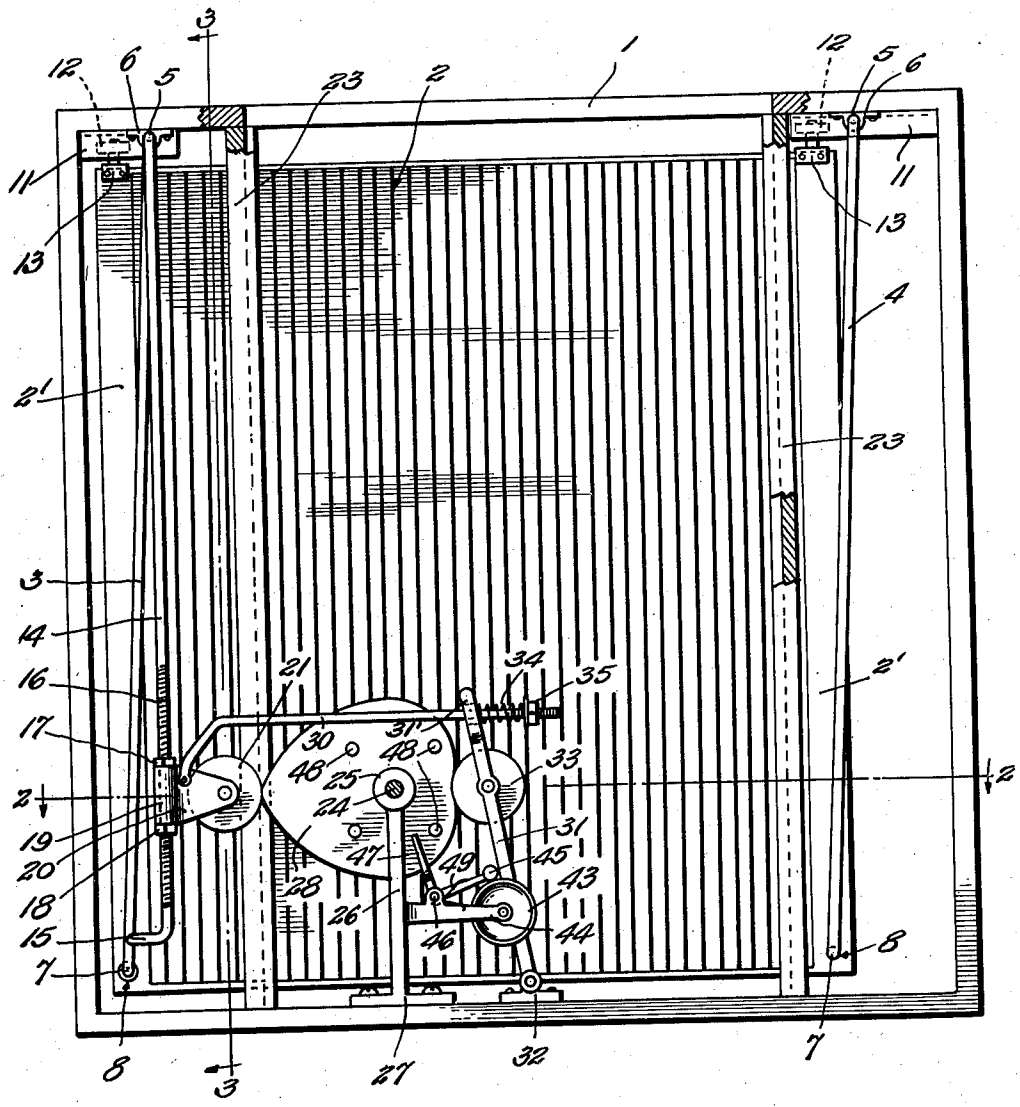
Oct. 11, 1938. H. J. BROWN 2,132,774

X-RAY APPARATUS

Filed Oct. 16, 1937 3 Sheets-Sheet 1

Fig. 1.



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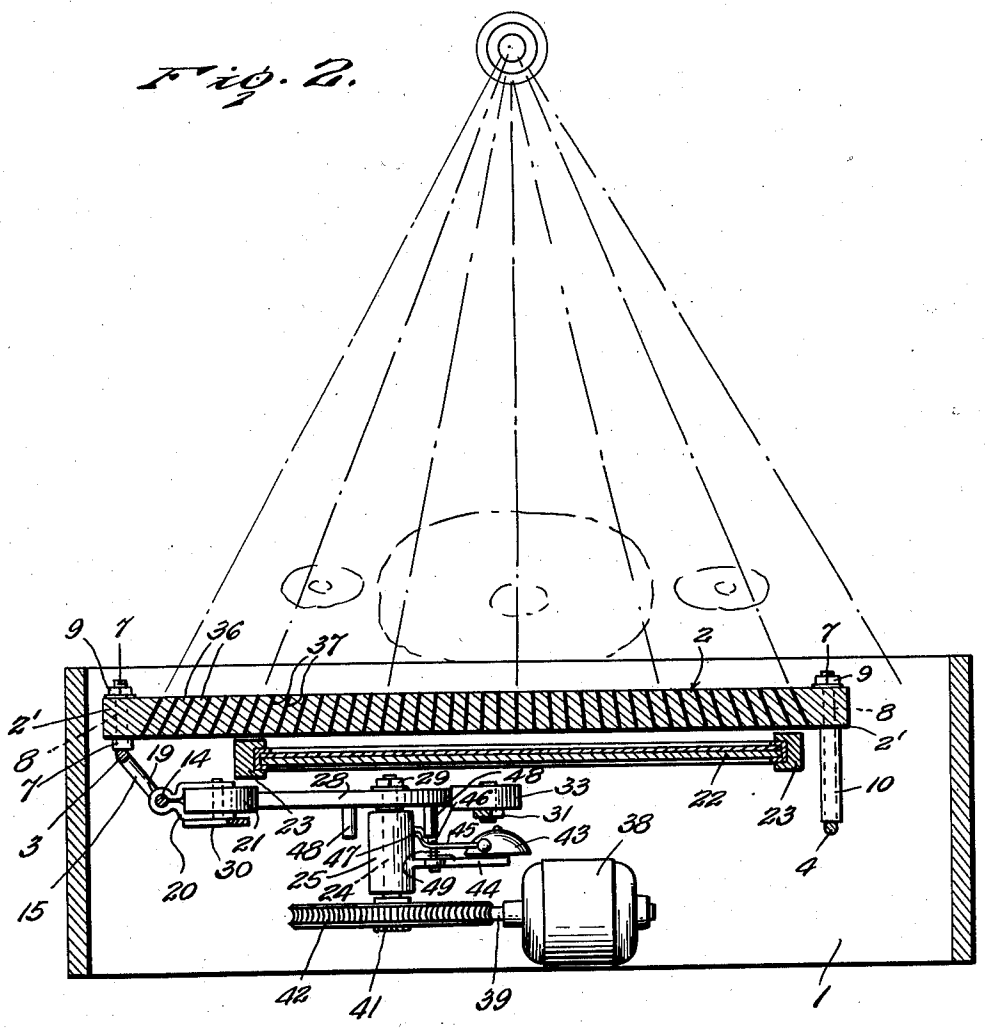
By Lacey & Lacey. Attorneys

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Fig. 2.



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X-RAY APPARATUS

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Fig. 3.

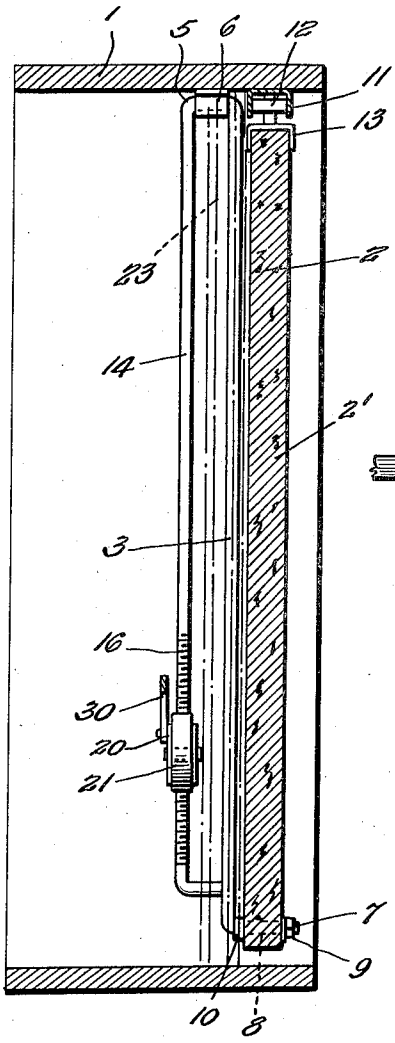


Fig. 4.

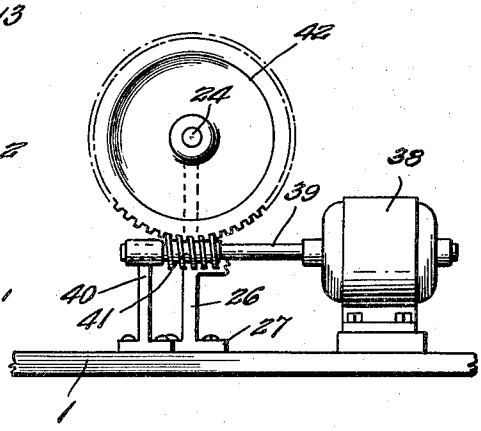


Fig. 5.

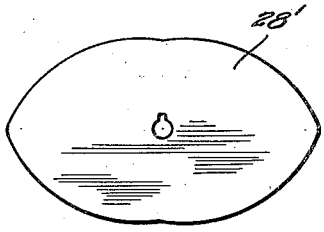
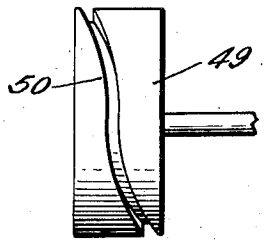


Fig. 6.



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Patented Oct. 11, 1938

2,132,774

UNITED STATES PATENT OFFICE

2,132,774

X-RAY APPARATUS

Howard J. Brown, Cawker City, Kans.

Application October 16, 1937, Serial No. 169,495

8 Claims. (Cl. 250—34)

This invention relates to an X-ray apparatus and more particularly to a grid or screen mounted for shifting movement in an improved manner and having improved actuating means for imparting reciprocating movement to the grid when the X-ray apparatus is in use.

One object of the invention is to so mount the grid or screen that, when the X-ray machine is in use, the grid may have reciprocating movement in the frame in which it is mounted and in addition provide actuating means for the grid so constructed that movement thereof will be substantially continuous and pauses in motion between movements of the screen or grid in opposite directions practically eliminated. It will thus be seen that the screen or grid will be substantially continuously in motion and spoiling of a film caused by Röntgen rays prevented.

Another object of the invention is to so construct the actuating means for imparting reciprocating movement to the screen or grid that a signal bell may be associated therewith and thus serve as an audible signal by means of which the operator can determine the length of time a film or plate has been exposed and shut off the X-ray apparatus at the proper time.

The invention is illustrated in the accompanying drawings, wherein

Figure 1 is a view in elevation of the improved grid and actuating mechanism,

Figure 2 is a sectional view taken horizontally through Figure 1 along the line 2—2,

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

Figure 4 is a view in elevation of a portion of the actuating mechanism for the grid,

Figure 5 is a view in elevation of a modified form of cam disk constituting part of the actuating mechanism, and

Figure 6 is a view of another cam which may be used.

The frame 1 in which the grid or screen 2 is mounted is rectangular, as shown in Figure 1, and will be of the proper dimensions to be received in an X-ray machine. The grid or screen extends vertically in the frame 1 and is suspended by hangers 3 and 4. Each of these hangers is formed from a metal rod having a portion bent laterally to provide an upper pintle 5 journaled through a bearing 6 carried by the top bar of the frame 1. Lower ends of the two rods forming the hangers 3 and 4 are bent to form lower pintles 7 which pass through openings 8 formed in lower corner portions of the grid or screen where they are secured by nuts 9 and sleeves 10 are provided upon the pintles 7 to prevent the pintles from sliding longitudinally through the openings in the screen. At its upper end the frame carries guideways or tracks 11 into which fit the rollers 12 carried by brackets 13 molded or otherwise firmly secured to upper corner portions of the screen. It will thus be seen that, while the grid or screen is permitted to have reciprocating movement transversely in the frame, it will be prevented from shifting out of its proper position and will be maintained in a vertical plane, as shown clearly in Figures 2 and 3. The rod from which the hanger 3 is formed is of greater length than the rod forming the hanger 4 and after being bent to provide the upper pintle 5 of the hanger 3 is bent downwardly to provide an arm 14, the lower end of which is bent towards the hanger, as shown at 15, and welded or otherwise firmly secured thereto. A portion of this arm 14 is threaded, as shown at 16, and carries securing nuts 17 and 18, between which is disposed the sleeve 19 of a bracket 20. This bracket 20 projects laterally from the arm 14 and carries a roller 21. By having the sleeve 19 engaged about the threaded portion 16 of the arm 14 the bracket 20 may be shifted vertically until it is in its proper position and the nuts then turned about the rod until they firmly engage the sleeve at its upper and lower ends and serve as lock nuts to hold the bracket in the adjusted position.

In order to impart reciprocating movement to the screen and cause it to shift back and forth in front of the film or plate holder 22 which is mounted in vertically extending guide bars 23, there has been provided actuating mechanism illustrated in Figures 1, 2 and 4. Referring to these figures, it will be seen that a shaft 24 is journaled through a sleeve or bearing 25 at the upper end of a bracket or standard 26, the base 27 of which is bolted or otherwise firmly secured upon the lower bar of the frame 1. A disk 28 which constitutes a cam is fixed upon the shaft 24 where it is secured by a nut 29. This cam may be heart-shaped, as shown in Figure 1, or tapered towards both ends, as shown in Figure 5, where a modified form of disk designated by the numeral 28' has been illustrated. By having the disk tapered to a point at one or both ends a quick movement of the roller 21 from one side of the disk to the other may quickly occur and reversal of the direction in which the screen moves very quickly effected. The roller bears against the edge face of the cam disk, as clearly shown in Figures 1 and 2, and in order to hold

this roller in contacting engagement with the edge face of the cam disk, there has been provided a tensioning rod or link 30 which is pivoted at one end to the bracket 20. This link 30 extends along one side of the cam over the bearing 25 and has its other end portion loosely engaged through an eye 31' formed at the upper end of a rocker bar or arm 31. This rocker bar has its lower end pivoted to a bearing bracket 32 bolted or otherwise firmly secured upon the lower cross bar of the frame 1 and below the eye 31' the rocker bar carries a roller 33 for engagement with the edge face of the cam disk. A spring 34 fits upon the link 30 between the eye 31' and a nut 35 which is threaded upon the free end portion of the link, and it will be readily understood that by adjusting the nut the tension of the spring may be controlled. This spring exerts pressure which maintains the rollers 21 and 33 in engagement with the edge face of the cam disk, and, as the cam shaft is turned during rotation of the shaft 24, shifting movement first in one direction and then in an opposite direction will be imparted to the grid or screen.

The grid or screen consists of strips of cork and lead which extend vertically in a wood or metal frame 2', this being clearly shown in Figure 2, wherein the strips of cork are designated by the numeral 36 and the thin lead strips by the numeral 37. Screens or grids consisting of a number of strips of wood having thin strips of lead between them have previously been provided in order to prevent an X-ray film or plate from being spoiled by transmission of secondary rays to the film or plate, but previous use of cork is unknown and it has been found that a screen having its strip 36 formed of cork is very efficient in operation and may also be very easily manufactured as the cork can be pressed to provide a flat screen having the lead strips disposed at the proper angle or an arcuate screen formed by properly compressing the cork.

In order to supply power for turning the shaft 24, there has been provided an electric motor 38 which is mounted upon the lower cross bar of the frame 1, as shown in Figures 2 and 4. The shaft 39 of this motor is elongated, as shown in Figure 4, and journaled in a bearing bracket 40 which is also secured upon the lower cross bar of the frame 1. A worm 41 is carried by the shaft 39 and meshes with a large worm gear 42 carried by the shaft 24. It will thus be seen that rotary motion will be transmitted from the motor shaft to the shaft 24 but the speed at which the shaft 24 rotates will be a great deal less than that of the motor shaft.

It is desirable to provide an audible signal in order that the operator of the X-ray apparatus may be warned when it is time to shut off the motor and thus prevent an over-exposure. In order to do so, there has been provided a bell 43 mounted upon an arm 44 extending laterally from the standard of the bearing bracket 26. A striker or clapper 45 is pivoted to the arm 44, as shown at 46, in position to have striking engagement with the bell 43 and has an arm 47 which projects upwardly into position for engagement by the pins 48 which project laterally from the cam disk. These pins are disposed equal distances from the shaft 24 and at equal distances from each other, and it will be readily understood from an inspection of Figure 1 that during rotation of the shaft the pins will be successively moved into engagement with the arm of the clapper to swing the clapper about its pivot 46. The pins then move out of engagement with the arm of the clapper and the springs 49 will swing the clapper into striking engagement with the bell and sound a signal. By sounding the signal the operator can accurately determine when it is time to shut off the motor and stop operation of the device. When a cam disk, such as shown in Figure 1, is in use, a complete reciprocating movement will be imparted to the screen or grid once for each rotation of the shaft 24 but when the double cam 28' illustrated in Figure 5 is in use, the screen will have two reciprocating movements imparted during each rotation of the shaft. Other forms of cams may be used for imparting reciprocating movement to the screen, such, for instance, as the disk 49 illustrated in Figure 6. This disk 49 is formed with a groove 50 to receive a roller and it will be readily understood that since the groove 50 extends in a spiral path about the disk 49, reciprocating motion will be imparted to the screen as the disk and the shaft carrying the same turn.

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

1. In an X-ray apparatus, a frame, a grid disposed vertically in said frame, hangers disposed vertically and having their upper ends pivoted to the frame and their lower ends pivotally connected with the grid and serving to mount the grid for reciprocating movement transversely of the frame, tracks carried by said frame and extending transversely of the frame and the grid, members carried by said grid and engaging said tracks to guide the grid during transverse movement thereof, and means for imparting reciprocating movement to the grid.

2. In an X-ray apparatus, a frame open at its front and back, a grid disposed vertically in said frame, hangers disposed vertically adjacent opposite side margins of the grid with their upper ends pivotally connected with the frame and their lower ends pivoted to lower corner portions of the grid, said hangers serving to mount the grid for reciprocating movement transversely of the frame, tracks in the upper portion of the frame extending transversely of the frame and the grid, rollers carried by upper corner portions of said grid and engaging said tracks to guide the grid during reciprocating movement thereof, and means for imparting reciprocating movement to the grid.

3. In an X-ray apparatus, a vertically disposed frame, a grid disposed vertically in said frame, hangers disposed vertically in the frame with their upper portions pivotally mounted in bearings carried by the frame and their lower ends provided with pinions journaled through lower corner portions of the grid, said hangers serving to mount the grid for reciprocating movement transversely in the frame, transversely extending guides in the upper portion of said frame, guide-engaging members carried by upper corner portions of said grid, a rod extending vertically and carried by one hanger, and means for imparting reciprocating movement to said grid including a cam and a follower for the cam carried by said rod and yieldably held in operative engagement with the cam.

4. In an X-ray apparatus, a frame, a grid disposed vertically in said frame, bearings mounted in said frame above said grid, hangers for mounting said grid for reciprocating movement transversely in said frame, said hangers being formed from rods having their lower portions bent to form pintles journaled through openings in lower

corner portions of the grid, the rods being also bent to form upper pintles journaled through the bearings and one rod being bent to provide a vertically disposed arm extending downwardly from its upper pintle and having its lower end bent laterally and anchored to the hanger adjacent the lower end thereof, and means for imparting reciprocating movement to said grid including a rotary shaft, a cam carried by said shaft and turning with the same, and a follower carried by the vertically disposed arm of the last-mentioned hanger and adjustable thereon into position for operative engagement with said cam.

5. In an X-ray apparatus, a frame, a grid disposed vertically in said frame, hangers for mounting said grid for reciprocating movement disposed vertically in the frame with their upper ends pivoted to the frame and their lower ends pivoted to the lower portion of said grid, a vertically disposed rod carried by and moving with one hanger, a bracket adjustable along said rod and extending laterally therefrom, a roller carried by said bracket, a rotary shaft, a cam carried by said shaft, yieldable means connected with said bracket and holding said roller in operative engagement with said cam, and means for imparting rotary motion to said shaft.

6. In an X-ray apparatus, a frame, a grid disposed vertically in said frame, hangers mounting said grid for reciprocating movement in said frame, a vertically disposed rod carried by one hanger, a bracket adjustable vertically along said rod and extending laterally therefrom, a roller carried by said bracket, a rotary shaft, a cam carried by said shaft and engaged by said roller, a rocker arm pivotally mounted in said frame and carrying a roller engaging the cam at the opposite side thereof from the first roller, a link carried by said bracket and loosely engaged through the upper end of said rocker arm, an adjustable abutment upon said link, a spring between the adjustable abutment and the upper end of said rocker arm and yieldably holding the rollers in contacting engagement with the cam, and means for imparting rotary motion to said shaft.

7. In an X-ray apparatus, a frame, a grid disposed vertically in said frame, hangers mounting the grid for reciprocating movement transversely of the hangers, a rod carried by one hanger and disposed vertically, a bracket carried by said rod and adjustable vertically thereon, a roller carried by said bracket, a standard having a bearing at its upper end, a shaft journaled through said bearing, a cam carried by said shaft and engaged by said roller, yieldable means holding said roller in operative engagement with said cam, abutment members extending from said cam in radial spaced relation to said shaft, and an audible signal device carried by said standard and including a striker having an actuating member disposed in position for engagement by the abutment as the cam turns with the shaft.

8. In an X-ray apparatus, a frame, a grid disposed vertically in said frame, hangers mounting the grid for reciprocating movement transversely in said frame, a follower carried by one hanger, a rotary shaft, a cam carried by said shaft and tapered to a point at one end, the other end of the cam being rounded and formed with a depression in its edge face, yieldable means for holding said follower in engagement with the edge face of the cam, and means for imparting rotation to said shaft.

HOWARD J. BROWN.