May 8, 1934. C. FAYER 1,958,191

X-RAY UNIT

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FIGURE 1

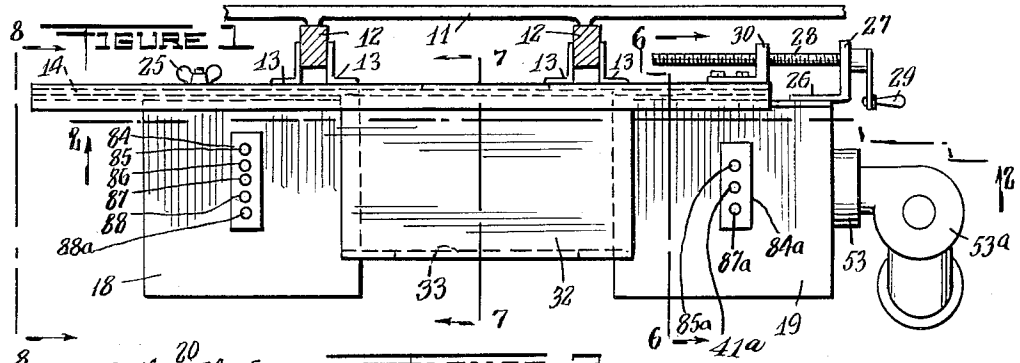


FIGURE 2

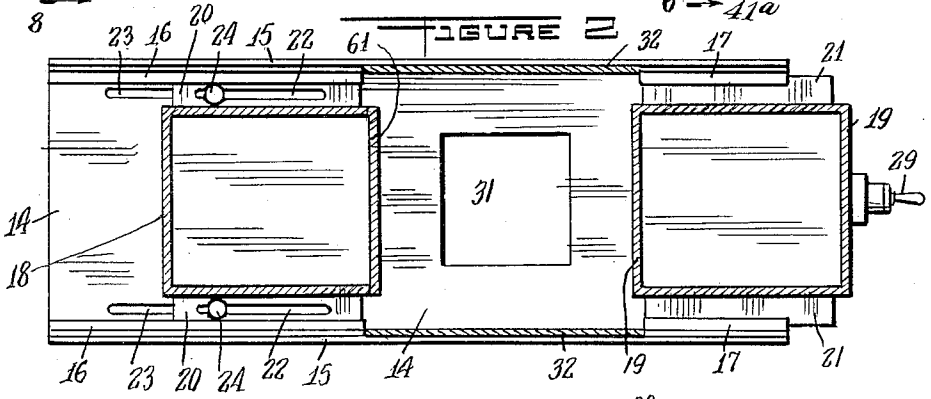


FIGURE 3

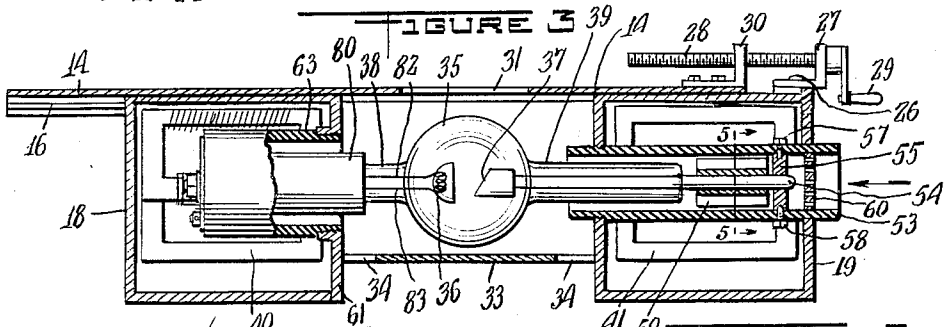


FIGURE 4

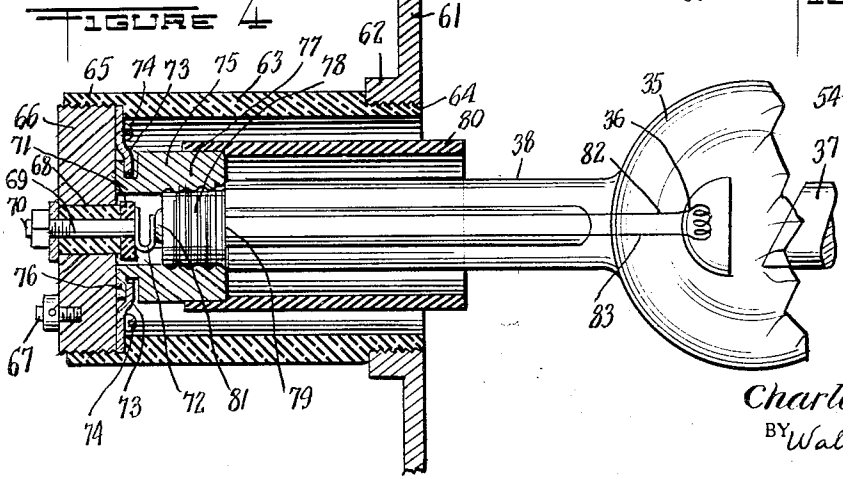
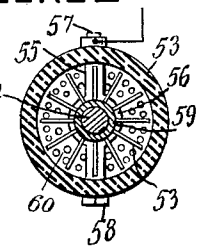


FIGURE 5



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FIGURE 5

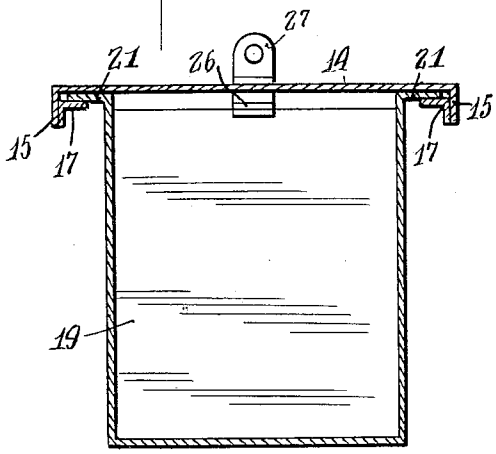



FIGURE 7

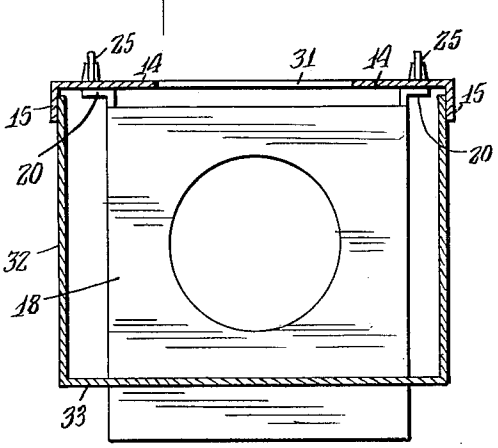



FIGURE 8

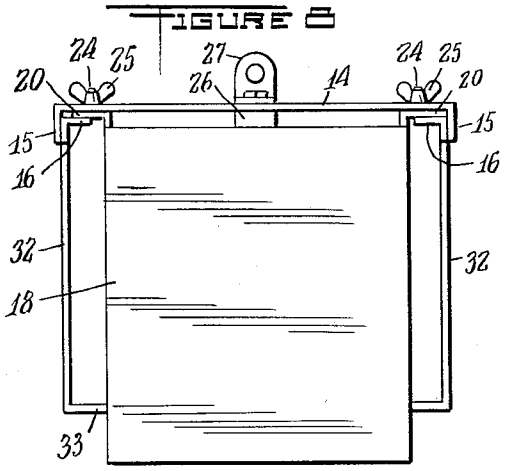
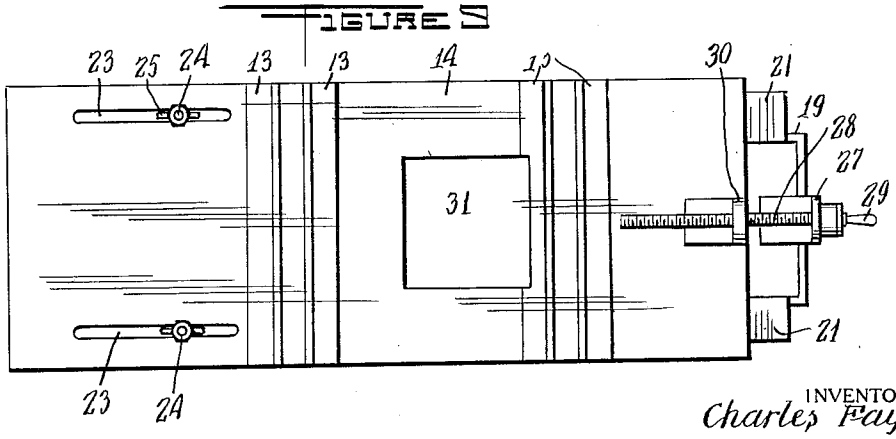



FIGURE 9



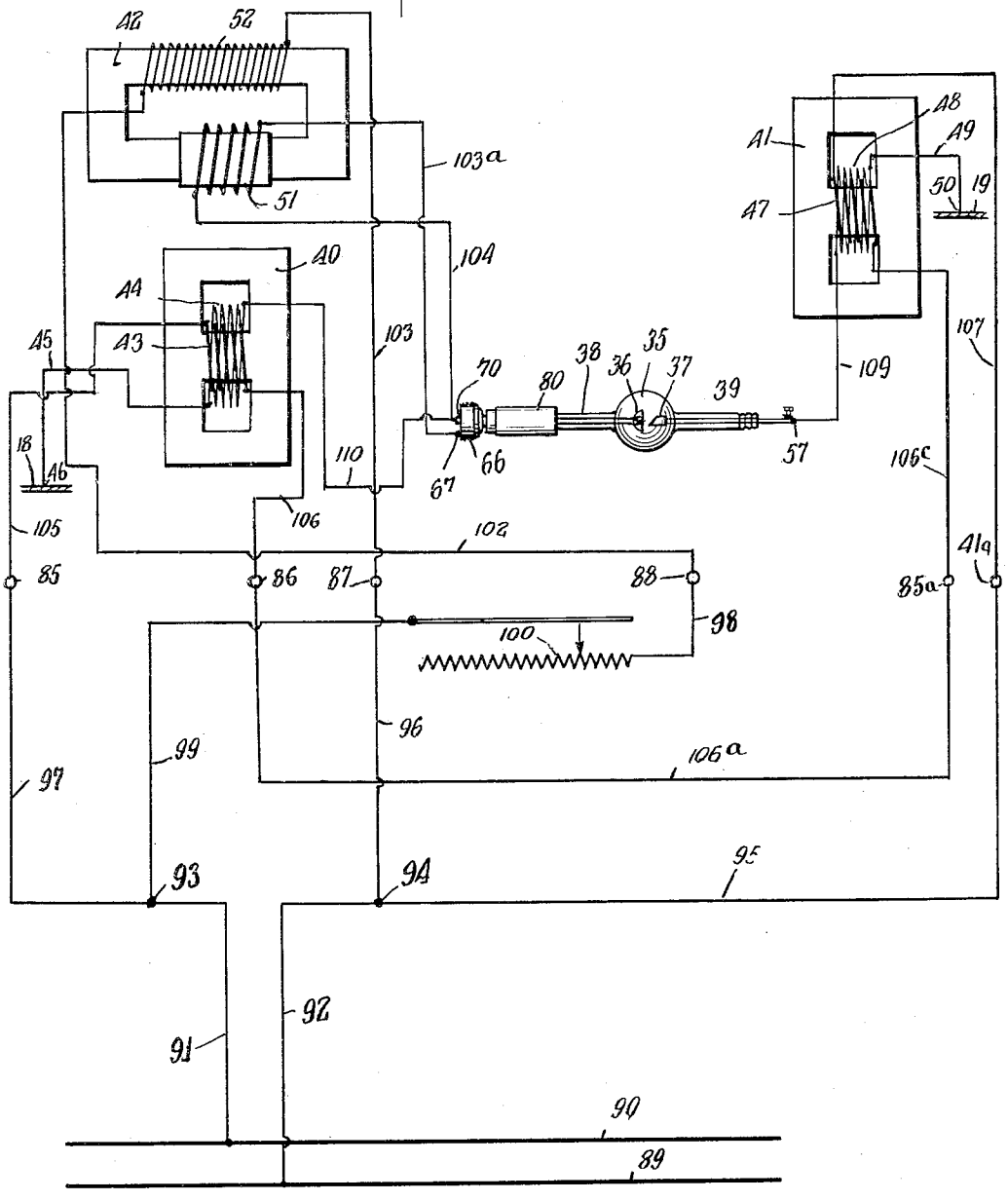

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FIGURE 10




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Patented May 8, 1934 1,958,191

# UNITED STATES PATENT OFFICE

1,958,191

## X-RAY UNIT

Charles Fayer, Flushing, N. Y., assignor to Wappler Electric Company, Inc., a corporation of New York

Application December 31, 1929, Serial No. 417,612

10 Claims. (Cl. 250—34)

My invention relates to X-ray units in which the transformer apparatus used in connection with the X-ray tube is housed in a pair of separate casings located at the ends of the X-ray tube and thus spaced apart, so as to localize the high tension effects of the transformers in the interest of safety to patients, operators and apparatus.

More particularly stated, I seek to so improve the two transformer casings as to render the X-ray tube easily demountable relatively thereto, thus enabling the operator to quickly and easily remove and replace the X-ray tube, or to examine and repair the mountings thereof.

I also seek to provide adjusting mechanism for enabling the operator to adjust the target of the X-ray tube relatively to an X-ray window, in order to control the direction in which the X-rays are projected from the target and out through said X-ray window.

Among the objects I seek to accomplish by my invention are the following:—

1. To provide a fluoroscopic or radiographic X-ray apparatus having no exposed high tension carrying parts, so that neither the patient nor the operator can be exposed to electrical shocks.

2. To use at the ends of the X-ray tube a pair of separate transformer casings containing the transformers used in connection with the tube, each of these casings with its contents being movable bodily as a unit relatively to the other, in order to facilitate the removal and replacement of the X-ray tube.

3. To place the X-ray tube in a housing, made of metal or otherwise rendered substantially opaque to the passage of X-rays, and having a window for enabling the X-rays to pass out, this housing normally extending over the adjacent ends of the two casings one of which is movable relatively to the other, as above mentioned.

4. To promote compactness in the X-ray unit, by so forming and arranging the tube mountings as to practically bring the two end casings with their contents closer together, in the direction of the length of the X-ray tube and its housing.

5. To facilitate the adjustment of the X-ray tube in order to enable the operator, by rotating the tube upon its axis, to bring the target of the tube into different angular positions, and particularly with reference to the position of the X-ray window.

6. To provide improved methods for cooling of the anode, this being useful for prolonged exposures or exposures with large energies.

7. To enable the two transformer casings to be moved in opposite directions relatively to a common central fixed point, in order to maintain the X-ray target in a substantially fixed position relatively to the X-ray window when the apparatus is adjusted for X-ray tubes differing in length.

8. To provide a number of minor improvements adapted for use in an X-ray unit of this general character, for increasing the general efficiency thereof.

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

Figure 1 is a side elevation of my improved X-ray unit;

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 substantially central vertical longitudinal section through my device, the supporting board being omitted;

Figure 4 is a substantially vertical fragmentary section, showing in detail the mounting for the cathode end of the X-ray tube;

Figure 5 is a section on the line 5—5 of Figure 3, looking in the direction indicated by the arrows;

Figure 6 is a section on the line 6—6 of Figure 1, looking in the direction indicated by the arrows;

Figure 7 is a section on the line 7—7 of Figure 1, looking in the direction indicated by the arrows;

Figure 8 is an end elevation of the apparatus, as seen by a person standing at the left of Figure 1 and looking toward the right.

Figure 9 is a plan view of the mechanism shown in Figure 3.

Figure 10 is a diagram of the wiring of the X-ray unit and parts immediately connected therewith.

A top board is shown at 11, and carries the mechanism suspended beneath it.

The top board 11 may be an X-ray table or an operating table such as is commonly adapted to be stood on end or adjusted into different angular positions. Such boards and tables being old and well known in this art, I will not describe them further.

The top board 11 carries upon its under side a pair of cross beams 12, 12, preferably made of wood.

Mounted upon the cross beams are angle beams 13, 13, of which four are here shown.

Secured to the angle beams 13 and depending therefrom, and thus located parallel with the top board 11, is a large supporting plate 14, made of thick sheet metal, preferably steel.

The supporting plate 14 is provided with side

flanges 15, 15 integral therewith and extending downwardly therefrom, these flanges each extending the full length of the top plate 14.

Mounted upon the flanges 15, 15 and supported thereby are two pairs of rails 16, 16 and 17, 17. Supported by the rails 16, 16 is a transformer casing 18, and supported by the rails 17, 17 is another transformer casing 19.

The casing 18 is provided at its top with a pair of outwardly extending flanges 20, 20, which rest upon the rails 16, 16, as indicated in Figure 8. Similarly, the casing 19 is provided with a pair of flanges 21, 21, which rest upon the rails 17, 17, as indicated in Figure 6.

Thus the casings 18 and 19 are slidable independently of each other relatively to the top plate 14.

The flanges 20, 20, are provided with slots 22, 22, and the adjacent portion of the top plate 14 is provided with slots 23, 23, in the same planes with the slots 22, as may be understood from Figure 2.

Bolts 24, 24 extend through these slots, and are provided with butterfly nuts 25, 25, whereby the bolts may be tightened, so as to fix the casing 18 in position.

The operator, by loosening the bolts 24, 24 can slide the casing 18 forward or backward in the direction of the length of the supporting plate 14, and this done, he can tighten the bolts, leaving the casing fixed firmly in position.

For shifting the position of the casing 19, however, I use a different arrangement.

Mounted upon the casing 19 is a bracket 26, provided with an eye 27, serving as a ring bearing. Extending through this bearing and journaled thereto is a threaded shaft 28, provided with a hand crank 29, by means of which it may be turned by hand.

The threaded shaft 28 extends through a nut 30, secured rigidly upon the adjacent portion of the supporting plate 14.

By turning the hand crank 29 the casing 19 may be moved back and forth relatively to the supporting plate 14, in the direction of the length thereof; the flanges 21, 21, simply sliding upon the rails 17, 17, as may be understood from Figures 1 and 2.

The supporting plate 14 is substantially opaque to X-rays, but provided with an opening 31, so disposed that the two transformer casings 18 and 19 are upon opposite sides thereof, as may be understood from Figures 2 and 3. Thus the two casings, being each movable relatively to the supporting plate 14, are adjustable independently of each other relatively to the opening 31. This opening serves as an X-ray window, and the adjustment of the two transformer casings relatively to this X-ray window is an important feature, as hereinafter more fully explained.

Secured firmly to the flanges 15, 15 and depending from the supporting plate 14 is a housing 32, made of thick sheet metal, preferably steel. This housing has in cross section substantially the form of a trough, as may be understood from Figure 7, the ends of the housing being open.

The width of the housing is a little less than that of the supporting plate 14, and is somewhat greater than the width of the casings 18, 19, but its depth is less than the depth of these casings, as may be understood from Figures 1 and 8.

The bottom wall 33 of the housing 32 is cut away so as to form two slots 34, 34, and the two transformer casings 18 and 19 extend into these slots and thus into the open ends of the housing. The slots 34, 34 prevent the bottom wall 33 from interfering with freedom of movement of the casings.

An X-ray tube is shown at 35, and is provided with the usual heat-controlled cathode 36 and an anode 37. For convenience I designate the end portions 38 and 39 of the X-ray tube as the cathode end and the anode end, respectively, the cathode end being to the left according to Figures 3 and 4.

In order to supply high tension currents to the X-ray tube I provide a pair of high tension transformers 40, 41; and to provide low tension currents to heat the cathode 36 I provide a very small transformer 42, of the type commonly known as a filament heating transformer.

The high tension transformer 40 has a primary winding 43 and a secondary winding 44. A wire 45 leads from the secondary winding 44 to the point 46, where it is grounded upon the casing 18, as indicated in Figure 10.

Similarly, the high tension transformer 41 has a primary winding 47 and a secondary winding 48, and from the latter a wire 49 leads to a point 50, where it is grounded upon the casing 19, as indicated in Figure 10.

The low tension transformer 42, which is of the step-down type, is provided with a primary winding 52 and a secondary winding 51, and is housed within the casing 18, along with the high tension transformer 40.

All of the transformers are insulated by means of oil or wax, in the manner well known in this art.

Extending entirely through the transformer casing 19 is a cylinder 53 of insulating material, used for supporting the anode end of the X-ray tube.

The anode 37 is provided with a metallic stem 54 which extends outwardly from the anode end, and into engagement with a swivel post 55, the latter being provided with an enlarged middle portion 56 of substantially annular form through which the stem 54 extends.

The swivel post 55 extends diametrically across the cylinder 53, and is held in place by two swivel bolts 57, 58, upon which it is free to rock slightly, as may be understood from Figures 3 and 5. The swivel bolt 57 serves also as a binding post, for making an electrical connection with the anode end of the tube.

A small radiator 59, in the form of an articulated cylinder, is mounted upon the metallic stem 54, and is used for cooling the latter, and thus keeping down the temperature of the anode end of the X-ray tube.

In order to prevent the high tension currents from arcing over from the casing 19 to the metallic stem 54, I extend the adjacent end of the cylinder 53 outward a little from the wall of the casing, and in some instances I also insert a perforated partition 60 within the cylinder, as indicated at the right of Figure 3.

My purpose in using the swivel post 55, as above described, is to avoid the danger of braking the X-ray tube. Since the metallic stem 54 is sealed in the glass wall of the X-ray tube, it may happen that in fitting the stem 54 into a rigid holder of any kind it may not fit perfectly, and when that is the case the glass may be subjected to mechanical strains, and especially when the stem 54 is subjected to abrupt and considerable changes in temperature. Hence it is desirable to allow a slight rocking movement, and this is accomplished by the above described arrangement of the swivel post 55.

This arrangement also allows the radiator 59 a slight freedom of movement, so as to allow it to adjust itself to its environment in the event that the metallic stem 54 happens to be bent or otherwise a little misshapen.

In order to cool the radiator 59 together with the parts in immediate proximity thereto and thus to keep down the temperature of the anode and adjacent portions of the X-ray tube, I provide for the circulation of air through the cylinder 53.

When my apparatus is so used that the X-ray tube is horizontal, and particularly when the X-ray tube is operated continuously for long periods of time, I use a blower 53*a*, for forcing a blast of air through the cylinder 53.

However, in most instances the blower is not necessary, and especially if the tube is inclined due to inclination of the supporting plate, as there is always a little circulation of free air around the X-ray tube.

The casing 18 is provided with a metallic casing head 61, having a neck 62, shown more particularly in Figure 4 and threaded internally.

A tubular sleeve 63 of insulating material is provided with a threaded end portion 64, which is screwed into the neck 62, so that the sleeve extends inwardly from the casing head, and is thus sunken back into the casing.

The inner end 65 of the sleeve 63 is threaded internally, and fitted into it is a metal disk 66, threaded externally for the purpose. This disk 66 carries a binding post 67, for use in making connections.

A tube 68 of insulating material extends through a hole in the disk 66, and a contact bolt 69 extends through the tube 68, and terminates in a binding post 70. This contact bolt carries also a rubber washer 71 and a contact spring 72, the form of which may be understood from Figure 4.

A spider 73, made of metal and having a substantially annular form, is secured upon the disk 66 by means of screws 74.

A contact sleeve 75 is provided with an annular flange 76 which extends into the spider 73 so as to allow the sleeve 75 to be turned relatively to the disk 66. The contact sleeve 75 is thus swiveled in position.

The contact sleeve 75 is provided internally with a thread 77 of coarse pitch, this thread mating the thread 78 of the contact sleeve 79 upon the cathode end of the X-ray tube. The sleeve 75 carries a barrel 80, made of insulating material, and whereby the sleeve may be turned by hand.

The X-ray tube is provided with a contact tip 81. By means of wires 82 and 83 the cathode 36 is connected with the contact sleeve 79 and contact tip 81. By means of the contact spring 72, the contact tip 81 and wire 82 are brought into metallic connection with the contact bolt 69 and binding post 70.

The purpose of the barrel 80 is to enable the operator to turn the X-ray tube 35, in order to rotate the target into different positions of angular adjustment relatively to the X-ray window 31, and independently of any rotation of the X-ray tube in order to fit the threaded contact sleeve 79 into the contact sleeve 75, which serves as a socket. By grasping the barrel 80 and holding it firmly, the X-ray tube may be turned relatively to the contact sleeve 75, and thus secured to or detached from the latter.

Mounted upon a plate 84 of insulating material are a pair of binding posts 85, 86 for supplying current to the primary windings of the high tension transformer 40, and also another pair 87, 88 for supplying currents to the primary winding 52 of the small transformer 42, used for heating the cathode 36 of the X-ray tube.

Connected with a pair of alternating current leads 90, 89 are two wires 91, 92, which extend therefrom to junctions 93, 94.

From the junction 94 a wire 95 extends to the binding post 41*a*, and a wire 96 leads to the binding post 87.

From the junction 93 a wire 97 extends to the binding post 85, and a wire 99 leads to a variable resistance 100, and thence a wire 98 leads to the binding post 88.

From the binding post 88 a wire 102 leads to the primary winding 52 of the small step down transformer 42 above described, and from this primary winding a wire 103 extends to the binding post 87.

A wire 103*a* leads from the secondary winding 51 of the transformer 42 to the binding post 67, shown at the lower left hand corner of Figure 4. Another wire 104 leads from the secondary winding 51 to the binding post 70. It is through the binding posts 67 and 70 (see Figure 4) that currents are supplied to the cathode 36 for the purpose of heating the same.

Connected with the primary winding 43 is a conductor 106, which leads to the binding post 86. Connected with this binding post is a conductor 106*a*, which may be a flexible cord, and which extends across from the casing 18 to the casing 19, where it is connected with a binding post 85*a*. From this binding post a conductor 106*c* leads to the primary winding 47 of the high tension transformer 41.

The conductor 106*a* may extend through the housing 33, or outside thereof as may be desirable.

From the primary winding 47 of the high tension transformer 41 a wire 107 extends to the binding post 41*a*. The two binding posts 85*a* and 41*a* are mounted upon a plate 84*a* of insulating material. Another binding post 87*a* is used for grounding the casing 19, and a similar binding post 88*a* is used for grounding the casing 18, this last mentioned binding post being mounted upon the plate 84 of insulating material, above described in connection with the casing 18.

A wire 109 is connected with the high tension secondary winding 48, and extends therefrom to the binding post 57, carried by the swivel post 55 as shown in Figure 5, and which is in metallic communication with the anode 37 of the X-ray tube 35 whenever the tube is mounted in position.

Connected with the binding post 70, shown more particularly at the left in Figure 4, and thus practically joined to the wire 104 (see Figure 10), is a wire 110, leading to the secondary winding 44 of the high tension transformer 40.

While the two primary windings 43 and 47 of the high tension transformers 40 and 41 are here shown as connected in series, they may be connected in parallel instead whenever this is preferable. In either case, however, it is desirable that they be so connected that high tension is developed on the free ends of the secondary windings at precisely the same instant.

The primary circuit for energizing the two high tension transformers 40 and 41 may be traced as follows: lead 89, wire 92, junction 94, wire 95, binding post 41*a*, wire 107, primary winding 47, conductor 106*c*, binding post 85*a*, conductor 106*a*,

binding post 86, wire 106, primary winding 43, wire 105, binding post 85, wire 91, lead 90 to source of electrical supply, and back to lead 89.

The secondary circuit common to the two high tension transformers may be traced as follows: Secondary winding 44, wire 110, binding post 70, contact bolt 69 (see Figure 4), contact spring 72, contact tip 81, wire 82, cathode 36, across to target of anode 37, metallic stem 54, swivel post 55, binding post 57, wire 109, secondary winding 48, wire 49 to ground at 50 on casing 19, thence back through ground at 46 on casing 18, and wire 45 to secondary winding 44. This is the circuit which energizes the X-ray tube.

The primary circuit for energizing the small step down transformed 42 in order to supply currents for heating the cathode of the X-ray tube may be traced as follows:—lead 89, wire 92, junction 94, wire 96, binding post 87, wire 103, primary winding 52, wire 102, binding post 88, wire 98, variable resistance 100, wire 99, junction 93, wire 91, lead 90 to source of electricity and thence back to lead 89.

The secondary circuit of the small step down transformer 42 may be traced as follows: Secondary winding 51, wire 104, binding post 70, contact bolt 69 (see Figure 4), contact spring 72 contact tip 81, wire 82, cathode 36, wire 83, contact sleeves 79 and 75, metallic spider 73, metallic disk 66, binding post 67 and wire 103*a*, back to secondary winding 51. This circuit supplies currents for heating the cathode 36.

The X-rays produced by the X-ray tube are unable to pass out of the metallic housing 32 to any appreciable extent except through the X-ray window 31, and thus only in a certain direction.

In order that the target of the anode 37 of the X-ray tube may be turned into a suitable angular position relative to the X-ray window 31, the X-ray tube is adapted to be turned upon its longitudinal axis, as above described.

The barrel 80 serves as a handle whereby the X-ray tube 35 may be thus turned, the rotation of the X-ray tube for this purpose being entirely independent of its rotation to connect it with and disconnect it from the contact sleeve 75 and other parts housed within the tubular sleeve 63.

The operation of my device may be readily understood from the foregoing description.

In order to remove an X-ray tube and substitute another one in its place, the operator first slides the casing 18 to the left, and if necessary moves the casing 19 to the right according to Figure 3, and by inserting his hand into the left end of the housing 33 he grasps the X-ray tube and unscrews it, and then removes it by carrying it obliquely downward to the left in order to avoid the casing 18.

Then the operator places in position the tube to be substituted, by practically following the same steps but in reverse order. That is, he inserts the tube obliquely upward and endwise into the housing 33, fitting the metallic stem 54 into the swivel post 55; and then he moves the casing 18 slowly to the right, meanwhile guiding the contact sleeve 79 into the swivel sleeve 75.

Next the operator inserts his hand through the window 31, and grasping the barrel 80, turns it so as to screw the contact sleeve 79 firmly into the contact sleeve 75, serving as a socket as above described.

Then the operator gives the casings 18 and 19 a further adjustment, if any be required, bringing the X-ray tube into such position that its target is substantially centered relatively to the X-ray window 31.

Finally, the operator grasps the barrel 80, and by turning it rotates the X-ray tube upon its axis and thereby brings its target into suitable angular position relatively to the X-ray window 31 to enable the X-rays to pass out through said window.

As may be readily understood from the foregoing description, my device is adapted for use with X-ray tubes differing in length. No matter if the tube be long or short, or if its anode end or its cathode end be long or short, my apparatus is so formed and arranged as to enable the operator to center the target of the X-ray tube relatively to the X-ray window.

It will be noted that when an X-ray tube is placed in position and the transformer casings are adjusted accordingly, nothing further is required to make any or all of the electrical connections necessary to energize the X-ray tube. The bodily movements of one transformer casing relatively to the other connects the X-ray tube in circuit, and disconnects it therefrom, to all intents and purposes automatically.

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

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is as follows:

1. An X-ray unit comprising a pair of casings spaced apart, a pair of high tension transformers mounted one in each casing, and an X-ray tube connected with said transformers and extending lengthwise from one casing to the other, said casings each being provided with a substantially cylindrical member into which the ends of the X-ray tube extend, in order to reduce the distance from each end of the X-ray tube to the transformer connected therewith.

2. An X-ray unit comprising a support, a pair of casings mounted upon said support, one of said casings being movable back and forth relatively to the other, a pair of high tension transformers mounted one in each casing, so that one of the transformers is movable back and forth relatively to the other, an X-ray tube extending lengthwise from one casing to the other, said tube being connected at its ends with said transformers and normally serving as a connection from one of the transformers to the other, said X-ray tube and one of said casings being provided with means for automatically disconnecting one end of said X-ray tube from the transformer adjacent thereto whenever one of said casings is moved in a direction away from the other, said casings each being provided with a substantially cylindrical member into which the ends of the X-ray tube extend, in order to reduce the distance from each end of the X-ray tube to the transformer connected thereto.

3. In an X-ray unit the combination of a pair of casings, a pair of high tension transformers mounted one in each casing, each of said casings with its transformer being movable bodily back and forth relatively to the other casing with its transformer, said casings each being provided with an inwardly extending cylindrical member and said inwardly extending cylindrical members facing each other, an X-ray tube extending from one casing to the other, the ends of said X-ray tube extending into the two cylindrical members, a contact in one cylindrical member for connect-

ing one end of the X-ray tube with the transformer in the casing at that end of the tube, said contact being controllable by the movements of one casing relatively to the other, and connections from the other end of the X-ray tube to the transformer adjacent said last mentioned end.

4. An X-ray unit comprising a pair of casings each provided with a cylindrical member extending inwardly, a high tension transformer mounted within each casing, an X-ray tube provided with a target and extending lengthwise from one casing to the other, the ends of the X-ray tube extending into said cylindrical members and being connected with said high tension transformers, and means connected with said X-ray tube for enabling the operator to turn said X-ray tube angularly upon its longitudinal axis in order to turn its said target into different angular directions.

5. In an X-ray unit the combination of a supporting plate, a pair of casings mounted thereupon and each provided with a cylindrical member extending inwardly, the two cylindrical members facing each other, one of said casings being movable toward and from the other, a pair of high tension transformers mounted one in each casing, an X-ray tube provided with a target for projecting X-rays, said X-ray tube having its two ends extending into said cylindrical members so that the two casings at their two portions nearest each other are separated by a distance less than the length of the X-ray tube, and connections from the ends of the X-ray tube to the high tension transformers, the connection at one end of the tube being detachable and controllable by movements of one casing relatively to the other.

6. In an X-ray unit the combination of an X-ray tube provided with a target positioned for throwing off X-rays in a particular direction relatively to the tube, said X-ray tube being further provided with a heat controlled cathode, a pair of casings disposed adjacent the ends of the X-ray tube, a high tension transformer located in one casing and connected with one end of the X-ray tube, a high tension transformer and a heating transformer located in the other casing and connected with the other end of the X-ray tube, a pocket carried by said last mentioned casing and sunken into one wall thereof adapted to receive one end of said X-ray tube, and means connected with said X-ray tube and under manual control of the operator for rotating the X-ray tube upon the longitudinal axis thereof, to bring said target into different angular positions.

7. In an X-ray unit the combination of a transformer casing, a high tension transformer mounted therein, a substantially cylindrical member of insulating material extending through said casing, an X-ray tube provided with a filamentary electrode and an anode stem, said anode stem extending into said cylindrical member, a metallic supporting member located within said cylindrical member and engaging said anode stem of said X-ray tube, said supporting member having a slight rocking movement in order to reduce the danger of straining said anode stem and breaking the X-ray tube, and an electrical connection from said supporting member to said high tension transformer and from said transformer to the filamentary electrode for use in energizing said X-ray tube by aid of said transformer.

8. In an X-ray unit the combination of a transformer casing, a high tension transformer mounted within said casing, a hollow member of insulating material carried by said casing and extending therethrough, an X-ray tube provided with a filamentary electrode and with an anode stem, said anode stem protruding therefrom and extending into said hollow member, electrical connections from said anode stem to said transformer and from said transformer to said filamentary electrode for energizing said X-ray tube by said transformer, and means for circulating air through said hollow member in order to cool said anode stem of said X-ray tube.

9. In an X-ray unit the combination of a transformer casing, a high tension transformer mounted therein, a hollow member of insulating material carried by said casing and extending thereinto, an X-ray tube provided with a filamentary electrode and with an anode stem, said anode stem extending into said hollow member, electrical connections from said anode stem to said high tension transformer and from said transformer to said filamentary electrode for energizing said X-ray tube, and a radiator carried by said anode stem for cooling the same and thereby promoting the safety of said X-ray tube.

10. In an X-ray unit the combination, with a pair of casings, a high tension transformer mounted in each of said casings, and an X-ray tube electrically connected to said transformers, of a pocket carried by one of said casings and extending inwardly thereof, a mounting within said pocket for receiving one end of the X-ray tube and maintaining conductive connections therefrom to one of said high tension transformers, and a member made of insulating material extending into said pocket and carried by said mounting and arranged to surround one end of said X-ray tube, said member being manually movable for the purpose of enabling the operator to turn said X-ray tube into different angular positions upon its own longitudinal axis.

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