Oct. 29, 1935. A. SCHNITZER 2,019,362

RÖNTGEN RAY APPARATUS

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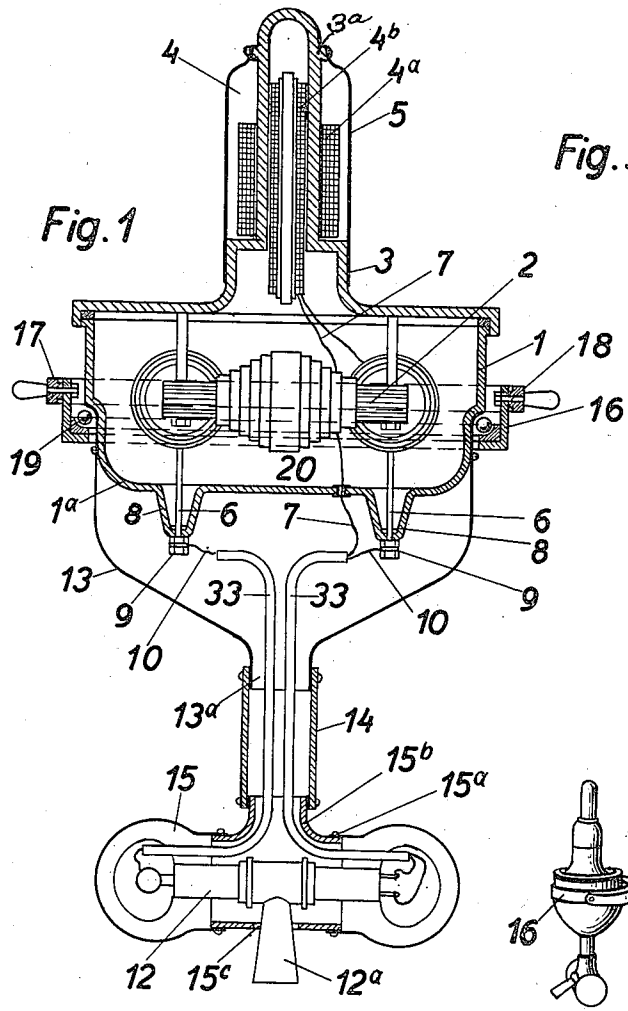


Fig. 1

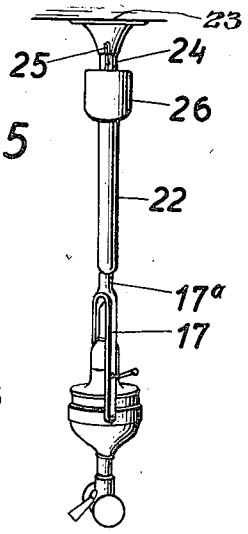


Fig. 5

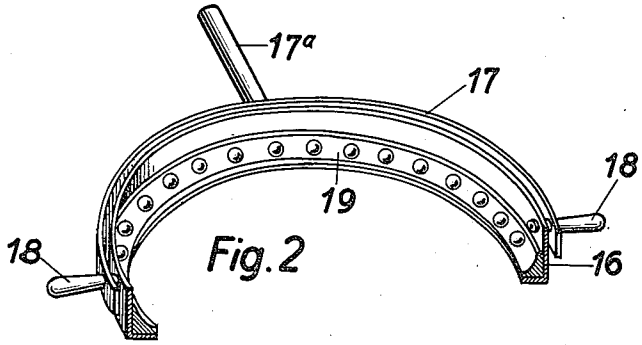


Fig. 2

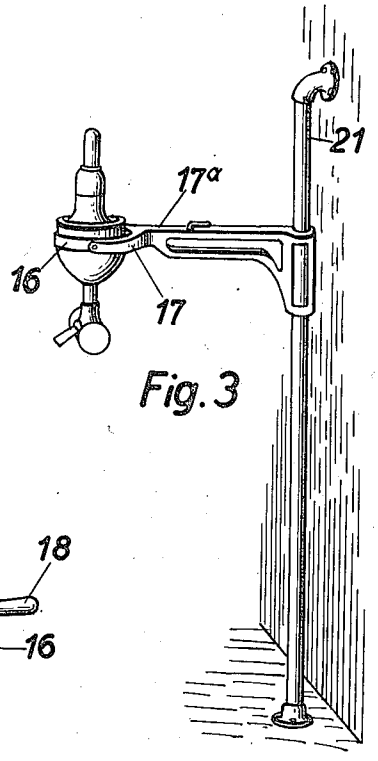


Fig. 3

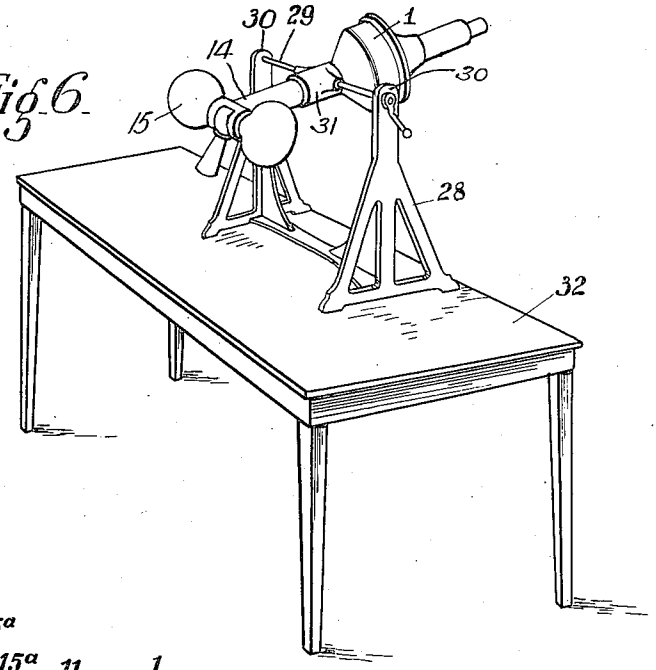
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RÖNTGEN RAY APPARATUS

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Fig. 6



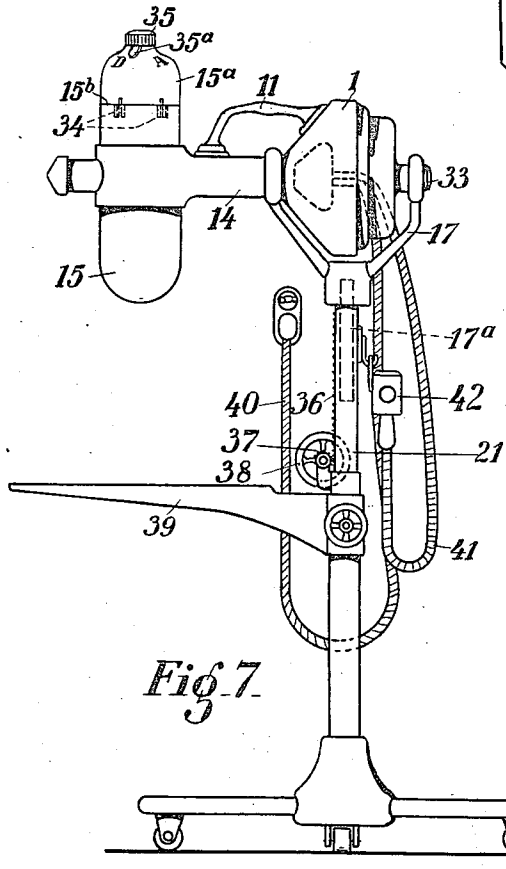


Fig. 7

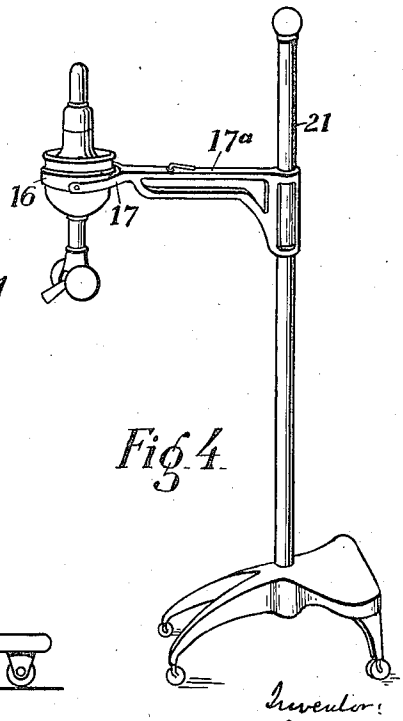


Fig. 4

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RÖNTGEN RAY APPARATUS

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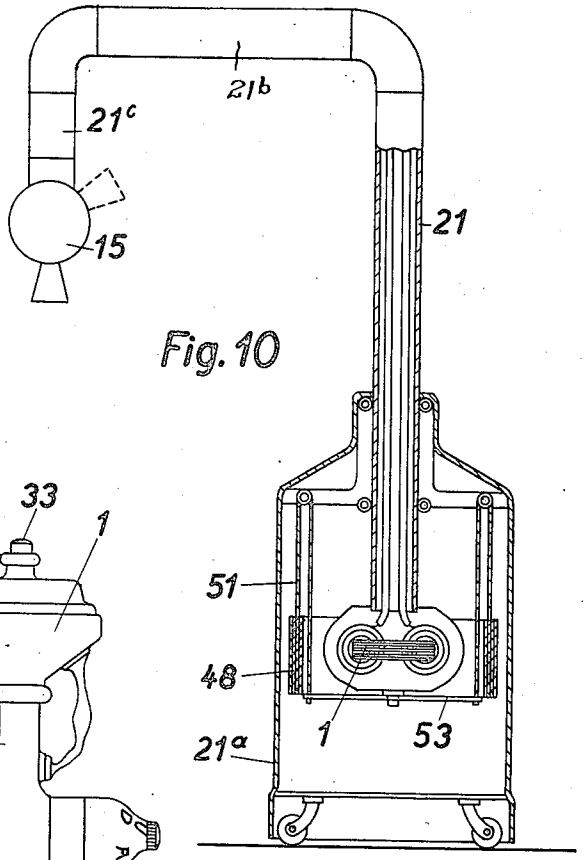


Fig. 10

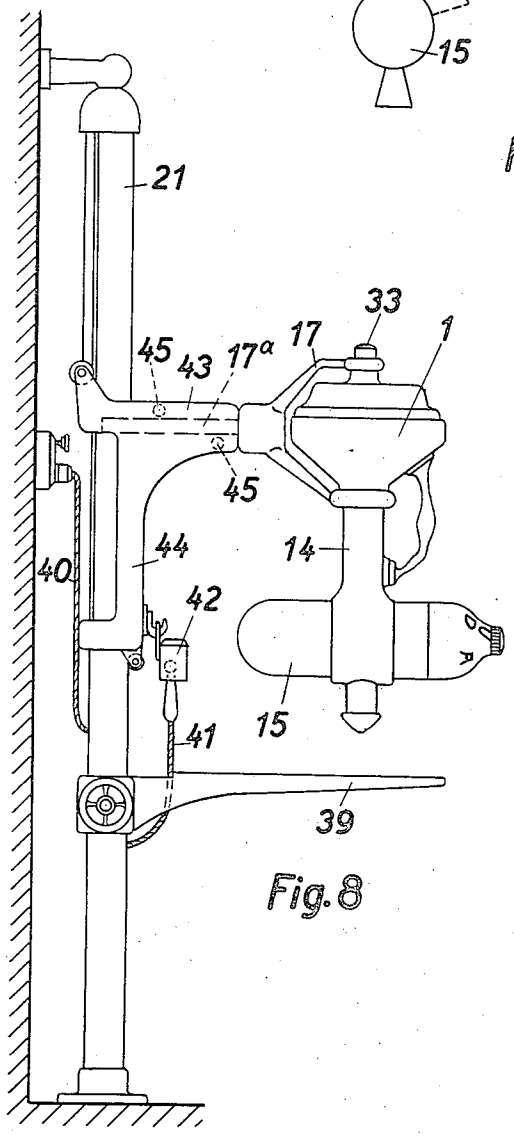


Fig. 8

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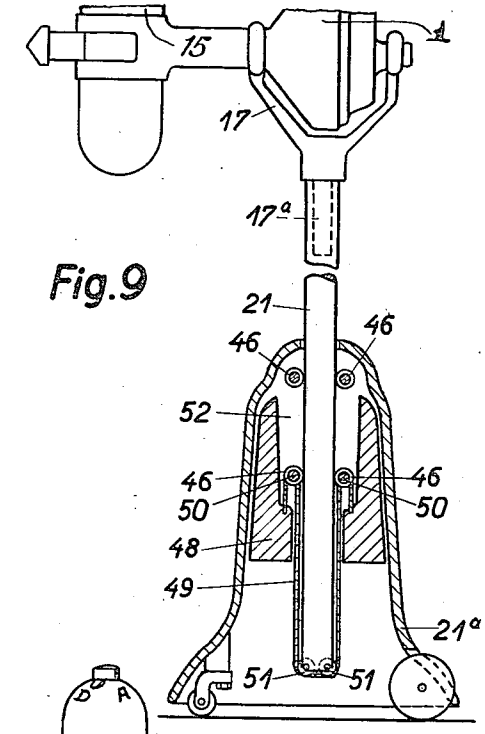


Fig.9

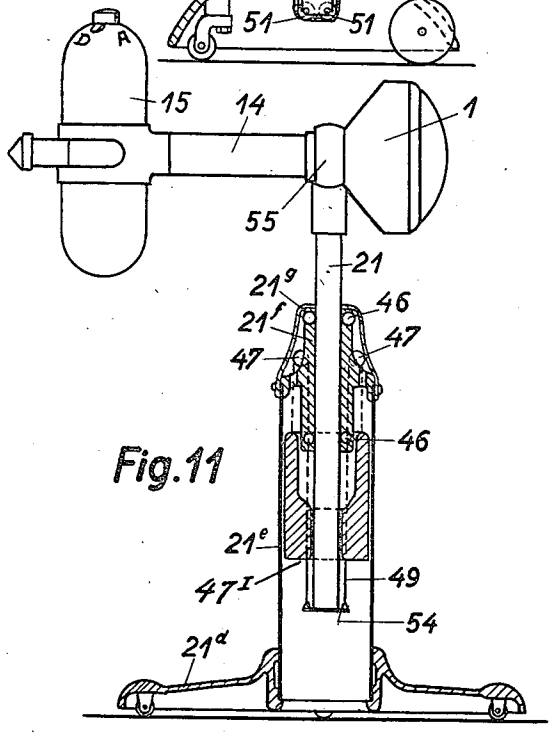


Fig.11

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RONTGEN RAY APPARATUS

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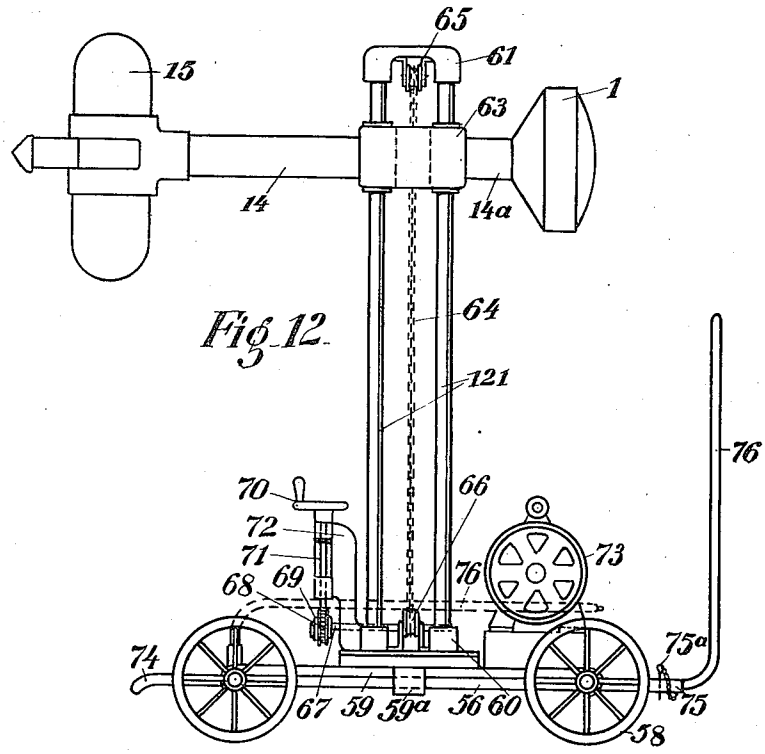


Fig 12

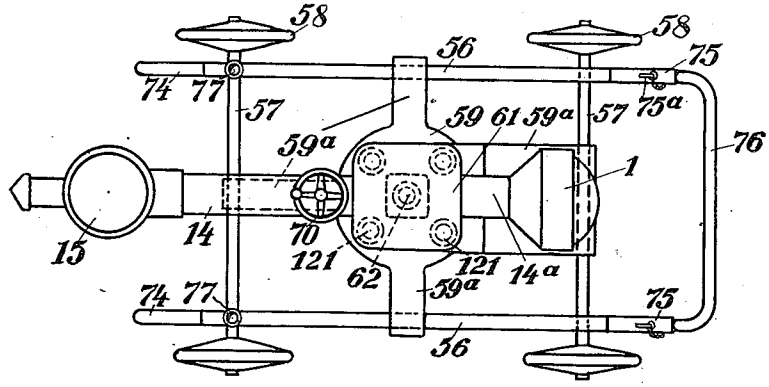


Fig 13

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UNITED STATES PATENT OFFICE

2,019,362

RÖNTGEN-RAY APPARATUS

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Application April 24, 1931, Serial No. 532,474
In Germany July 16, 1929

3 Claims. (Cl. 250—34)

This invention relates to Röntgen-ray apparatus.

The invention and its aims and objects will be readily understood from the following description taken in connection with the accompanying drawings showing the features of the invention in illustrative form, the true scope of the invention being more particularly set forth in the appended claims.

In the drawings:

Fig. 1 shows in vertical section an illustrative embodiment of the unit comprising the transformer and Röntgen-ray tube housing;

Fig. 2 is a perspective view, partially in section, of the bearing ring;

Fig. 3 shows the mounting of the unit on a wall bracket;

Fig. 4 shows the mounting of the unit on a column stand;

Fig. 5 shows the unit suspended in a ceiling bracket;

Fig. 6 shows the mounting of the unit on a stand to be placed upon a table;

Fig. 7 shows the mounting of the unit in a fork carried by the column of a base support, said fork forming in a sense a part of the unit;

Fig. 8 shows the mounting of the unit by means of the same fork in a wall bracket;

Fig. 9 shows the same unit and fork mounted upon an extensible column of a stand or support;

Fig. 10 shows a similar extensible support in combination with a unit, the transformer of which is housed in the foot of the supporting standard;

Fig. 11 shows a somewhat different combination of the unit with an extensible support;

Figs. 12 and 13 are a side and top plan view respectively of a Röntgen apparatus in which the unit comprising the transformer and Röntgen-ray tube housing is carried upon a column support rising from a frame mounted on wheels.

Referring to Fig. 1 the high tension transformer 2 is lodged in a housing 1 forming a substantially cylindrical rotatable body, said high tension transformer consisting, as is well known, of an iron core forming a quadrangular frame having windings upon all four branches. At the top of the housing 1 is provided a hollow boss 3 containing the heat transformer 4, the secondary coil 4b of which being contained in a sleeve 3a upon which is slipped the primary coil 4a enclosed in a metal covering 5.

From the secondary terminals of the high tension transformer 2 conductors 6 lead through ducts 8 of the housing 1 to exterior terminals 9, to which are connected the conductors 10 leading to the terminals of the Röntgen-ray tube 12. In addition a conductor 7 leads from one of the terminals of the heating transformer 4, through a duct 20 to the cathode of the Röntgen-ray tube. Upon the reduced lower portion 1a of the transformer housing 1, there is mounted, from below, a funnel-shaped hood 13 upon the reduced tubular end 13a of which there is secured an insulating tube 14 (the latter could be of metal). In the lower end of the latter there is secured the protective housing 15 of the Röntgen-ray tube 12, by means of a sleeve 15a, 15b, in such manner that the axis of said housing 15 is at right angles to the axis of the insulating tube 14. The conductors 7 and 10 that pass through the sleeves 13a and 15b and the tube 14, within insulating tubes 33, are bent within the Röntgen tube protecting housing so as to run along and parallel to the Röntgen-ray tube 12 to their terminals.

As all the high tension conductors are enclosed within the joint housing formed by the housings 1 and 15 and the connecting tube 14, nothing can come in contact with them, and furthermore as an extra precaution for safety said joint housing, in so far as it consists of metal, will preferably be grounded.

The housing 1 of the transformer is mounted to turn about its axis on ball bearings 19 contained in a collar or ring 16 surrounding said housing, said ring being provided with diametrically opposed pivots or trunnions 18 journalled in the two ends of a fork 17 having a supporting spindle (Fig. 2) or arm 17a, said housing being thus free to swing or pendulate about the axis of said trunnions.

The middle portion 15a of the protector housing 15 for the Röntgen-ray tube is provided with an annular slot 15c through which projects the focusing tube 12a secured to the middle portion of the Röntgen-ray tube 12 and through which said rays are projected, said focusing tube being thus rotatable about the axis of the Röntgen-ray tube.

Owing to its mobility in so many directions the device is adapted to a very wide range of applications.

Referring to Fig. 3, the arm 17a, the fork 17 of which pivotally supports the ball bearing ring 16 of the housing, is mounted for vertical adjustment upon a vertical rod 21 having sockets secured to the floor on the one hand and to the wall on the other.

As shown in Fig. 4 the rod 21 is mounted upon a stand.

As shown in Fig. 5 the pendulous suspension of the bearing ring 16 is effected by means of a fork 17 at the end of a spindle 17a adapted to telescope within a tube 22 carried by a ceiling bracket 23. Said spindle 17a has connected thereto cords 24 that pass over pulleys 25 and are connected at their other ends to a counter weight 26 surrounding the tube 22 and slidable thereon.

Fig. 6 illustrates how the apparatus can be mounted upon a stand 28 by means of a shaft 29 journalled in bearings 30 of said stand, said stand being adapted to be placed upon a table or any other suitable supporting surface. The shaft 29 is provided with a collar 31 which encircles the connecting tube 14 at a point between the transformer housing 1 and the Röntgen-ray tube protective housing 15, immediately adjacent said transformer housing. In this case also provision may be made if necessary for rotation about the common axis of the transformer housing and the tube 14.

Referring to Fig. 7, the transformer and Röntgen-ray housing unit, provided with a handle 11 for convenient carrying thereof, is rotatably mounted in the fork 17 on the one hand by means of the tube 14, and on the other hand by means of a trunnion or pivot 33 having its axis coincident with that of said tube 14. The fork has a spindle 17a having a rotary fit in the bore of the supporting column 21, so that the unit is also rotatable above the axis of said column 21.

The Röntgen-ray tube housing 15 may be opened at the joint 15b by removal of the part 15a, to render the Röntgen-ray tube accessible. Plug contacts 34 serve to break the primary current of the transformer when said housing 15 is thus open, so as to avoid any danger of accident from the high tension current. A switch 35 is provided upon the housing portion 15a by which the apparatus may be adjusted as desired for radiography (position A) or radioscopy (D) as indicated by the index 35a. The switch is connected to cut-in or cut-out a resistance (not shown) to increase or decrease the current flowing through the transformer.

The column 21 of the support is in two parts, of which the upper part telescopes in the lower part. The upper part is provided with a rack 36 with which meshes a gear 37 mounted on the lower part and operated by hand wheel 38. The column 21 is also provided with a vertically adjustable table 39. A cable 40, provided with a plug, extends from the transformer housing 1 for connecting up with the network; also a second cable 41 having connected thereto a portable time switch 42.

Referring to Fig. 8, the spindle 17a of the fork 17 is received in a horizontal arm 43 of a carriage 44 adjustable vertically upon a wall bracket 21, said spindle resting upon a roll 45 upon which it is readily slidable, thus enabling the apparatus to be drawn out more or less.

Referring to Fig. 9, two pairs of rolls 46 are rotatably mounted within the hollow foot 21a of the support, the column 21 of the unit extending between said pairs of rolls and being guided thereby for vertical movement. Within the hollow foot of the support 21a, there is also a counter-weight 48 which slidably surrounds the column 21. A cord or other traction member 49 has its free ends secured to said weight and extends over the lower pair of rolls 46, said rolls being grooved for that purpose, and also over two rolls 51 rotatably mounted upon the lower end of said column 21. The weight 48 is recessed as shown at 52, said recess receiving the lower guide rolls 46 and their axes 50, when said column 21 being lowered said weight is raised.

Referring to Fig. 10, the supporting column 21 forms the connecting tube between the transformer housing 1 and the Röntgen-ray tube housing 15. The column 21 is bent horizontally at its upper portion to form a bracket 21b which is bent down again vertically at 21c, at the end thereof which supports the Röntgen-ray tube housing 15. The high tension transformer 1 is secured to the lower end of the column 21 within the box-like foot 21a of the support. The counterweight 48 forms a ring, its opening having a sufficient diameter to give free passage therethrough to said transformer. The transformer 1 rests upon a plate 53 to which one end of each of the traction members 51 is secured, the other ends of said traction members being secured to the weight 48.

Referring to Fig. 11, the foot of the support comprises a cast iron bed plate 21d, a tube of hard paper 21e having its lower end fitting within the central opening of said plate, and a head piece 21f shaped to constitute a guiding sleeve. Within the head piece 21f, there are provided an upper and a lower set of guiding rolls 46 for guiding the column 21 received between them. Within said head piece are also provided pulleys 47 over which pass cords 49, one end of each cord being secured to a counter-weight 47[1] and their other ends to a plate 54 upon which the lower end of the column 21 rests. Said weight 47[1] is bored longitudinally to give free passage to said column 21.

The sleeve 21f with its rolls 46 and pulleys 47 is enclosed by a metal cap 21g having a central opening for the passage of the column 21 which is freely rotatable upon the plate 54. The upper end of the column 21 carries a collar 55 which embraces the reduced or neck portion 14 of the transformer unit, so that said neck can turn therein, said collar being preferably adjacent the transformer housing 1. The electrical unit comprising the transformer and Röntgen-ray housing is thus freely rotatable about its longitudinal axis within said collar 55.

Referring to Fig. 12, the unit comprising the transformer and Röntgen-ray tube housing is vertically guided upon four columns 121 which rise from the wheeled carriage. Said carriage comprises two longitudinal supports 56 and two cross rods 57 which serve as axles for the wheels 58 of the carriage. The longitudinal supports 56 and axles 57 carry a bed plate 59 secured thereto by arms 59a. The columns 121 connect a cap piece 61 with a base plate 60 which rests upon the bed plate 59 and is rotatable about a central boss 62 rising from the latter and engaging a circular opening in said base plate 60. The four-column construction makes for greater stability with relatively slight weight.

A carriage 63 is slidingly guided by the columns 121, and supporting tubes 14, 14a project from said carriage in opposite directions. The transformer 1 is carried at the free end of the supporting tube 14 and the Röntgen-ray tube housing 15 at the end of the supporting tube 14. A chain 64 has its free ends secured to said carriage 63 and passes over rolls 65, 66. The carriage 63 is preferably frame-shaped so that the section of the chain 64 not engaging said carriage can pass

freely through its central opening. Roll **65** is freely rotatable about its axle on the cap piece **61**, but roll **66** is rigidly secured upon a shaft **67** journalled in the base plate **60**, said shaft being rotatable by a worm gear **68**, **69** or operated by a hand wheel **70**, whereby said carriage **63** may be raised and lowered. By reason of the self-braking or locking characteristic of worm gears, said carriage **63** will remain in any vertical position to which it may be raised or lowered by operation of the hand wheel **70**, so that said carriage requires no counter-weight. The shaft **71** is journalled in suitable bearings **72** carried by the base plate **60**.

A converter **73** may be provided on the bed plate **59**, as shown in Fig. 12, if desired.

At one end, the longitudinal supports **56** are formed as handles **74**. At their opposite ends they are bored to form sockets **75** for the lower ends of the side members of a push handle **76** which extends upwardly to a height convenient for pushing the apparatus about, the lower ends of the side members of said push handle being bent to engage said sockets. Pins **75***a* extending through openings in the walls of said sockets and engaging openings provided in the free ends of said push handle serve removably to secure the push handles in said sockets. Two vertical sockets **77** are provided near the opposite ends of the side members **56** to receive the free ends of said push members **76** when said push handle is not in use or when the apparatus is to be carried. The push handle then occupies the dotted line position shown in Fig. 12. If left in its full-line position, Fig. 13, said push handle might interfere with the person carrying the apparatus at that end.

I am aware that the invention may be embodied in other specific forms than that herein illustrated without departing from the spirit or essential attributes thereof, and I therefore desire the present embodiment to be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

I claim:

1. In Röntgen-ray apparatus, in combination, a unit comprising a high tension transformer, a heating transformer, connecting conductors and a protective housing therefor; a collar in which said housing is mounted for rotary movement; and a fork carried by a spindle and pivotally supporting said collar.

2. In Röntgen-ray apparatus, a unit comprising a Röntgen-ray tube; a transformer housing; a Röntgen-ray tube housing; a single tube of small cross-section rigidly connecting said housings and constituting the sole support for said Röntgen-ray tube housing; and an annular member having anti-friction means supporting said transformer housing for rotation about the axis of said connecting tube, said Röntgen-ray tube being rotatable within the Röntgen-ray tube housing about an axis perpendicular to said connecting tube.

3. Röntgen-ray apparatus comprising, in combination, a transformer and a Röntgen-ray tube; a housing for said transformer; an elongated housing for said Röntgen-ray tube spaced from and at right angles to the axis of said transformer housing; a single tubular member of small cross section rigidly connecting said housings coaxial with the transformer housing and providing a shield for a portion of the conductors connecting the transformer to the Röntgen-ray tube; a bearing for the transformer housing supporting the whole unit for rotation about the axis of said tubular member; and means permitting swinging movement of the Röntgen-ray tube about an axis at right angles to the axis of said tubular member.

ALEXANDER SCHNITZER.