

April 15, 1930.

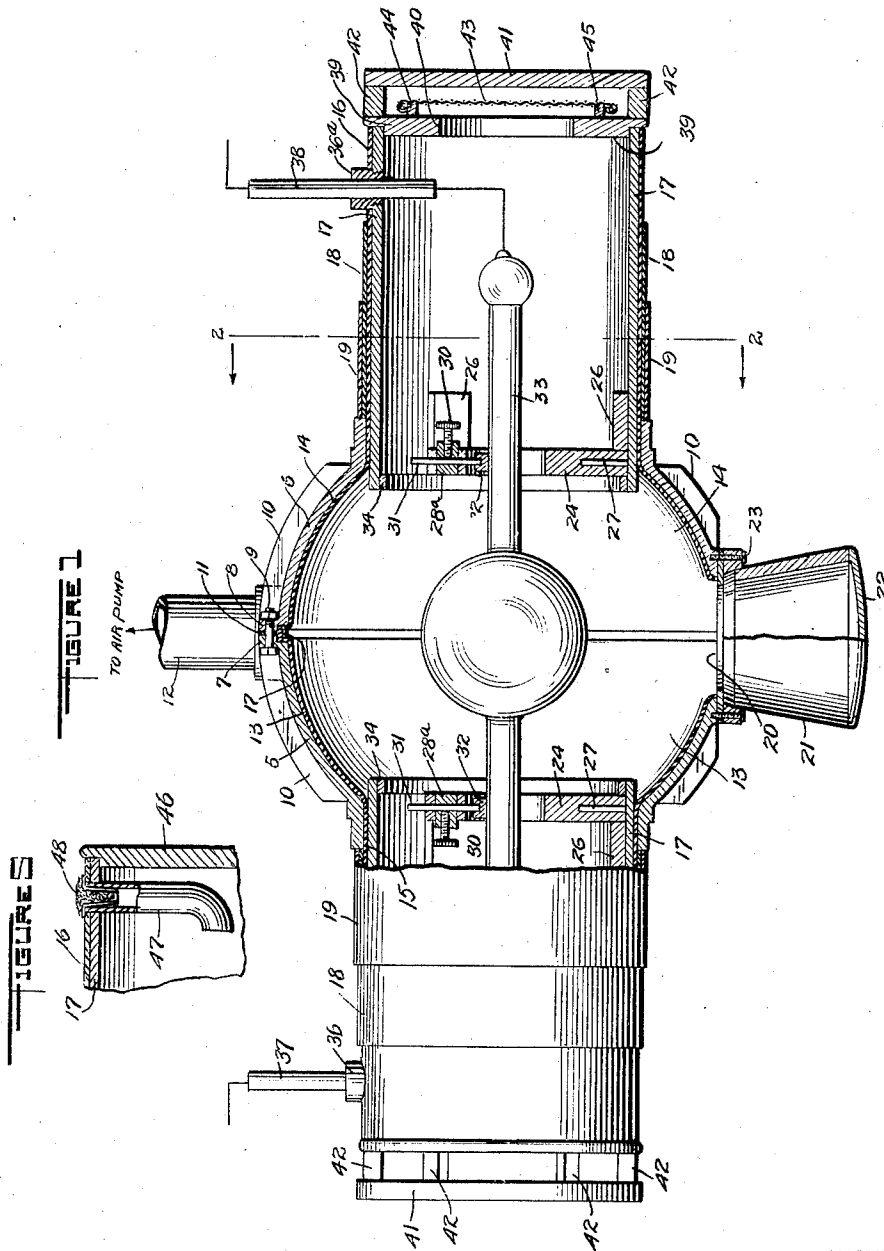
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1,754,810

X-RAY PROTECTIVE DEVICE

Filed March 21, 1922

2 Sheets-Sheet 1



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FIGURE 2

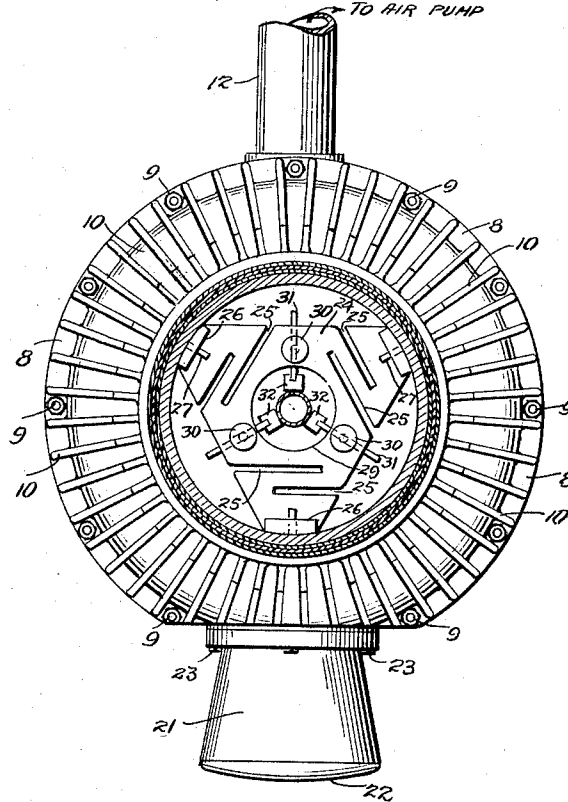


FIGURE 3

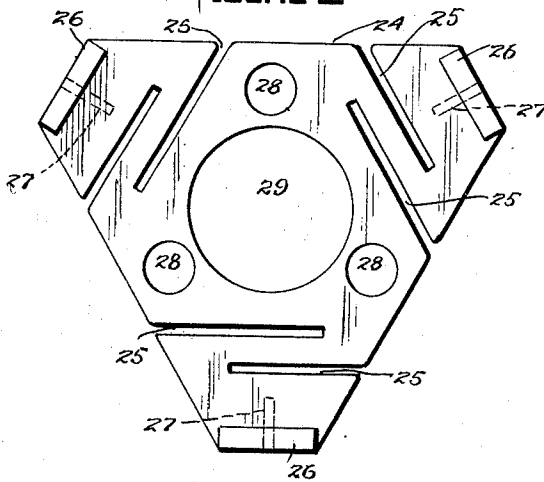
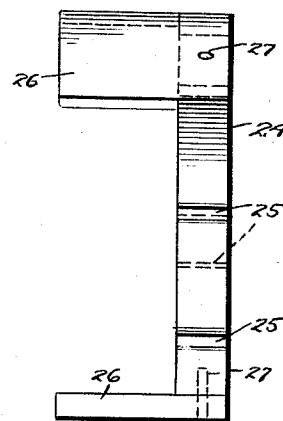


FIGURE 4



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X-RAY PROTECTIVE DEVICE

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My invention relates to X ray protective devices; that is, to mechanism used in connection with X ray tubes for preventing X rays from doing damage of various kinds as hereinafter set forth more in detail.

More particularly stated, I seek to enclose the X ray tube in a casing which is impervious to the X rays, and which is provided with means for enabling the X rays to be applied in the manner intended and to prevent them from doing harm to or otherwise affecting persons at work around the X ray tube.

Heretofore in this art many attempts have been made to protect X ray patients and operators against various injurious effects of X rays; that is, the so-called accidental effects of the rays. Such attempts, however, have not proven very satisfactory in practice.

What I seek to do is to provide an X ray protective device, having the general form of a container impervious to the X rays and in which the X ray tube is housed; the device being so formed and arranged that the X ray tube, while in action, is unable to throw off rays in any considerable quantity in such directions as might do harm.

I further seek to facilitate the removal of air which has been heated and otherwise affected by exposure to the tube while in close proximity thereto and with the tube in action.

I also seek to prevent particles of dust, smoke, or the like from getting into close proximity to the X ray tube, and settling thereupon.

In addition to the objects just mentioned I seek to accomplish several others, as hereinafter pointed out more in detail.

It is a fact, not generally recognized, that particles of dust, smoke and the like are attracted by the X ray tube and tend to concentrate upon the surface thereof. This action is lessened by means of my invention.

The X ray tubes now used in practice are of relatively great power, because the X rays required for most purposes nowadays are more penetrating and of greater intensity than those used a few years ago; thus the problem of protection against the accidental effects of the X rays is a problem of increasing importance.

Reference is made to the accompanying drawings forming a part of this specification and in which like reference characters indicate like parts throughout the several figures.

Figure 1 is a side view, partly an elevation and partly a section, of my improved X ray protective device.

Figure 2 is a section on the line 2—2 of Figure 1 looking in the direction indicated by the arrows.

Figure 3 is a face elevation of one of the supports for holding the X ray tube.

Figure 4 is a side elevation of the support shown in Figure 3.

Figure 5 is a fragmentary section showing my device as used with a filter differing slightly in form from that appearing in Figure 1.

Two halves 5, 6 together constitute a two-part casing. These parts are made of metal and provided with flanges 7, 8. Extending through these flanges are bolts, 9. The parts 5, 6 are provided with ribs, 10, for the purpose of dissipating heat. A packing 11, is disposed between the flanges 7, 8 and helps to render the casing airtight.

An exhaust pipe 12, is connected with the casing and leads therefrom to an air-pump, not shown, the action being such that air is drawn off through the pipe 12, so as to reduce the air pressure within the casing and thus maintain a partial vacuum therein.

The casing is provided with metallic members 13, 14, made of sheet metal and formed in halves, as may be understood from Figure 1. The metal members 13, 14 together constitute a lining for the casing, this lining being provided with tubular extensions 15, 16. Located within these tubular extensions are a pair of barrels 17, made of metal and each having the general form of a cylinder. Encircling the tubular extensions 15, 16 are annular bands 18, 19, the purpose of which is to strengthen the mounting of the barrels 17, and also to increase the thickness of the composite wall.

The casing is provided with an opening 20, and extending from this opening is a cone 21, which may be used for compression or for any other purpose well known in this art.

The cone 21, is provided with a window 22, made of any suitable material transparent to the X rays; for instance aluminum or other light metal, or even hard rubber or thin glass. The purpose of the cone 21 is to allow the X rays to pass out of the casing, and yet to localize them so that they are unable to pass out except through the cone.

Fastenings 23, are used for the purpose of detachably supporting the cone upon the casing.

Located within each barrel 17, and thus housed within the casing, is a support 24, having a form which may be understood more particularly from Figures 3 and 4. The support 24, is made of micanite, lava, porcelain or any other material which is capable of standing a fairly high degree of heat, and is also an insulator. The support has the general form of a plate approximately triangular and provided with slots 25, so disposed as to overlap each other as indicated in Figure 3 in order to break the continuity of the surface to some extent, and thus improve the insulation. The plate 24, is secured to blocks 26, which are fitted within the barrel 17, and secured thereto in any appropriate manner. They may be even secured by fitting them tightly if this arrangement be desirable. Each block 26, is held in position relatively to the plate 24, by a pin 27. The support 24, is provided with holes 28, and with a central opening 29. Fitted into each hole 28, is a plug 28^a, and fitted into this plug is a screw 30. The clamp stem 31, extends through the plug 28^a and may be moved in the general direction of its length. Each stem 31 carries a block 32, and is operated by loosening the screws 30, sliding the stems 31 radially outward or inward. The X ray tube is shown at 33, and may be of any type known in this art.

In order to fit the tube in position some one or more of the screws 30 are loosened and the corresponding stem or stems 31 moved radially, so as to displace one or more of the blocks 32. The tube is now placed through the supports 24, and secured in position by shifting the block or blocks 32 against it. This done, such of the screws 30 as are loose, are now tightened. Thus the X ray tube is centrally supported within the casing, and so positioned as to be practically co-axial therewith.

Each barrel 17, carries a stop ring 34, secured rigidly in position and against which one of the supports 24, is lodged.

The casing is provided with a pair of openings 36, 36^a, and extending through these openings are a pair of high tension conductors 37, 38 by aid whereof the X ray tube is energized.

Fitted upon the outer end of each barrel 17, is an end plate 39, provided centrally with an opening 40. The cap plate 41, is disposed

parallel with the end plate 39, and is supported upon spacing blocks 42, the latter being mounted upon the end plate 39. A filter cloth 43 is mounted upon supports 44, 45 and thus carried by the end plate 39, in such position as to cover and screen the opening 40. That is to say the parts are so arranged as to be practically airtight, except that the air can find its way through the filter cloth 43. For this purpose the air passes freely in between the space blocks 42 but it cannot get into the barrel 17, except by passing directly through the filter cloth 43. The purpose of this arrangement is to cause the air to pass through the filter cloth 43, in order to divest the air of all light particles of matter which it may carry, such as particles of dust or smoke. In this manner the light particles carried by the air are unable to reach the X ray tube.

Owing to the fact that the casing and parts associated therewith are made of metal, it becomes necessary to see that the insulation becomes very effective. For this reason the casing and parts immediately associated therewith are made of considerable size, so that the various metallic parts surrounding the X ray tube are spaced therefrom by distances across which a discharge cannot take place from the tube.

In other words, all metallic parts of the casing must be spaced sufficiently far from the X ray tube as to remove all danger to the patient, who may be located below the cone 21 according to Figure 1.

When the device is in action and the X ray tube 33, is therefore being energized, the air which passes in through the filter cloth 43, flows around the X ray tube and is drawn out through the exhaust pipe 12, by action of the air pump as above described and thus carried out of the room.

In the form shown in Figure 5, a cap plate 46 closes the outer end of the barrel air tight. An induct 47, having in this instance the form of a J-pipe, extends through the wall of the casing for the purpose of admitting air therinto. A filter 48, is fitted into the upper or outer end of the induct. Otherwise the parts shown in Figure 5 are identical with others above described.

While the X ray tube is in action the rays of course are thrown off in practically all directions. However, they are unable to pass out of the casing except through the opening 20—and that is through the cone 21 when the cone is employed. Even if some of the rays manage to find their way through the metallic casing their intensity is greatly reduced and the probability of their doing any harm is greatly reduced.

While I prefer to use metals, and even dense metals as the material for the casing and parts immediately associated therewith, it is possible that non-metallic substances

impervious to the action of X rays may be used instead.

I do not limit myself to the precise mechanism shown, as numerous changes may be made therein without departing from my invention, the scope of which is commensurate with my claims.

I claim:—

1. In a device the combination of a hollow casing member made of material substantially opaque to X-rays, said casing member being provided with tubular extensions and further provided with a window transparent to X-rays, metallic barrels carried by said tubular extensions projecting in opposite directions from said casing member, slides carried by said barrels for the purpose of supporting an X-ray tube, and mechanism carried by said slides for adjusting said X-ray tube.

2. A device comprising a casing member made in halves and provided with ribs for dissipating heat, said casing member being substantially opaque to X-rays and provided with a window through which X-rays can pass out freely, a lining made in halves and fitted into the halves of said casing member, the two halves of said lining being provided with tubular portions extending in opposite directions from said casing member, said lining being made of metal, metallic barrels carried by said tubular portions, bands of metal encircling said tubular portions and therewith forming composite walls of substantially tubular form, and an X-ray tube housed within said casing member and provided with portions extending into said barrels.

3. A device comprising a hollow casing member substantially opaque to X-rays and provided with a portion transparent to X-rays, said casing member being made in halves and provided with means for holding said halves together, a metallic lining member made in halves and fitted into said hollow casing member, said metallic lining member being provided with tubular portions extending in opposite directions from said hollow casing member, a pair of metallic barrels mounted within said tubular portions of said metallic lining member, and means for mounting an X-ray tube within said hollow casing member so as to allow portions of said X-ray tube to extend into said metallic barrels.

4. A device comprising a hollow casing member made of material substantially opaque to X-rays and provided with a window through which X-rays can pass out freely, said hollow casing member being provided with openings, a metallic lining fitted into said hollow casing member and provided with tubular portions extending outwardly through said openings, metallic barrels carried by said hollow casing member and ex-

tending outwardly through said openings, said barrels being fitted into said tubular portions of said metallic lining, and means for mounting an X-ray tube within said hollow casing member, so as to allow portions of said X-ray tube to extend into said barrels.

5. A device comprising a hollow casing member provided with open ends, a metallic lining fitted into said hollow casing member and provided with hollow portions extending outwardly from said open ends, metallic barrels fitted into said hollow portions thus extending outwardly, and means for mounting an X-ray tube within said hollow casing member, so as to allow portions of said X-ray tube to extend out into said barrels.

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