

Dec. 29, 1925.

1,567,833

G. BUCKY

GRID SHAPED SCREEN FOR X-RAY APPARATUS

Filed Oct. 22, 1923

Fig. 1.

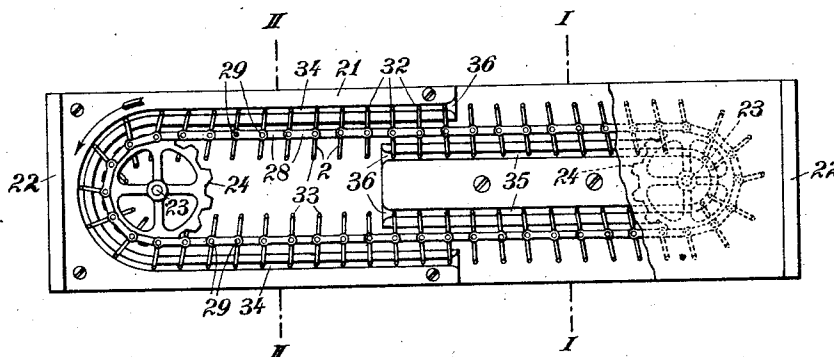


Fig. 2.

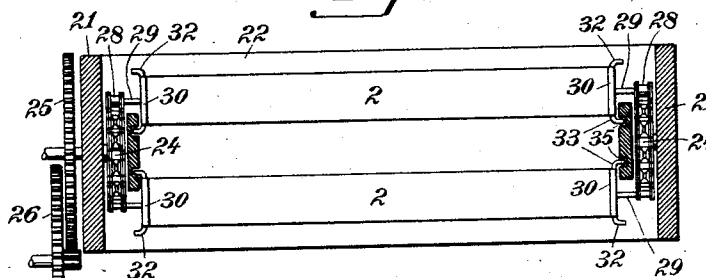
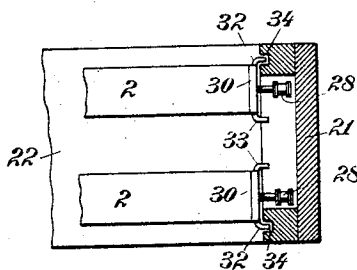


Fig. 3.



INVENTOR
Gustav Bucky
By *Walton Harrison*,
Attorney.

UNITED STATES PATENT OFFICE.

GUSTAV BUCKY, OF NEW YORK, N. Y.

GRID-SHAPED SCREEN FOR X-RAY APPARATUS.

Application filed October 22, 1923. Serial No. 669,914.

To all whom it may concern:

Be it known that I, GUSTAV BUCKY, a citizen of the German Empire, and resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Grid-Shaped Screens for X-Ray Apparatus (for which I have filed an application for a patent in Germany on November 15, 1922, Serial No. B 107,221 VI 57A1), of which the following is a full, clear, and concise description.

It is well known that the secondary X-rays produced in a body during the passage of X-rays cause a veiling or clouding of the image projected by the primary X-rays.

This veiling effect has been eliminated by stopping the secondary rays by means of a screen or blind disposed between body and image carrier, which screen consists of a material which the X-rays can only penetrate with difficulty and which is provided with ducts or openings in the direction of the primary rays. In order to make the shadow of the screen disappear a reciprocating motion in the direction of the plane of the screen has been imparted to the screen during the exposure. During this motion the slats or staves lose, however, their exactly radial position and produce shadows of different widths which make themselves noticeable on the plate by unequal exposure.

My present invention has for its object to provide an improved screen or blind of the general character referred to above, and to construct said screen and its operating mechanism in such a manner that the slats will always preserve their proper radial position so that the several slats will converge toward the source of the X-rays, and that this relation will be preserved while the screen moves in the same direction through a range sufficient for two or more exposures. In particular, I have devised a new form of screen which is flexible and endless, enabling it to be operated continuously in one direction, instead of requiring it to be moved alternately in opposite directions, and also enabling any position of the screen to be used as the initial position for an exposure, while with previous devices it was necessary to

have the screen in a definite position at the beginning of an exposure.

In the drawings a satisfactory and preferred embodiment of my invention has been shown by way of example. In the drawings—

Fig. 1 shows the screen in front elevation with portion of the side of the frame cut away, the slats or staves being mounted upon an endless chain,

Fig. 2 a cross-section along line I—I of Fig. 1 and

Fig. 3 a cross-section along line II—II of Fig. 1.

The same numerals indicate similar parts throughout all the figures of the drawings.

In the construction illustrated in the Figures 1-3 the blind or screen is disposed in a frame-like part, which consists of two long side walls 21 and two transverse end walls 22 joining them together. In the side-walls are journaled two spindles 23, upon each of which two chain wheels 24 are fixed. One of the spindles 23 projects beyond the side-walls 21 and is so coupled with a small electromotor 27 by means of a gearing 25, 26, that it is set in very slow rotation. Around each pair of chain wheels 24 an endless chain 28 is laid and stretched as taut as possible. The links of the chains are hinged together by pins 29 which are fixed to the individual flat staves 2 of the screen or blind. These staves which may for instance consist of strips of ribbon-steel are provided with reinforcing mountings 30 at their ends in which the hinge pins may be securely fixed.

The staves of the screen or blind moved by the chain in the direction of the arrow, Fig. 1, should be so adjusted that their produced central planes always pass through the focus of the X-ray tube. For this purpose special guides are provided and the end mountings 30 of the laths are each provided with pins 32, 33. The outer of these pins 32 cooperate with a guide groove 34 provided at the inside of the side wall 21. For the inner pins 33 further guide grooves 35 are provided. These guide grooves extend each only over a part of the total path of the staves of the blind and of the two only that one is employed for the time being in which the guide pins of the blind strips are dragged along. Only at the central portion of

the blind or screen, where the staves or strips 2 are substantially vertical, both grooved guides overlap. At their starting points the grooves are conically expanded or flared 5 in order to facilitate the engagement of the pins with the grooves. The object of this one-sided arrangement is to maintain the staves constantly in the correct position pointing towards the focus of the X-ray tube, the friction in the guide-rails tending 10 to keep the staves back. As in the central portion of the path, where the laths temporarily take up a vertical position, the sense of direction of the staves changes, the guidance must pass from the pins on the one side 15 to those on the other, as clearly shown in Fig. 1.

The two guide-rails for the pins of the staves of the blind may also be continued 20 over the whole length of the blind, but the construction illustrated ensures the easier adjustment of the staves even if the guide faces should not be very accurate.

The photographic plate is disposed below 25 the blind, so that the X-rays are obliged to pass through both rows of staves. As during the larger portion of the travel the superimposed staves will be relatively displaced in the direction of the rays an essentially better screening effect will be 30 attained by the arrangement of this double screen.

The photographic plate or box may, however, also be disposed between the two rows 35 of staves. In such a case the staves are preferably made somewhat higher. The guide for the lower path of the chain may then be omitted as long as provisions are made that the staves during their passage on 40 to the upper path are automatically brought into the correct position. Differing from the practice of the prior art, it will be observed that in the particular embodiment of my invention shown in the drawings, the 45 length of the entire series of slats is at least twice that of the field of exposure. The progress of the entire series of slats or staves is consequently such that irrespective of the time involved in making a good exposure or the point where the movement of 50 the slats or staves ceases, the apparatus is always set and ready for a new exposure. In other words, it neither has nor requires a definite starting position. The apparatus is 55 at all times ready for a new exposure. It therefore is not necessary to reverse the direction of movement of the connected slats, after making an exposure, in order to bring them to a proper position for the next exposure. In the particular embodiment shown, 60 where the connected slats form an endless chain, the slats are always in every position in which their movement may have been arrested at the end of an exposure, in proper 65 position for beginning an exposure. It is

not absolutely essential, however, that the connected slats form an endless series, although this is the preferred construction, provided the arrangement of the slats is such 70 as to accomplish the desired end, i. e., a continuity of operations without requiring re-setting of the slats.

What I claim as my invention and desire to secure by Letters Patent is:—

1. Apparatus of the type described, comprising a stationary frame, a screen movable on said frame and composed of a series of spaced slats, the number of slats being a multiple of the number of slats which 75 occupy the field of exposure simultaneously, so that said series is arranged to function for a plurality of successive exposures, without requiring resetting thereof, and means for keeping the slats pointing toward the same focus as they pass through the field 80 of exposure. 85

2. Apparatus of the type described, comprising a stationary frame, a screen movable on said frame and composed of a series of spaced flat rods, means whereby in any 90 position which said rods may occupy they will constantly and continuously be in proper position for a new exposure, so that a multiplicity of successive exposures may be continuously effected without resetting 95 the screen or reversing the direction of movement of the screen, and means for keeping the rods pointing toward the same focus as they pass through the field of exposure. 100

3. Apparatus of the type described, comprising a stationary frame, a screen movable on said frame and composed of an endless series of spaced slats, and means for keeping 105 the slats pointing toward the same focus as they pass through the field of exposure. 110

4. Apparatus of the type described, comprising a stationary frame, a screen movable on said frame and composed of an endless series of spaced slats arranged to form two 115 approximately parallel runs in the field of exposure, and means for keeping the slats of both runs pointing toward the same focus as they pass through the field of exposure. 120

5. Apparatus of the type described, comprising a stationary frame, a screen movably mounted in said frame, said screen consisting of two endless chains and slats 125 mounted on the hinge pins of and between said chains, means for propelling said chains, and guiding means for automatically adjusting said slats between said chains in such a manner that they always point 130 to the focus of the X-ray tube.

6. Apparatus of the type described, comprising a stationary frame, a screen movably mounted in said frame, said screen consisting of two endless chains and slats 135 mounted on the hinge pins of and between said chains, means for propelling said chains, and guiding means for automati-

cally adjusting said slats between said chains in such a manner that they always point to the focus of the X-ray tube, the upper as well as the lower row of slats being interposed in the path of the rays.

5 7. Apparatus of the type described, comprising a stationary frame, a screen movably mounted in said frame, said screen consisting of two endless chains and slats
10 mounted on the hinge pins of and between said chains, projecting pins at the ends of said slats, guide rails fixed at the inner sides of said stationary frame and adapted to be engaged by said pins and to adjust said
15 slats in said screen in such a manner that they always point to the focus of the X-ray tube, and means for propelling said chains.

8. Apparatus of the type described, comprising a stationary frame, a screen movably mounted in said frame, said screen consisting of two endless chains and slats
20 mounted on the hinge pins of and between said chains, projecting inner and outer pins at the ends of said slats, an inner and an outer guide rail fixed at the inner sides of said stationary frame, the outer of said
25 guide rails being adapted to be engaged by the outer of said pins and the inner of said guide rails by the inner of said pins
30 and to adjust said slats in said screen in such a manner that they always point to the focus of the X-ray tube, and means for propelling said chains.

35 9. Apparatus of the class described, comprising a stationary frame, two chain-

wheels mounted on each side within said frame, two endless chains on each pair of said chain-wheels, slats mounted on the hinge pins of and between said chains, laterally projecting pins at the corners of said
40 slats, an outer and an inner guide rail upon the inner sides of said stationary frame adapted to be engaged by those of said pins upon which said guide rail exerts
45 a dragging action and adjusts said slats in such a manner that they always point to the focus of the X-ray tube, and means for propelling said chains.

10. Apparatus of the class described, comprising a stationary frame, two chain-wheels mounted on each side within said frame, two endless chains on each pair of said chain-wheels, strips of band-steel
55 mounted on the hinge pins of and between said chains, reinforcing mountings upon the ends of said strips, laterally projecting pins at the reinforced corners of said strips, an outer and an inner guide rail upon the inner side of said stationary frame adapted
60 to cooperate with those of said pins upon which said guide rail exerts a dragging action in the direction of motion and adjusts said strips in such a manner that they
65 always point to the focus of the X-ray tube and a motor for slowly propelling said chains through a reduction gear.

Signed at New York city, in the county of New York and State of New York, this 19th day of October, 1923.

GUSTAV BUCKY.