

(No Model.)

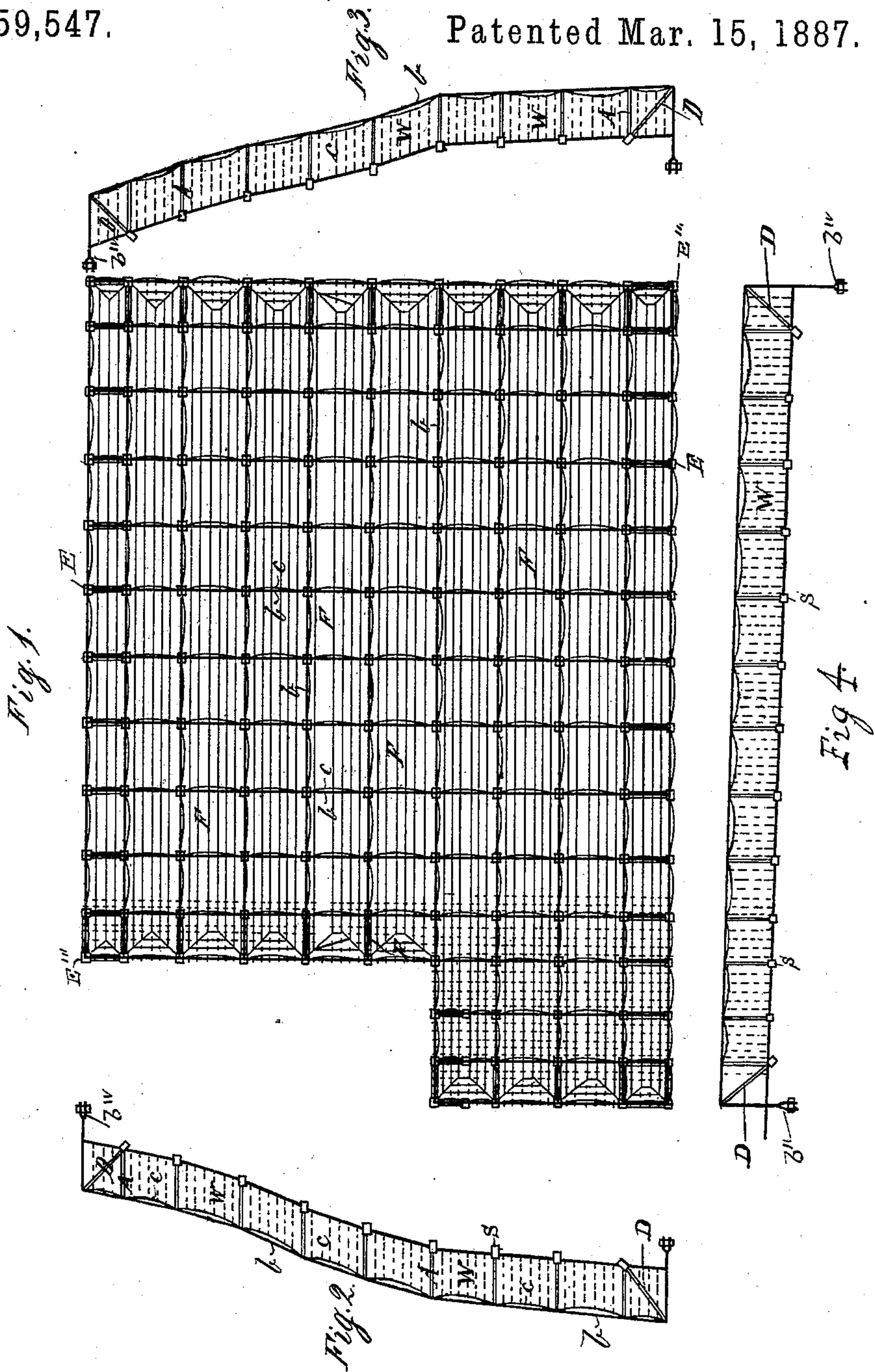
3 Sheets—Sheet 1.

C. SCHWEND.

TRELLIS.

No. 359,547.

Patented Mar. 15, 1887.



Witnesses:  
Edward C. Ellis  
J. F. White

Inventor:  
Carl Schwend  
O. E. Buff  
Atty.

(No Model.)

3 Sheets—Sheet 2.

C. SCHWEND.

TRELLIS.

No. 359,547.

Patented Mar. 15, 1887.

Fig. 5.

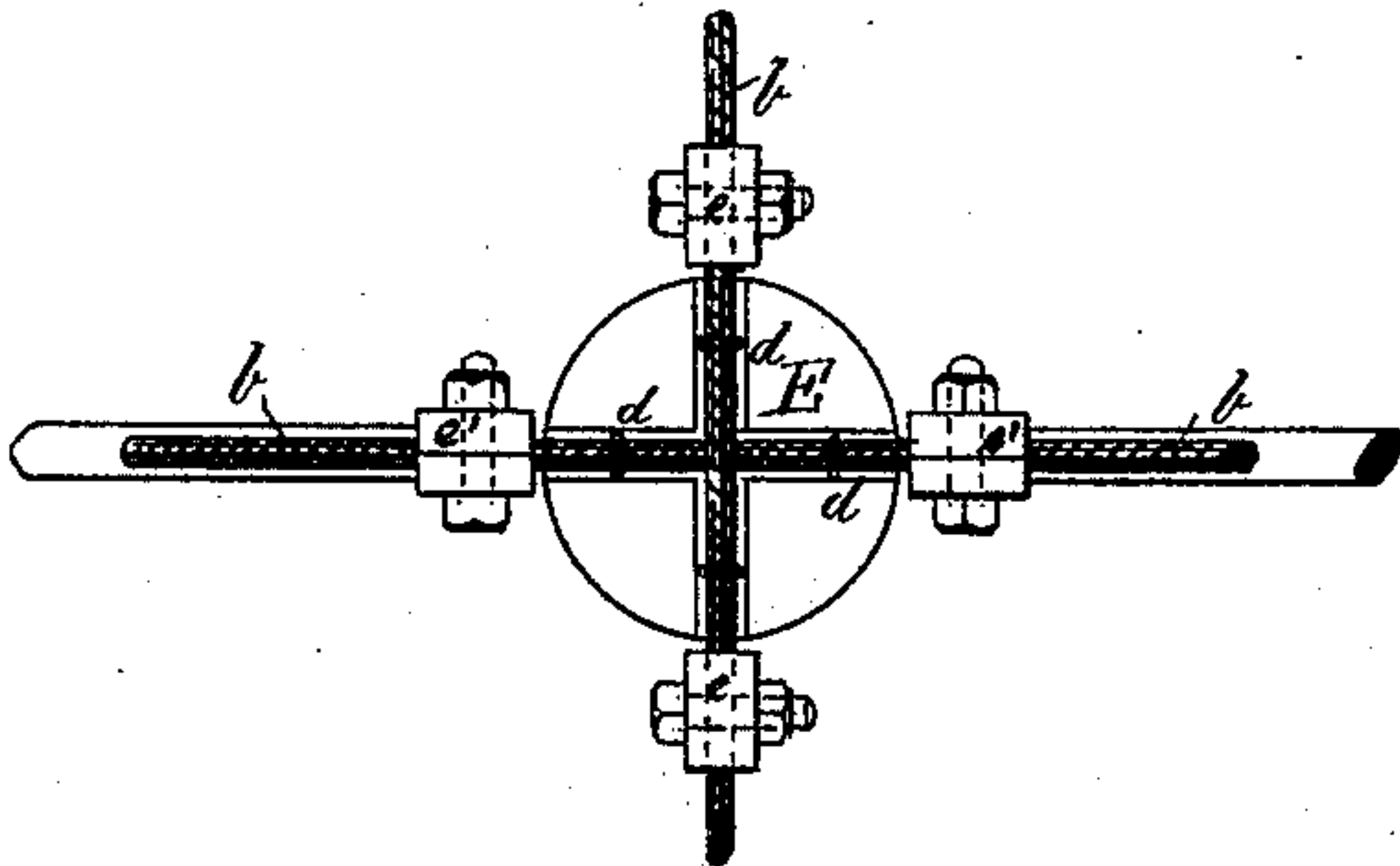


Fig. 5.

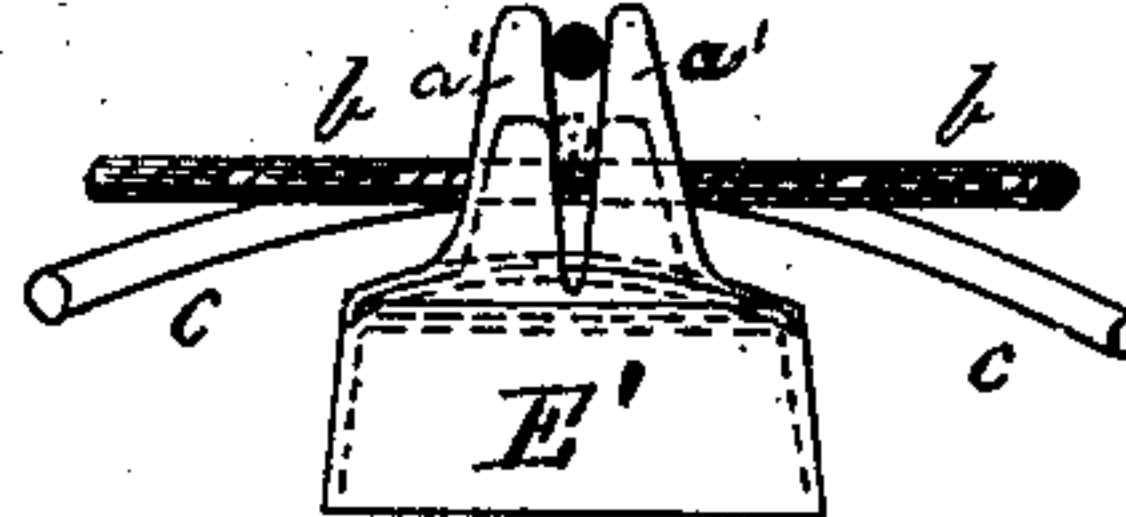


Fig. 6.

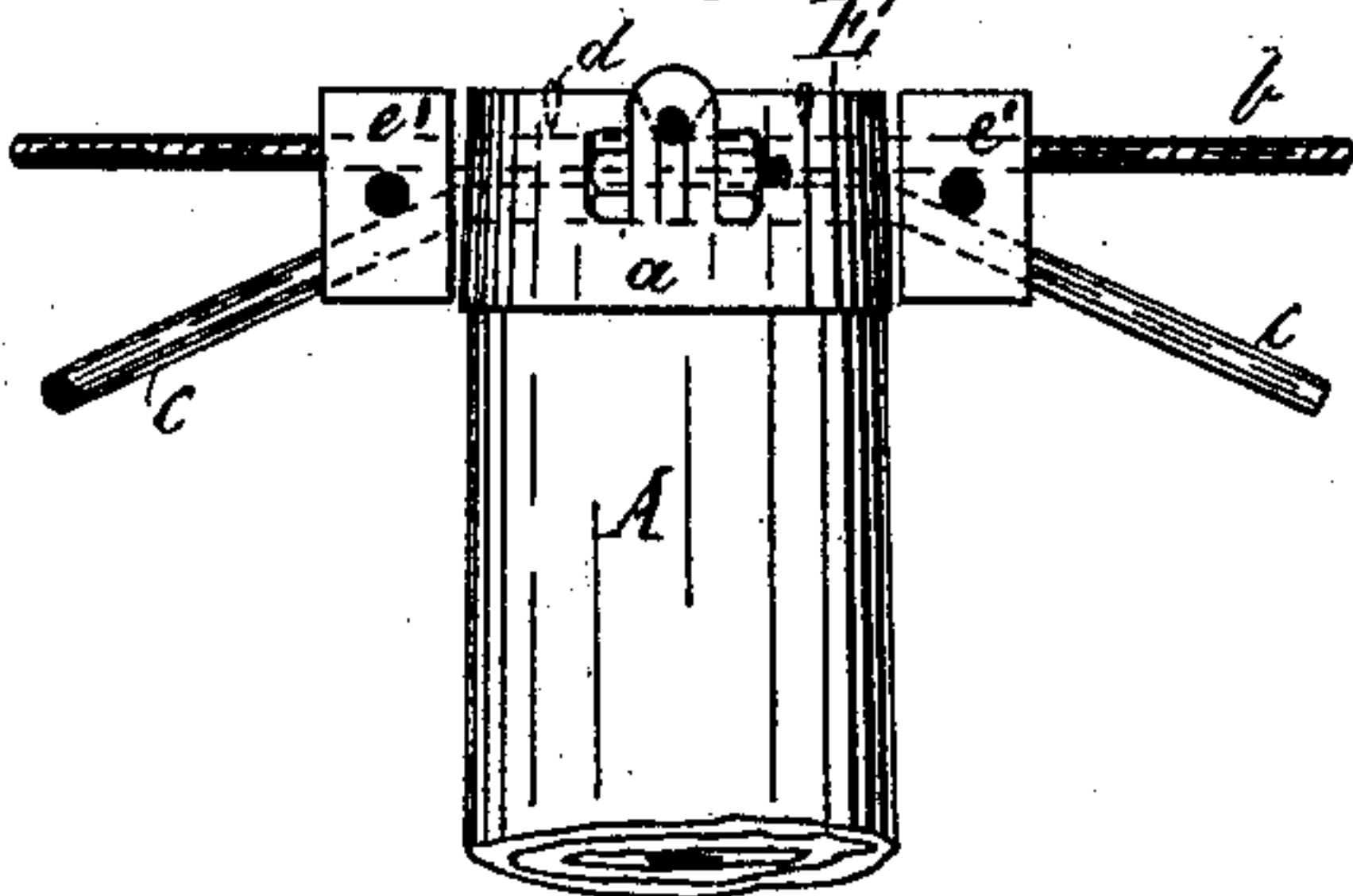


Fig. 7.

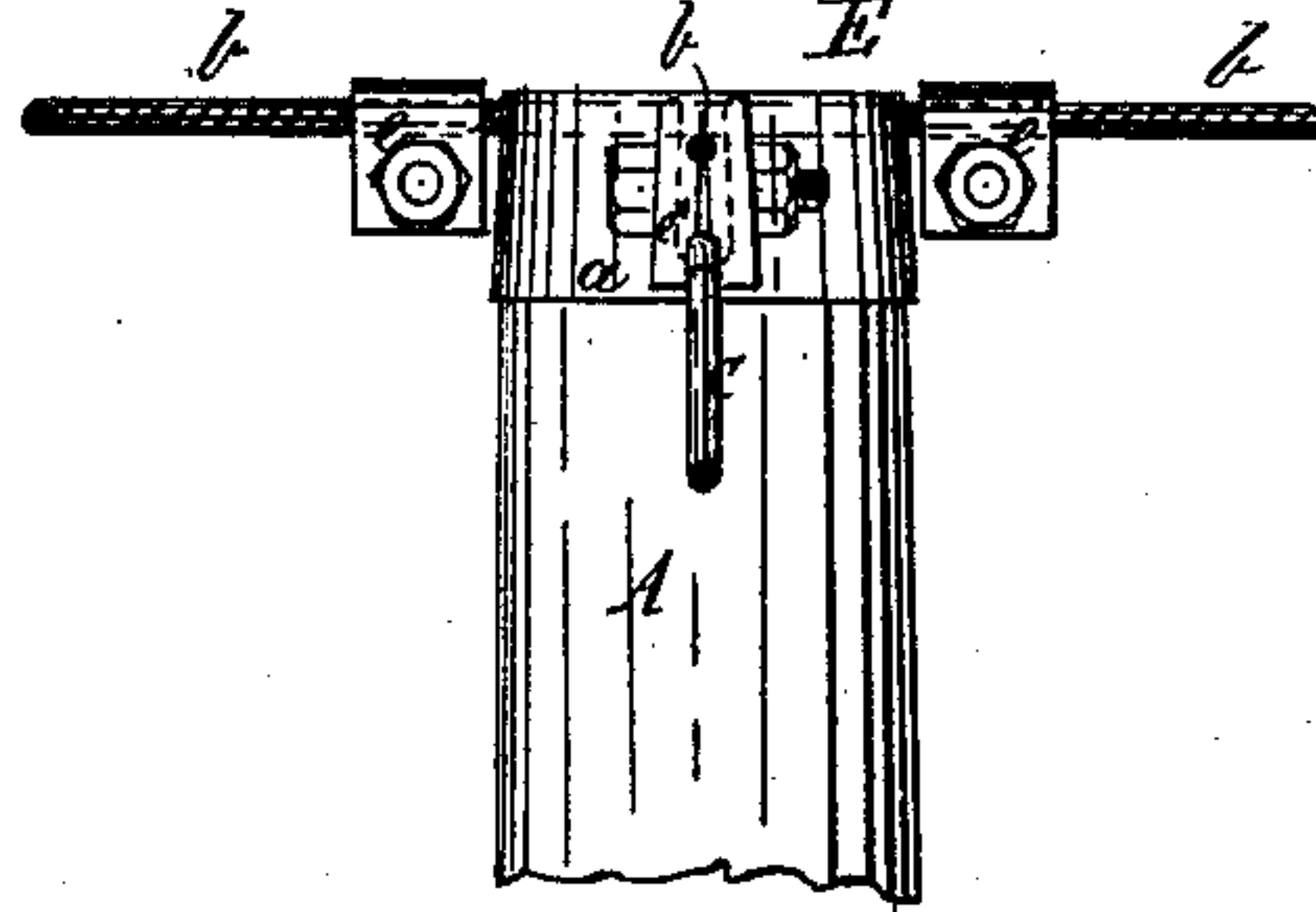


Fig. 9.

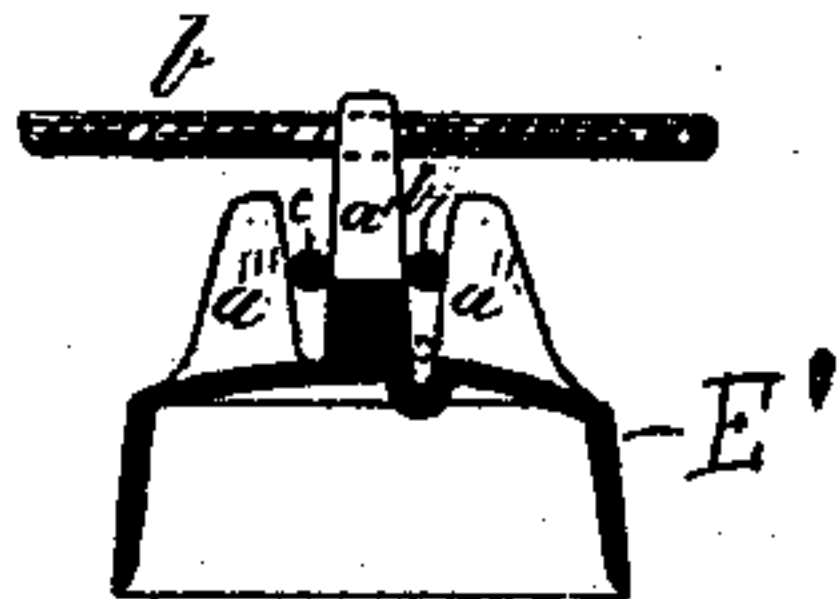


Fig. 11.

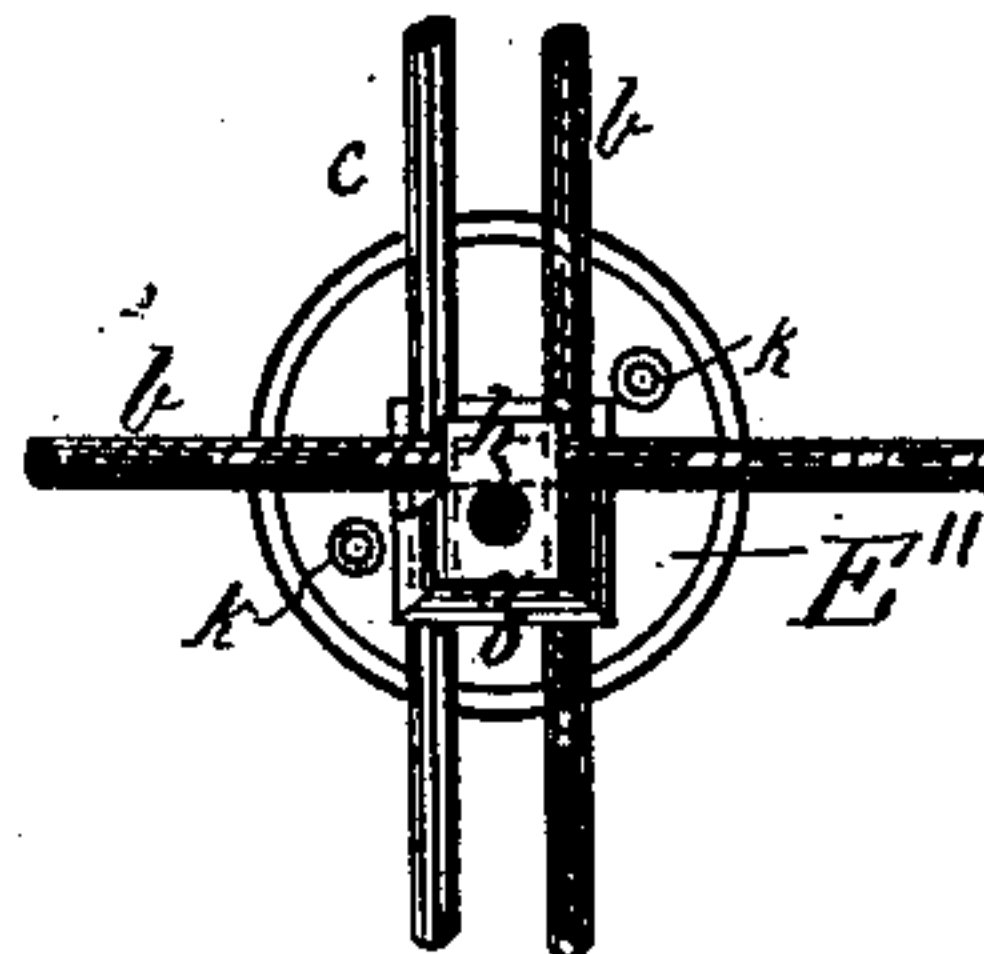


Fig. 10.

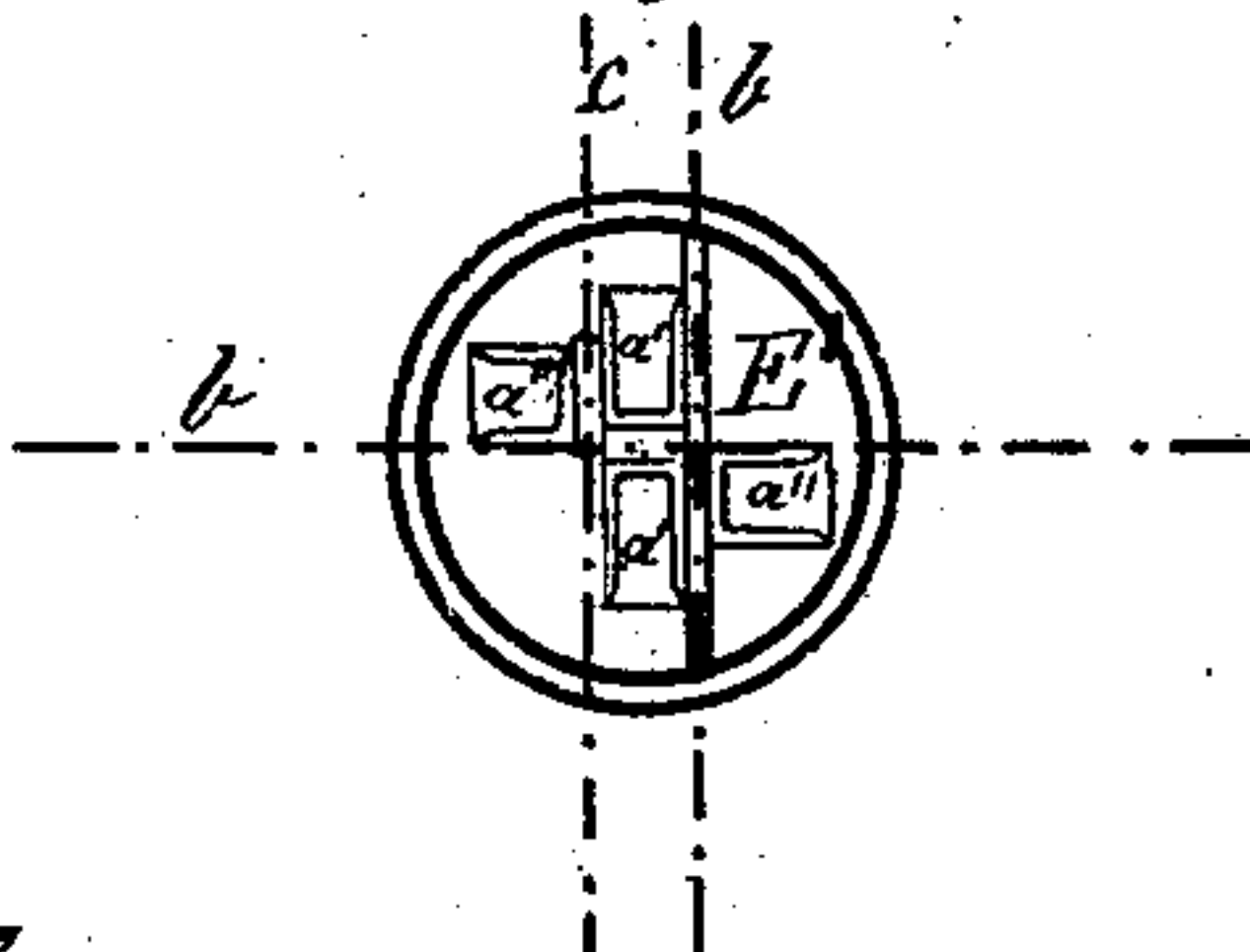
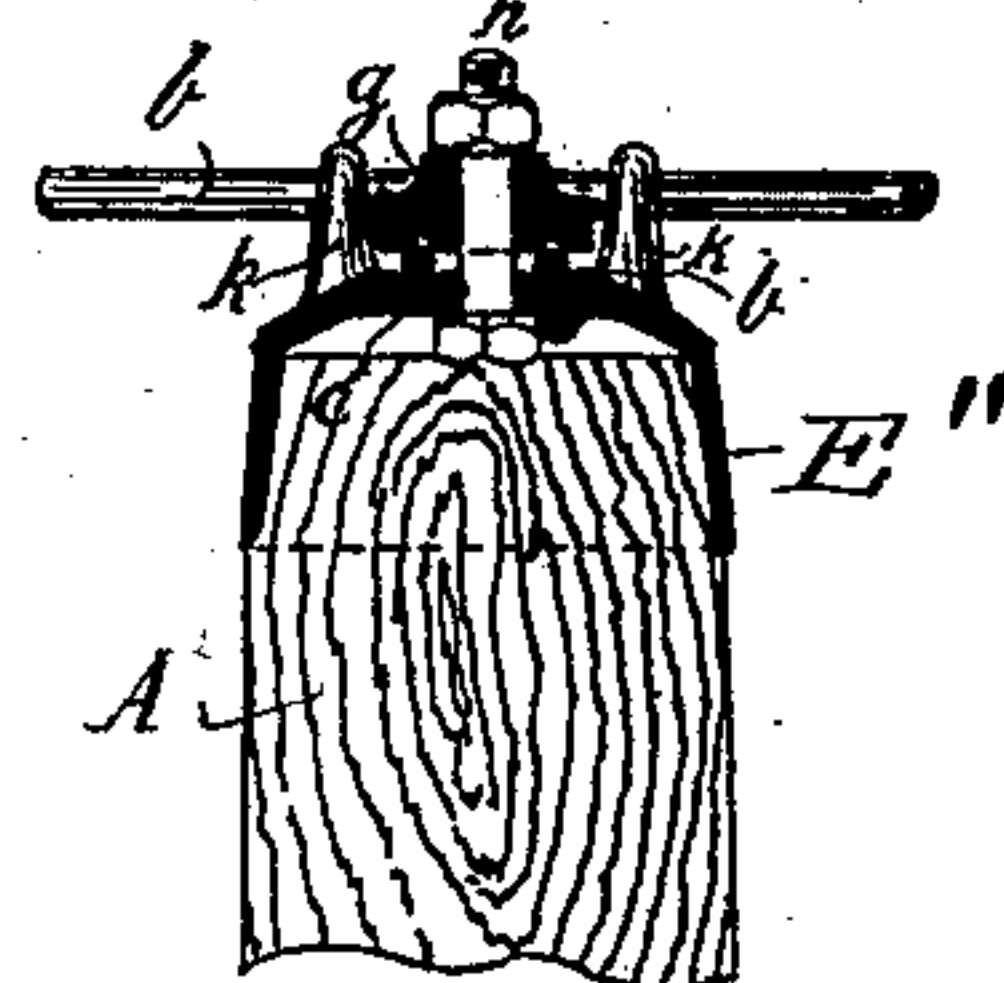


Fig. 12.



Witnesses  
Edward E. Ellis  
J. F. White

Inventor  
Carl Schwend  
By O. E. Duff, atty.

(No Model.)

C. SCHWEND.  
TRELLIS.

3 Sheets—Sheet 3.

No. 359,547.

Patented Mar. 15, 1887.

Fig. 14.

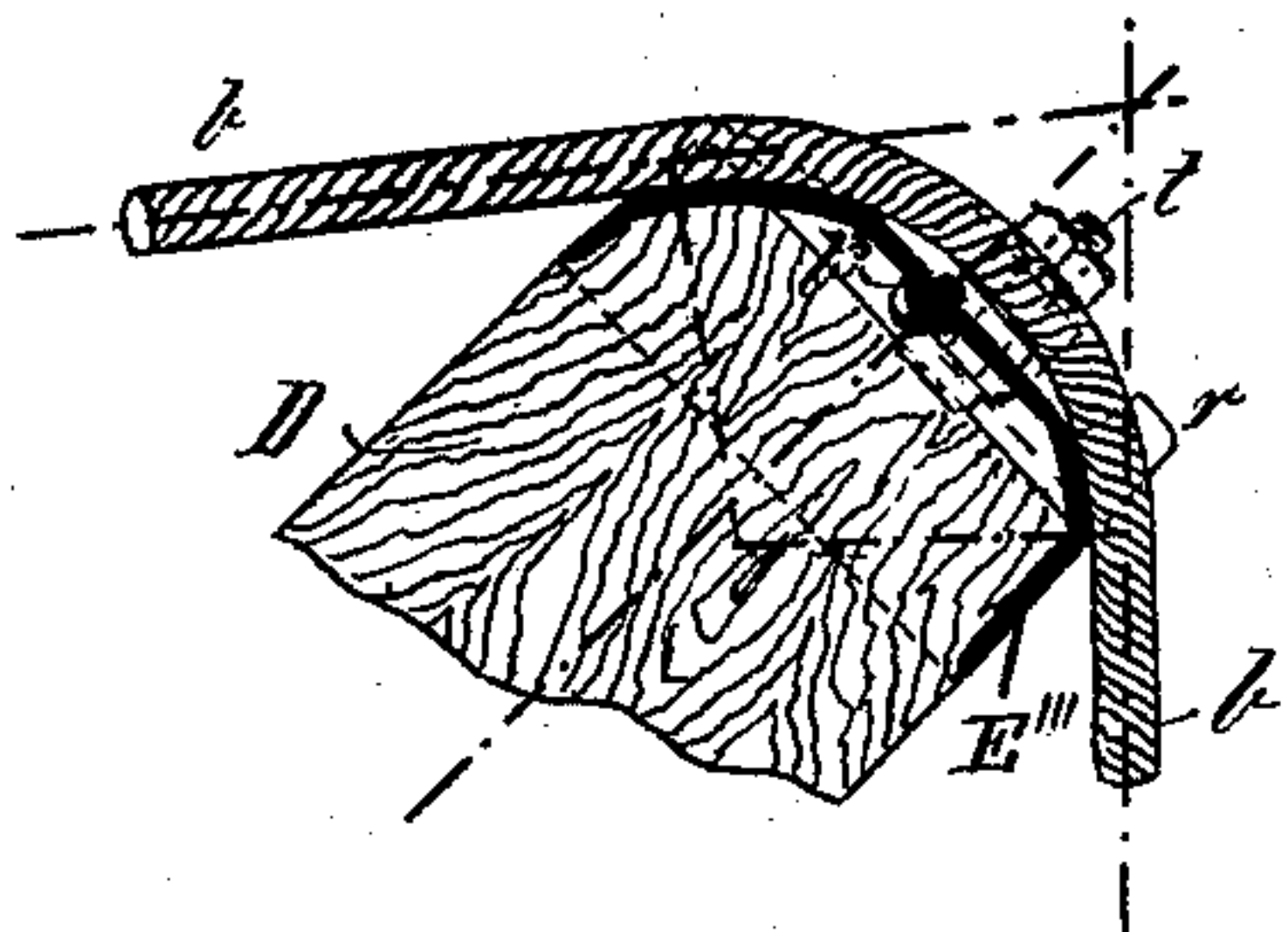


Fig. 20

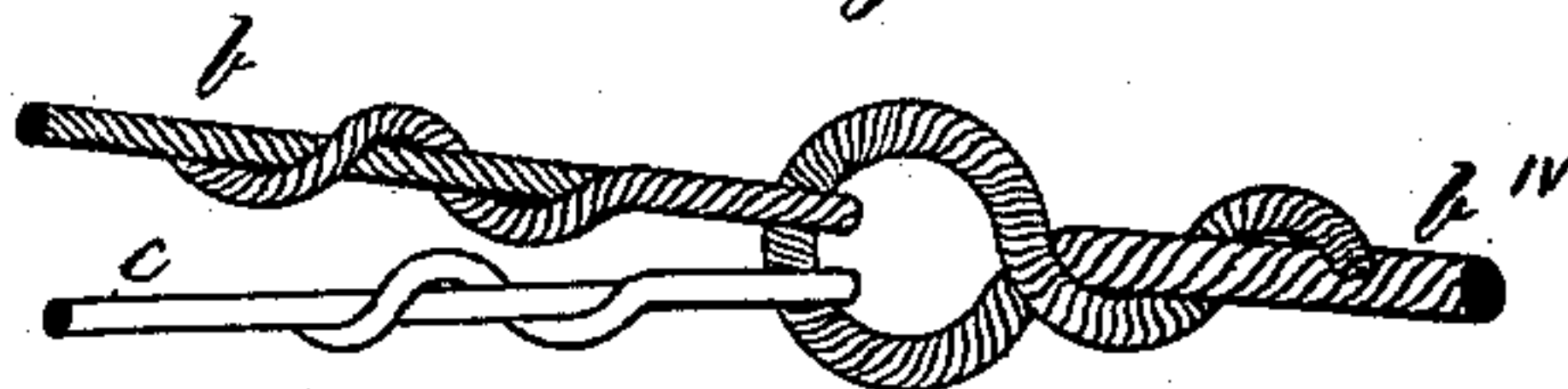


Fig. 13.

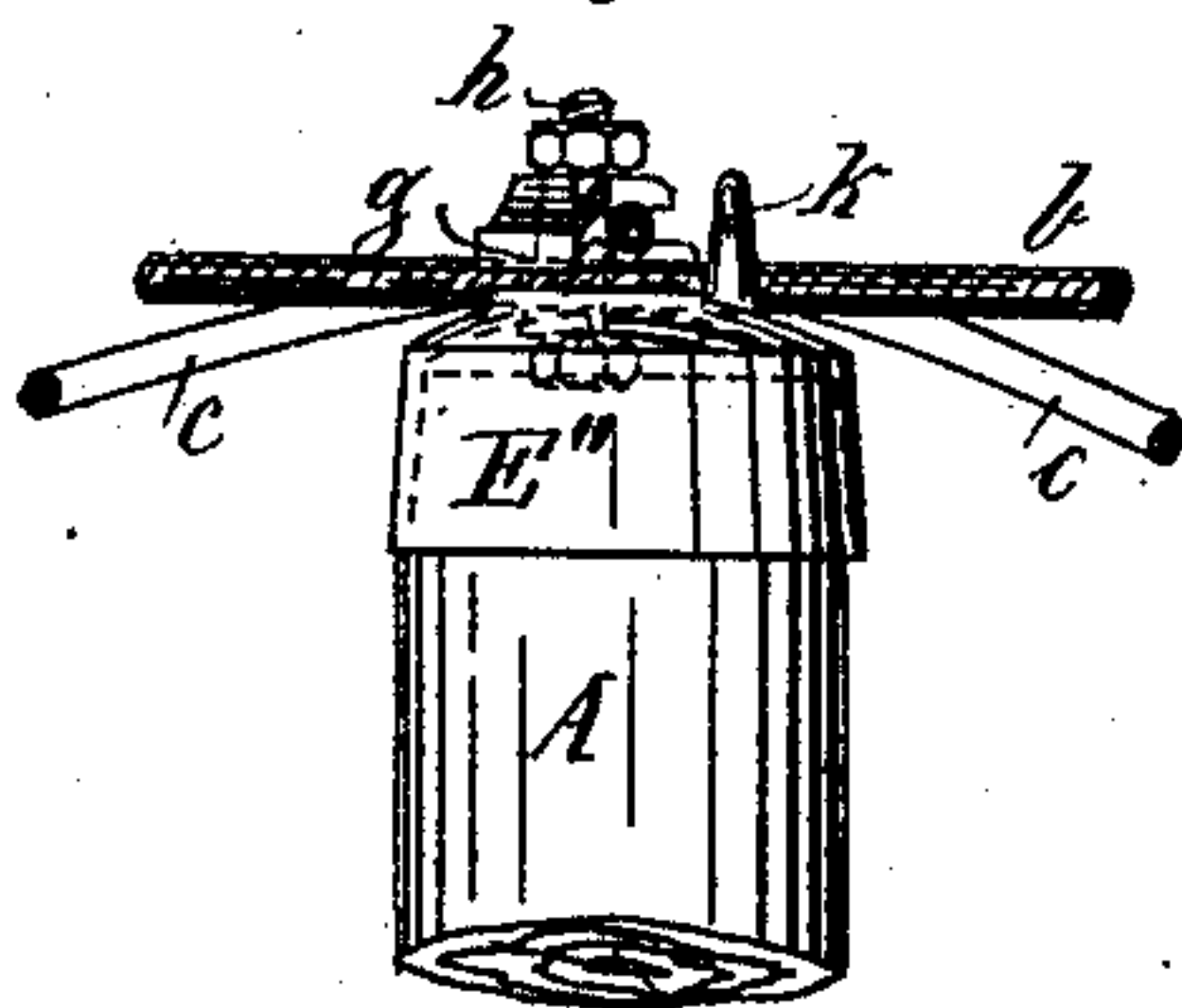


Fig. 15.

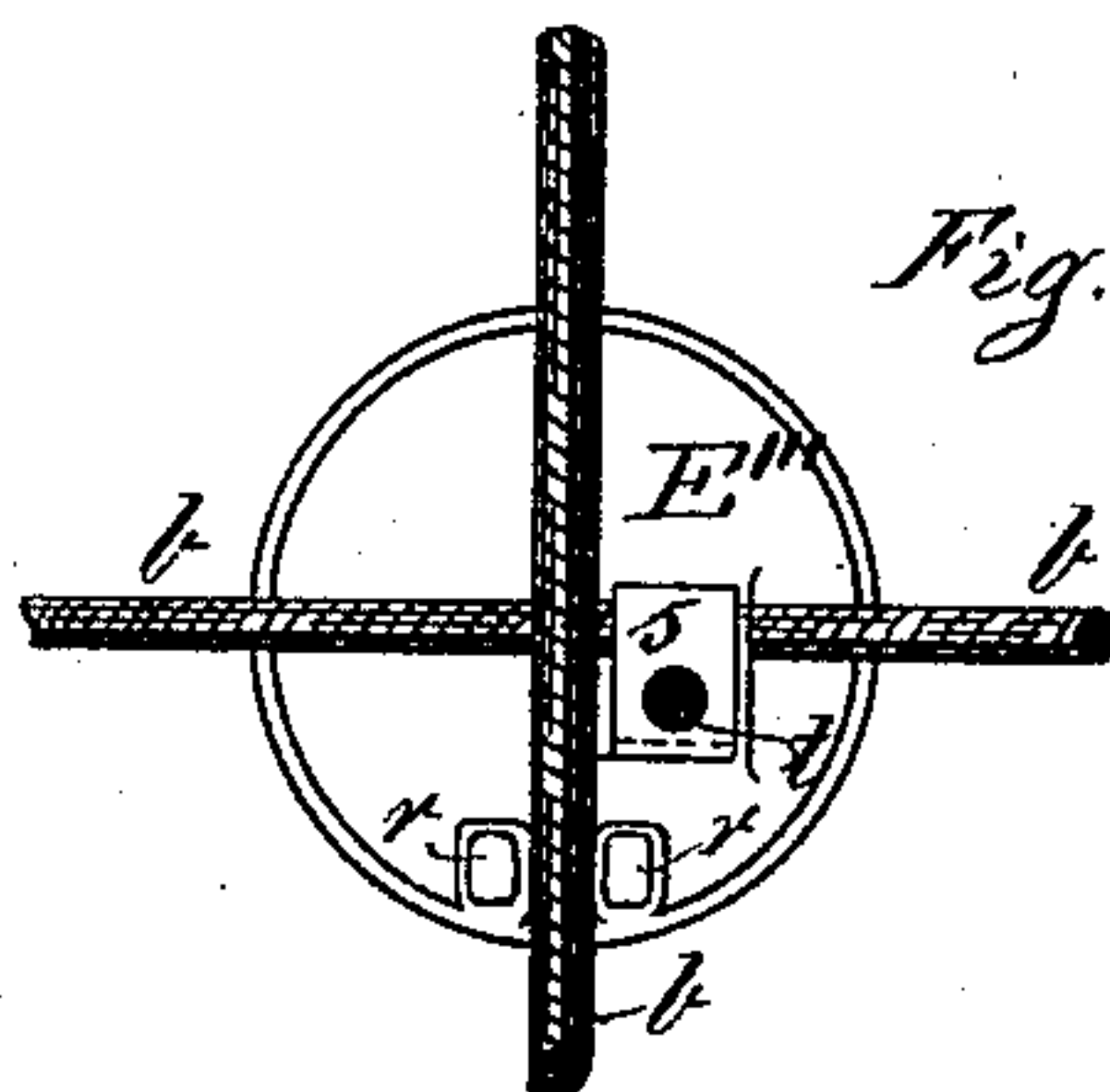


Fig. 16.

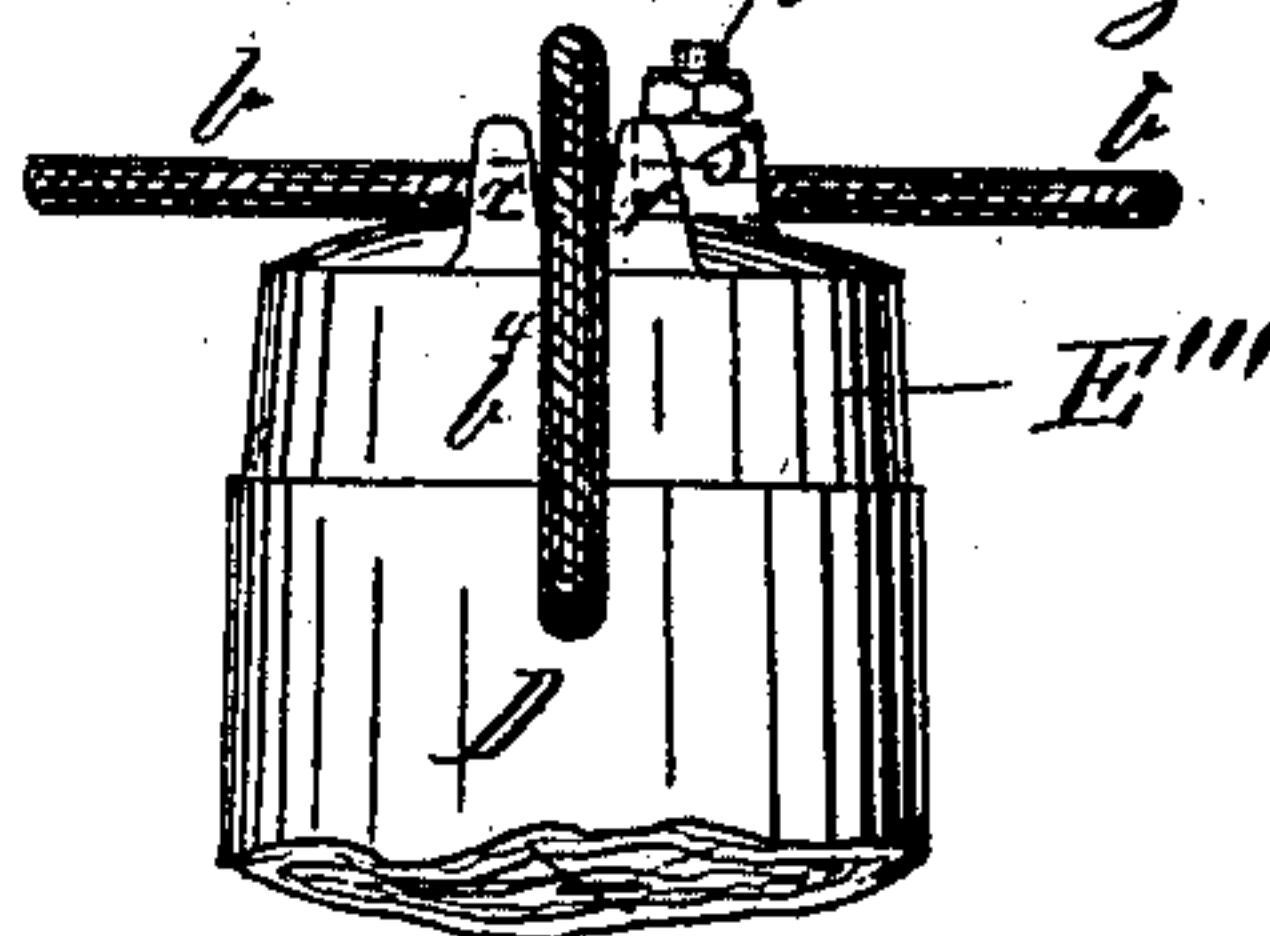


Fig. 17

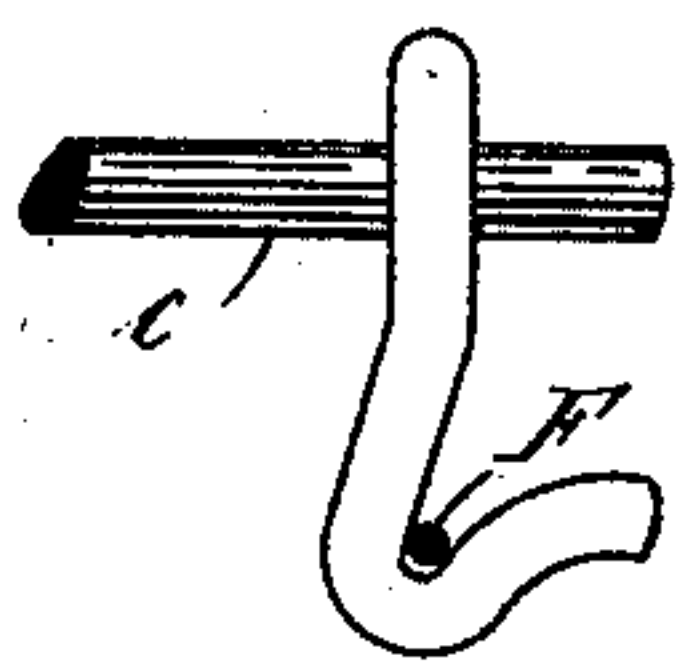


Fig. 17a

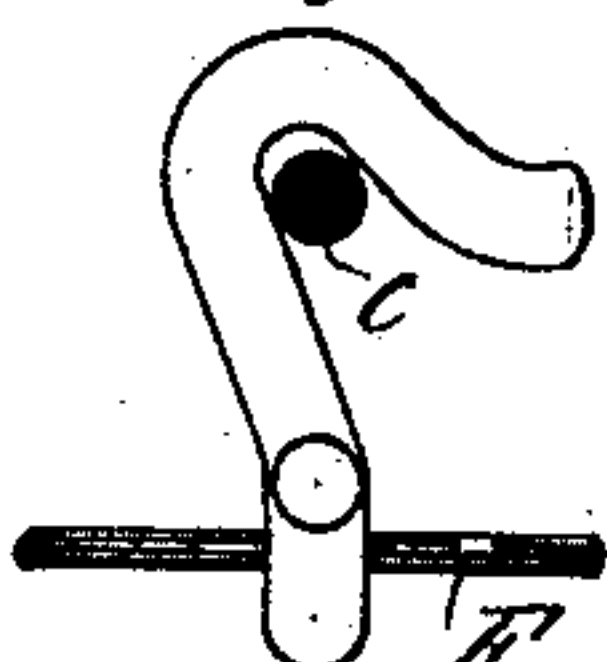


Fig. 18.

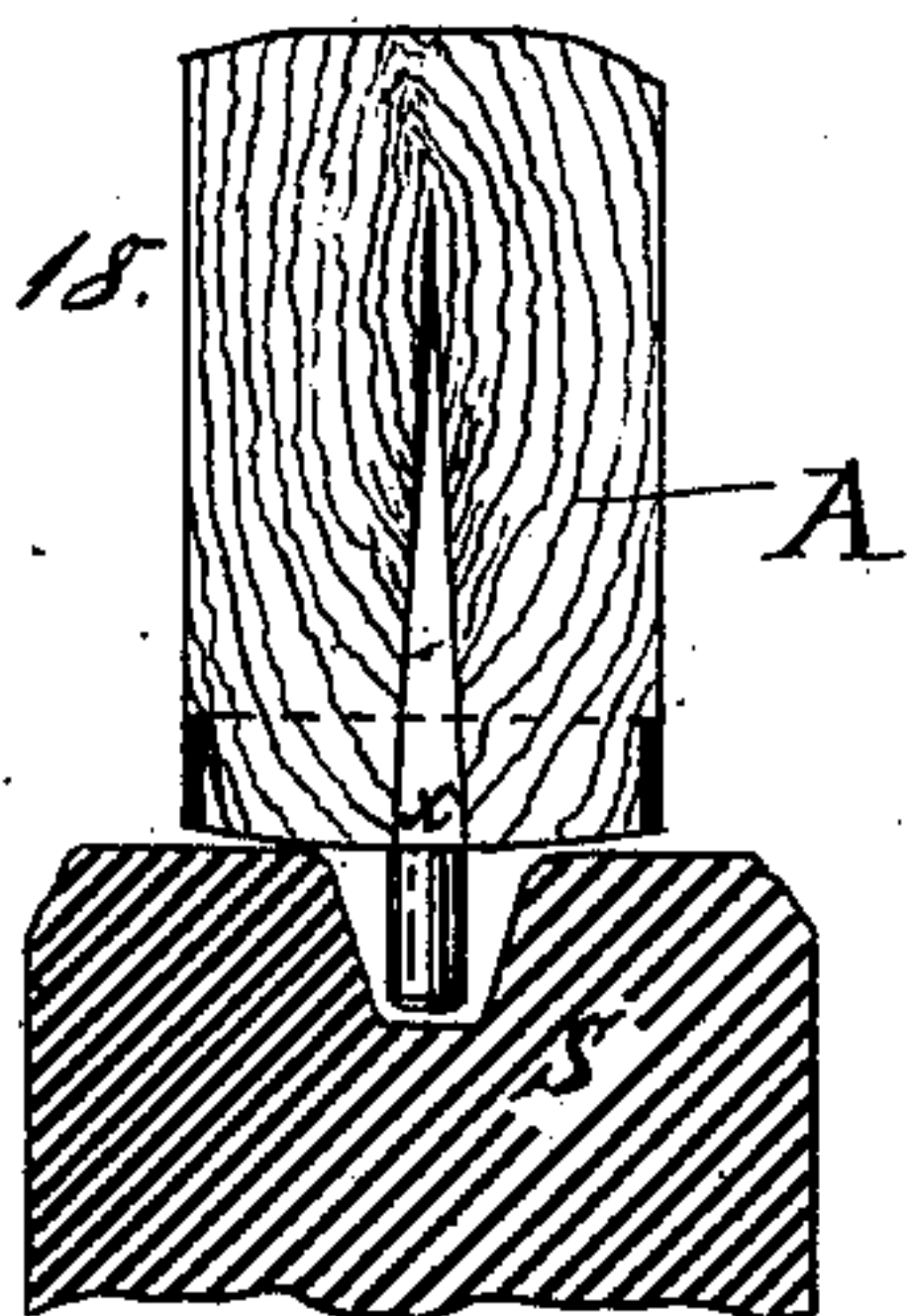
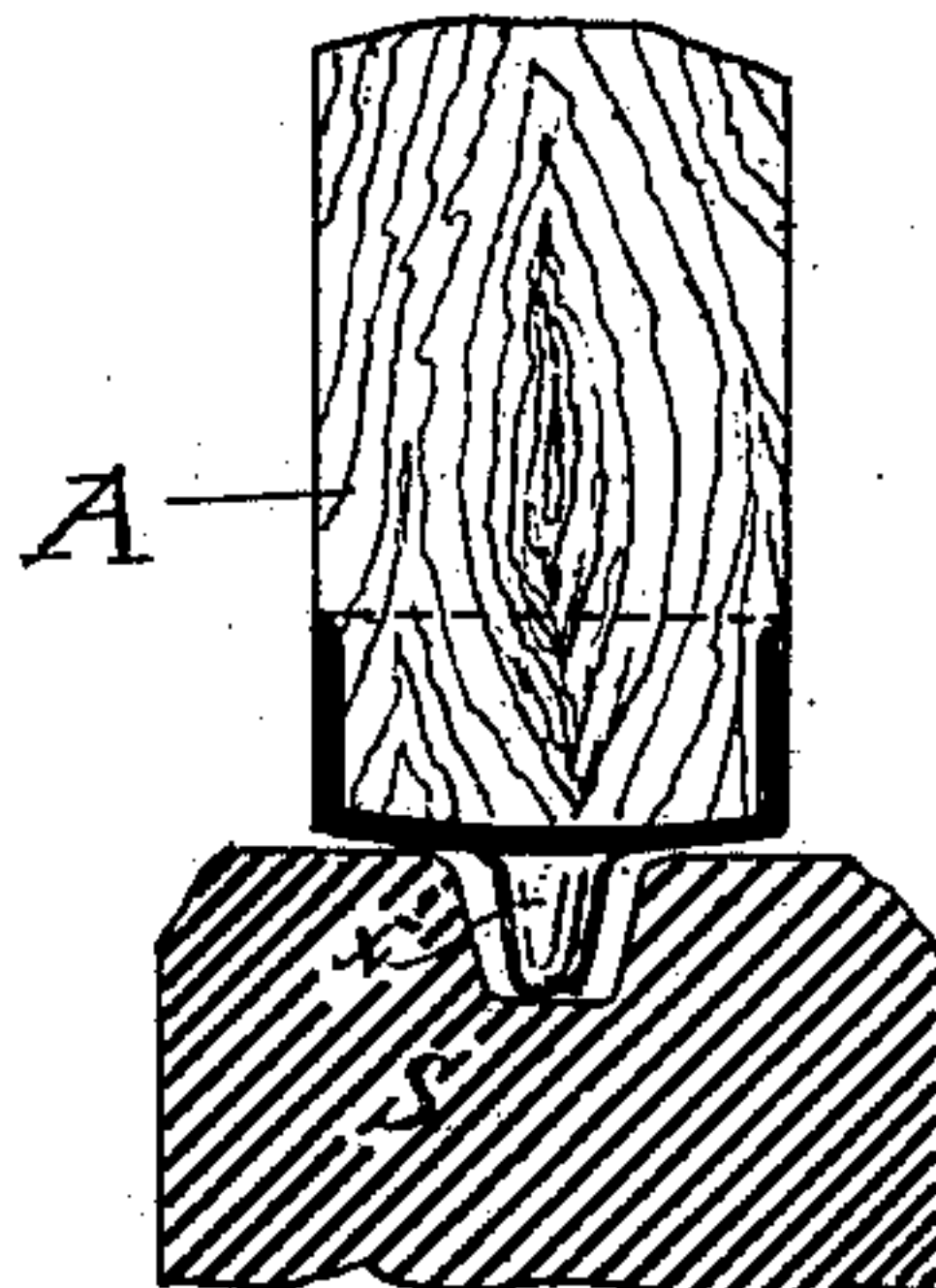


Fig. 19.



Inventor  
Edward E. Ellis  
J. F. White

Inventor  
Carl Schwend  
O. E. Deff  
C. F. Deff



# UNITED STATES PATENT OFFICE.

CARL SCHWEND, OF MULHEIM-ON-THE-RHINE, PRUSSIA, GERMANY.

## TRELLIS.

SPECIFICATION forming part of Letters Patent No. 359,547, dated March 15, 1887.

Application filed September 3, 1884. Serial No. 142,158. (No model.) Patented in Germany May 16, 1884, No. 30,083; in England June 30, 1884, No. 9,591; in Belgium August 26, 1884, No. 66,139; in Austria-Hungary November 14, 1884, No. 23,950 and No. 51,871, and in France December 15, 1884, No. 165,934.

*To all whom it may concern:*

Be it known that I, CARL SCHWEND, a citizen of the Kingdom of Würtemberg, and of the Empire of Germany, a subject of the King of Würtemberg, and a resident of the city of Mulheim-on-the-Rhine, in the Kingdom of Prussia and Empire of Germany, have invented a new and useful Improvement in Trellises, (for which I have obtained Letters Patent in England, No. 9,591, dated June 30, 1884; Germany, No. 30,083, dated May 16, 1884; Austria-Hungary, No. 23,950 and No. 51,871, dated November 14, 1884; France, No. 165,934, dated December 15, 1884, and Belgium, No. 66,139, dated August 26, 1884,) of which the following is a specification.

My invention relates to espaliers or trellises upon which to train hop or other vines; and it consists in the combination of devices hereinafter described and claimed.

Although it is generally recognized that wire espaliers or trellises for climbing plants or creepers—especially for hop-growing—are advantageous for the plants themselves and cheap in construction, most hop-growers nevertheless fall back upon the pole-plantations, or retain the same. The reason for this, seemingly, is that the wire arrangements hitherto made were of faulty construction and consequently could not resist storms. The main fault of all these constructions is that the horizontal wires are drawn tight, and consequently have to bear tensile strain and at the same time have to support the weight of the hop-plants. Now, if lateral wind-pressure is also to be borne, it is clear that the wires must break, as because of difficulties in mounting, and because of cost they cannot be made so heavy as to resist these combined influences, and as a tight wire cannot be expected to carry weight.

The arrangement of a wire espalier or trellis for hop-plantations shown in the annexed drawings presents a principle entirely different from the hitherto customary ones and characterized by the employment of a special system of storm-wires, which is totally independent from the carrying-wires and those for the plants to climb upon, and has to bear no further load, and which, when a storm occurs, holds

the whole structure together. The carrying or supporting wires also constitute an independent system and are not tightly stretched, so that as the growth of the plants progresses they form a pendent curve, imparting to the same considerable carrying power, the rising wires (those for the plants to climb upon) being to some extent movable, so that they may yield to some extent in a high wind. Lastly, the posts are not, as heretofore, buried or planted in the soil, but stand loosely on a stone foundation, so that when the storm-wires are drawn tight and sufficiently anchored at the limits of the garden, a rigid system is produced, in which the strains are equalized in all parts and remain equally divided, even if the wires are elongated by heat or shortened by a decreasing temperature, and this for the reason that the posts are capable, within certain limits, of following the storm-wires.

In order that my invention may be fully understood, I will proceed to describe it with reference to the accompanying drawings, in which—

Figure 1 is a plan view of my improved espalier or trellis for use on a hill-side. Fig. 2 is a vertical section of the same as seen from the right. Fig. 3 is a side elevation thereof as seen from the left. Fig. 4 is a front view at the broadest part of the garden. Fig. 5 is a top view of a standard head-piece. Fig. 6 is a side elevation of the same. Fig. 7 is a side elevation at right angles to that shown in Fig. 6. Fig. 8 is a side elevation of a modified form of head-piece. Fig. 9 is a vertical section of the same at right angles thereto. Fig. 10 is a top view of that shown in Fig. 8. Fig. 11 is a top view of another form of head-piece. Fig. 12 is a vertical section of the same. Fig. 13 is a side elevation at right angles to that shown in Fig. 11. Fig. 14 is a vertical section of a stay head-piece. Fig. 15 is a top view of the same at right angles to that shown in Fig. 14. Fig. 16 is a side elevation thereof. Fig. 17 is a side elevation of the hook for supporting the cross-wires on the supporting-wires. Fig. 17<sup>a</sup> is a side elevation of the same at right angles to that shown in Fig. 17. Fig. 18 is a vertical section of the lower end of the standard and the upper end of the supporting-



block. Fig. 19 is a similar view showing a modification. Fig. 20 is a view of the eyelet for connecting the anchoring-wire with the main wire and storm-wire.

5 A are the vertical posts or standards; D inclined stays or standards, both loosely connected to base S. E is the head-piece on the vertical standard. E''' is the head-piece of the inclined stays; W, the rising wires, (those for the plants to climb upon;) F, cross-wires carrying the latter; *c*, the main supporting-wires upon which the cross-wires are suspended, and *b* the storm-wires.

15 Figs. 5, 6, and 7 show head-pieces E for the standards for supporting the storm-wires and supporting-wires, the wires being held fast by means of clamping-pieces.

Figs. 8, 9, and 10, show head-pieces E' (cast in metal) for the standards in which the storm-wires and supporting-wires are only held in recesses narrowed toward the lower end, and merely by wedging or jamming.

25 Figs. 11, 12, and 13 show head-pieces E'' for the standards, in which the storm-wires and supporting-wires are held by clamping-jaws on the top, capable of being tightened up by screws.

30 Figs. 14, 15, and 16 show head-pieces E''' for the oblique post or stays, over which the storm-wires are led to their ground anchorage, and provided with clamping-jaws and tightening-screws.

Hereby the insecure and troublesome knotting and tying of the wires upon the standard-heads is avoided. The wires pass through the whole length or breadth of the garden without knotting, and in a single piece, whereby the mounting is much facilitated and security against breaking increased.

40 The standards or posts A, Figs. 1, 2, 3, 4, are raised, according to the plan of the garden, vertically and loosely upon stone foundations, at such distances from one another that one standard is allowed for about forty-nine plants or vines. The head-pieces E E' E'' of these standards carry both storm-wires and supporting-wires. By the tightly-stretched storm-wires the standards are rigidly connected with one another. To this end these may be provided with one of the fittings hereinafter described.

55 Figs. 5, 6, and 7 show the head-piece E of the standard, provided with grooves or recesses crossing one another at right angles upon their front ends, and a ring, *a*, tightly wedged upon the same, so as to prevent splitting. The storm-wires *b* and supporting-wires *c*, which cross one another, lie in these recesses, and are secured by hooks *d*, driven in after the espalier is finished. To prevent change of position of the standard-head with relation to the storm-wires, and also to prevent alteration of the correct shape of the supporting-wire *c*, (the shape being that of a curve depending between the standard-heads,) and to prevent all increase of tensile strain upon the supporting-wire by its load, (consequently

upon the alteration of the shape of the depending curve,) the clamping-pieces *e* are jammed upon these wires. The clamping-pieces are pushed tightly up to the ring *a* of the standard-head and drawn together by a screw.

As seen in Fig. 5 of the drawings, that storm-wire which does not run parallel with the supporting-wire receives clamps of a less size than the storm-wire which runs parallel with the same. In the latter case clamps *e'* are used, Figs. 6 and 7, which hold both the storm-wire and the thicker supporting-wire underneath it.

The standard head-piece E' (shown in Figs. 8, 9, and 10) is intended to be preferably made of malleable cast-iron or cast-steel, and forms a kind of hood, which is tightly driven upon the end of the standard.

90 *a' a'' a'''* are cheek-pieces, which, arranged in pairs, form recesses between them. These recesses are narrower at their lower end than at the top, in which both the storm-wires and the supporting-wires are tightly pushed, and thus are held by friction only, which can be increased by corrugating or roughening the inner surfaces of the inner faces of these tapering recesses or clefts. The transverse storm-wire *b* passes through the recess between the jaws *a' a'*, that which is parallel with the supporting-wires is in the recess of the jaws *a' a''*, while the supporting-wire *c* is jammed tightly into the recess of the jaws *a' a'''*.

It must be observed that the supporting-wire is not placed directly beneath the storm-wire, but somewhat at the side of the same. This, however, does not affect the stability of the whole system, Figs. 8, 9, and 10.

105 A head-piece, E'', also cast of metal and serving for the wire-post, is shown in Figs. 11, 12, and 13. The storm-wires *b b*, crossing one another and supporting the wire *c*, are simultaneously pressed into a small prismatic recess by a clamping-jaw, *g*. The clamping-jaw *g* is drawn tight by means of the screw *h*. The projections *k* on the head-piece are to prevent the turning of the standard A, and serve for the purpose of preventing the wires from slipping off the same before being drawn tight and wedged fast.

120 The inclined stays D over the head-pieces E''', (likewise cast,) of which the storm-wires and supporting-wires pass, (see Figs. 14, 15, and 16,) serve to hold the entire system up, and the storm-wires and supporting-wires are by a loop or eyelet, Fig. 20, connected with the anchor-wires *b<sup>iv</sup>*, which in turn are attached to an earth-anchor or foundation of masonry or the like. The storm-wire *b*, which extends directly downward, is not wedged fast upon the head, but is merely guided between two projections, *r r*, Figs. 14, 15, and 16. The second storm-wire *b*, passing around the entire limits of the garden or plantation, is fastened to each of the inclined standards or stays D by a clamping-plate and a screw, *t*.

In hop-gardens of the usual extent the in-



clined posts or stays D need be placed at suitable distances apart and upon the limits of the garden only, as the storm-wires are anchored at those points only, while in large gardens this will be required within the planted garden also.

Instead of the simple stretched steel or iron wires, which are herein termed the "storm-wires," plaited wire cord or thin wire rope may be used, as these, costing little more, are considered more durable.

The cross-wires F, to which the rising wires W, Figs. 1, 2, 3, 4, are attached, are hooked to the supporting-wires *c* by the hooks represented in Figs. 17 and 17<sup>a</sup>, and in such a manner that they cannot shift. To this end this hook, of the shape of a somewhat distorted S, is so arranged that each of the bent ends forms a narrowing opening in which the wires wedge themselves tight, so that all lateral movement of the same is prevented. The security of this attachment increases with the weight and growth of the plant climbing upon the rising wire.

Both the vertical and the inclined stays or standards are at the bottom only loosely placed upon a stone base and engage in a recess of the base either by a pin, *x*, driven into the lower end of the posts, as shown in Fig. 18, or by a projection, *x'*, as shown in Fig. 19, cast upon a cap which is tightly driven upon the post end. In either case the pin *x* or the projection *x'* prevents the post from slipping off its base. The said pin *x* or the projection *x'* are, however, of less diameter than the recess in the stone base, so that the post is free to move within certain limits, and that, as has been hereinabove stated, the strains in the entire system may as far as can be equalized. Moreover, the rotting of the ends of the poles that have heretofore been buried in the ground to the depth of more than three feet is avoided.

The posts or standards may consist of iron piping fixed together, or of poles or the like. In Figs. 18 and 19, S is the base or socket, of stone. It is obvious that the arrangement of these espaliers will have to be varied, according to requirements, both as to the placing of the vertical posts or stays, as also of the inclined stays placed at the confines of the plot; but on the whole the principle of strictly separating the storm-wires or wire ropes, which sustain the standards from the supporting-wires which carry the cross-wire to which the rising wires are attached, constitutes the leading features of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an espalier or trellis, the combination of the standards, the tightly-stretched storm-wires extending thereover, the cross-wires, the rising wires, and the main supporting-wires extending over the standards on which the cross-wires and rising wires are sustained independently of the storm-wires, substantially as described.

2. In an espalier or trellis, the combination of the standards, the tightly-stretched storm-wires thereover, the sagging main supporting-wires, and the sagging cross-wires, sustained on the main supporting-wires independently of the storm-wires, substantially as described.

3. In an espalier or trellis, the combination of the vertical standards A, inclined standards D, and head-pieces E, having grooves or recesses, with the storm-wires *b*, for supporting said standards, and independent supporting-wires *c*, cross-wires F, connected to the supporting-wires, and rising wires W, substantially as described.

4. In an espalier or trellis, the combination, with a base provided with a recess and a standard provided with a pin or projection on its lower end, loosely fitting the recess in the base, and having a head-plate at its upper end, provided with grooves or recesses, of supporting-wires and storm-wires in said grooves, each of said wires being independent of the other, and means whereby said wires are secured in the grooves, substantially as described.

5. An improved espalier or trellis consisting of vertical and inclined posts or standards provided with pins or projections on their lower ends, and head-pieces with grooves or recesses on their upper ends, independent storm-wires and supporting-wires in said grooves in the head-pieces on the standards, anchored at their ends in the ground, cross-wires attached to the supporting-wires, vertical wires attached to the cross-wires, and recessed bases in which are placed the pins or projections of the vertical and inclined standards, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

CARL SCHWEND.

Witnesses:

ALAN SCHOLZE,  
B. ROI.