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PATENTED JAN. 19, 1904.

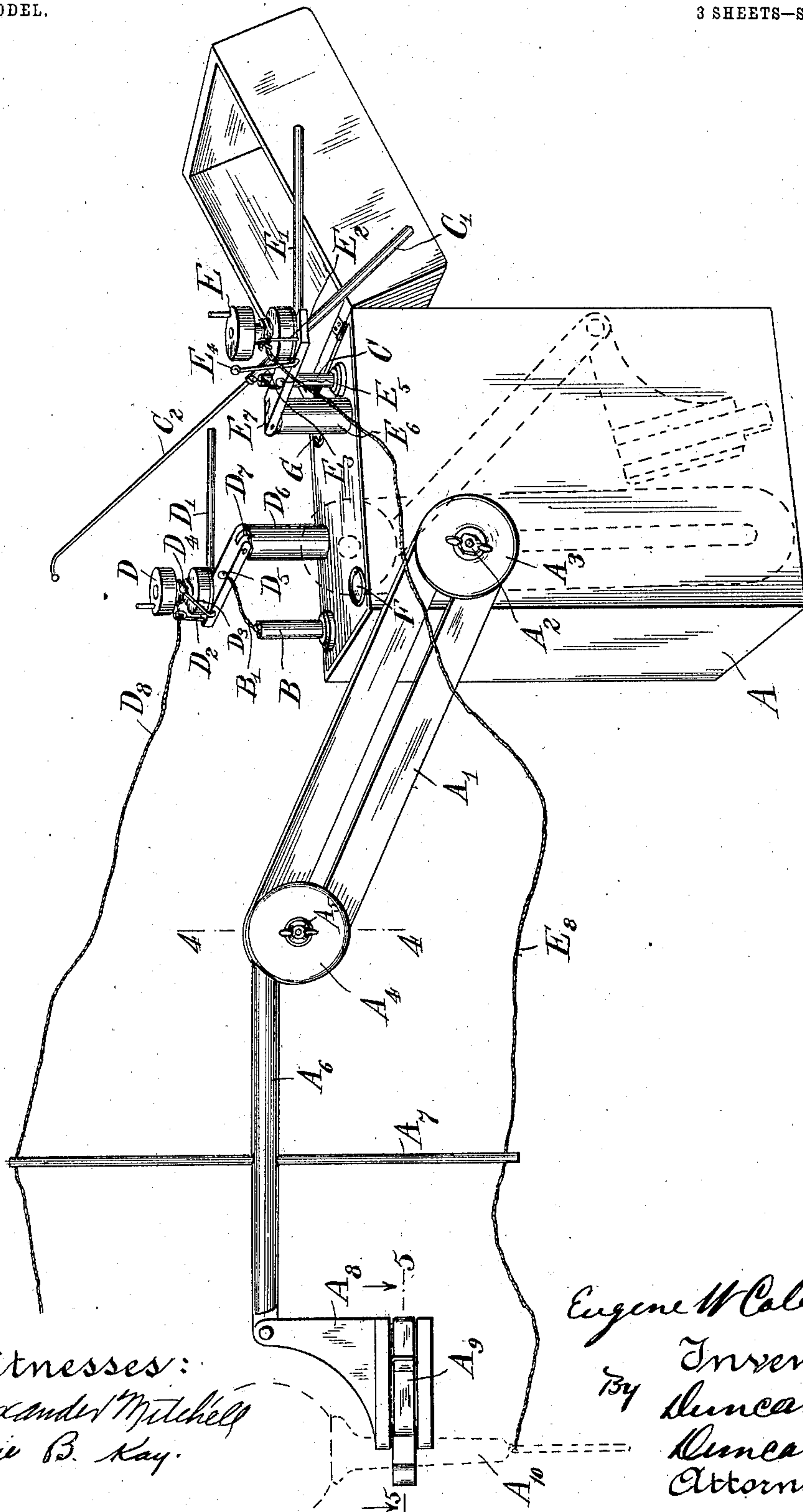
E. W. CALDWELL.
PORTABLE X-RAY APPARATUS.

APPLICATION FILED JAN. 16, 1903.

NO MODEL.

3 SHEETS—SHEET 1.

Fig. 1,



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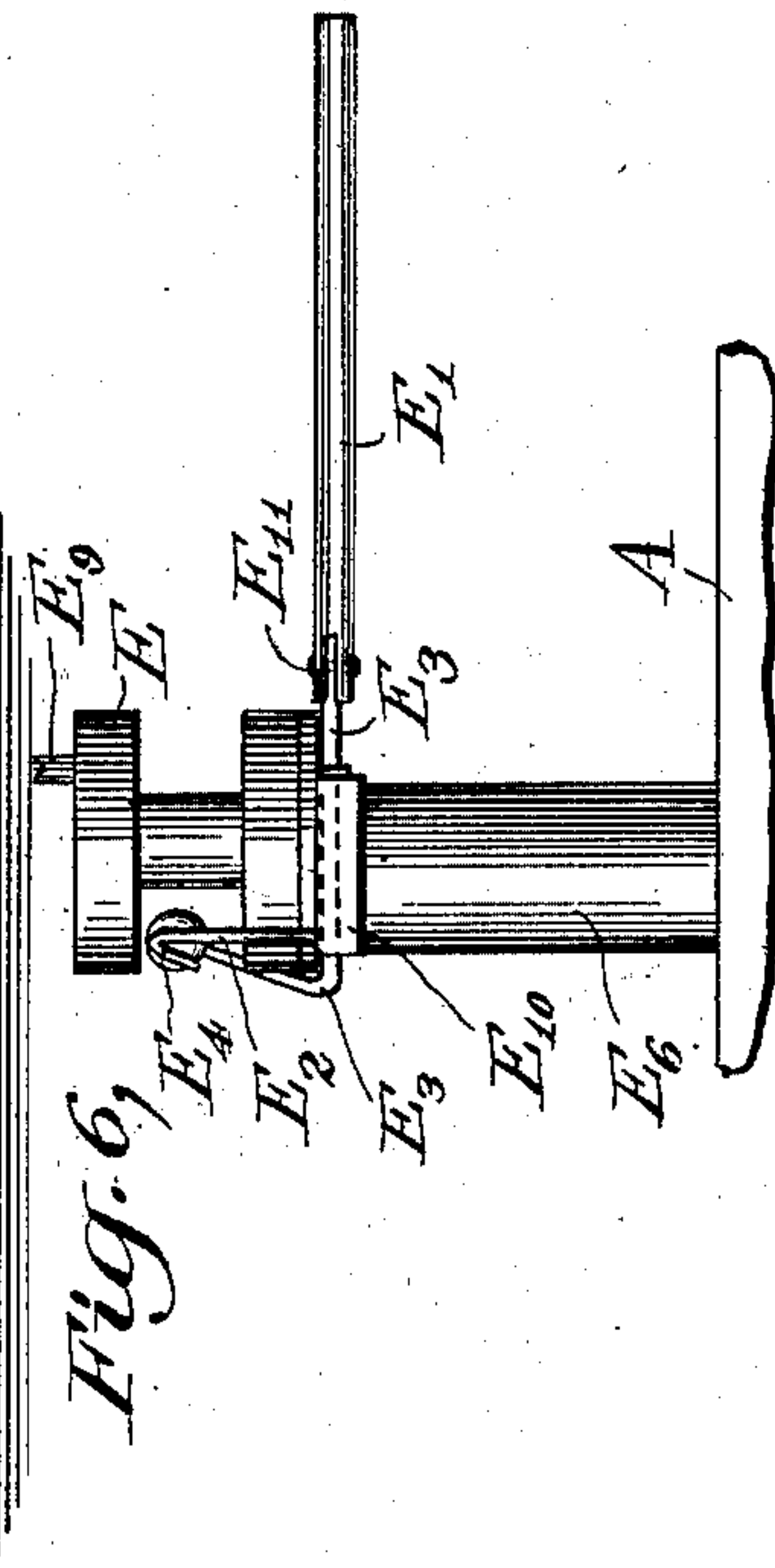
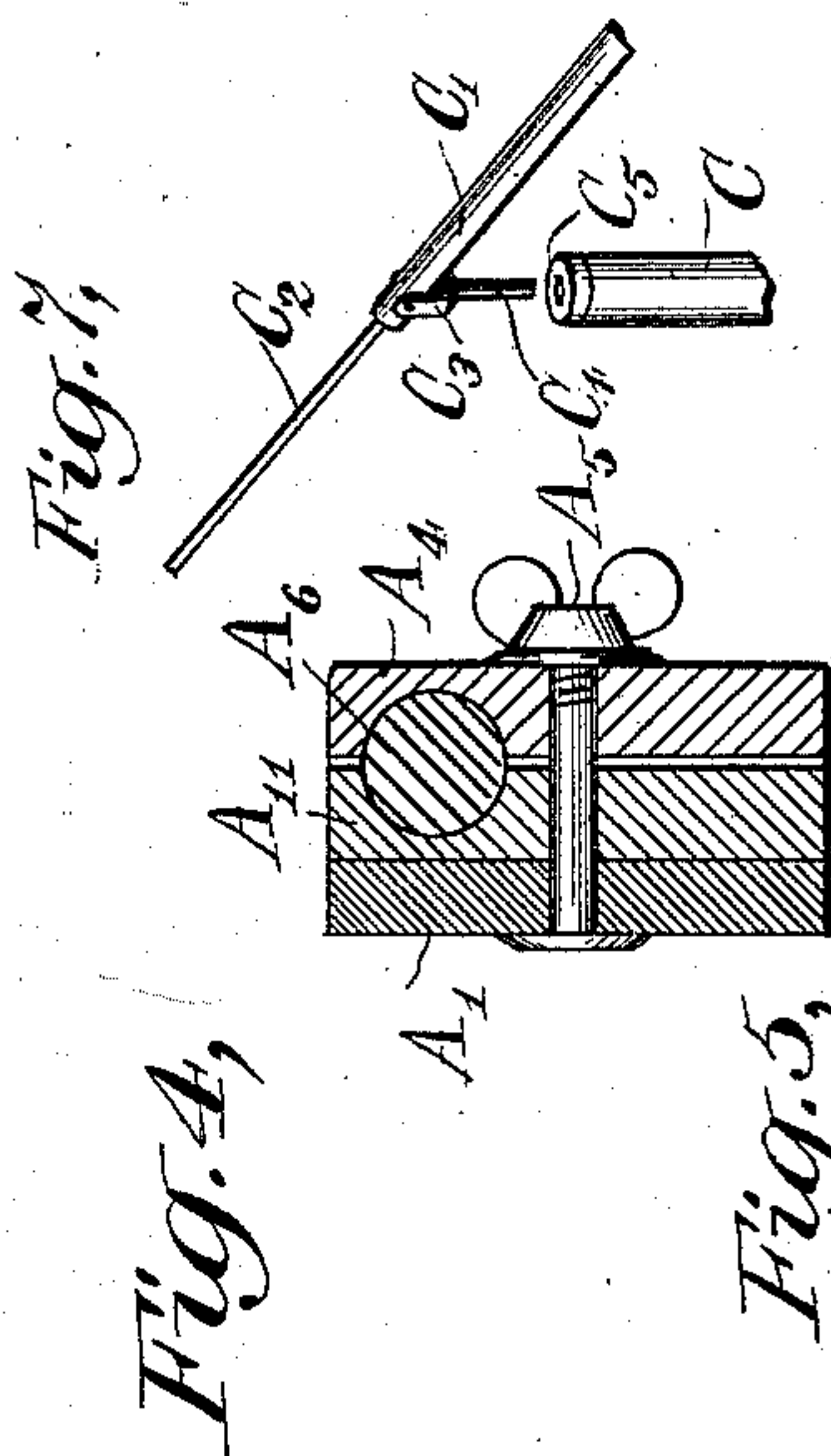
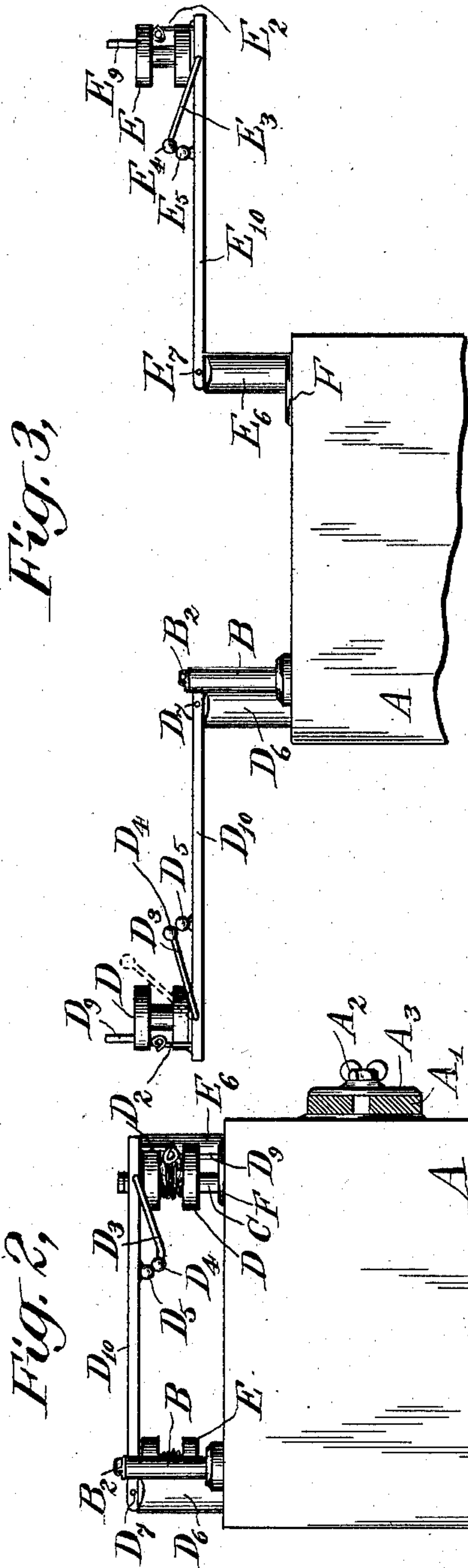
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3 SHEETS—SHEET 2.



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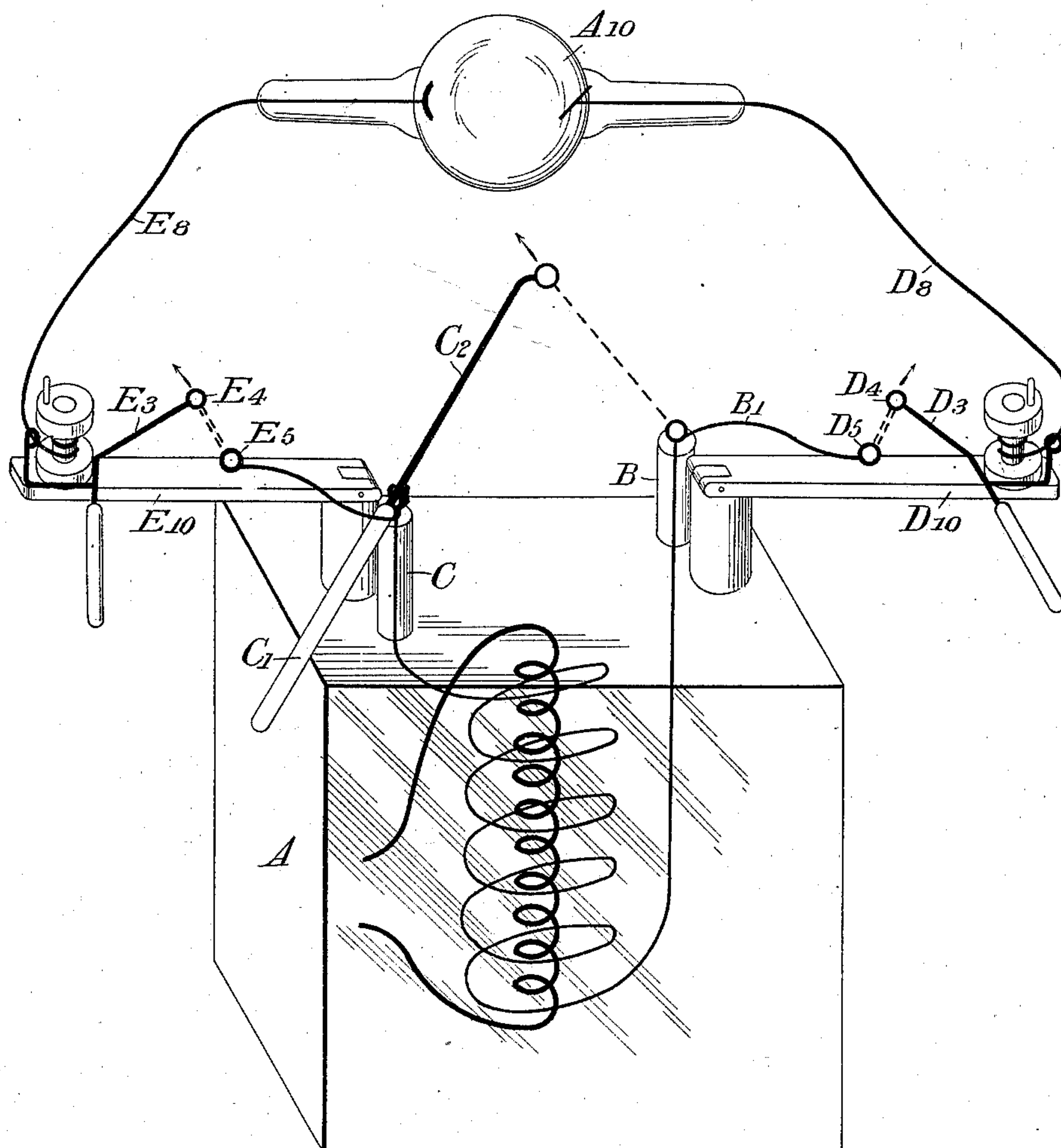
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NO MODEL.

3 SHEETS—SHEET 3.

Fig. 8.



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PORTABLE X-RAY APPARATUS.

SPECIFICATION forming part of Letters Patent No. 749,813, dated January 19, 1904.

Application filed January 16, 1903. Serial No. 139,282. (No model.)

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, such as is especially adapted for convenient transportation.

In the accompanying drawings, in which the same reference characters refer to similar parts in the several figures, Figure 1 is a perspective view showing one embodiment of this invention. Fig. 2 is a partial front view of the same. Fig. 3 is a similar view showing the parts in their extended position. Fig. 4 is a detail section on the line 4 4 of Fig. 1. Fig. 5 is a similar view on the line 5 5 of Fig. 1. Figs. 6 and 7 show several details of construction. Fig. 8 is a diagram showing the electrical connections of this apparatus.

In the embodiment of the invention shown in the drawings the coil-box A is adapted to contain a suitable X-ray coil, this coil being preferably arranged with its core in vertical position, the two terminals of the secondary winding of this coil being provided with heavy insulation, as indicated at B and C. The coil-box is provided with a suitable cover (indicated) which is adapted to inclose the apparatus when the same is folded into the closed position indicated in Fig. 2, and thus protect this apparatus during transportation.

The tube-support in which the X-ray tube is adjustably mounted is firmly secured to the coil-box A. This tube-support preferably comprises the slotted arm A', which is firmly clamped to the coil-box A by any suitable means, such as the wing-nut A², which engages the heavy washer A³. The slot in this arm allows the arm to be slid longitudinally, so as to give it any desired length, the bolt to which the wing-nut is secured sliding in the slot in the arm. At the outer end of this arm a universal joint is formed with the rod A⁶, this rod passing through a suitable opening which is formed in the washers A⁴ and A¹¹, so

as to be longitudinally adjustable with respect thereto, these washers being preferably clamped together and secured to the arm A' by the thumb-nut A⁵. At the outer end of the rod the clamp A⁸ is pivotally secured, this clamp extending laterally from the rod, as indicated in Fig. 1, and the gripping-jaw A¹², which is drawn inward by the elastic band A⁹ or by any other suitable means, engages the tube and firmly holds it in position, the construction of these parts being indicated in detail in Fig. 5. As that figure shows, the gripping-jaw slides in suitable guides in the clamp, and the band which operates this jaw is adjustably held by a buckle or any other means A¹³. It will be seen that this construction of tube-support allows the tube to be so arranged that the source of X-rays is substantially in line with the axis of the rod A⁶. By this means the rotation of the rod about its axis allows for the adjustment of the direction of the rays without materially altering the position of their source.

The two pillars D⁶ and E⁶ are secured to the coil-box, and the bars D¹⁰ and E¹⁰, of insulating material, are pivotally mounted on the tops of these pillars by the pivots D⁷ E⁷, respectively. The bar D¹⁰ carries at its outer end the conductor-spool D, which is mounted to rotate in a suitable bearing, and by this means the conductor D⁸, preferably in the form of tinsel cord or other suitable conductor, may be wound up upon the spool by rotating the same by the pin D⁹. The conductor-guide D² is secured to the bar adjacent the spool and is electrically connected with the adjustable regulator D³, which is mounted on the bar D¹⁰, so that its movement regulates the length of a series air-gap in the secondary circuit. This regulator preferably passes through a bar D¹⁰, as indicated, and is provided at its outer end with the regulator-ball D⁴, which coöperates with the ball D⁵, mounted upon the bar. The insulating-handle D' is hinged to the rearwardly-extending end of the regulator D³ by a suitable pivot, the construction of these parts being indicated in Fig. 6, where the similar regulator-handle E' is pivoted by the pin E¹¹ to the regulator E³. The coil-terminal B' emerges from the insulation B and is connect-

ed with the regulator-ball D⁵, this connection being flexible. The regulator thus forms a series spark-gap which is readily adjustable to vary the action of the apparatus. Since
 5 this regulator is connected with the guide D², through which the conductor D⁸ passes, the high-tension electricity is supplied to the tube A¹⁰ in a regular manner, the conductors D⁸ and E⁸ on either side being preferably held apart
 10 by the spreader A⁷, of suitable insulating material. It is of course understood that the construction of the spool-arm E¹⁰, the spool E, and the other parts mounted thereon is the same as has already been described.

15 The coil-terminal C⁵ in the insulation C is given the form of a metallic socket, which is of course connected by a flexible cord with the regulator-ball E⁵. The discharger C², which is provided with the insulating-handle
 20 C', is movably mounted, so as to form an adjustable parallel spark-gap in connection with the terminal B'. This discharger is preferably pivotally mounted in the stirrup C³, the lower end of this stirrup C⁴ being removably
 25 fitted in the socket C⁵, so as to firmly support the discharger. The distance of the end of this discharger from the terminal B' regulates the action of the apparatus in a well-known manner, as is indicated by the circuit-diagram
 30 shown in Fig. 8.

The parts are indicated in Fig. 1 in their operative extended position, the tube-support being extended and the apparatus being ready for operation in connection with a suitable
 35 supply of electrical energy to feed the primary winding of the X-ray coil. The various parts of this apparatus may also be assembled within a very small compass, so as to be placed within the cover of the coil-box, the
 40 regular handles being swung inward against the spool-bars, these bars being folded over into the closed position indicated in Fig. 2, so as to occupy very little room, the conductors having been previously wound up upon
 45 the spools D and E. The discharger is removed, together with the stirrup from the socket C⁵, and is inserted in one of the compartments F and G, which are formed in the coil-box. The spreader A⁷ also fits within
 50 these compartments for transportation. The tube-support may be folded after the tube has been removed therefrom into the closed position indicated in dotted lines in Fig. 1. Thus when the cover of the coil-box is closed
 55 the whole apparatus is in a compact and convenient form for transportation and the apparatus is so constructed that when in the extended position indicated in Fig. 1 the various parts are so separated and mounted
 60 upon their insulating-supports that the proper operation of the apparatus is insured and undesirable sparking and leakage avoided.

It is of course apparent that many modifications may be made in this apparatus, the
 65 proportions and number of parts may be

changed, parts of the same may be omitted, and other parts may be substituted without departing from the spirit of this invention. I do not, therefore, wish to be limited to the disclosure which has been made in this case; 70
 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 slotted 75 arm adjustably secured to said coil-box, a rod slidingly mounted at the outer end of said arm and having a universal motion with respect thereto, means to secure said rod in position with respect to said arm and a tube- 80 clamp at the outer end of said rod to adjustably support a tube from said coil-box.

2. In X-ray apparatus, a coil-box, a slotted arm adjustably secured to said box, a rod 85 mounted in a universal joint at the end of said arm, a pivoted laterally-extending tube-clamp at the outer end of said rod and a gripping-jaw mounted on said clamp to engage a tube.

3. In X-ray apparatus, a coil-box, a slotted 90 arm adjustably secured to said coil-box, washers mounted at the outer end of said arm, a rod passing through an opening in said washers to slide therein and to rotate with respect thereto, said rod being adjustably secured be- 95 tween said washers and a tube-clamp pivotally mounted at the outer end of said rod.

4. In X-ray apparatus, a support, a slotted arm adjustably mounted on said support, a rod 100 sliding in an opening in the outer end of said arm and rotatable with respect thereto and means to secure said rod with respect to said arm and a tube-clamp mounted at the outer end of said rod.

5. In X-ray apparatus, a coil-box provided 105 with a cover, a tube-support adjustably mounted on said coil-box, pillars secured to said box, hinged spool-bars mounted on said pillars and provided at their outer ends with conductor- 110 spools, guides and regulator-balls mounted on said bars, a movable regulator provided with an insulating-handle mounted on each of said bars to cooperate with said regulator-ball 115 thereon, each of said regulator-balls being connected with the coil-terminals and an adjustable discharger removably mounted on one of said terminals.

6. In X-ray apparatus, a coil-box provided with a cover, spool-bars carrying conductor- 120 spools movably mounted on said box and regulators adjustably mounted on said bars adjacent said spools, said regulators being connected with the coil-terminals.

7. In X-ray apparatus, a coil-box, a spool- 125 bar movably mounted on said coil-box, a conductor-spool on said spool-bar and a movable regulator on said bar connected with the coil-terminal.

8. In X-ray apparatus, a coil-box, a spool- 130 bar hinged to said coil-box, a conductor-spool

on said bar, a conductor-guide and a regulator-
ball on said bar adjacent said spool and a mov-
able regulator coöperating with said ball and
provided with a folding handle mounted on
5 said bar.

9. In X-ray apparatus, a coil-box, conduc-
tor-guides mounted on said box, adjustable
regulators and adjustable dischargers mount-
ed on said box providing series and parallel
10 spark-guides for the secondary circuit.

10. In X-ray apparatus, a support, a spool-

bar movably mounted on said support, a con-
ductor-guide on said spool-bar, a conductor-
spool revolvably mounted on said spool-bar
and a flexible conductor secured to said spool 15
passing through said guide to make contact
therewith.

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