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Patented Nov. 6, 1900.

C. REMY.

APPARATUS FOR DETERMINING THE POSITION OF FOREIGN BODIES BY MEANS OF
ROENTGEN RAYS.

(Application filed Sept. 28, 1899.)

(No Model.)

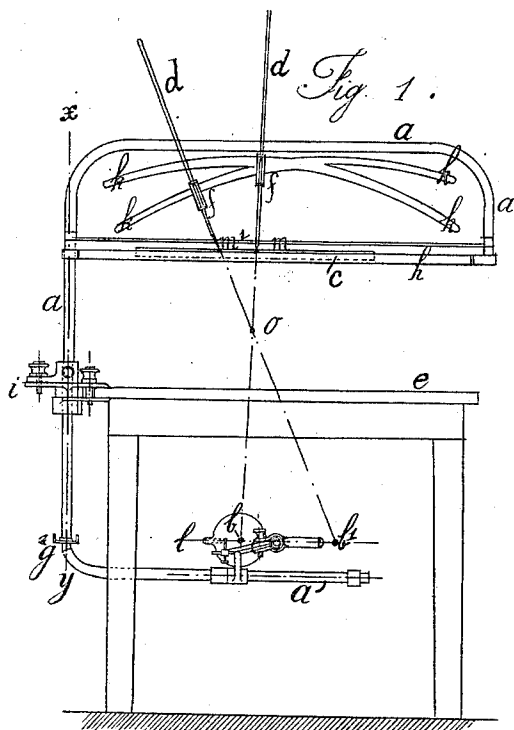
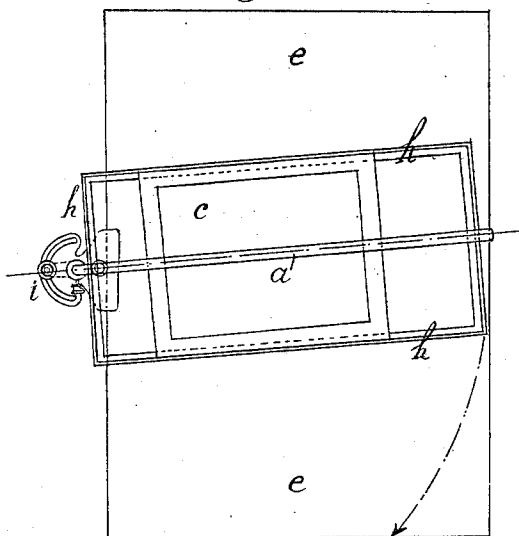


Fig. 2.



Witnesses.
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APPARATUS FOR DETERMINING THE POSITION OF FOREIGN BODIES BY MEANS OF ROENTGEN RAYS.

SPECIFICATION forming part of Letters Patent No. 661,385, dated November 6, 1900.

Application filed September 28, 1899. Serial No. 731,961. (No model.)

To all whom it may concern:

Be it known that I, CHARLES REMY, a citizen of the Republic of France, residing at 31 Rue de Londres, Paris, in the Republic of France, have invented certain new and useful Improvements in Apparatus for Determining the Position of Foreign Bodies by Means of the Roentgen Rays, (for which I have obtained a patent in France, No. 287,494, dated April 4, 1899, and for which I made application for patent in Germany on June 27, 1899;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My apparatus belongs to the category of radiographic apparatus, in which one or more Crookes tubes are employed for collecting on a screen or sensitive plate the shadows thrown onto the opaque body interposed between the tubes and the screen. By uniting each shadow thrown onto the focus whereby they have been formed rays are obtained which intersect one another exactly at the seat of the object for which search is being made. The problem to be solved is the fixing or materializing of these rays, the intersection of which determines the seat of the body being sought for, in such a manner that this seat may be formed again at will after the radiographic operation. In the processes hitherto known the portion of the rays between the screen or the sensitive plate and the focus has alone been considered, this giving rise to difficulties easily foreseen, since the body to be acted on is itself in the space between the screen and the focus, thus clearly constituting a cause of trouble in the operation. In my apparatus, on the contrary, I fix or materialize the portion of the rays situated beyond the screen in relation to the foci. This portion of the rays being outside the space occupied by the body to be operated on and as far from this body as desired, it will be seen that the fixing or materializing of this portion of the rays is in no way interfered with by the presence of the body to be operated upon. The materializing of this portion of the rays being effected, the materialized rays may be displaced for the purpose of returning them to their initial position by suitable marking or adjusting parts,

if necessary. Thus my apparatus enables the seat of foreign bodies to be determined and the patient to be operated on immediately afterward, the operator being able to displace momentarily the materialized rays which indicate to him the position of the foreign body in order to return these rays to their initial position if the examination should require it. My apparatus thus serves not only for localizing the seat of the foreign bodies, but for guiding the surgeon in what is, properly speaking, his surgical operation.

In the accompanying drawings, Figure 1 is an elevation of apparatus constructed according to this invention, and Fig. 2 is a plan of the same.

My apparatus comprises a frame or bracket *a*, capable of being fixed on an operating-table *e* by means of suitable jaws or clamps. The lower arm of the frame *a* is beneath the table *e* and carries the supports for the Crookes tube *l*. The support for this tube may be movable on the frame in such a manner that the focus of the tube may occupy two precisely-determined extreme positions *b* and *b'*. The employment of two fixed tubes is thus avoided. The upper bent arm of the frame *a* carries a metal plate perforated with two circular slots *k k*, having the points *b* and *b'* as their respective centers, the extreme positions in the Crookes tube. In each of these slots slides a ferrule *f*, carrying a long thin rod *d*. These ferrules can be fixed by a suitable tightening-screw at any point of the slot. In every position of the ferrules *f* the extensions of the rods *d* always run through the foci *b* and *b'*, respectively. The rods *d* may thus serve for materializing all the X-rays comprised in the plane of the rods, which also passes through the foci *b* and *b'*. A vizor *g*, fixed on the vertical arm of the frame *a*, enables the position of the focus of the Crookes tube to be so regulated that the direction of the rods *d* runs exactly through the respective foci. For this purpose the support of the rod is furnished with suitable mechanism enabling the position of the focus of the said tube to be precisely regulated.

The bracket-frame *a* carries another frame *h*, preferably of rectangular form, Fig. 2, intended for the reception of the diffusing-screen *c* on the photographic plate.

The frame *a* is able to rotate on its own axis *x y*, and this rotation can be regulated by means of a slide which moves in the groove of a sector *i* furnished with a movable stop.

5 In this way it is easy to determine the angle of rotation and to bring the frame back again into any given position. Besides this rotary motion the frame *a* can be moved vertically in the support, which serves for fixing it on
10 the operating-table *e*.

The patient being placed on the operating-table and assuming that *o* is the foreign body to be searched for, the focus of the Crookes tube throws a shadow of this body onto the dif-
15 fusing-screen *c*. The focus of the tube being at *b*, I return the frame *a* and displace the corresponding rod *d*, so that the point of this rod comes into contact with the shadow *m* of the body *o*. At this moment the rod *d* will
20 represent the materialized ray which has issued from the focus *b* and is passing through the body *o*. Again, the frame *a* remaining fixed in the same position I displace the Crookes tube, so as to bring the focus of the
25 same into the second extreme position *b'*, thus obtaining a second shadow *m'* of the body *o* on the screen *c*. I bring the point of the second rod *d* over this shadow *m'*, and thus materialize a second ray, the intersection of these two
30 rays giving the precise position of the body *o* in the plane determined by the position of the frame *a*. By means of a sheet of paper I can as required reproduce graphically the direction of the two rays and determine their intersection and the exact position of the body *o*. By
35 raising the screen *c* I can lower the rods *d* until they touch the body of the patient, which determines the direction of the body *o* in the body of the patient, and consequently enables
40 the surgical operation to be effected quickly and without fumbling. If the presence of the rods and of the frame *a* cause any inconvenience in the surgical operation, they can, after having by any means noted or fixed the
45 position of research of the frame *a*, be moved out of the way by rotating the frame on its own axis, so as to move it away from the table. If later on it is necessary to determine
50 the position of the body *o*, I can return the frame *a* to its original position, which I call the "position of research."

It will thus be seen that my apparatus not only enables the seat of foreign bodies to be quickly determined, but the surgeon to be
55 guided during his surgical operation.

It is of course understood that I do not

limit myself to the constructional details described above and illustrated in the accompanying drawings furnished by way of example, but reserve the right of modifying
60 these details without altering the nature of my invention. For instance, instead of slots *k k* and ferrules *f f* I might employ a metal plate bearing two series of plates or grooves
65 very close together, the one series converging toward the position *b* of the focus and the other toward the position *b'*. In this way the rods *d* might be placed in the appropriate
70 grooves, so that the points of the rods would come in contact with the shadow of the foreign body on the diffusing-screen. Thus the same result would be obtained as with the arrangement indicated in the accompanying drawings.

What I claim, and desire to secure by Letters Patent, is—

1. In apparatus for determining the position of foreign bodies by means of Roentgen rays, consisting of a double-armed bracket or frame, a means for pivoting the frame to
80 the operating-table with one arm above and the other below the same, a support mounted on the lower arm and capable of limited movement, a Crookes tube fixed to the support and movable therewith, a slotted plate
85 fixed to the upper arm of the bracket, said slots being circular and struck from the focus of the Crookes tube in its two extreme positions, slides or ferrules adjustably mounted
90 in the slots, rods mounted in the ferrules with their axes coinciding with the radius of the slots and a diffusing screen or plate mounted on the frame below the rods, substantially as described.

2. In apparatus for determining the position of foreign bodies by means of Roentgen rays, the means for carrying the screen and indicating apparatus so as to allow of such
95 apparatus being turned aside during the surgical operation consisting of a clamp or support, a double-armed bracket mounted to rotate on its axis in the support, a means for determining the angle of rotation and a means
100 for fixing the bracket, substantially as described.

In testimony whereof I have affixed my signature in presence of two witnesses.

CHARLES REMY.

Witnesses:

CHARLES FABER,
GASTON DAMOITEAU.