as best illustrated in Figure 2. The stringers 12 and 13 are connected to the end walls 11, at the bottom thereof. A stringer 13' is connected to the end walls 11 at their top and extends across the front of the device.

Extending from one end wall to the other of the table, and preferably supported in said end walls, there are two supporting guide members 14, preferably in the form of channel members positioned on edge.

The reference numeral 15, designates a frame, and said frame is slidably mounted upon the guide members 14, as best illustrated in Figures 4 and 5. This frame consists of side members 16, and end members 17 and 18. The several side members of the frame are preferably formed of channels 19, and mounted in said channels 19, there is a light sensitive element supporting member 20. Carried by the member 20, and connected as at 21, to its forward edge, there is a bar 22, upon the outer face of which there is an operating handle 23. By this means the light sensitive element supporting member 20, may be adjusted transversely of the panel.

The frame 15, heretofore mentioned, is adjustable longitudinally of the panel upon the guide members 14, in one direction and the light sensitive element supporting member 20, is adjustable transversely of the panel in the frame 15 by the manipulation of the handle 23.

In the present embodiment of the invention, we have illustrated the supporting member 10, of the table as a fabricated structure comprising a base 30, of wood or other suitable material, and a suitable composition upper surface 31. Between the base 30, and the composition upper surface 31, a layer of lead or other suitable material which is impervious to Röntgen rays which are used in making X-ray pictures, is employed. The base 30 and layer of lead or other suitable material are provided with an exposure opening which, however, is not present in the outer member 10. This opening constitutes an exposure area B which, as illustrated in dotted lines in Figure 1, is located substantially centrally of the panel A.

Means is provided to determine the adjusted position of the frame 15, relative to the exposure area B, heretofore mentioned. This is desirable for the reason that the light sensitive element supporting member 20, must be adjustable relatively to the exposure area in order to position a light sensitive element in different positions beneath the same, to enable a plurality of exposures being made on one light sensitive element. This means consists in part of a pair of shafts 25, and 26, which are mounted in the end walls 11, of the panel, and which are adapted to

be rocked by operating means which extends to the front edge of the table, and which operating means, in the case of the shaft 25, consists of an operating rod 27, connected to a crank or arm 28, secured to the shaft 25, and in the case of the shaft 26, of an operating rod 29, which extends to the front edge of the table and is connected to a crank or arm 30, connected to the shaft 26. The shaft 25, carries two stops 31, and 32, and the shaft 26 carries two stops 33 and 34. These stops are adapted to be engaged by the side walls 16, of the frame when they are moved in position to be engaged thereby, it being understood that the stops are in the form of projecting arms which may be adjusted by rotation of their respective shaft to position into and out of the path of travel of the frame 15.

Means is provided to adjust the light sensitive element supporting member transversely of the panel and to this end the handle 23 thereof, which is rotatably connected as at 23', to the light sensitive element supporting tray 20, has a plurality of stops 43, 44, and 45, thereon, which are adapted to engage the member 13', to determine the adjusted positions of said light sensitive element supporting member relative to the exposure area B.

In Figures 6 and 7, there is illustrated two different group arrangements of multiple exposures on one light sensitive element, Figure 7, showing a group of four exposures, and Figure 6, showing a group of nine exposures. It will be noted that when there are four exposures in a group, each exposure is larger than when there are nine exposures in the group. When the group comprises four exposures, each exposure is of a size substantially equal to the size of the exposure area B. When, however, there are nine exposures in the group, each exposure must necessarily be smaller, and to obtain this result, we employ a mask for reducing the size of the exposure area B.

The mask as herein illustrated comprises a framelike member 50, having an opening 51, which is smaller than the exposure area B. This frame is formed from any suitable material which is impervious to Röntgen rays, of which, lead is one very good example. The mask is slidably mounted in guides 52, secured to the inner face of the member 19, of the panel and suitable operating means is provided for reciprocating the same. This operating means preferably consists of an arm 53, pivotally mounted as at 54, to the inner face of the member 19, and which is rocked about its pivotal point 54, by a link 55, which as shown, extends to the forward side of the panel and which is pivotally connected to one end of the arm 53, as at 56. The other end of the arm 53 is pivotally connected as at 57, to a connecting link or similar member 58, which is secured as at 59, to the mask 50. Thus, with the several parts in the position in which they are shown in Figure 2, if the link 55, be pushed inwardly the mask 50 will be moved to the position in which it is shown in dot and dash lines. After the mask has been adjusted to this position, a slight pull upon the link 55, will return the mask to the position in which it is shown in full lines in said figure.

We will now proceed to describe the operation of the device to produce a group of nine pictures or exposures such as illustrated in Figure 6.

In Figure 6, the nine exposures are designated G, H, I, J, K, L, M, N, and O. While the device may be operated in various manners, it is more convenient to make the exposure G the initial exposure and to carry out the sequence in which the exposures are taken in the alphabetical order as designated in said Figure 6. To position the several parts to make the exposure G, the frame 15 is moved to the left in Figure 2 until its right hand side passes the stop 31. The stop 31 is then adjusted to position in the path of the frame and the frame is moved until it engages the stop 31. The light sensitive element supporting tray 20 is then moved outwardly in Figure 2 until the edge to which the handle is connected occupies a position flush with the member 13' of the device. With the parts in this position the area designated G in Figure 6 will be disposed directly beneath the exposure opening 51 of the mask 50, it being understood, of course, that the mask 50 will be adjusted to its central position in which it is illustrated in dot and dash lines in said Figure 2. After this exposure has been taken, the light sensitive element supporting tray 20 is moved inwardly until the stop 43 of the handle 23 thereof, engages the member 13' whereupon the area H of a light sensitive element mounted upon the tray will be disposed beneath the exposure opening 51. After this exposure has been taken, the stop 43 of the handle 23 is moved out of engagement with the member 13' and the tray moved inwardly until it engages the member 17 of the frame 15, in which position the area I of the light sensitive element will be positioned directly beneath the sight opening 51. To obtain the exposure J the stop 31 is moved out of the path of the frame 15 and the stop 32 is adjusted into the path of the frame 15, and the frame is moved to the right in Figure 2 until it engages the stop 32. In this position of the frame, the area J of the light sensitive element will be positioned beneath the opening 51 of the mask 50. To obtain the exposure designated K, the tray is moved outwardly until the stop 43 of the handle 23 can be engaged with the outer edge of the member 13', in which position the area K will be positioned beneath the exposure opening 51 of the mask 50. After this exposure has been taken, the tray is moved still farther outwardly until its front edge is flush or in alinement with the front edge of the member 13', whereupon the area designated L will be disposed beneath the exposure opening of the mask. The next exposure to be taken is the one designated M and to adjust the parts to obtain this exposure, the stop 32 is moved out of the path of the frame 15, and the frame moved to the right until it engages the stops designated 70. With the parts in this position the area M is positioned beneath the exposure opening 51 of the mask. After the exposure M has been taken, the tray is moved inwardly until the stop 43 engages the front face of the member 13', whereupon the area designated N will be positioned beneath the opening 51 of the mask 50. After the exposure N has been taken, the tray is moved inwardly until its inner edge engages the member 17, in which position the area designated O will be positioned beneath the exposure opening 51.

Having described the manner in which nine exposures are taken on a single sensitive element we will now describe the manner in which four exposures are taken upon a similar light sensitive element of substantially the same dimensions as the light sensitive element bearing nine exposures.

In making the four exposures upon a single

light sensitive element, the mask 50 is not used, and is, therefore, moved to the position in which it is shown in full lines in Figure 2 by operation of the member 55 to rock the lever 53 about its pivotal point 54.

In this latter method of operation, the exposure designated C is the first exposure taken and this area is positioned beneath the exposure area B in the following manner. With the parts in the position shown in Figure 2, the stops 31, 32, and 33 are moved out of the path of the frame 15, and the stop 34 is positioned in the path of the frame 15. The frame 15 is now moved to the right in Figure 2 until it engages the stop 34. The tray is now moved outwardly until the stop 44 on the handle 23 thereof will be engaged with the front face of the member 13', it being understood that the handle has been reversed about its pivotal point 23' from the position in which it is shown in Figure 2. With the parts in this position the area designated C in Figure 7 will be postioned beneath the exposure area B. After the exposure C has been taken, the handle is operated to disengage the stop 44 relative to the member 13', and the tray is moved inwardly until the stop 45 engages the member 13', in which position the area designated D will be positioned beneath the exposure area B. After the exposure D has been taken, the stop 34 is moved out of the path of the frame 15 and the stop 33 moved into the path of the frame, after which the frame is moved to the left until it engages the stop 33, whereupon the area designated E will be positioned beneath the exposure opening B. After the exposure E has been taken, the tray is moved outwardly until the stop 44 on the handle thereof may be engaged with the outer face of the member 13' whereupon the area designated F in Figure 7 will be positioned beneath the exposure area B.

While in describing the operation of the device, we have given a particular sequence of movements, it is to be understood that successful operation of the invention is not dependent upon the recited sequence of movement and that by proper adjustment of the several stops and manipulation of the parts, the several exposures may be taken in any desired sequence. It is also to be understood that the light sensitive element on which the exposures are made is carried by the member 20 and is adjusted as described with relation to the exposure area B and the opening 51 of the mask 50 as the case may be.

From the foregoing, it will be apparent that the present invention provides a new and improved apparatus for use in the making of X-ray and similar pictures in which a plurality of exposures of a single subject may be made without disturbance of the subject and merely by an easy and simple adjustment of the various parts of the apparatus.

While the invention has been herein illustrated in its preferred form, it is to be understood that it is not to be specifically limited to the various constructions and arrangements herein shown, and that it may be practiced in other forms without departing from the spirit thereof.

Having thus described the invention, what is claimed is:

1. A device for taking X-ray pictures comprising a hollow panel defined by walls, one wall of which is provided with an exposure area, a frame member mounted for sliding movement within said panel relative to said exposure area, means for slidably supporting said frame member, a light sensitive element supporting tray slidably mounted in said frame, stops movable into the path of and engageable by said frame to selectively position predetermined portions of the tray relative to the exposure area of the panel, a handle for manipulating the tray and a plurality of stops carried by the handle for determining the position of the tray relative to said frame and to the exposure area of the panel.

2. A device for taking X-ray pictures comprising a hollow panel defined by walls, one wall of which is provided with an exposure area, a frame member adjustable in one direction in the panel, a light sensitive element supporting tray mounted in the frame for adjustment in a direction transversely with respect to the direction of adjustment of the frame, and a handle connected to the tray and movable inwardly and outwardly of the panel for adjusting the position of the tray in the frame said tray providing a connection between the handle and frame and said handle also being movable in a direction transversely with respect to the tray adjusting movement for adjusting the position of the frame in the panel.

3. A device for taking X-ray pictures comprising a hollow panel defined by walls, one wall of which is provided with an exposure area, a frame member adjustably mounted in the panel, a light sensitive element supporting tray adjustably carried by the frame member and a manipulating handle movable longitudinally and transversely of the panel and operable to adjust the position of the frame when the handle is moved in one direction and operable to adjust the position of the tray when the handle is moved in another direction.

4. A device for taking X-ray pictures comprising a hollow panel defined by walls, one wall of which is provided with an exposure area, a frame member mounted for adjustment longitudinally in the panel, a light sensitive element supporting tray carried by the frame and adjustable transversely of the panel and a manipulating handle connected to the tray and projecting from the panel, said handle being operable to adjust the position of the frame and the tray when pressure is applied to the handle in a direction longitudinally and transversely respectively of the handle.

5. A device for taking X-ray pictures comprising a hollow panel defined by walls, one wall of which is provided with an exposure area, a frame member adjustable in one direction in the panel, a light sensitive element supporting tray mounted in the frame for adjustment in a direction transversely with respect to the direction of adjustment of the frame, a handle connected to the tray for adjusting the position of the tray in the frame, said tray providing a connection between the handle and frame for adjusting the position of the frame in the panel, stops for securing the frame in adjusted position and stops carried by the handle and engageable with the panel for securing the tray in adjusted position.

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