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X-RAY APPARATUS

Filed June 7, 1930

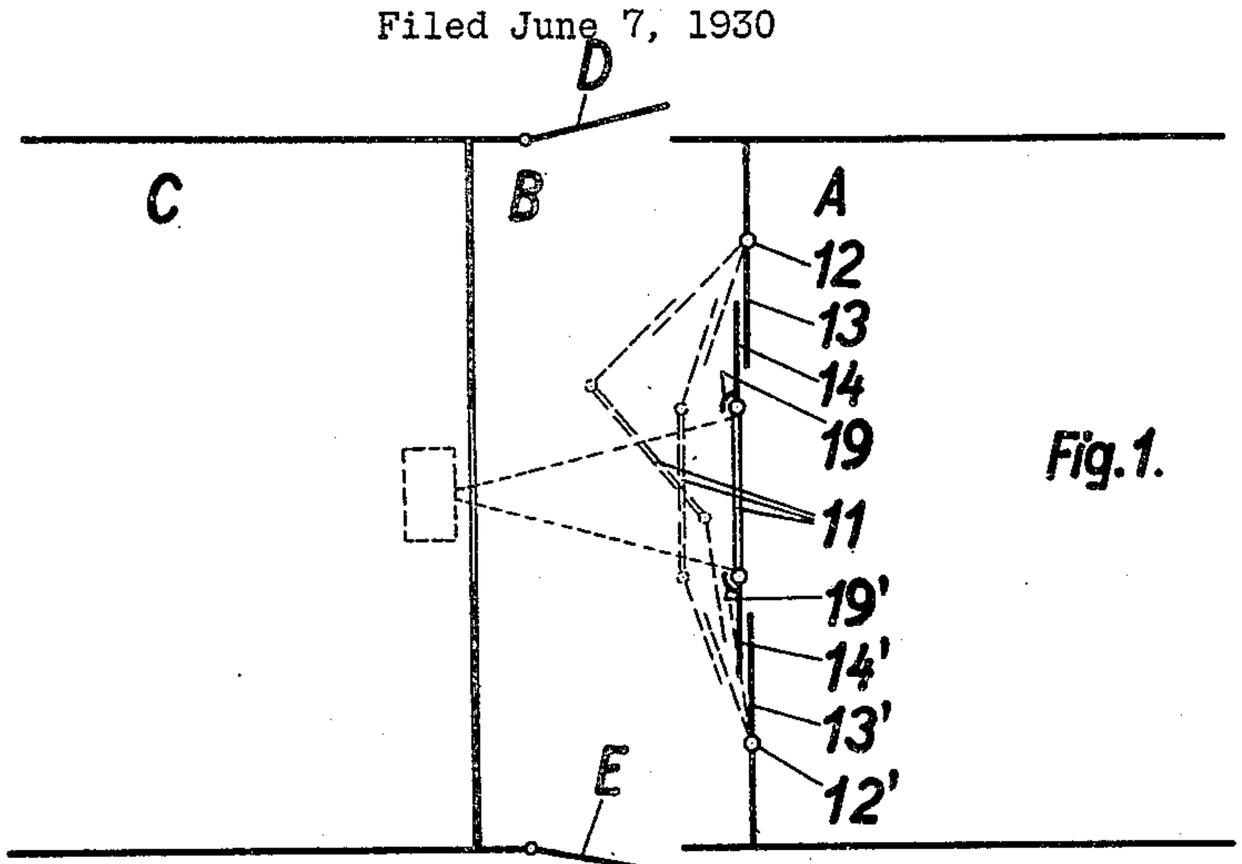

Fig. 1.

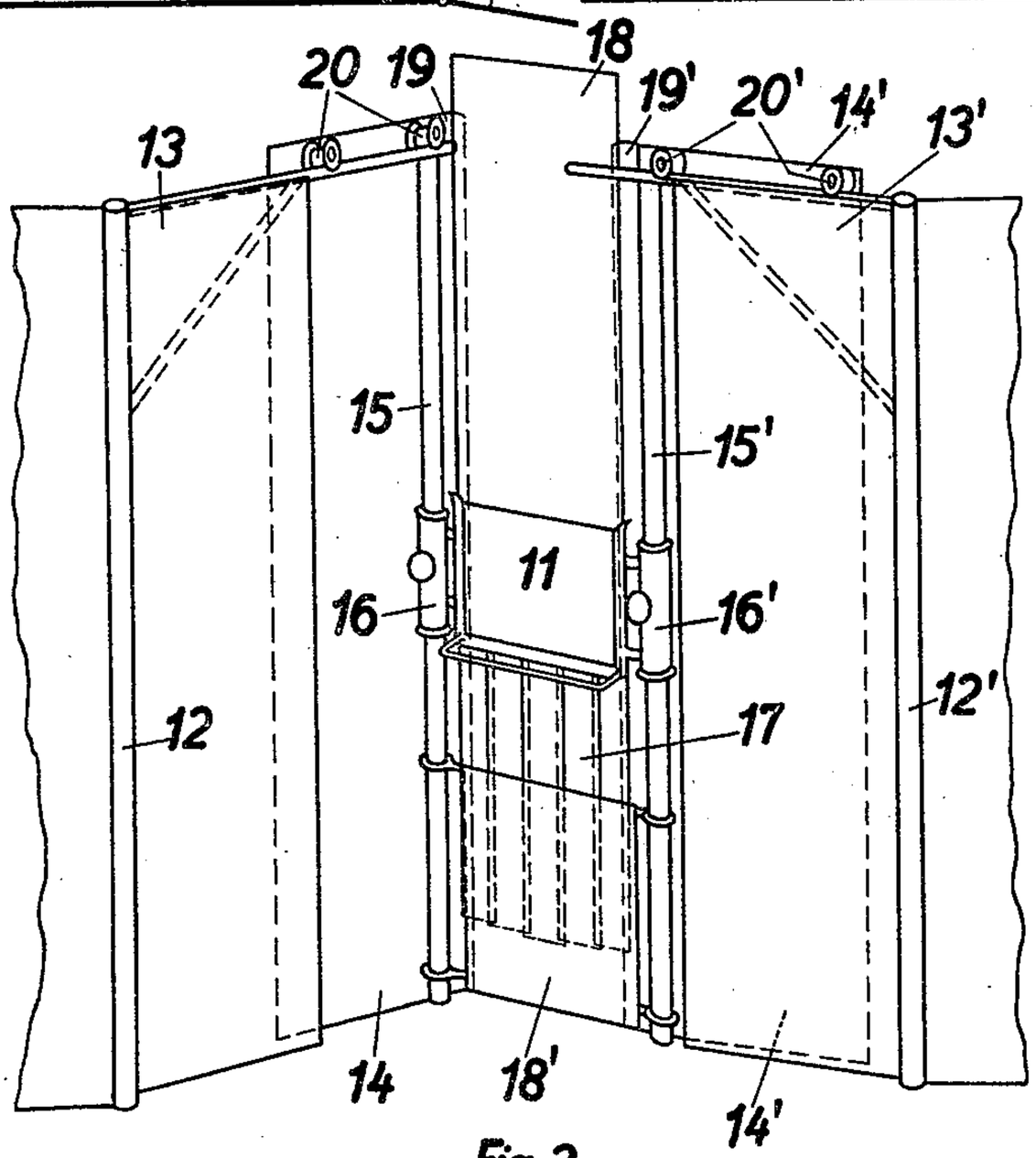

Fig. 3.

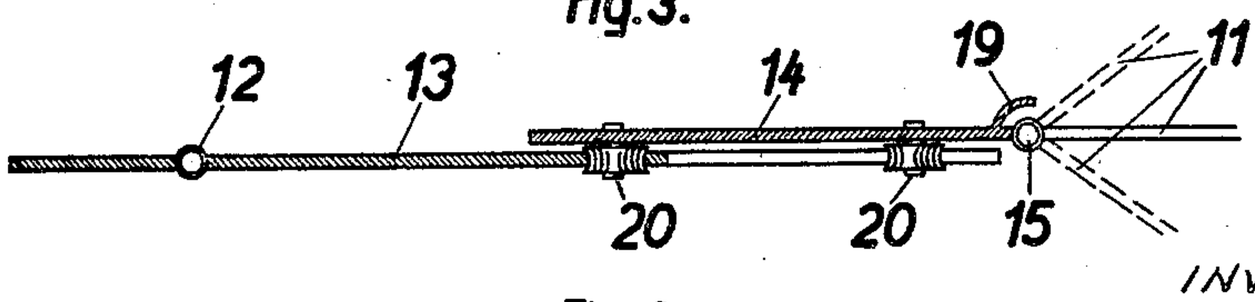

Fig. 2.

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UNITED STATES PATENT OFFICE

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X-RAY APPARATUS

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Up to now it was possible to provide complete protection of medical attendants against secondary radiations issuing from the patient or from objects exposed to radiation in the case of X-ray apparatus used for radiotherapeutic treatment only, where the exposure room and the room for operating the apparatus are separated from each other in such a manner as to prevent any leakage of radiations from one of the rooms referred- to to the other.

The reason why it is possible to employ the known method of separation by radiation-proof partition walls in the case of radiotherapeutical treatment is that in this case the medical attendant administering the treatment will during the time during which the patient is exposed to radiation have nothing to do except to regulate the X-ray apparatus and to observe through windows protected against the passage of rays, whether the patient alters his position during the time of exposure to radiation. For this purpose it is possible to make use of partition walls placed in a fixed position, and of observation windows of a similar description, there being no difficulty in constructing these walls or respectively observation windows so as to be radiation-proof.

For the purpose of radioscopic examination for diagnostic purposes, however, it was not possible up to now to ensure protection in the same degrees, as in this case it is necessary, that the observation screen or respectively the radiographic plate box should be capable, as far as possible, of being moved in all directions. Especially it is necessary that it should be possible to vary the position of these parts relatively to the patient between wide limits. As long as complete freedom of movement was maintained, it appeared to be impossible to ensure complete protection against the effects of radiation. It has indeed been proposed to effect the observation from a box closed so as to be impermeable to radiation, in which box an opening is provided at a point inaccessible to X-rays, through which opening light rays serving the purpose of indirect observation are allowed to pass. Such an arrangement, is, however, unsuitable for radioscopic examination for diagnostic purposes, as this arrangement does not permit to employ a movable screen, radiographic plate box or other similar instrument enabling an exact examination to be effected.

It is generally known, that the known means employed against secondary radiation, as protective pulpits, flaps of rubber containing lead in dispersion arranged around the patient etc. offer insufficient protection only. Another drawback of the known types of radioscopic outfits is that the patient is in a dark room, as the medical man also in order to be able to observe well has to effect the radioscopic examination in a dark room. This circumstance hinders the movements of the patient and is particularly disadvantageous in those cases when children or nervous persons have to be examined.

The invention concerns an arrangement by which the drawbacks referred to are avoided and which enables to separate the observation room from the room in which the patient is exposed to radiation in case of radioscopic examination for diagnostic purposes in the same radiation-proof way, as has been possible up to now in the case of radiotherapeutic treatment only, whilst at the same time enabling in the case of one possible arrangement of the device according to the invention, the patient to remain in a lighted room, whilst the medical attendant effects the examination in a separate darkened room.

According to the invention the observation screen or respectively radiographic plate box is arranged in a wall separating the room for operating the apparatus from the observation room, which wall is composed of elements capable of mutual displacement by

sliding and capable of being deflected in groups around a pivot for each group, which pivot is arranged in a lateral position relatively to the observation screen. The observation screen or respectively its supporting device is connected in an articulated manner with the adjoining pivotable and longitudinally displaceable elements of the wall so as to enable the screen or respectively its supporting device to be adjusted into any desired position, and accordingly also into an oblique position and fixed in the same. At the same time the screen is arranged so as to be capable of being displaced by sliding in the vertical direction by means of supporting devices of known type. The wall elements resembling stage wings or slides and capable of being displaced by sliding parallel to each other are armored for complete protection against radiation and mutually overlap in each position, they can therefore be constructed so as to be not only radiation-proof, but also proof against the passage of light through them.

An embodiment of the invention shown by way of example is illustrated in a diagrammatical manner on the drawing.

Fig. 1 is a plan of an arrangement for radioscopic examination according to the invention.

Fig. 2 is a section through the articulated partition wall, drawn to a larger scale;

Fig. 3 is a view, partly drawn in perspective.

Fig. 1 A denotes the observation room, B the room for effecting the exposure to radiation for diagnostic purposes, and C denotes the apparatus room. The partition wall between rooms A and B is constructed in its middle part, in accordance with the invention, so that it is possible to bring the observation screen 11 nearer to the patient, or remove it to a greater distance from the patient, to adjust it in the vertical and in the lateral direction and to bring it into any desired oblique position, and to fix it in the same, without any secondary rays being able to penetrate into the observation room during these operations. For this purpose two wings 13 and 13′ capable of being deflected around vertical pivots 12 and 12′ are provided, each of which wings carries in the embodiment shown by way of example on the drawing, a protecting screen 14 or respectively 14′ capable of being displaced in parallel to the corresponding wing in the manner of a slide, which protecting screen possesses a height equal to that of the corresponding wings and is sufficiently wide to ensure that the two parts 13 and 14 or respectively 13′ and 14′ pivotable together around the corresponding pivot 12 or respectively 12′ will overlap in their extreme positions. The observation screen 11 is capable of being slid along guide rods 15 and 15′. These guide rods are of a cylindrical shape, so that the sleeves 16 and 16′ at the same time also form articulations around which the observation screen 11 is capable of being deflected in order to be adjusted into different positions. The path along which it is possible to displace the observation screen 11 in the vertical direction is screened off partly by means of pliable cloth, for instance by means of mutually overlapping strips of rubber containing a dispersion of lead 17 and partly by means of plates 18. The protecting screen consisting of mutually overlapping strips is arranged below the observation screen and provides the possibility for the medical attendant to extend his hand through it for the purpose of any manual operation, as palping etc. required in the course of the examination, the mutually overlapping strips preventing any passage of rays at such an occasion. This protecting screen is overlapped by the fixed plate 18′. Protecting screens 19 and 19′ are likewise provided, for the purpose of preventing any passage of rays near the guides 15, 15′. The protecting screens 14 or respectively 14′ which are in the form of slides, slide along the wings 13, 13′ by means of rollers 20 or respectively 20′.

In Fig. 1, various positions of the observation screen are shown by means of dotted lines.

It is also possible to effect another kind of sub-division of the partition wall, in which it is only the distance of the guides 15 or respectively 15′ from the pivots 12, 12′ which can be varied.

The arrangement described enables the free adjustment and fixing of the screen or respectively of the radiographic plate box in any desired position and enables the screen or respectively radiographic plate box to be moved in a manner independent of the X-ray tube. The freedom of movement of the patient is not hindered by any projecting parts of the screen supporting device as is the case with existing types of apparatus, and it is possible to light the room in which the patient is exposed to radiation in any desired manner.

According to Fig. 1 the radioscopic exposure room is constructed as a passage possessing two mutually opposite doors D and E. This arrangement is particularly suitable for the successive radioscopic examination of a large number of patients.

Deviations from the embodiment shown by way of example are possible. Thus, for instance, it is possible to make the radioscopic room in the shape of a box, the front wall of such box being constructed according to the invention.

What we claim is:

1. An X-ray apparatus, comprising in combination a plurality of main panels, each panel being mounted for pivotal movement about a vertical axis, a secondary panel slid-

ably mounted upon each of said main panels, and a member sensitive to X-rays pivotally connected to and intermediate said secondary panels.

2. An X-ray apparatus, comprising in combination two main panels, each panel being mounted for pivotal movement about a separate vertical axis, a secondary panel slidably mounted upon each of said main panels, and a member sensitive to X-rays pivotally and slidably connected to and intermediate said secondary panels.

3. An X-ray apparatus, comprising in combination a plurality of main panels, each panel being mounted for pivotal movement about a vertical axis, a secondary panel slidably mounted upon each of said main panels, a plurality of guide rods, each one of said secondary panels being connected with a separate guide rod, a member sensitive to X-rays rotatably mounted on each one of said guide rods and situated intermediate said secondary panels, a plurality of protecting screens connected with said member and movable therewith, and a plate connected with and carried by said guide rods, said plate overlapping at least one of said protecting screens in each position of the latter.

4. An X-ray apparatus, comprising in combination a plurality of main panels, each panel being mounted for pivotal movement about a vertical axis, a secondary panel slidably mounted upon each of said main panels, a plurality of guide rods, each one of said secondary panels being connected with a separate guide rod, a member sensitive to X-rays rotatably mounted on each one of said guide rods and situated intermediate said secondary panels, a plurality of protecting screens connected with said member and movable therewith, at least one of said protecting screens comprising a plurality of mutually overlapping elastic strips; and a plate connected with and carried by said guide rods, said plate overlapping at least one of said protecting screens in each position of the latter.

5. An X-ray apparatus, comprising in combination a plurality of partition walls, said walls separating space reserved for patients from space reserved for observation, a plurality of main panels, each panel being pivotally connected with a separate partition wall, a secondary panel slidably mounted upon each of said main panels, and a member sensitive to X-rays pivotally connected to and intermediate said secondary panels.

6. An X-ray apparatus, comprising in combination a plurality of X-ray proof partitions, a plurality of X-ray proof walls connected with said partitions, said walls and said partitions forming a patients' room, a plurality of main light-proof panels, each panel being pivotally connected with a separate partition, a secondary light-proof panel slidably mounted upon each of said main panels, a member sensitive to X-rays pivotally connected to and intermediate said secondary panels, one of said walls having an opening opposite said member for the passage of X-rays, and two doors pivotally connected with two of said walls and situated opposite each other.

In testimony whereof we have signed our names to this specification.

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