Aug. 30, 1938. H. LINKE ET AL 2,128,655

X-RAY APPARATUS

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FIG. 2.

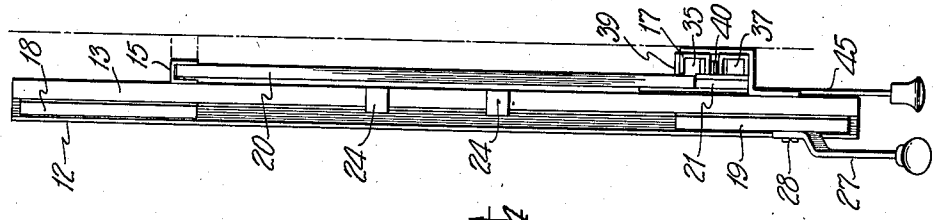
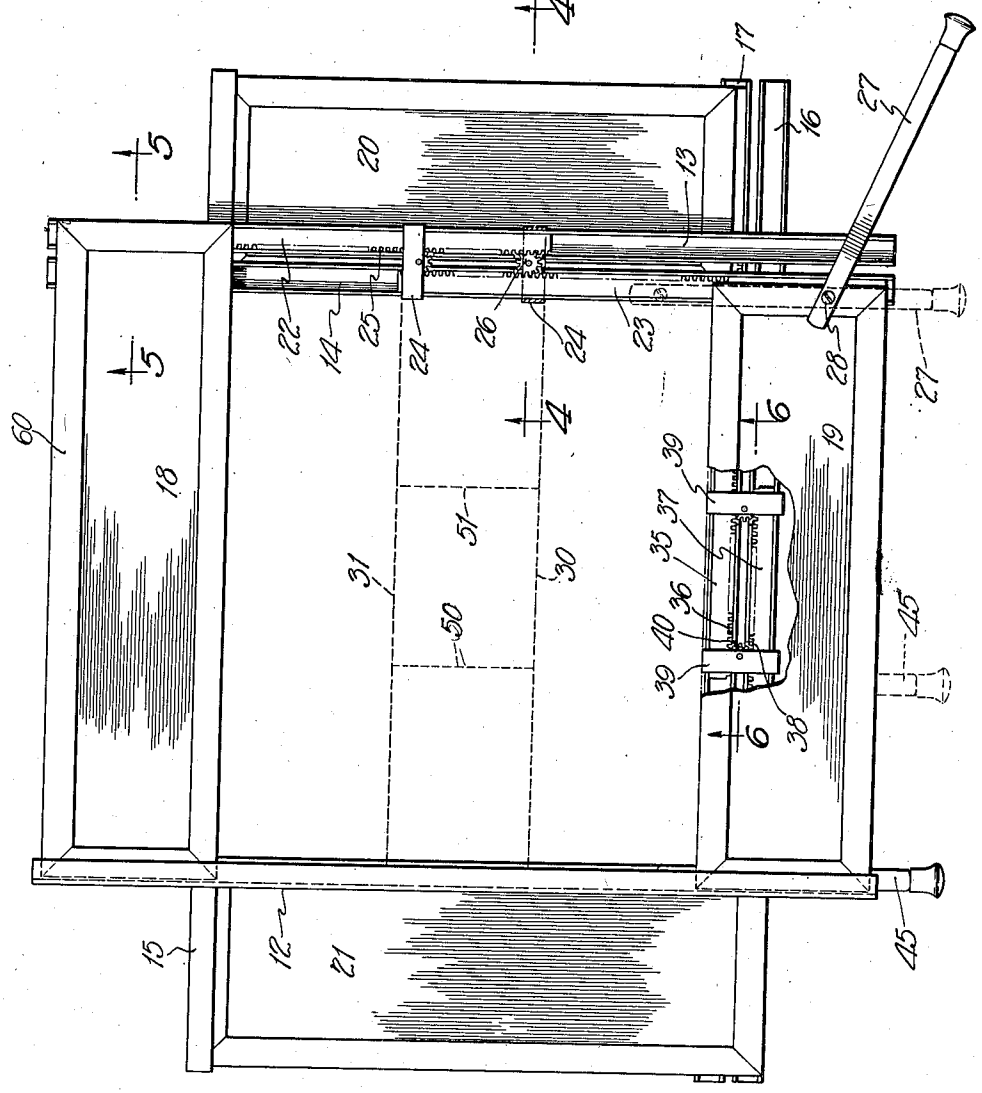


FIG. 1.



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FIG. 3.

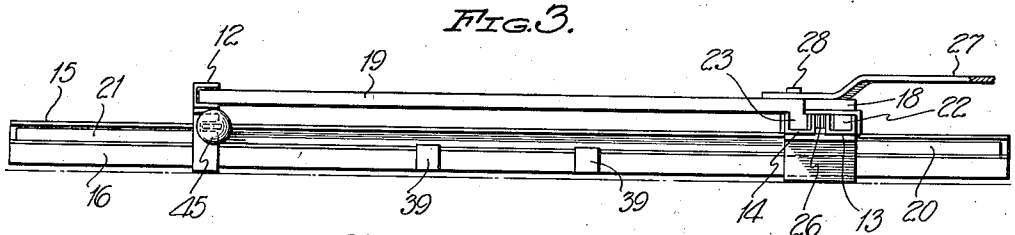


FIG. 4.

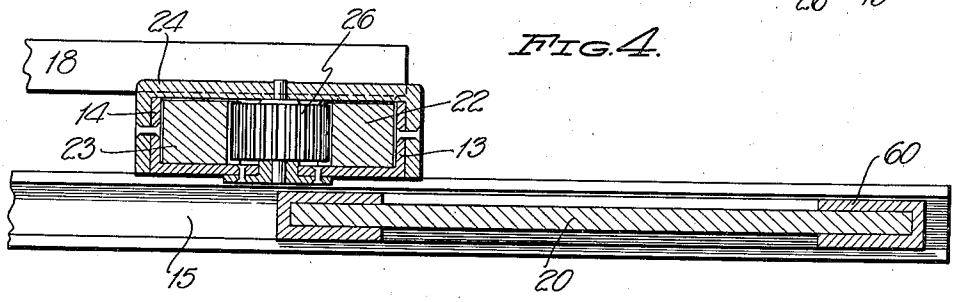


FIG. 5.

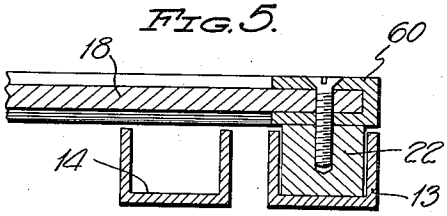


FIG. 6.

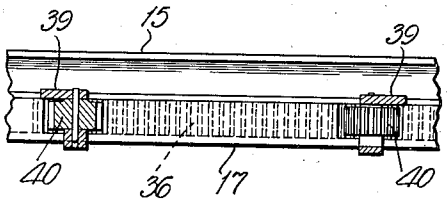


FIG. 7.

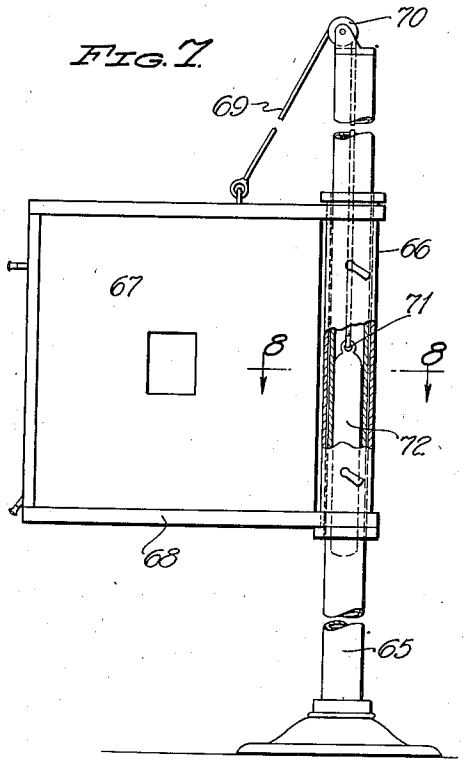
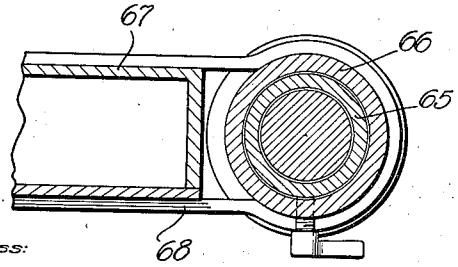


FIG. 8.



WITNESS:

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UNITED STATES PATENT OFFICE

2,128,655

X-RAY APPARATUS

Howard Linke and Wilmer M. Priest,
New York, N. Y.

Application March 2, 1937, Serial No. 128,591

5 Claims. (Cl. 250—34)

This invention relates to new and useful improvements in X-ray apparatus and more particularly it pertains to a new and novel mechanism for varying both the size and shape of the area to be exposed to the action of an X-ray photographic apparatus.

In our prior Patent Number 2,063,878, issued December 8, 1936, we show an X-ray apparatus in which a mask having an exposure opening therein is movable with respect to a light sensitive element in order that a plurality of relatively smaller exposure areas may be made upon a single light sensitive element.

In the aforementioned apparatus, however, the exposure opening of the mask is of fixed size or area and the apparatus forming the subject matter of the present application differs therefrom in that the exposure area may be varied in size at the will of the operator within, of course, certain limitations.

It is one object of the present invention to improve the construction and mode of operation of X-ray apparatus, particularly of the type illustrated in our aforementioned patent and to render such apparatus of greater utility than such prior apparatus with which we are familiar.

A feature of the invention resides in a new and novel construction whereby the exposure area may be varied at will within certain limitations, as to size.

A further feature of the invention resides in the provision of a novel construction whereby the exposure area may be varied at will within certain limitations as to shape.

Other features of the invention relates to certain novel and improved constructions, arrangements, and combinations of parts hereinafter described and particularly pointed out in the claims, the advantages of which will be readily understood and appreciated by those skilled in the art.

The invention will be readily understood from the accompanying drawings illustrating the invention in its preferred form and the following detailed description of the constructions therein shown.

In the drawings,

Figure 1 is a top plan view of an apparatus constructed in accordance with the present invention, the device being shown in one of its adjusted positions in full lines and in another of its adjusted positions in dotted lines;

Figure 2 is a view thereof in side elevation, the view being taken looking at the right hand side of Figure 1;

Figure 3 is a view thereof in side elevation, the view being taken at right angles to Figure 2;

Figure 4 is a detail sectional view taken substantially on the line 4—4 of Figure 1;

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

Figure 6 is a detail sectional view taken substantially on the line 6—6 of Figure 1;

Figure 7 is a view in elevation illustrating conventionally one manner of use of the device; and

Figure 8 is a detail sectional view taken substantially on the line 8—8 of Figure 7.

An apparatus constructed in accordance with the present invention comprises a frame which is preferably rectangular in form. One side of the frame is formed from a channel iron 12 laid on edge with its open side disposed inwardly. The opposite side of the frame is formed from two channel irons 13 and 14. These channel irons are positioned with their open side disposed upwardly. Another side of the frame is formed by a channel iron 15 positioned upon its edge with its open side disposed inwardly, and its opposite side is formed by two channel irons 16 and 17 positioned with their open side disposed upwardly.

The channel irons 12, 13 and 14 are disposed upon the upper side of the channel irons 15, 16, and 17, and the several channel irons are rigidly secured together at their points of contact in any desired manner. The several channel irons are so arranged with relation to each other that each end of a channel iron extends beyond the point where the channel irons are secured together, which construction provides, in the present instance, a rectangular exposure area with the ends of the channel irons extending beyond the open frame which forms the said rectangular exposure area.

Mounted for sliding movement in the channel iron 12 and the channel iron 13 there is a screen 18, and mounted for sliding movement in the channel iron 12 and the channel iron 14 there is a screen 19. These two screens 18 and 19 are, as illustrated in Figure 1, slidably mounted in the upper channel irons. Slidably mounted in the channel irons 15 and 16 there is a screen 20, and slidably mounted in the channel irons 15 and 17 there is a screen 21.

These screens are adapted to be moved inwardly of the frame to vary both the shape and the size of the space or area enclosed in the frame and which will be hereinafter referred to as the exposure area.

While the purpose of the invention may be

accomplished after a fashion by individual or separate movement and adjustment of the screens, we prefer to have the screens arranged in pairs in such a manner that operation or movement to adjust the position of one of the screens of either pair will effect movement of the other screen in the pair so that the screens in each pair will be simultaneously moved either towards or away from each other. The means by which this is accomplished is also preferably of such a construction that the simultaneous movement of the two screens in either pair towards or away from each other will be uniform.

In the present embodiment of the invention the screens 18 and 19 constitute one pair, the screens 20 and 21 constituting the other pair, the frame being of such rectangular shape as to be square although other shapes may be employed without departing from the spirit of the invention.

The screen 18 has an inwardly extending rectangular bar 22 which lies and operates within the channel iron 13, while the screen 19 has an inwardly extending rectangular bar 23 which lies and operates within the channel iron 14. The channel irons 13 and 14 are rigidly connected together intermediate of their ends by straps or the like 24, and said straps also provide guides beneath which the rack bars 22 and 23 slide and by which the rack bars are aided in maintaining their positions within the channel irons in which they operate. The teeth of the rack bars, which teeth are designated 25 in Figure 1, are provided in the adjacent side edges of the rack bars, and interposed between the rack bars and having engagement with said teeth there are gear wheels 26. In the present embodiment of the invention there is one gear wheel carried by each strap 24, the gear wheels being rotatably mounted in said straps. One of the screens, preferably the screen designated 19, is provided with an operating handle 27. The operating handle 27 is pivotally attached to the screen as at 28 and may be rocked about its pivotal point into the position in which it is shown in full lines or that in which it is shown in dotted lines in Figure 1, or any other desirable intermediate position.

The operating handle 27 provides means for sliding the screen 19 within the channel irons in which it is mounted, and it will be obvious that when the screen 19 is moved by its operating handle 27 from the position in which it is shown in Figure 1 in full lines to the position in which it is shown in said figure in dotted lines, which latter position is designated 30, the rack bar 23 attached to the screen 19, will operate the gears 26 which in turn will operate the rack bar 22 carried by the screen 18 and move said screen 18 from the position in which it is shown in full lines in Figure 1 to the position in which it is shown in dotted lines in said figure, which latter position is designated 31. With the two screens 18 and 19 adjusted to the position in which they are shown in dotted lines and the screens 20 and 21 adjusted to the position in which they are shown in full lines in Figure 1, the space of the rectangular frame or the exposure area would be of a relatively long narrow shape reading from left to right in Figure 1 of the drawings and such as designated by the dotted lines 30 and 31.

If it is desired to reduce the length of this opening of the exposure area it is only necessary to make an adjustment of the screens 20 and 21 to the desired position by moving them inwardly of the frame, and this is accomplished in the following manner.

Rigidly attached to the screen 20 and occupying a position in the channel iron 17 there is a rack bar 35 which has teeth 36, and rigidly attached to the screen 21 and occupying a position in the channel iron 16, there is a rack bar 37 having teeth 38. As in the heretofore described manner, the channel irons 16 and 17 are connected by straps 39, and mounted in said straps there are gears 40 similar to the gears 26, heretofore described. The rack bars 35 and 37 are positioned with the rack teeth adjacent each other, and meshing with the gears 40 in such a manner that movement of one rack bar will communicate or transmit movement to the other rack bar through the medium of the gears 40. Extending forwardly of the machine from the screen 21 there is an operating handle 45 and this operating handle, when moved from the position in which it is shown in full lines to that in which it is shown in dotted lines in Figure 1, will move the screen 21 inwardly of the frame or exposure area to the position indicated by the dotted line 50. During the interengagement of the rack bars 35 and 37 with the gears 40 the screen 20 will likewise be moved inwardly of the frame or exposure area to approximately the position designated by the dotted line 51, in which position of the several screens the exposure area will be reduced to approximately one-ninth of its total area as defined by the frame.

From the foregoing it will be apparent that the screens are simultaneously adjustable in pairs and that by adjustment of the screens both the shape and size of the exposure area may be varied to any desired extent within the limitations of the device which are determined, of course, by the size of the frame.

The device may be used upon a table and when so employed, the light sensitive device which is in the form of a film carried by a suitable apparatus for taking X-ray pictures will be movable therebeneath in order that exposures may be taken at various locations thereon, and it will be obvious that exposures of different sizes and shapes may be had upon the light sensitive element merely by adjustment of the screens, as heretofore described.

It is to be understood that the several screens are formed of any suitable material which would be impervious to Rontgen rays such as employed in the taking of X-ray pictures and they may, if desired, be maintained in suitable frames 60. In Figure 5 these frames are shown as channels embracing the edges of the screen, and in this figure also is illustrated the manner in which the screens are attached to their respective rack bars.

In Figures 7 and 8 we have illustrated the device as used in a vertical plane and in such construction the reference numeral 65 designates a suitable standard upon which is slidably mounted a sleeve 66. A separate frame, which carries the entire unit heretofore described, designated conventionally by the reference character 67, may be rigidly secured to the sleeve 66 by a bracket or similar member 68. The sleeve 66 is slidably mounted upon the standard 65 which is hollow and by means of a flexible element 69 in the form of a rope or cable which passes over a pulley 70 in the upper end of a standard and which is secured as at 71 to a counter-weight 72, the device is counter-balanced whereby it may be adjusted to any vertical position within the limitations of the height of the standard 65.

From the foregoing it will be apparent that the present invention provides a new and im-

proved structure for use in connection with X-ray apparatus in which the exposure area may be varied both as to size and shape at liberty within the limitations of the device, and while the invention has been herein disclosed in its preferred form, it is to be understood that it may be practiced in other forms within the scope of the appended claims.

Having thus described the invention, what is claimed as new, is:

1. In apparatus of the class described, a rectangular open frame, a screen slidably mounted on said frame at each side thereof, means for connecting opposed screens together in pairs, means for simultaneously operating both screens of a pair upon operation of one screen only of the pair, and means for operating one screen only of the pair.

2. In apparatus of the class described, an open rectangular frame, a screen slidably mounted in the frame at each side of said frame, a rack bar extending inwardly of the frame from each of said screens, means for connecting the racks of opposed screens together to provide pairs of screens, means interposed between the racks of each pair of screens to effect simultaneous operation of both screens of the pair upon operation of either of the screens of the pair, and separate means for operating one of said screens in each pair of screens.

3. In apparatus of the class described, a rectangular frame, two adjacent sides of which are each formed of a single channel iron with its open side disposed inwardly of the frame and two adjacent sides, each of which is formed of two channel irons having their open sides disposed in a plane at right angles to the open sides of the channel irons of the first mentioned two adjacent sides of the frame, a screen mounted at each side of the frame, said screens being slidably mounted in said channel irons, and means for moving opposed screens simultaneously inwardly and outwardly of the frame.

4. In apparatus of the class described, a rectangular frame, two adjacent sides of which are each formed of a single channel iron with its open side disposed inwardly of the frame and two adjacent sides, each of which is formed of two channel irons having their open sides disposed in a plane at right angles to the open sides of the channel irons of the first mentioned two adjacent sides of the frame, a screen mounted at each side of the frame, said screens being slidably mounted in said channel irons, and means for moving opposed screens simultaneously inwardly and outwardly of the frame, said operating means including interconnected rack bars extending from opposed screens and mounted for sliding movement in those channel irons which form the second mentioned adjacent side edges of the frame.

5. In apparatus of the class described, a rectangular frame, two adjacent sides of which are each formed of a single channel iron with its open side disposed inwardly of the frame and two adjacent sides, each of which is formed of two channel irons having their open sides disposed in a plane at right angles to the open sides of the channel irons of the first mentioned two adjacent sides of the frame, a screen mounted at each side of the frame, said screens being slidably mounted in said channel irons, and means for moving opposed screens simultaneously inwardly and outwardly of the frame, said operating means including interconnected rack bars extending from opposed screens and mounted for sliding movement in those channel irons which form the second mentioned adjacent side edges of the frame, and a handle connected to one of each of said opposed screens for moving the same to operate the interconnected rack bars.

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