No. 797,718

PATENTED AUG. 22, 1905.

E. W CALDWELL.

PORTABLE X-RAY APPARATUS.

APPLICATION FILED AUG. 18, 1904.

3 SHEETS—SHEET 1.

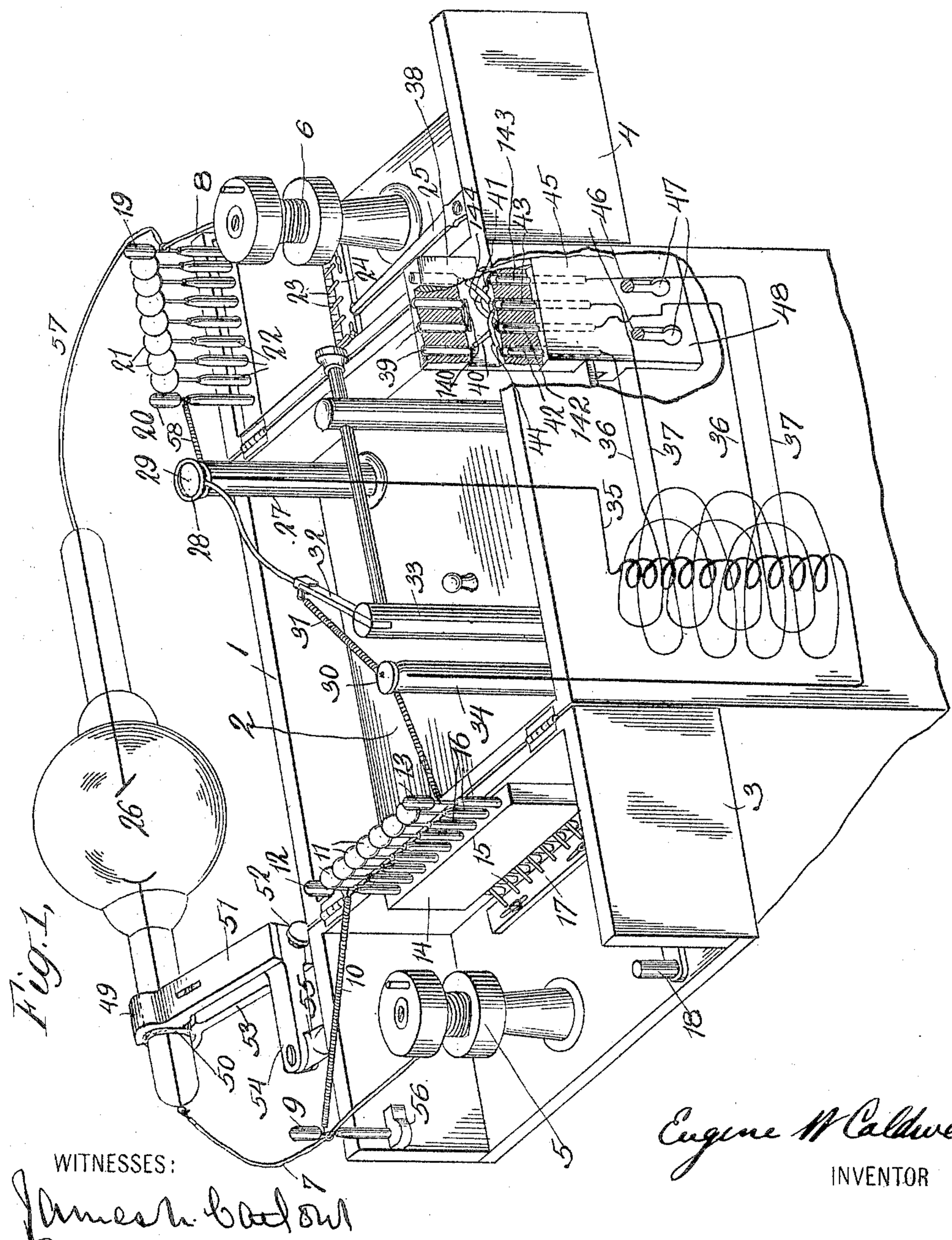

Fig. 1.

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3 SHEETS—SHEET 2.

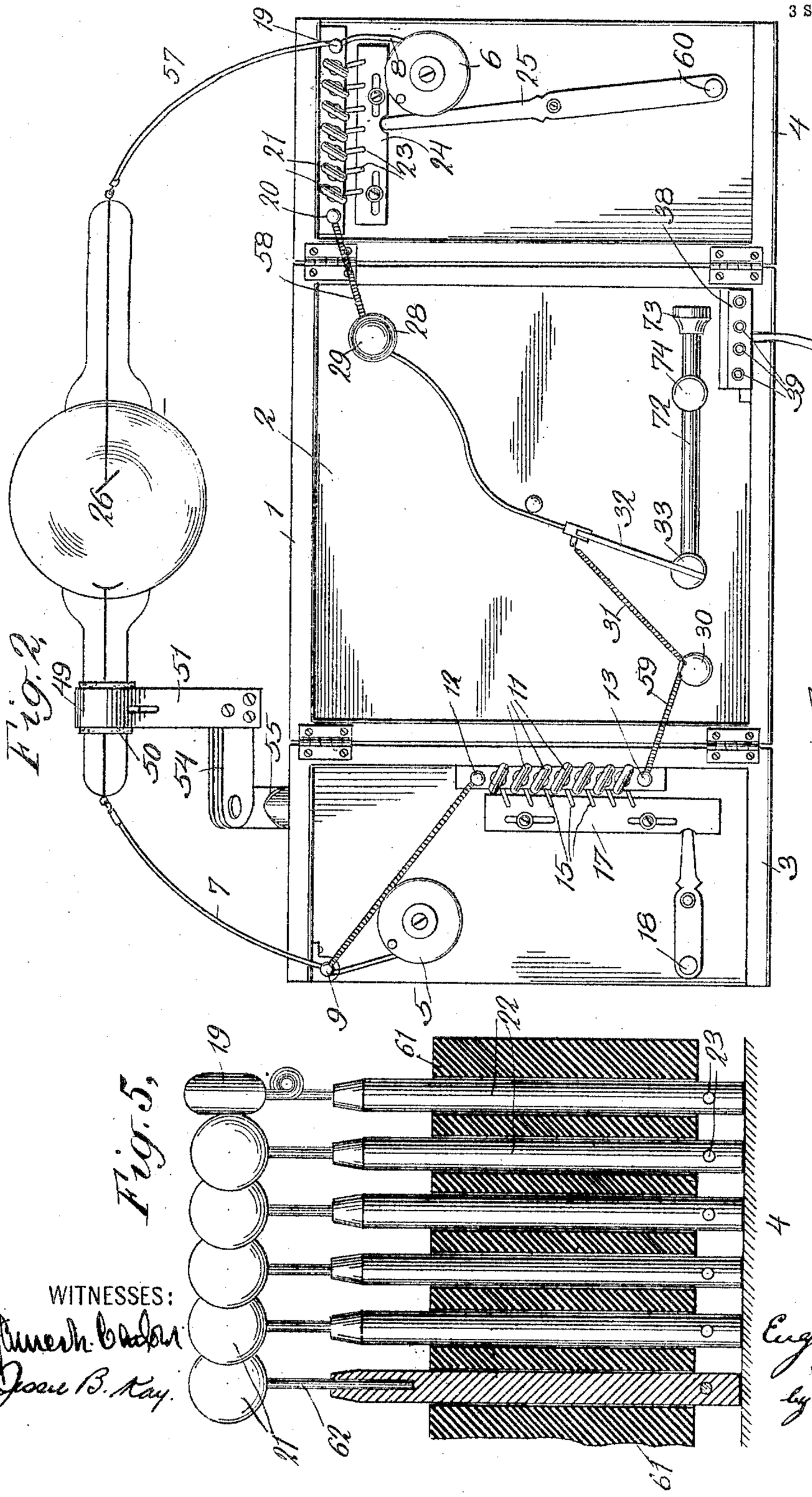

Fig. 2.

Fig. 4.

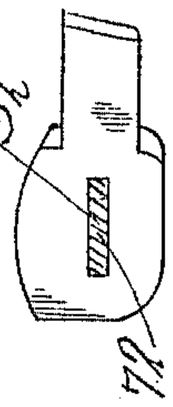

Fig. 3

Fig. 5.

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3 SHEETS—SHEET 3.

Fig. 7.

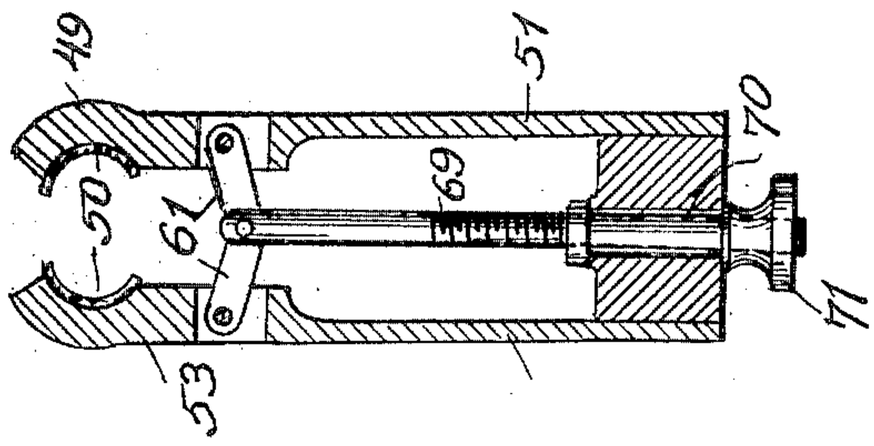
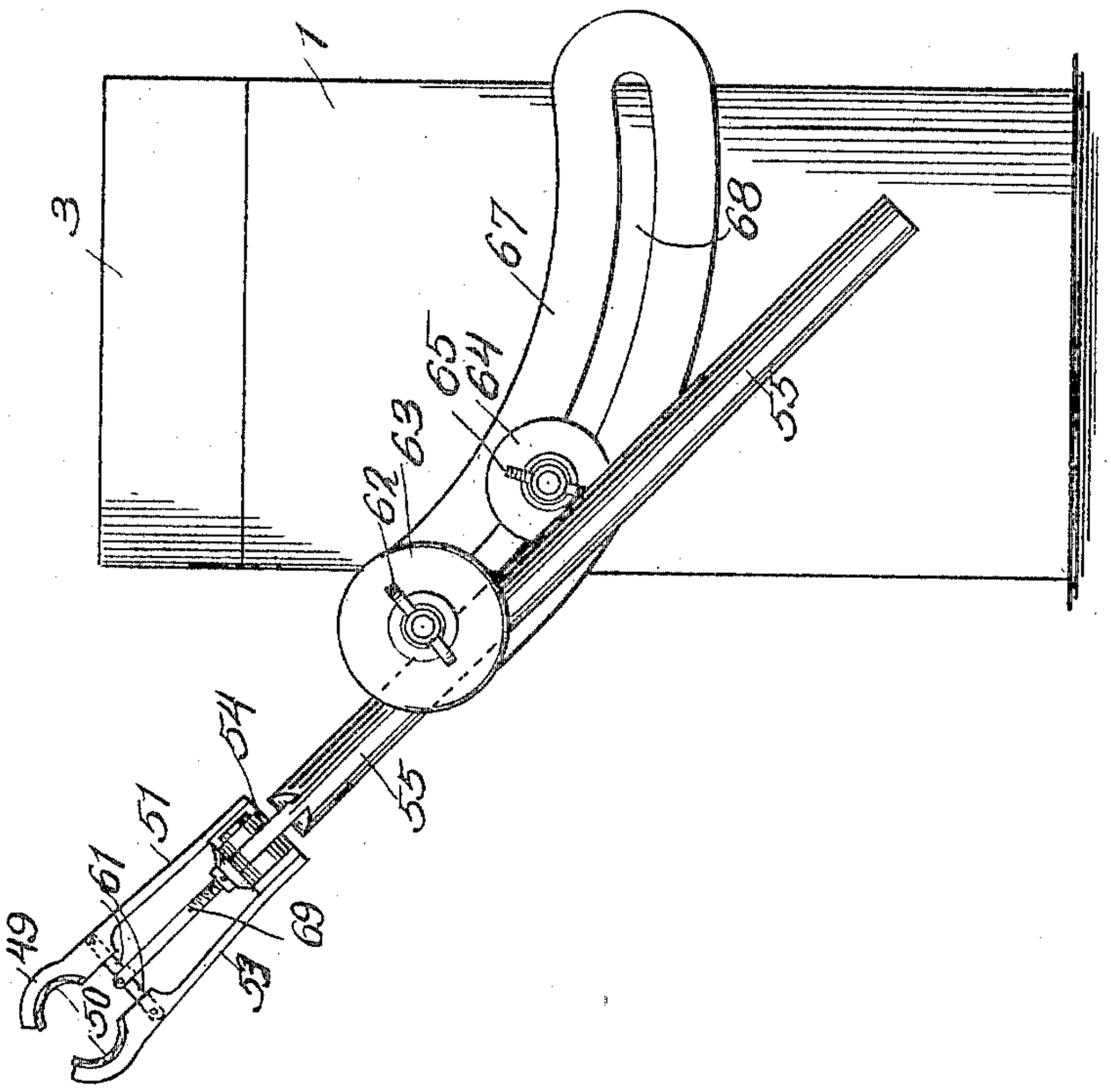


Fig. 6



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PORTABLE X-RAY APPARATUS.

No. 797,718. Specification of Letters Patent. Patented Aug. 22, 1905.

Application filed August 18, 1904. Serial No. 221,266.

To all whom it may concern:

Be it known that I, EUGENE W. CALDWELL, a citizen of the United States, and a resident of New York city, in the county and State of New York, have invented certain new and useful Improvements in Portable X-Ray Apparatus, of which the following is a specification, taken in connection with the accompanying drawings, which form a part of the same.

This invention relates to X-ray apparatus, and relates especially to portable X-ray apparatus such as is described in my Patent No. 749,813, granted January 19, 1904.

In the accompanying drawings, in which the same reference-numeral refers to similar parts in the several figures, Figure 1 is a perspective view disclosing an embodiment of this invention. Fig. 2 is a top view of the same. Figs. 3, 4, and 5 are enlarged sectional details. Fig. 6 is a side view. Fig. 7 is a sectional detail view of the clamp.

In the illustrated embodiment of this invention the coil-box 1 is constructed to contain the heavy induction-coil used in this apparatus, the windings of the coil being indicated diagrammatically in Fig. 1. The ends of the secondary winding 35 pass through the two heavy insulating-pillars 27 and 34 and communicate with the terminals 29 30, which may be removably supported upon the tops of these pillars, the terminals having, if desired, suitable plugs which removably fit into metallic sockets at the tops of the pillars. The primary winding, which is preferably removable from the rest of the coil, is divided for convenience of operation, two coils 36 and 37 being indicated in Fig. 1. The ends of these coils, which project from the body of the coil itself, are preferably flexibly connected with a series of pins in the removable terminal block 45. This block is, as indicated, secured to the coil-box by a couple of headed pins or screws 46, which coöperate with the keyhole-slots 47 in the block. In operating the coil electric connection with the primary winding may conveniently be made by using the reversing-plug 38, which comprises two series of tubular contacts 39, either one of which may engage the pins in the terminal block. As indicated, the parallel connection is in use and one of the leading-in wires which is in contact with the connector 41 supplying electricity, through the connector 44, to the pins 42 and 43. After passing in parallel through the two primary coils the electricity passes through the connector 144 and the connector 40 to the other supply-wire. If a series operation is desired, the plug is reversed, and in that case the electricity passes in through the connector 40, and the two parts of the primary winding are placed in series by the connector 140, which makes an electrical contact between the two intermediate pins 142 and 43.

The cover of the coil-box is made in several sections, and, as indicated, the two sections 3 and 4, which are hinged to the top of the coil-box, are adapted when opened out into the position indicated in Fig. 1 to support the controlling apparatus and to give sufficient separation, so that there is no danger of short circuit or leakage of the high-tension electricity employed. The opening of the sectional cover brings all this apparatus into operative position and when closed into the position shown in Fig. 6 securely protects all the devices. The tube-support is detachably and adjustably mounted on the box, as is seen in Fig. 6, and this support comprises the arm 67, preferably having the curved form indicated and having the elongated slot 68, through which the supporting-screw passes and by which the arm is clamped in position through the washer 64 and the nut 65. The rod 55 is mounted in a universal joint at the end of the arm and passes through a hole in the split or divided washer 63, these parts being made rigid by setting up the nut 62. The clamp-yoke 54 is hinged on the outer end of this arm, and this yoke connects with the back 70, connecting the two arms 51 of the clamp 53. These arms may be made of wood or other insulating material and are sufficiently resilient to allow the desired range of movement of the jaws 59, which may be lined with grips 50, of leather or other yielding material. The clamp is operated by the nut 71, swivelingly mounted in the back and engaging the screw 69. The outer end of this screw is pivotally connected with the two links 61, which are also pivoted to the clamp-jaws, and in this way a toggle connection is provided which controls the clamp and provides for its convenient operation without approaching the jaws themselves or the adjacent electrical connections.

The discharger 32 is mounted upon a suitable support 33 in the inner cover 2, which is removable and which loosely engages the terminal pillars 27 34. This discharger, which has a substantially diagonal location between the diagonally-arranged terminals, moves in a slot in the support, and the discharger-rod

72, which rotates in bearings in the supports 33 and 74, passes loosely through a slot in the discharger, the form of connection being illustrated in detail in Figs. 3 and 4. In this way the rotation of the handle 73 of the discharger-rod rotates the angularly-disposed discharger and moves the ring 28, which is preferably used at the end of this discharger, away from the coöperating terminal 29. In this way, since the discharger is connected with the other terminal 30 by the flexible connector 31, an adjustable parallel spark-gap is provided between the secondary terminals of the apparatus, thus regulating its action in a well-known manner.

The X-ray tube 26, which may be of any desired construction, is supported in the clamp and adjusted in proper position by the adjustable tube-support described, and electricity is furnished to the tube through the flexible cords or connectors 7 and 57, which pass loosely through the guides 9 and 19, the inner ends of these cords being rolled up on spools 5 and 6. The guide 9 is connected by the flexible connector 10, which may be in the form of a light spiral spring or other electrical connection, with the regulator, and the regulator is connected by a similar connection with the terminal 30. The guide 19 forms one end of the other regulator, the other end of which is connected by the flexible connector 58 with the terminal 29. In this way it will be seen that the high-tension electricity from the secondary winding of the coil passes through the series regulators and through the cords to operate the tube, and it is also apparent that the cords and terminals are at all times flexibly and permanently connected with the regulators.

The regulators are employed in this case as series spark-gaps for this X-ray apparatus; but they manifestly may be used for other purposes, such as wireless telegraphy, &c. The regulators comprise a series of relatively movable conducting members, which are simultaneously given a relative movement, so that the distance between the adjacent members is simultaneously varied, thus giving an efficient and reliable regulation. As indicated in Fig. 5, these members may have the form of buttons or rounded disks 21 and may be mounted by the stems 62 upon the rods 22, which pass loosely through the support 61. The arms 15 are mounted in the apertures 23 at the lower ends of these rods, and these arms are all loosely pivoted in holes in the regulator-plate 24, as shown in Fig. 2. This plate is guided by the pin-and-slot connection indicated and is operated by the lever 25, the forward end of which engages a suitable notch in the plate. When this lever is rotated by the handle 60, the plate is moved and each of the arms is simultaneously moved through the same angle, thus giving a simultaneous oscillation to each one of the buttons 21. In this way each one of the gaps between the two terminals 19 and 20 of the regulator is simultaneously adjusted, the gaps being greatest when the flat buttons lie perpendicularly between the terminals 19 and 20, and each gap can be decreased until the buttons are oscillated to such an extent that they are in contact with each other and with the terminals. The stems, which are preferably of metal, remove the buttons from the vicinity of the rods and support, which are preferably of vulcanite or similar material, thus preventing the heavy discharges from occurring in contact with these insulating-supports, which might tend to injure their insulating properties. Furthermore, the yielding character of this mounting enables all of the buttons to be brought positively into contact, thus making good electrical contact throughout the whole series. The other regulator is constructed in a similar manner, the buttons 11 being similarly mounted between the terminals 12 13 and being moved through the arms 15 by the plate 17, which is operated by the regulator-lever 18.

It is of course understood that those familiar with this art may make many modifications in the form, size, proportion, and number of parts of this apparatus. Parts of the same may be used without employing the whole, and parts may be used in connection with other devices without departing from the spirit of this invention or losing the advantages of the same. I do not, therefore, desire to be limited to the details of the disclosure which has been made in this case; but

What I claim as new, and what I desire to secure by Letters Patent, is set forth in the appended claims.

1. In X-ray apparatus, a coil-box, a coil within said box, the ends of the secondary winding of said coil passing through insulating-pillars and connecting with removable terminals mounted at the tapered tops of said pillars, a removable primary winding for said coil, a terminal block detachably mounted on said box and connected with the ends of said primary winding and a reversing-plug supplying said terminal block.

2. In X-ray apparatus, a coil-box, a coil in said box, pillars projecting upward at the corners of said box, and having tapered upper ends, detachable terminals mounted in said pillars, and electrically connected with the secondary of said coil, a swinging discharger connected with one terminal and adapted to engage the other and a discharger-rod angularly disposed with relation to said discharger and connected thereto by a loose slotted connection.

3. In X-ray apparatus, a coil-box, a coil in said box, terminals mounted within said box at diagonal corners of the same, cover-sections movably mounted on said box to swing outward therefrom and be supported thereby,

cord-spools in said cover-sections and regulators in said cover-sections flexibly and permanently connected with said terminals and said cord-spools.

4. In electrical apparatus, terminals mounted in a support, a series of rods mounted in said support between said terminals, buttons mounted upon said rods, arms secured to said rods, a sliding plate connected with said arms and a lever to operate said plate to simultaneously oscillate said buttons.

5. In electrical apparatus, a support, a series of rods rotatably mounted in said support, stems secured to said rods and carrying buttons, arms secured to said rods, a plate loosely connected with said arms to simultaneously oscillate said buttons.

6. In electrical apparatus, a support, a series of buttons rotatably mounted in said support and means to simultaneously oscillate said buttons to simultaneously vary the distances between adjacent buttons.

7. In electrical apparatus, a support, a series of buttons rotatably mounted in said support and means to rotate said buttons to vary the distance between adjacent buttons.

8. In electrical apparatus for regulating high-potential electricity, a support, a series of stems rotatably mounted in said support, regulator members mounted on said stems and having portions eccentrically located with respect thereto and means to simultaneously oscillate said stems to simultaneously vary the distances between said members.

9. In electrical apparatus for controlling high-potential electricity, a support, a series of regulator members provided with eccentrically-located portions rotatably mounted in said support and means to cause the relative movement of said members to vary the distance between adjacent members.

10. In X-ray apparatus, a box, a coil within said box, the ends of the secondary winding of said coil passing through insulating-pillars permanently secured to said secondary winding, removable terminals on said pillars, a removable inner cover for said box provided with holes for said pillars, a removable primary winding for said coil and a terminal block detachably mounted on said box and permanently connected with the ends of said primary winding.

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