W. MEYER.

PROTECTING MEANS FOR X-RAY TUBES AND THE LIKE.

APPLICATION FILED JAN. 27, 1916.

1,237,362.

Patented Aug. 21, 1917.

2 SHEETS—SHEET 1.

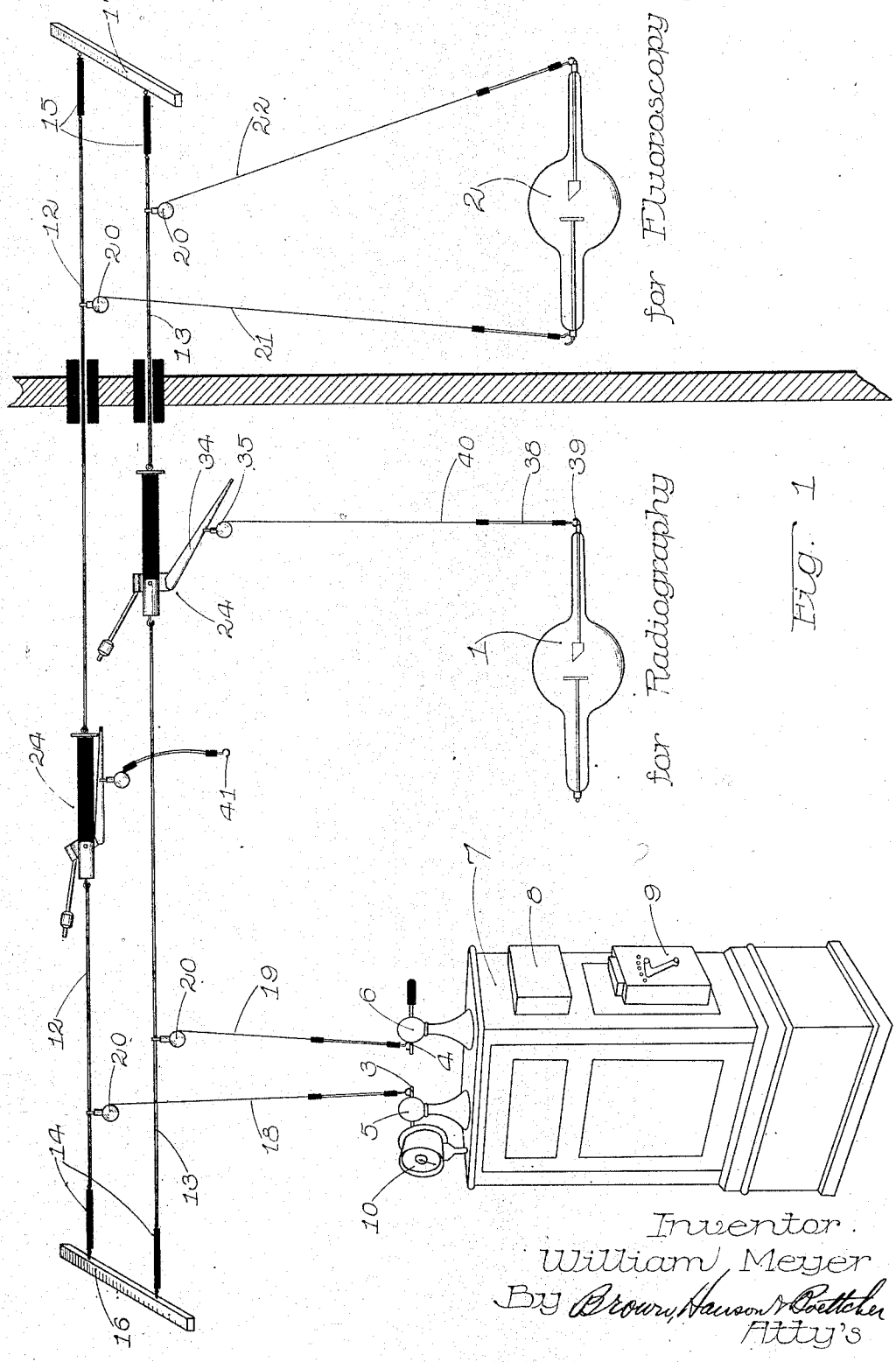

Fig. 1

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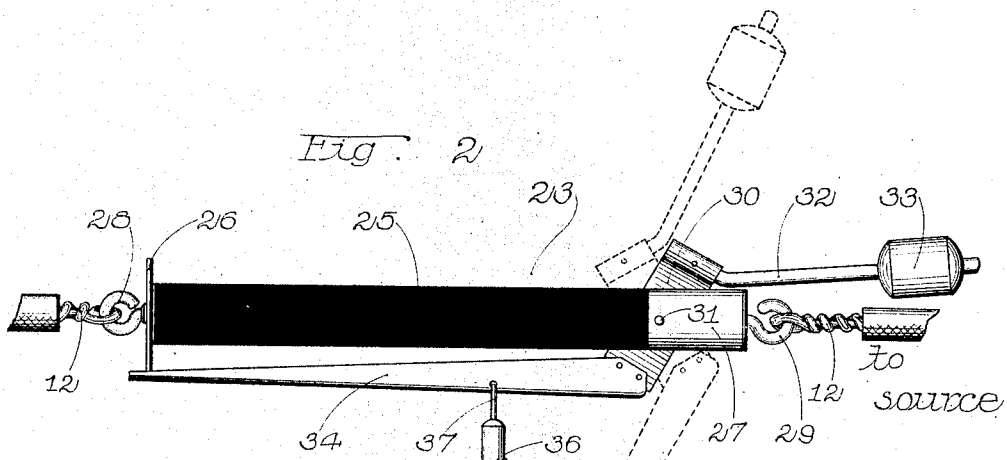
2 SHEETS—SHEET 2.

Fig. 2



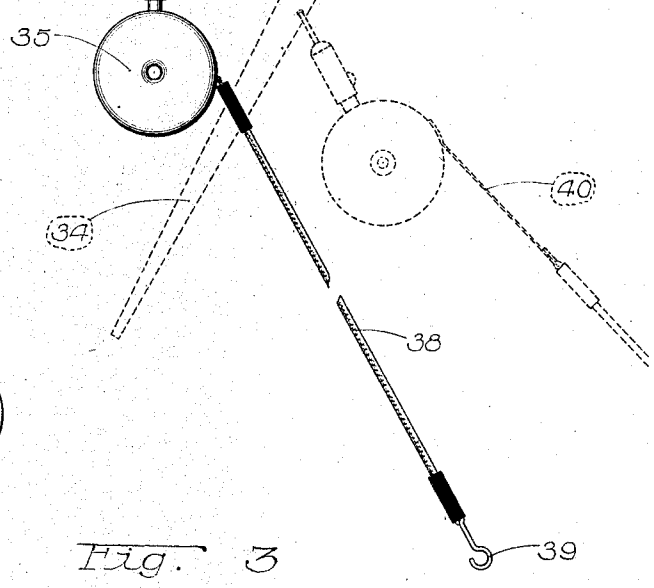
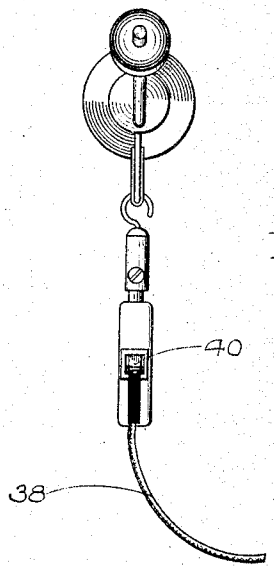


Fig. 3



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UNITED STATES PATENT OFFICE.

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PROTECTING MEANS FOR X-RAY TUBES AND THE LIKE.

1,237,362. Specification of Letters Patent. Patented Aug. 21, 1917.

Application filed January 27, 1916. Serial No. 74,586.

To all whom it may concern:

Be it known that I, WILLIAM MEYER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Protecting Means for X-Ray Tubes and the like, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to a system of distribution of current for X-ray tubes or the like, and more particularly to protecting means for automatically disconnecting a low current capacity X-ray tube when a tube of greater current capacity is connected.

I have found that it is often desirable to employ X-ray tubes of different discharge capacities for different classes of work—that is to say, I employ one tube for fluoroscopy and another tube for radiography. The characteristics of the two classes of work differ materially. In the fluoroscopic work, a small amount of current is employed and a relatively feeble discharge occurs. It is often necessary in fluoroscopic work to subject the patient to the X-ray for a considerable length of time. For radiography, the current required for proper work is relatively great to secure a quick and intense exposure. The two classes of work are often carried on in different rooms and a single source of current is employed to supply each tube with current. The current source is provided with suitable regulating means to supply the proper current value to each of the tubes. Where a single source of current is utilized, the two tubes may be supplied with current over an aerial distributing line. When the fluoroscopy tube is to be used, the tube is connected to the aerial line and the current source is regulated to give a low current value such as is proper for this class of work.

When the radiography tube is to be employed, it is necessary to disconnect the fluoroscopy tube or the same would be injured by the heavy current which would flow through it if the current source were regulated to give the increased output required by the radiography tube. There is always grave danger of damaging the lower rating tube due to failure of the operator to disconnect the lower rating tube when the higher rating tube is employed.

My invention provides means for automatically opening the line beyond the tube that is connected when the particular tube is connected. The attachment of the nearest tube in each case opens the circuit for the remote tube or tubes so that when the source of current is applied and regulated to produce the proper intensity of discharge there will be no danger of injuring any other tube or tubes even though the same should remain connected to the distributing mains.

In the accompanying drawings, I have illustrated one embodiment of my invention—

Figure 1 is a diagram of the system constructed in accordance with my invention;

Fig. 2 is a side elevation of the automatic switching and connecting mechanism; and

Fig. 3 is an end view of the same.

In Fig. 1 the source of current for exciting the X-ray tubes 1 and 2 is connected to the adjustable spark gap terminals 3 and 4 which are mounted on suitable pillars 5 and 6 on the cabinet 7.

The cabinet 7 is preferably of the type disclosed in my co-pending application, Serial No. 26708 filed May 8th, 1915, having suitable control mechanism, diagrammatically illustrated at 8 and 9 and an ammeter, as indicated at 10 for regulating the strength of current. It is to be understood that any desired type of mechanism may be employed for furnishing current of a proper character for the tubes 1 and 2. It is necessary only that the current supply means be provided with suitable regulating means to provide current of one strength for the tube 1 and current of another strength for the tube 2. The tube 2 may be employed in a separate room as is indicated by the wall 11. A pair of aerial mains 12 and 13 are suspended by means of the insulators 14 and 15 from suitable supports such as the crossbars 16 and 17. The overhead mains 12 and 13 are connected to the terminals 3 and 4, respectively, by means of the flexible metallic leads 18 and 19. These flexible metallic leads are connected to a spring reel contained in a suitable metallic shell 20. said shell being connected through the proper conductor. The conductors 18 and 19 are thus continuously under a slight spring ten-

sion which serves to keep them taut and to keep the ends firmly in contact with the body to which they are connected. The tube 2 is connected through the mains 12 and 13 by means of similar flexible conductors 21, 22, held under the tension of the springs contained in the cases 20. The reel allows the flexible cord to be extended or wound up as desired.

The tube 2 is allowed to remain connected with the mains 12 and 13 as the apparatus which connects the tube 1 to these mains automatically disconnects the tube 2.

The gravity closed switches 23 and 24 connect the distant end of the mains 12 and 13 with the ends adjacent the source of current. But when the tube 1 is connected the switch is automatically opened to render the remote portion of the mains dead, and thus disconnect the tube 2. The structure of the automatically operating mechanism is shown more clearly in Fig. 2. The switch comprises a bar of insulation 25, preferably of cylindrical shape, having a metal disk 26 secured on the remote end thereof, and a slotted metal sleeve 27 connected to the opposite end thereof.

The disk 26 and the sleeve 27 are connected to the respective portions of the main 12 by means of suitable eyes or hooks 28 and 29, respectively. A thin arm, preferably constructed of sheet metal, 30, is pivoted upon a pin 31 which passes through the sleeve 27 and to the end of the insulating rod 25. The upper end of the arm 30 is connected by means of a rod 32 to a counterbalancing weight 33. The lower end of the arm 30 is connected to a light switching arm 34 which extends to a point beyond the disk 26 so that the counterweight 33 will always press the switch arm 34 and the disk 26 together to make contact unless the action is interfered with by the reel 35 or otherwise. The reel 35 is connected by means of a swivel 36 and a hook 37 to the arm 34 adjacent the pivot 31 in order that the counterbalancing weight 33 will overcome the weight of the arm 34 and of the reel 35. The arm 34 is preferably made of aluminum or is otherwise constructed of light weight in order to obviate the necessity of a heavy counterweight 33. The reel 35 is provided with a spring roller upon the interior thereof which automatically takes up the excess tape or cord which is employed. The reel 35 preferably employs a flexible metallic tape which will wind flat upon the spring roller above mentioned. To the end of the flat tape or ribbon I secure a flexible cylindrical conductor 38 which may be covered with suitable insulation, and which has upon the end thereof a suitable hook 39.

The structure of the switch 24 is identical with that of the above described switch. When the hook 39 of the flexible conductor 38 is attached to the X-ray tube 1, the switch blade 34 is pulled down into the dotted line position shown in Fig. 2. The tension of the spring roller in the reel 35 holds the switch blade in the open position and thus protects the tube 2 so long as the tube 1 is connected. The flexible tape or ribbon 40 would alone serve the purpose of making suitable connection but the same is inconvenient to grasp with the hand and the provision of the cylindrical flexible conductor 38 upon the end of the metallic ribbon 40 provides a greatly appreciated convenience. The operation of the system will now be apparent. The low current capacity tube 2 is always connected to the mains 12 and 13 and the operator, knowing this, regulates the source of current at the cabinet 7 so as to put no greater voltage upon the mains 12 and 13 than will cause the proper amount of current to flow through the tube 2. If it is desired to use the tube 1, the current is shut off and the operator grasps the flexible cord 38, unwinds the reel 35, attaching the hook 39 to the proper terminal of the tube. The spring tension of the reel 35 automatically opens the switch blade 34, disconnecting the remote end of the mains thereby. In a similar manner when the hook 41 is connected to the other terminal of the tube the line wire 12 is opened and the other side of the tube 2 is disconnected. The operator then regulates the source of current to give the proper discharge at the tube 1.

As it is necessary for the operator to disconnect the source of current before the tube 1 can be disconnected, there is no danger of the switches 23 and 24 being closed before the current is shut off at the cabinet 7.

It is apparent that the details of construction of the switch that I have illustrated may be varied without departing from my invention as the form and proportions that I have shown are not strictly essential for obtaining the benefit of the same.

What I claim is:

1. In combination, a pair of relatively stationary terminals, a movable switch blade pivoted to one of said terminals, a counterbalancing weight for moving said switch blade into contact with said other terminal, a conductor and spring take-up means connected to said conductor, the spring in the take-up means being adapted to exert a greater pull than the pull caused by the weight, said take-up means being adapted to hold the switch blade open when the conductor is extended.

2. In combination a switch having open and closed positions, means for yieldingly holding the switch in one of said positions, a conductor having connection with the switch, yielding take-up means in said con-

ductor, said yielding take-up means being adapted to exert a pull greater than that of the yielding holding means and to hold the switch open when the conductor is extended.

3. In combination, a rod of insulation, having a metallic disk secured to one end, a metallic sleeve secured to the other, a slot in said sleeve, a switch arm pivoted in said slot and connected with said sleeve, means for normally holding said switch blade against said disk, a conductor for connecting said blade with a load device and spring means connected to said blade and a portion of said conductor for holding said switch blade open.

4. In combination, a body of insulation, a stationary terminal secured to said insulation, a second stationary terminal secured to the other end of said body of insulation, a switch blade for connecting said terminals, means for holding said switch blade in closed position, an extensible conductor for connecting said blade with a load device and spring take-up means for said extensible conductor for moving said switch blade to the open position, said take up means being adapted to hold the switch blade open when the conductor is extended.

5. In combination, a normally closed switch having a movable member, means for holding said member normally in closed position, a flexible extensible conductor for connecting said member with a load device and a spring reel for taking up said flexible conductor, said spring reel being adapted to hold the switch open when the conductor is extended.

6. In combination, a pair of switch terminals, a movable switch blade for connecting said terminals, means for holding said switch blade normally in closed position, a spring reel having a metallic casing secured to said switch blade, a flexible extensible conductor for connection with said metallic casing, said reel having a spring for opening said switch blade and for holding said flexible conductor taut when the conductor is extended.

7. In a switch adapted to be connected in a transmission line, a rigid body of insulation, a terminal rigidly mounted upon said body, a second terminal mounted upon said body, a switch blade for connecting said terminals, means for normally holding said switch blade closed and a spring take-up conductor for connecting said switch blade with another terminal, the spring in said take-up being strong enough to hold said switch blade open when the conductor is extended.

8. In combination a bar of insulating material, a metallic sleeve on one end of said bar, a metallic flange on the other end of said bar, said sleeve and flange being adapted to be connected in a transmission line, said sleeve and said bar having a slot therethrough, a switch blade pivoted in said slot, said switch blade being adapted to connect said sleeve with said flange, and a counterbalance connected to said switch blade for holding said switch blade in normal contact with said flange.

9. In combination a bar of insulating material, a metallic sleeve on one end of said bar, a metallic flange on the other end of said bar, said sleeve and flange being adapted to be connected in a transmission line, said sleeve and said bar having a slot therethrough, a switch blade pivoted in said slot, said switch blade being adapted to connect said sleeve with said flange, and a counterbalance connected to said switch blade for holding said switch blade in normal contact with said flange, and a spring take-up conductor connected to said switch blade and adapted to hold said blade open against said counterbalance when the conductor is connected to a stationary terminal.

10. In combination a pair of switch terminals adapted to be connected serially in a transmission line, an insulating member rigidly supporting said terminals in fixed relation with respect to each other, a switch blade adapted to make contact between said terminals, means tending to close said switch blade, said switch blade being permanently connected to the terminal nearest the source of current, an apparatus terminal adapted to be supported rigidly at various distances from said switch blade, and a branch conductor comprising a spring take-up conductor mechanically and electrically connected to said switch-blade, said spring take-up conductor being adapted when extended and attached to said terminal to hold the switch blade open against the tension of said closing means to disconnect the blade from the terminal remote from the source of current.

In witness whereof, I hereunto subscribe my name this 18th day of January A. D. 1916.

WILLIAM MEYER.