

W. L. HAMILTON.
AERIAL OR SUSPENDED RAILWAY.
APPLICATION FILED AUG. 5, 1910.

978,581.

Patented Dec. 13, 1910.

4 SHEETS—SHEET 1.

Fig:1

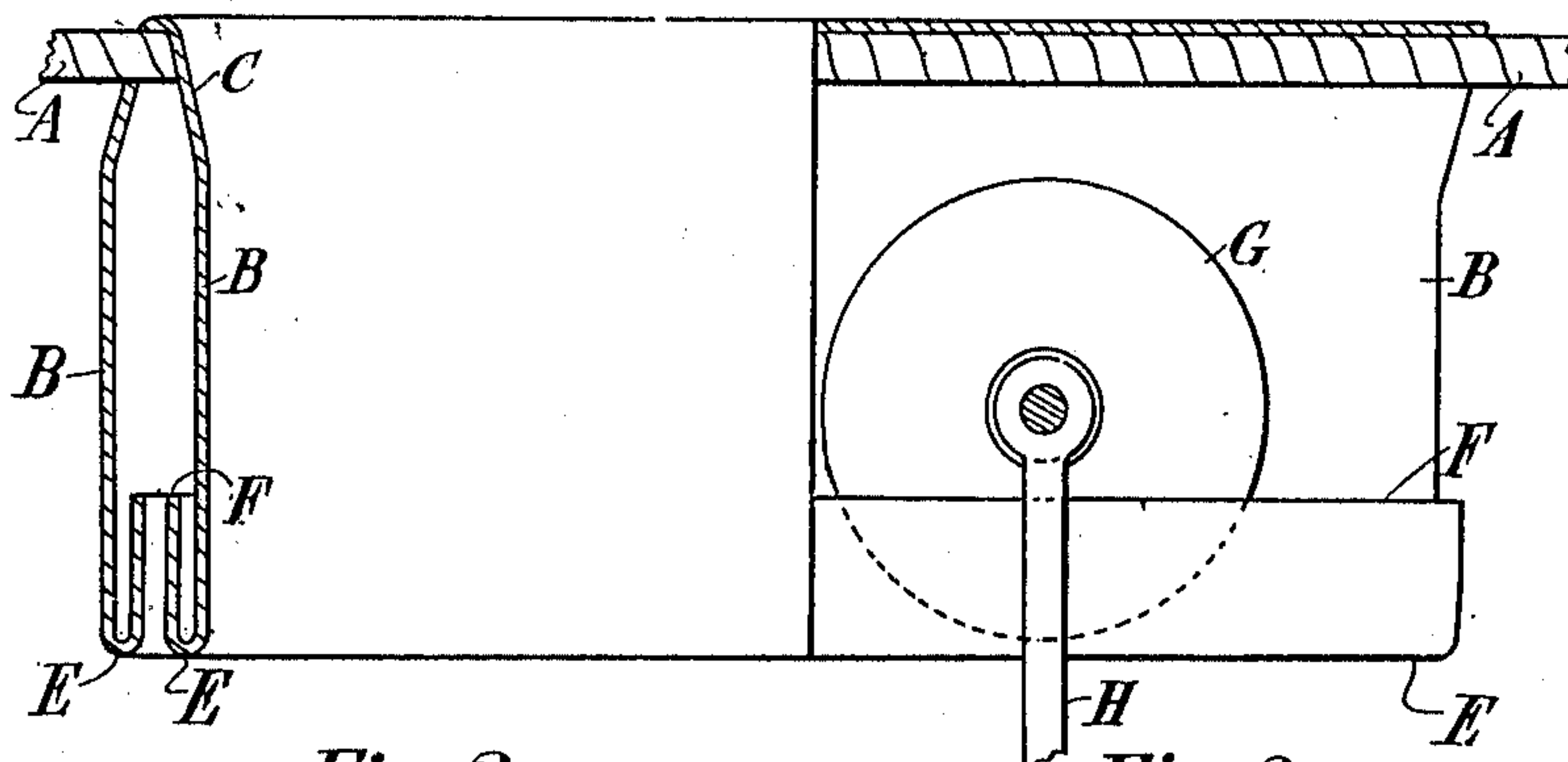


Fig:2

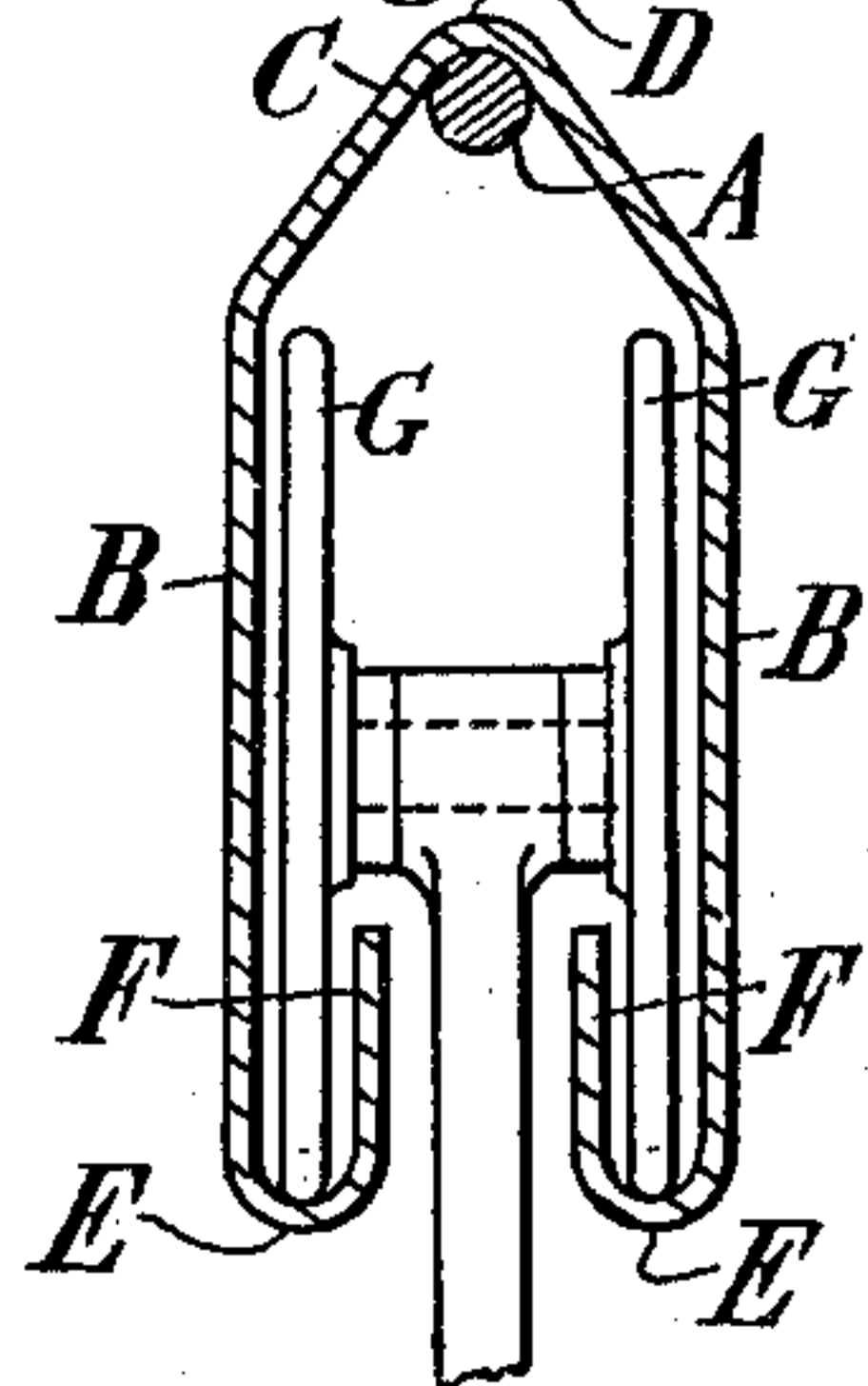


Fig:3

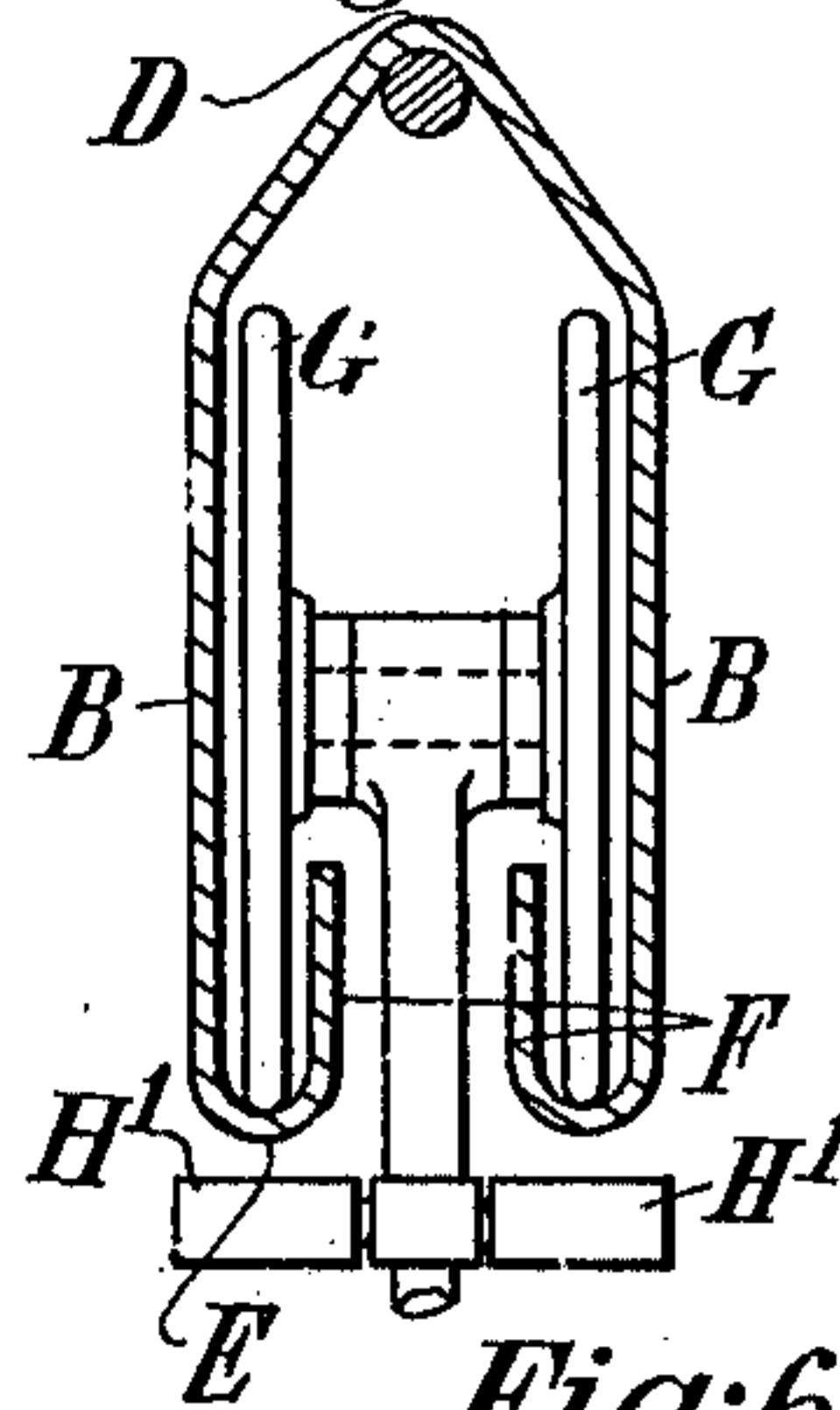


Fig:4

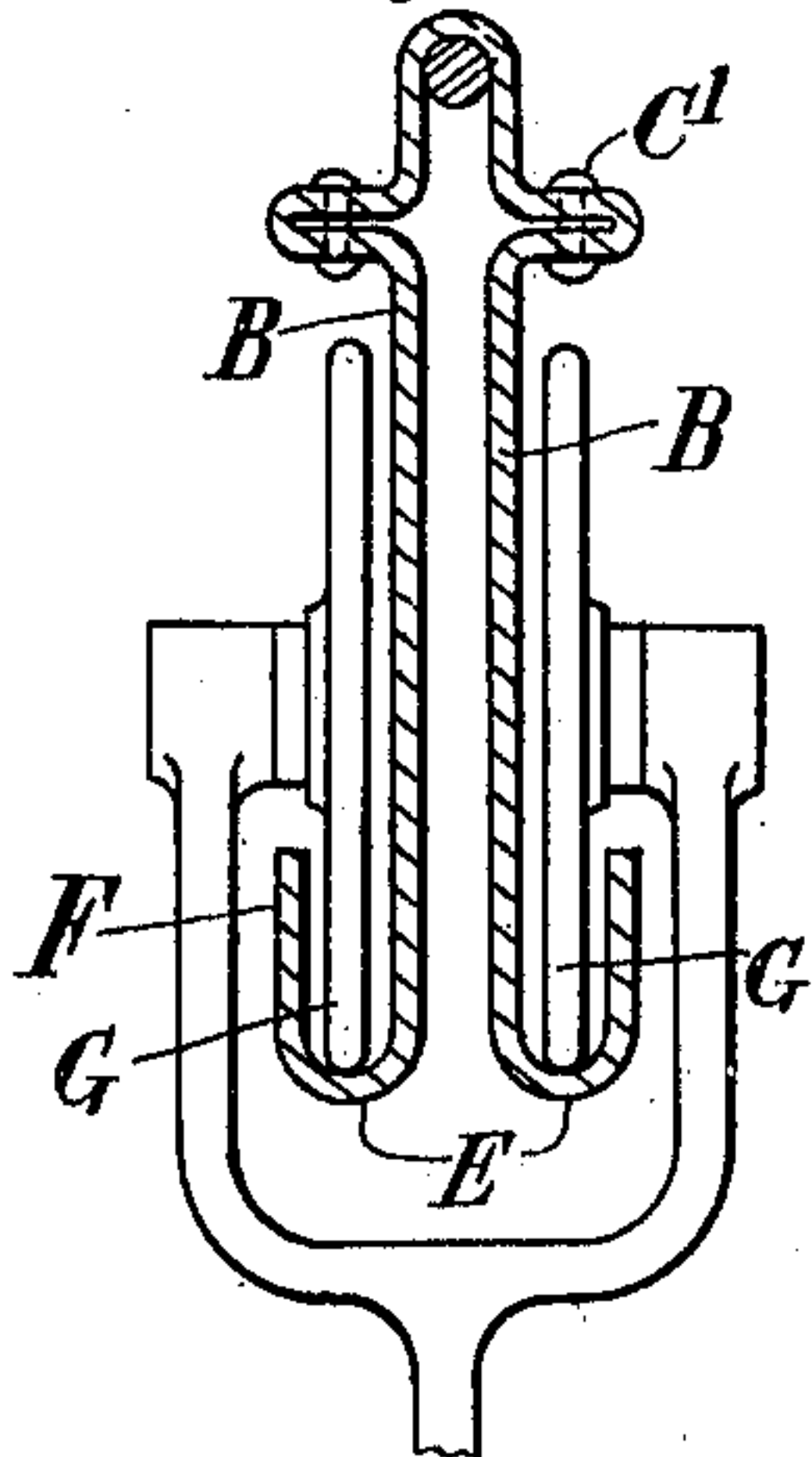


Fig:5

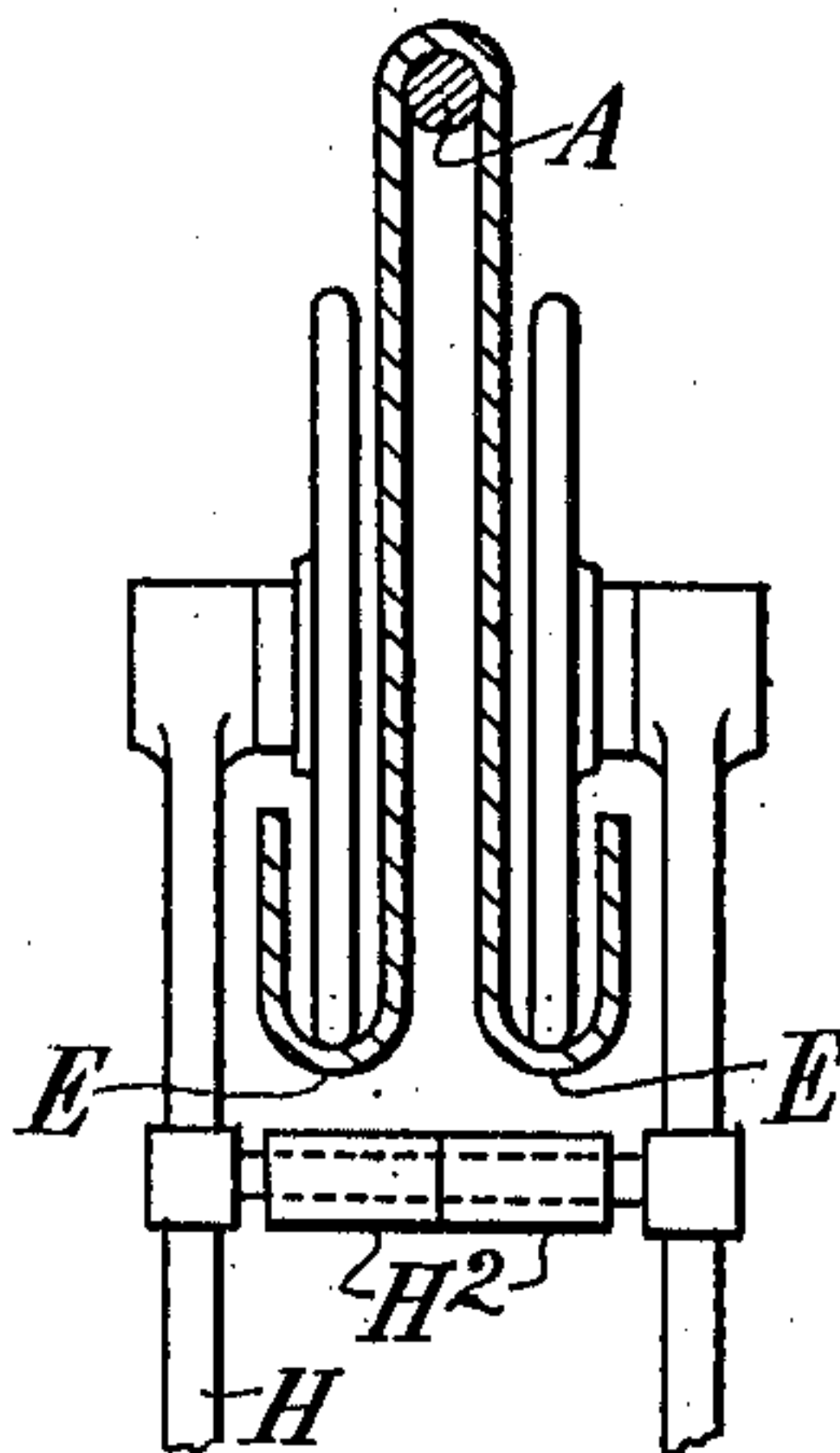
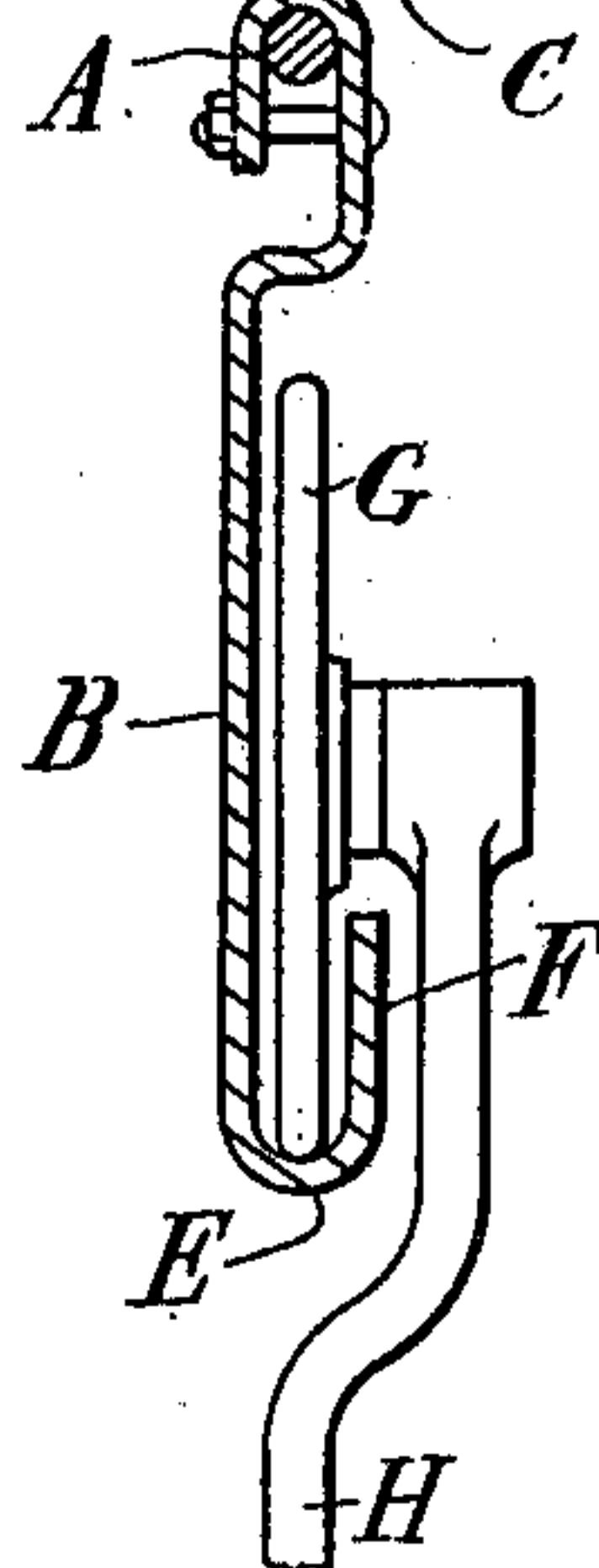


Fig:6



Witnesses

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A. H. Berrell

Inventor

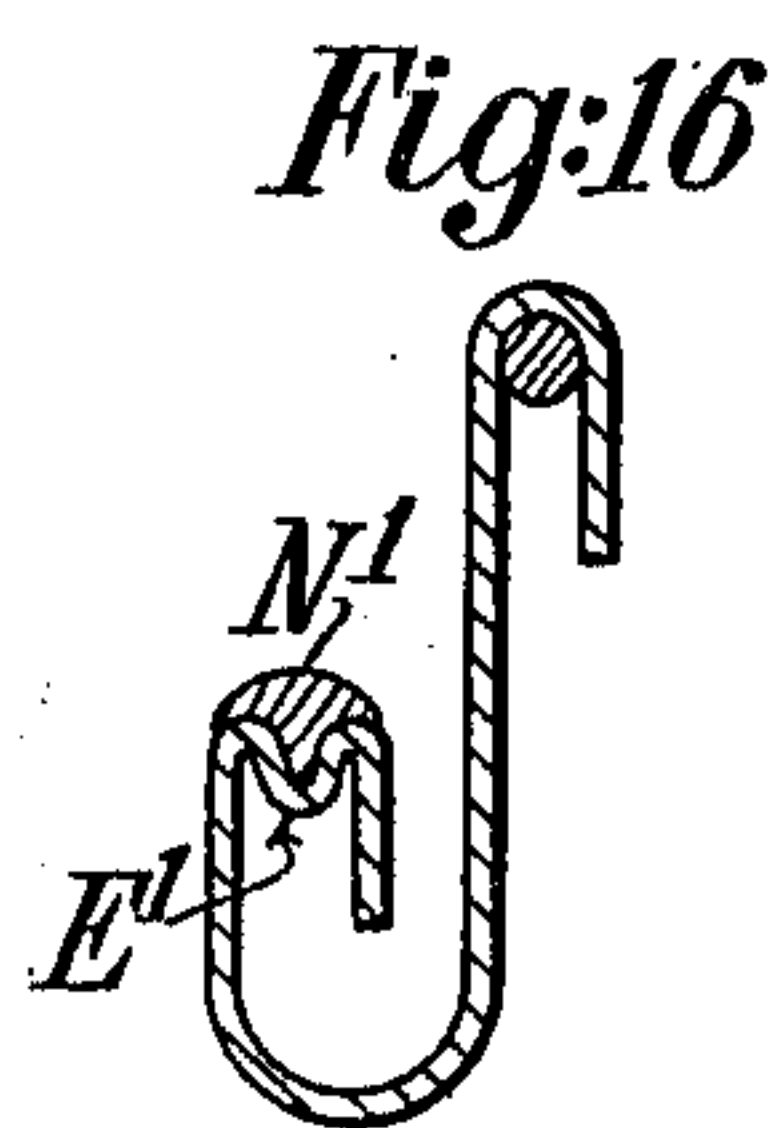
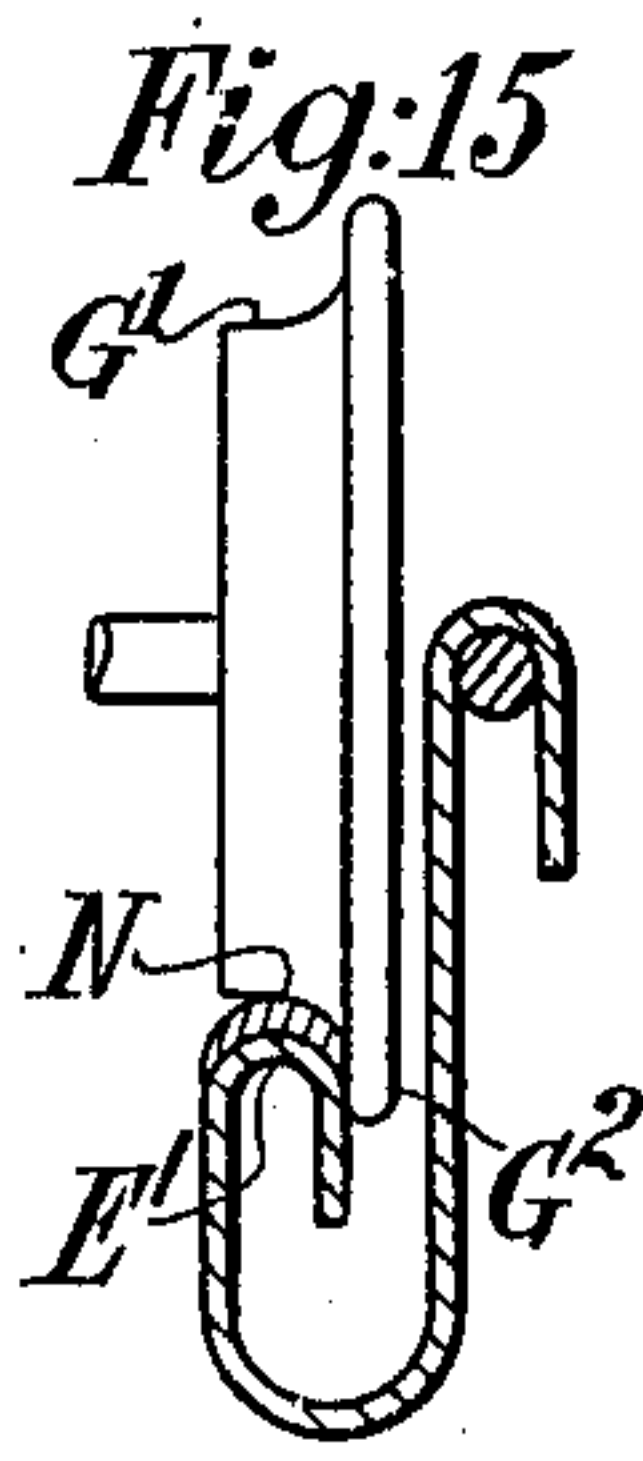
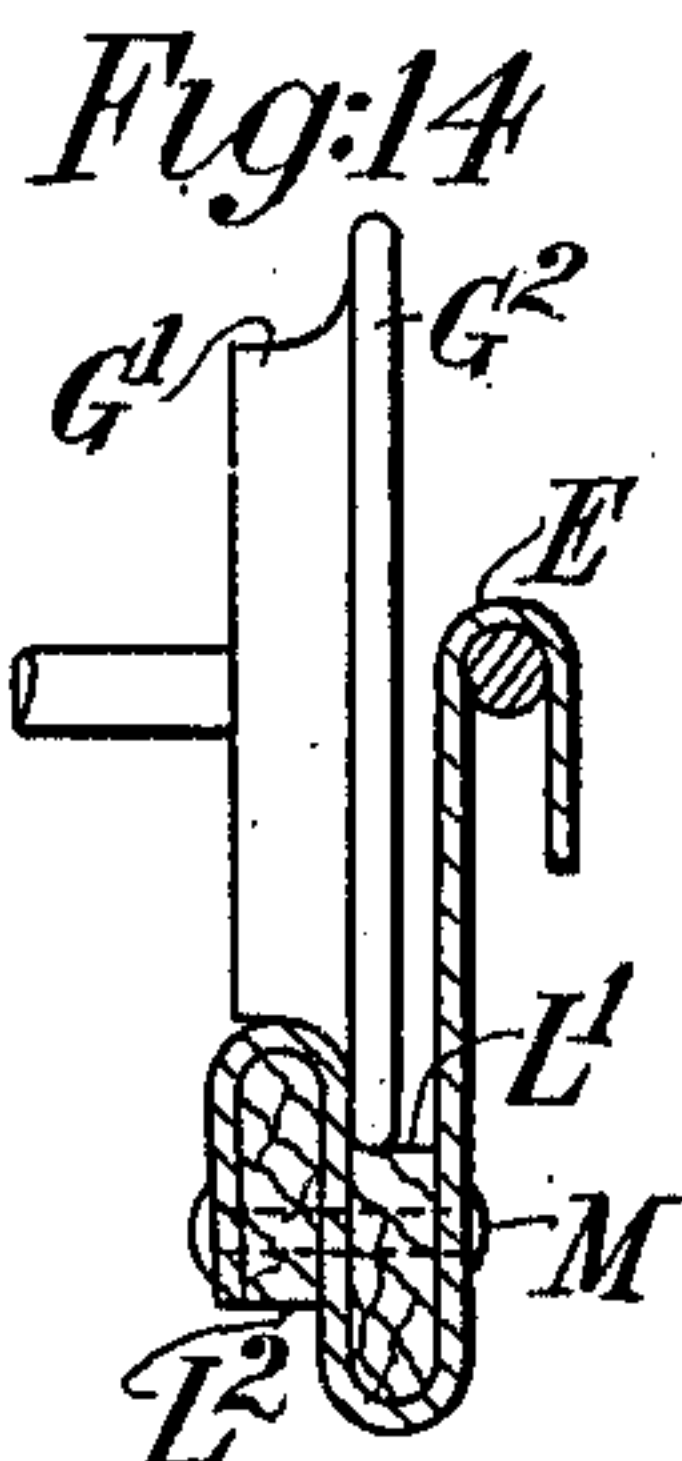
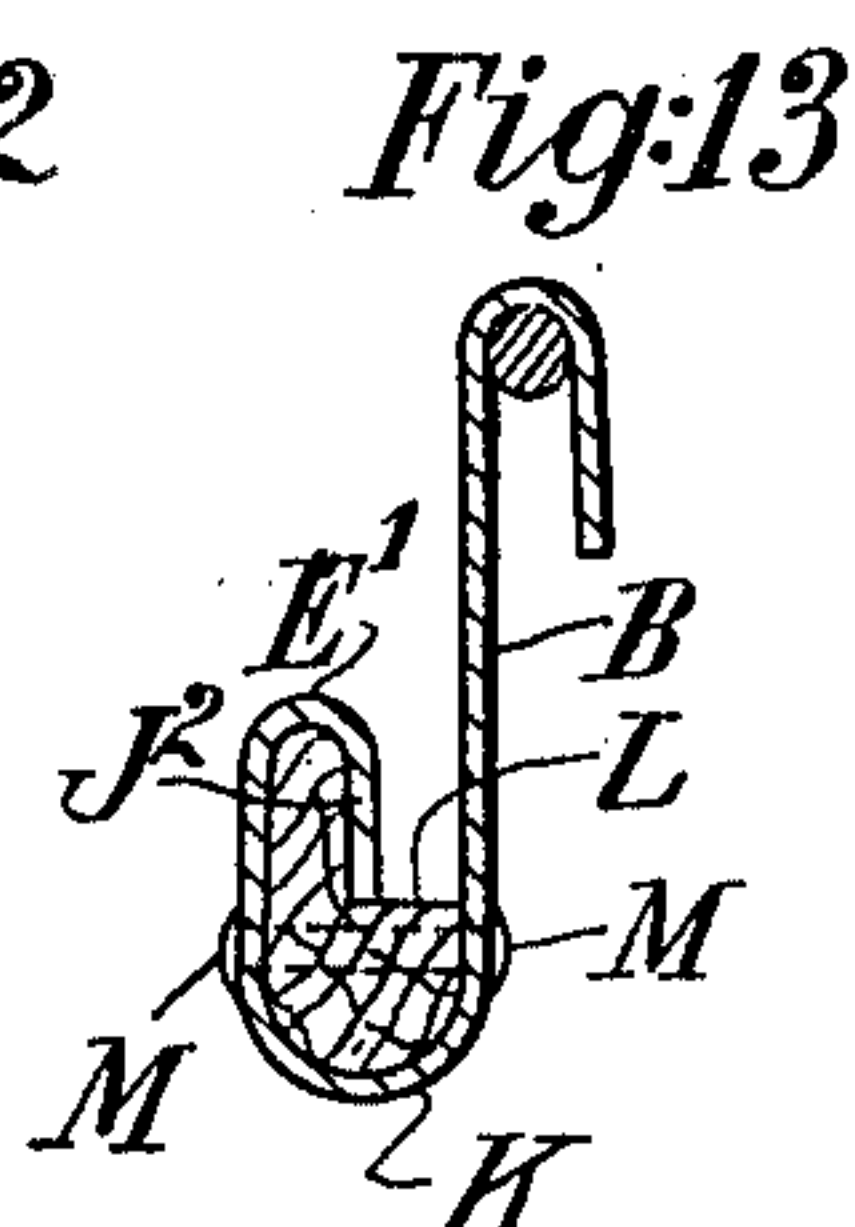
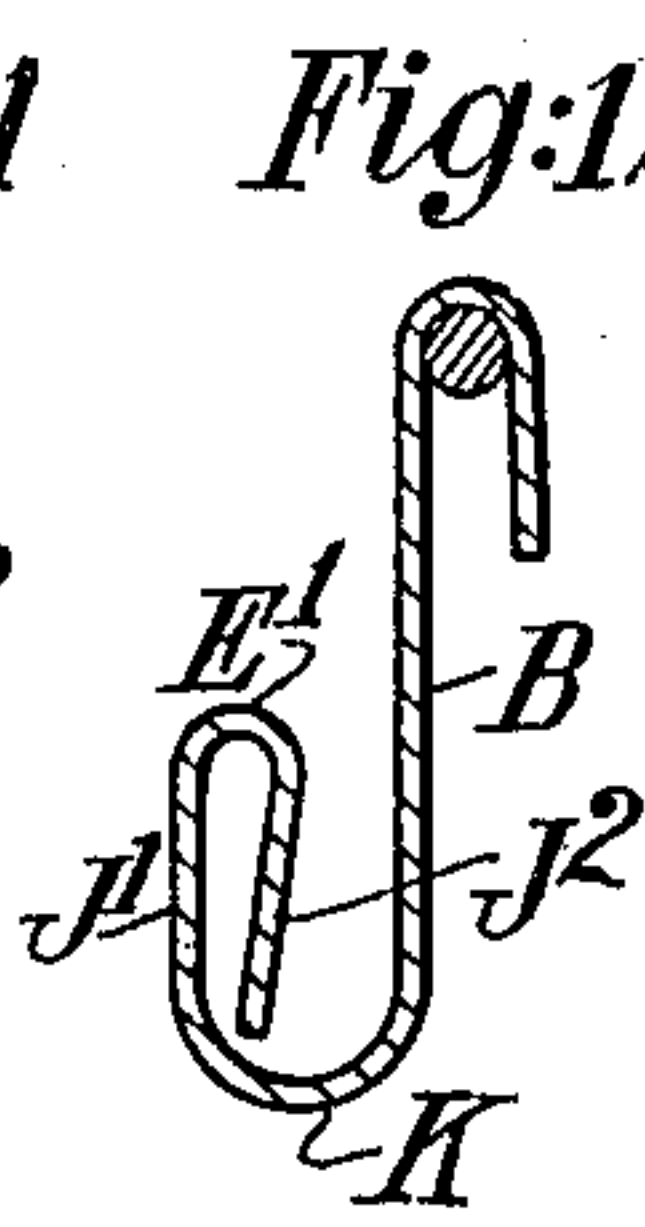
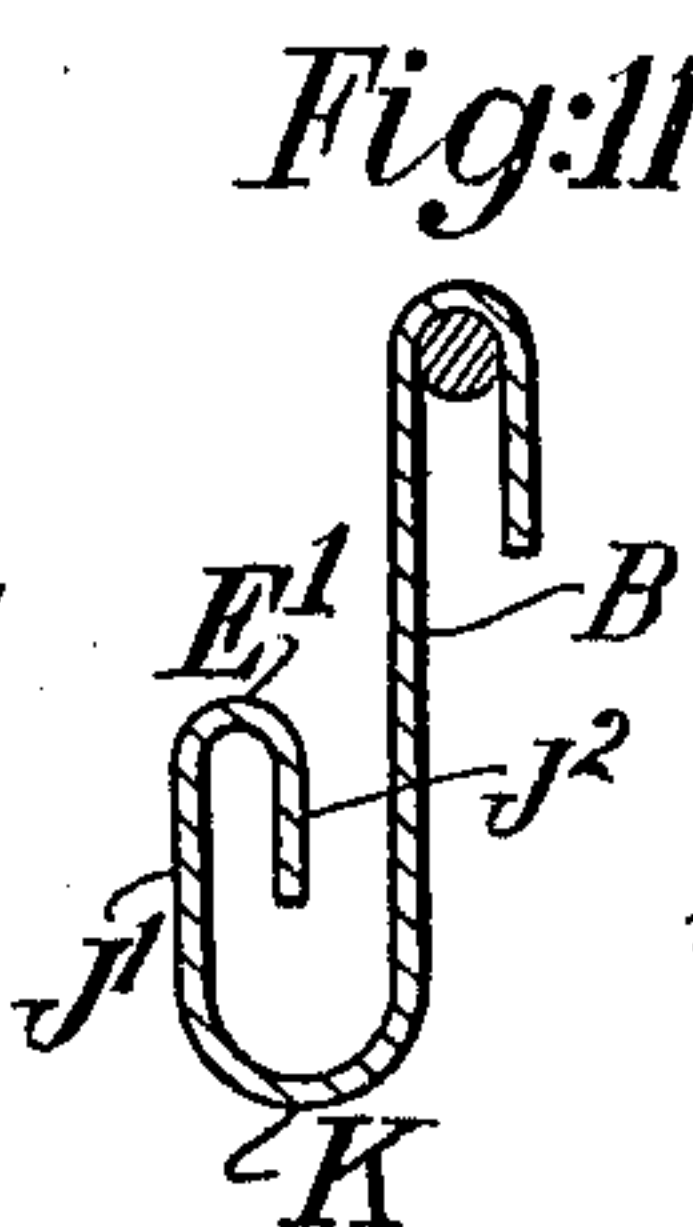
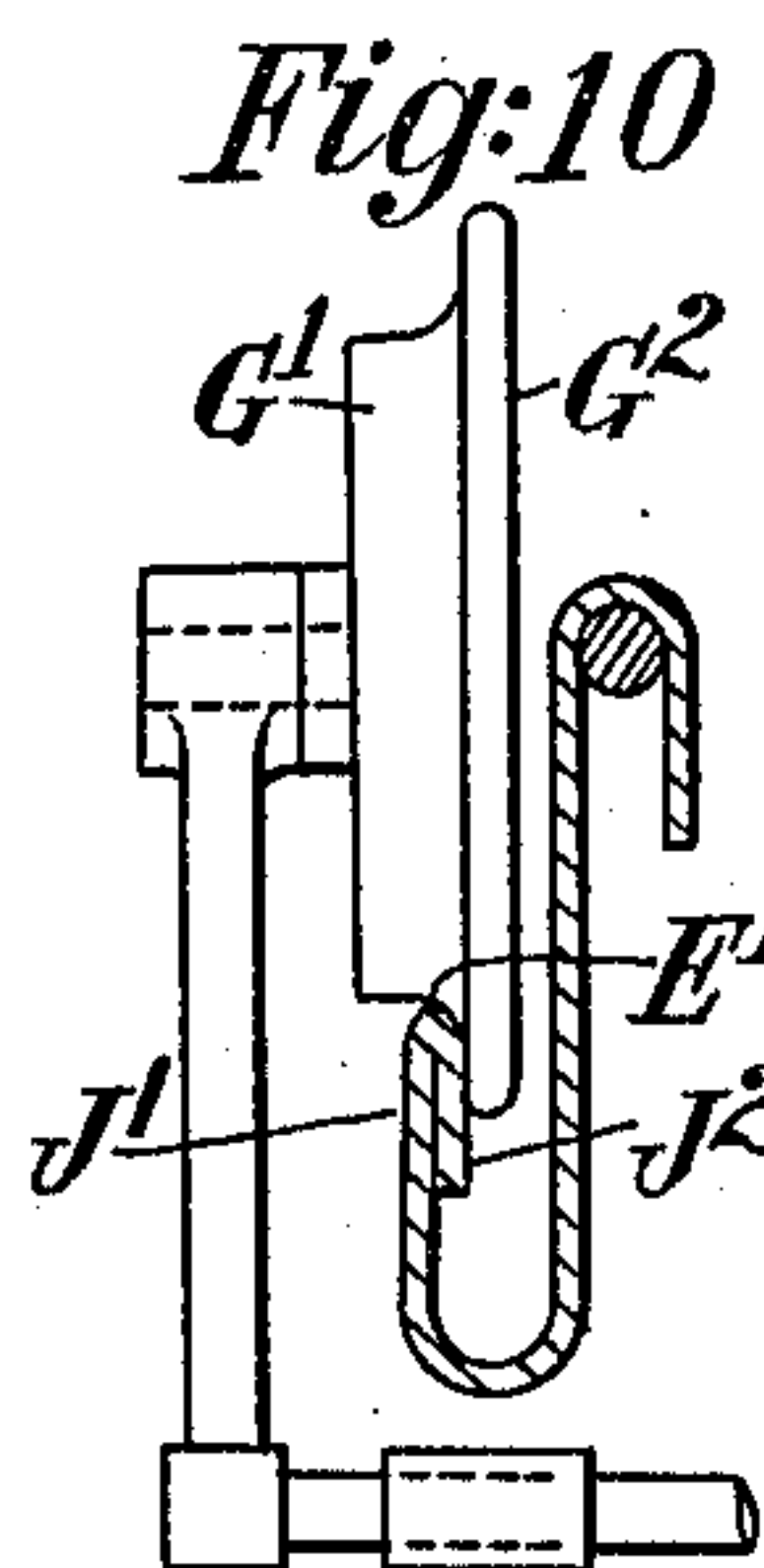
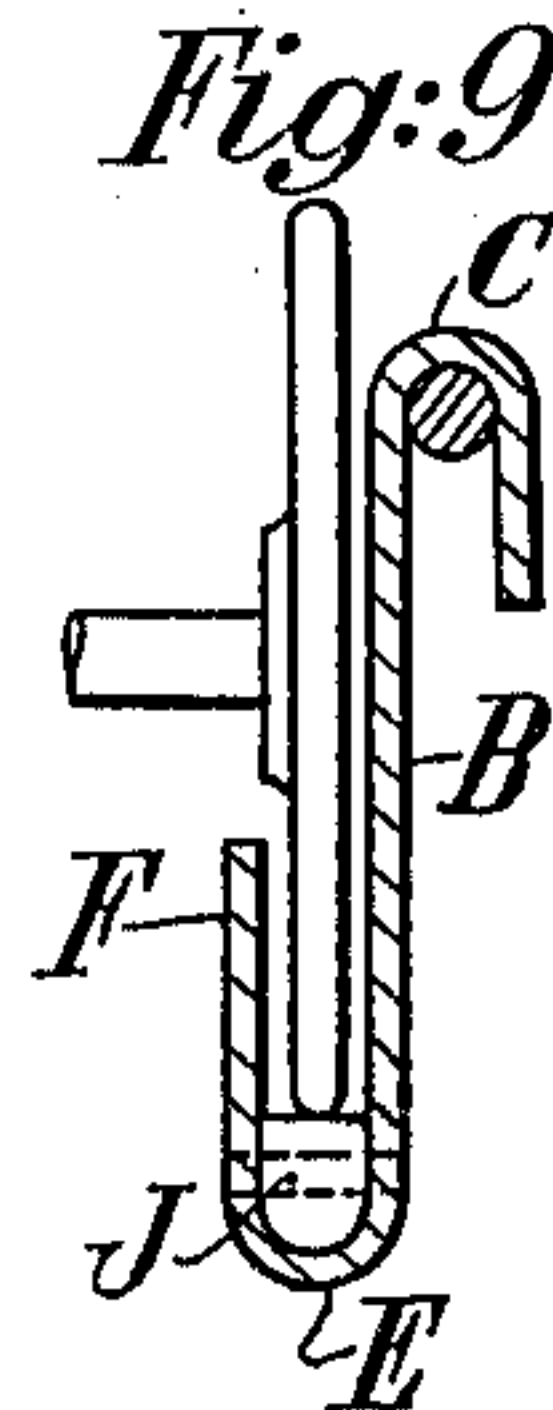
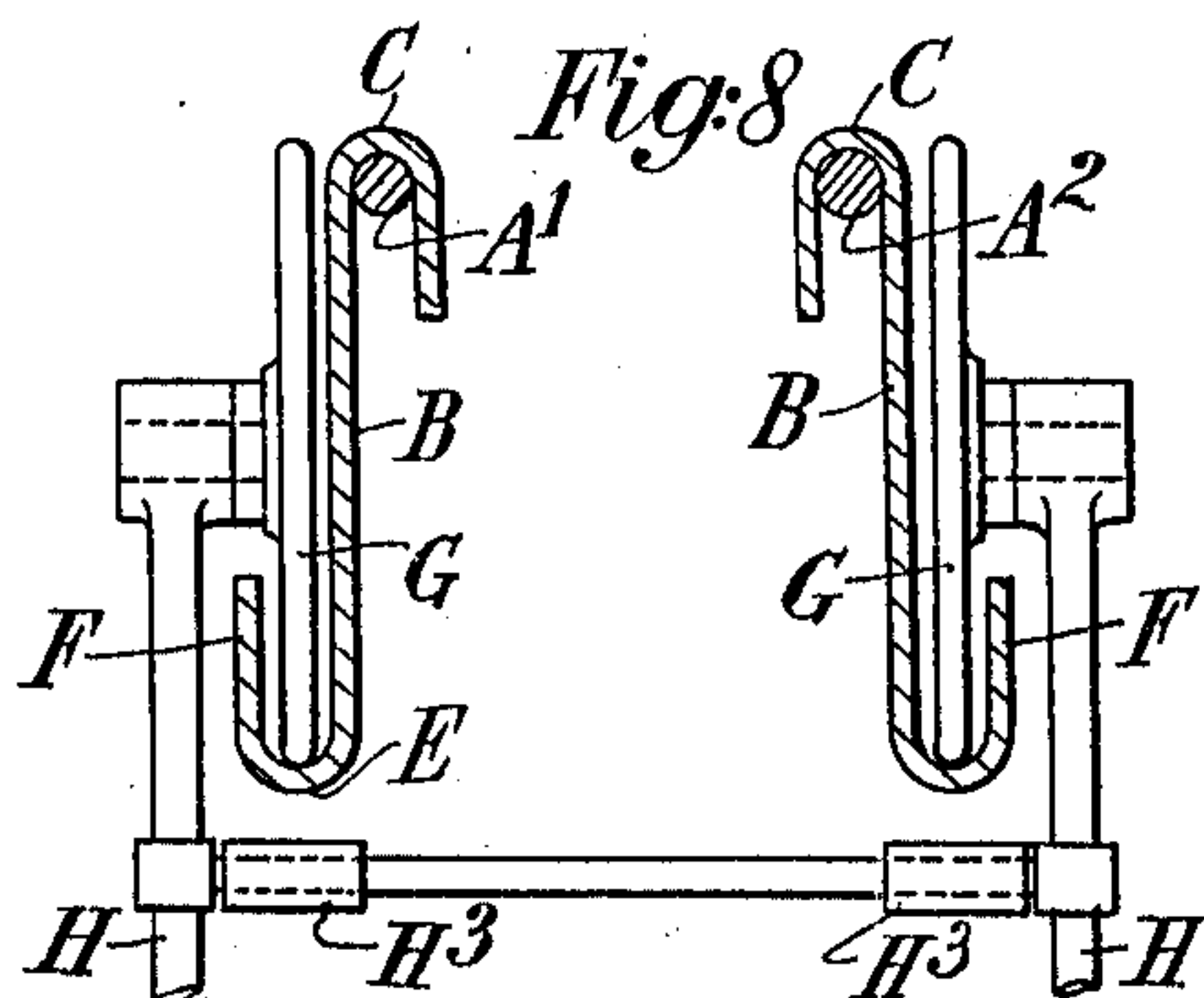
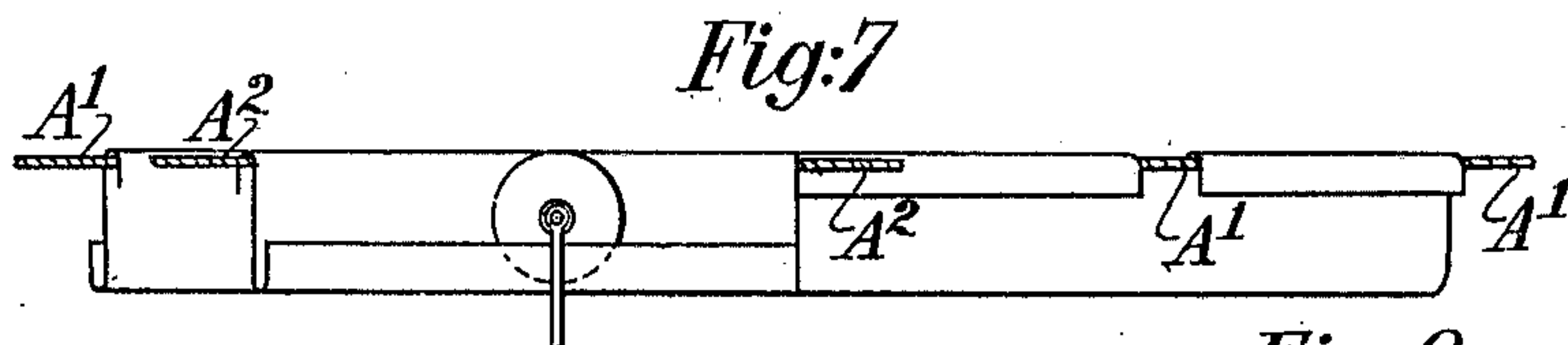
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4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

Fig:17

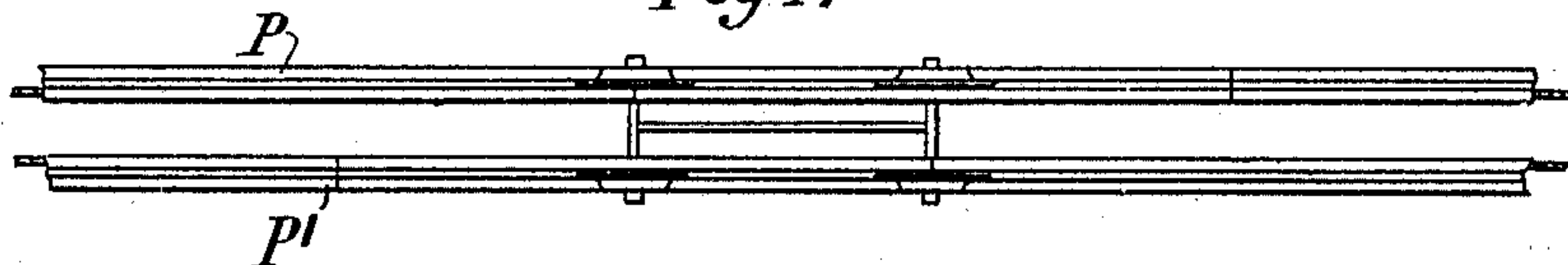


Fig:18



Fig:19

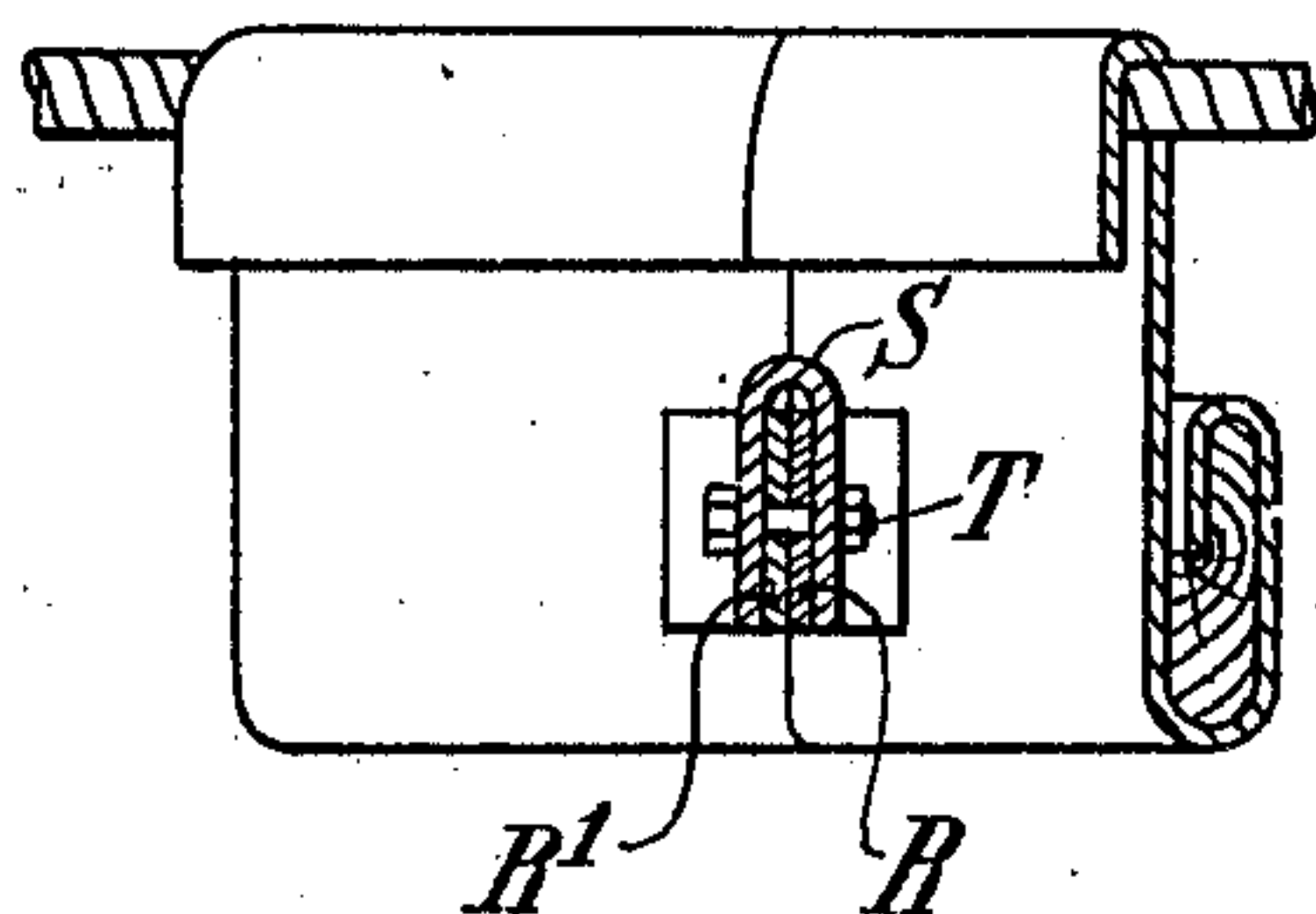


Fig:20

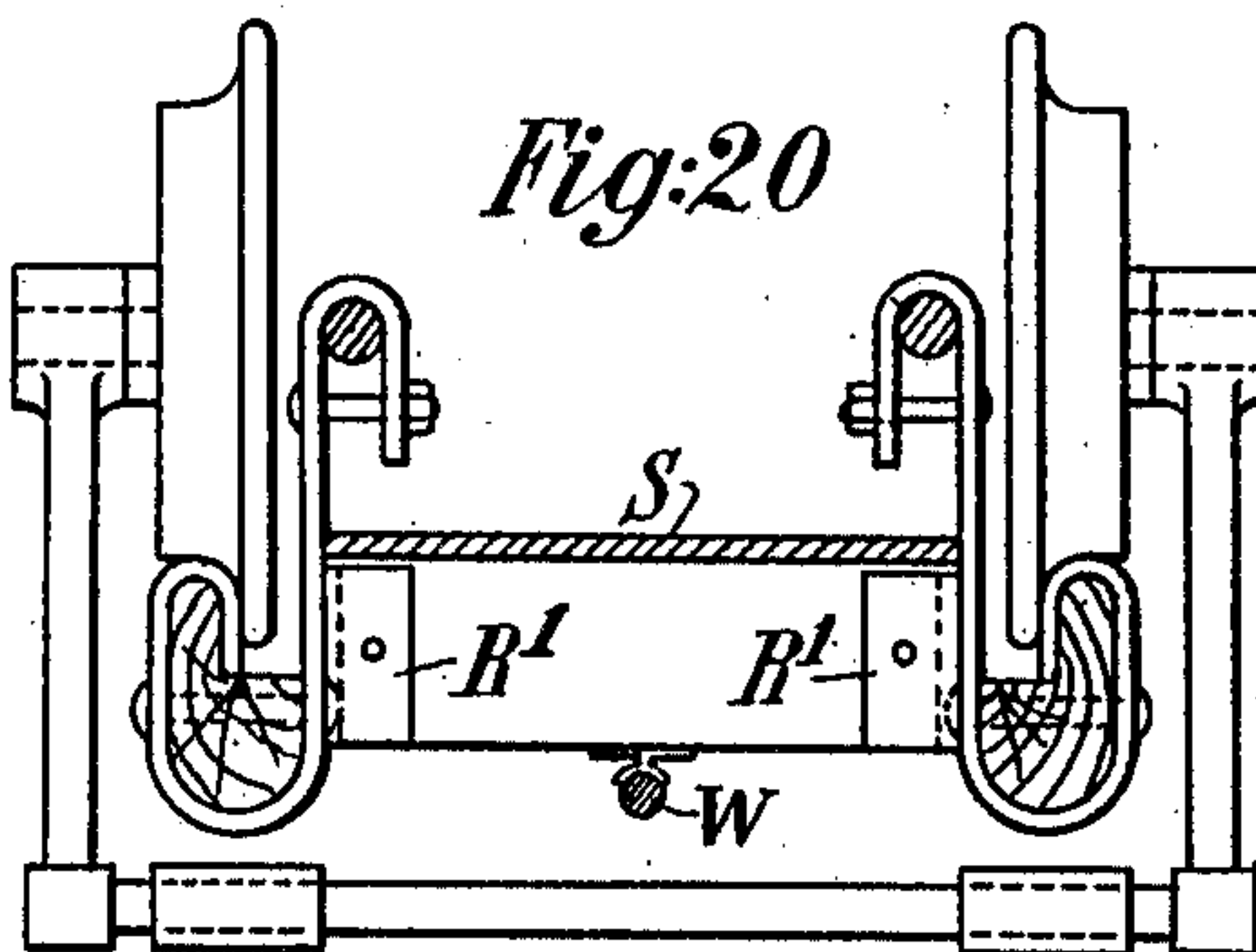


Fig:21

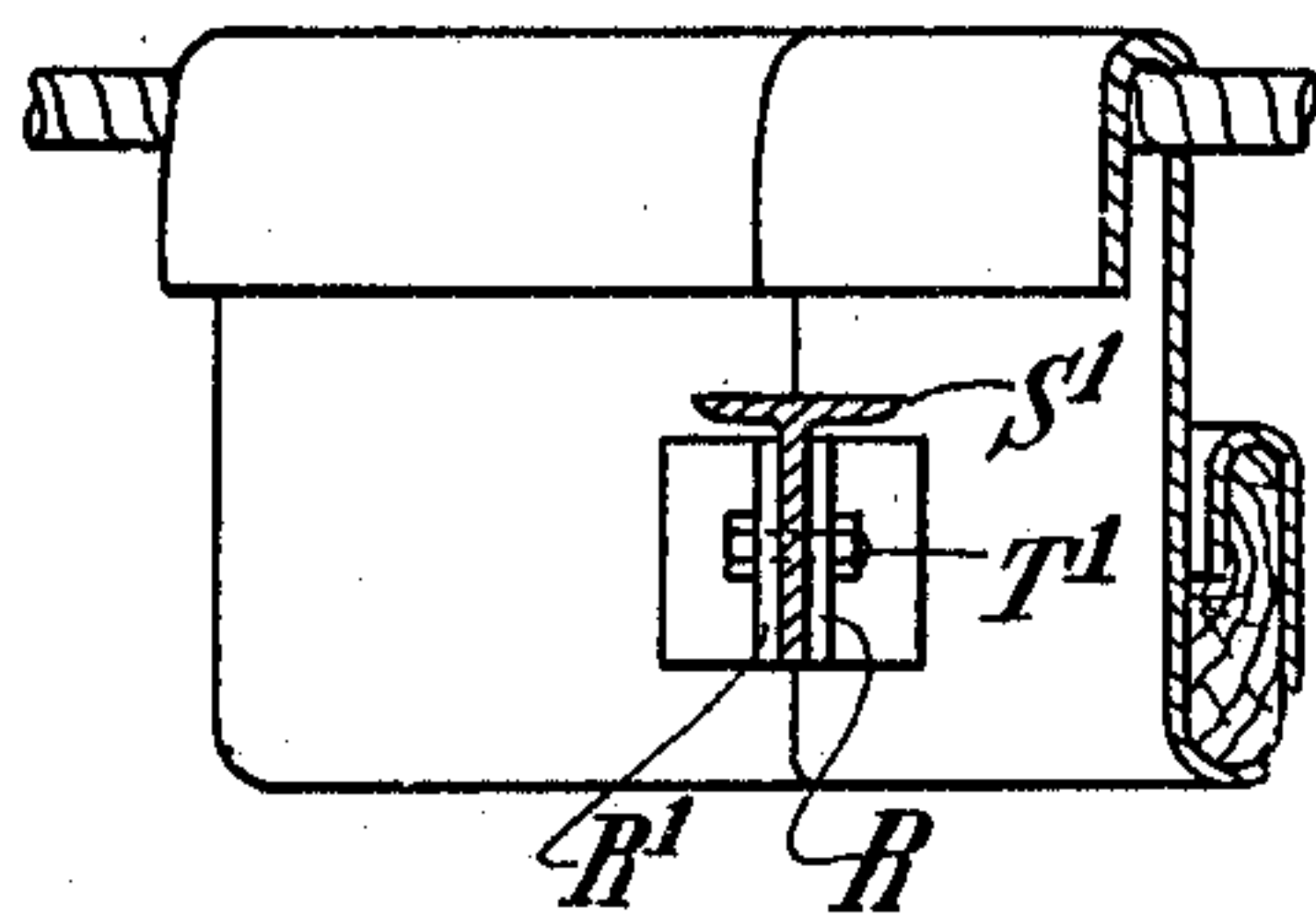
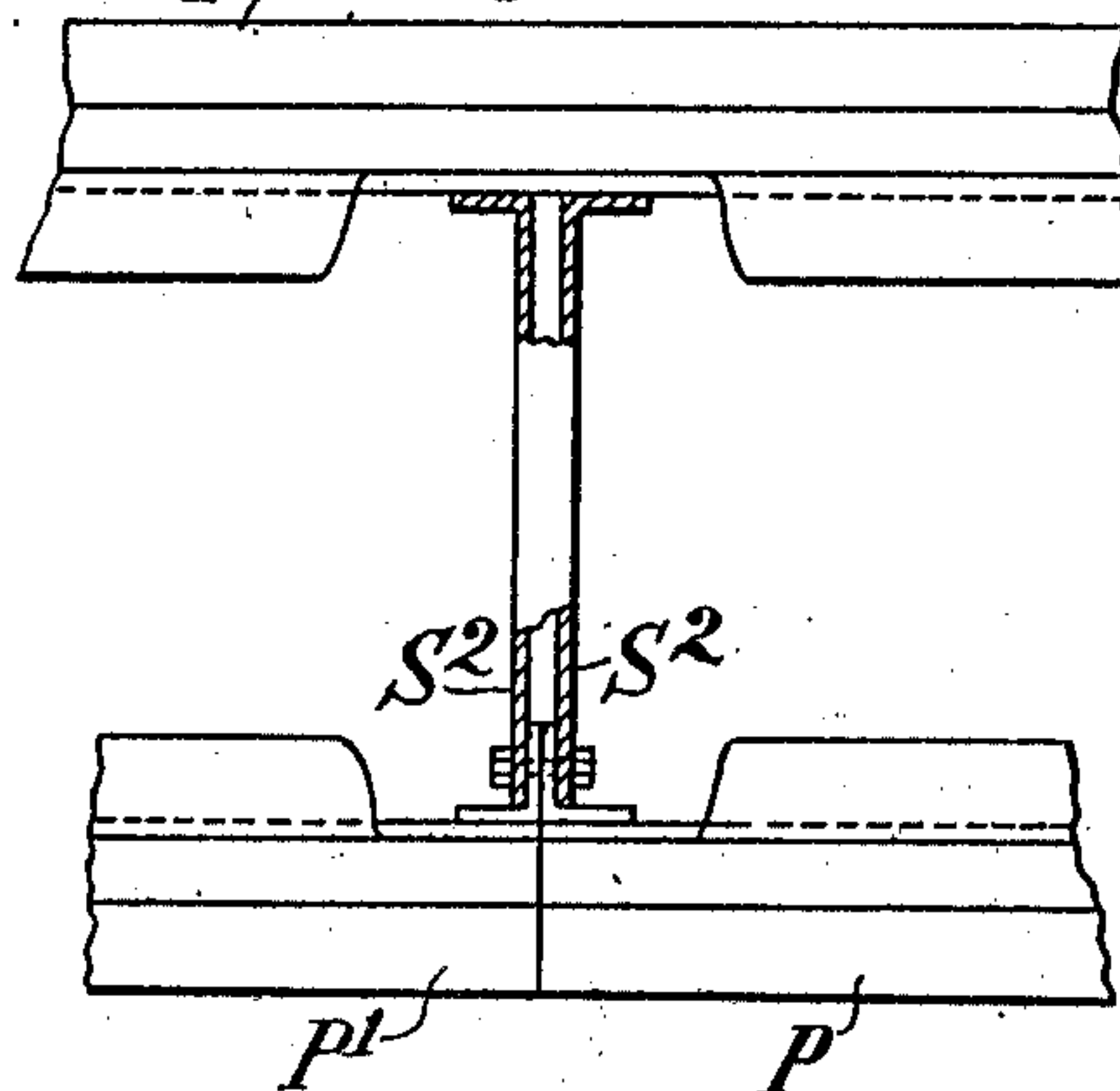


Fig:22



Witnesses

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4 SHEETS—SHEET 4.

Fig:23

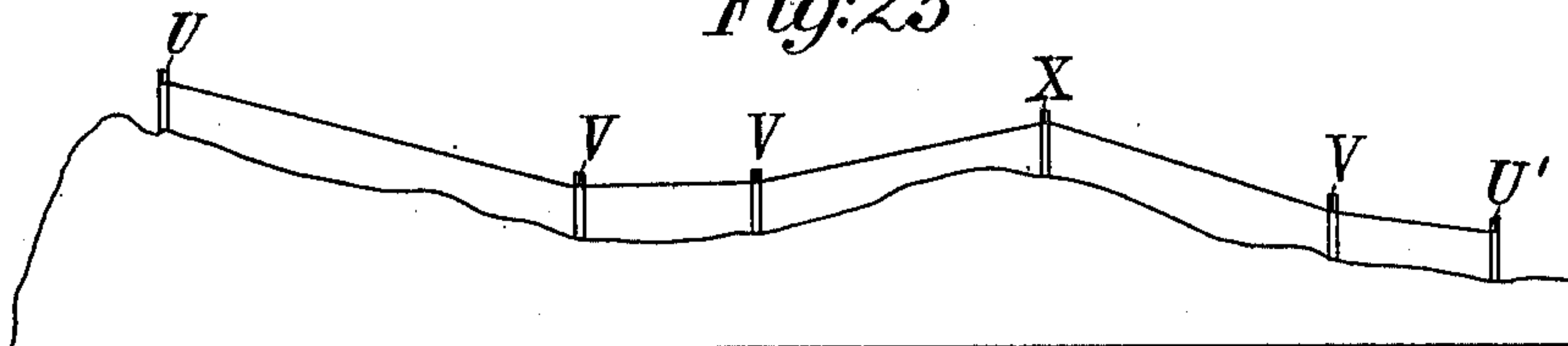


Fig:24

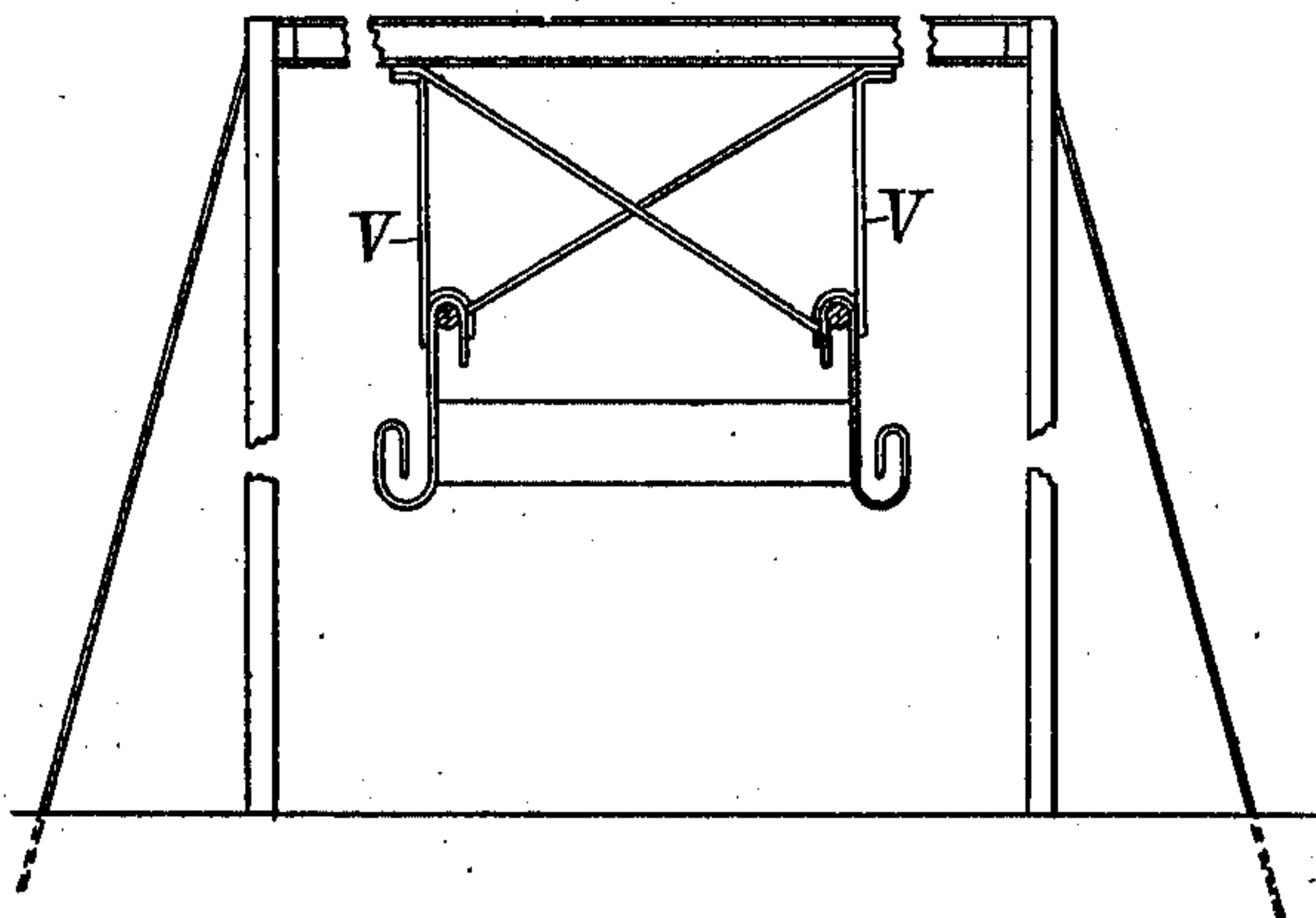


Fig:25

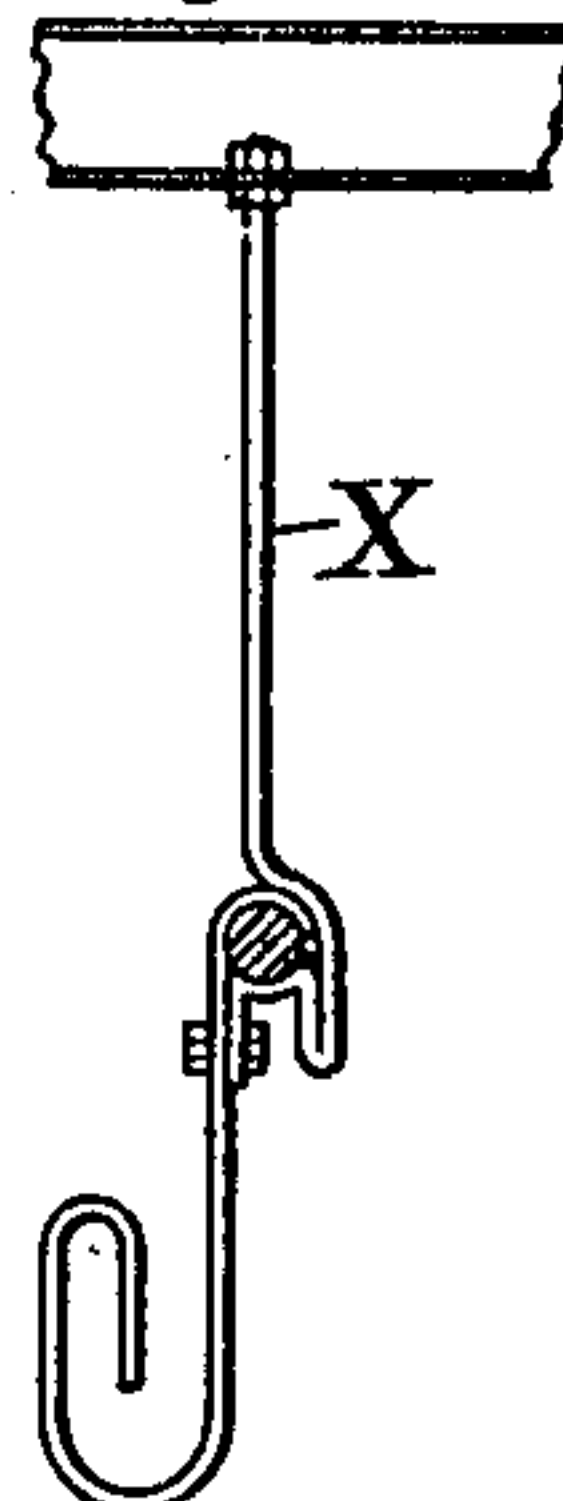


Fig:26

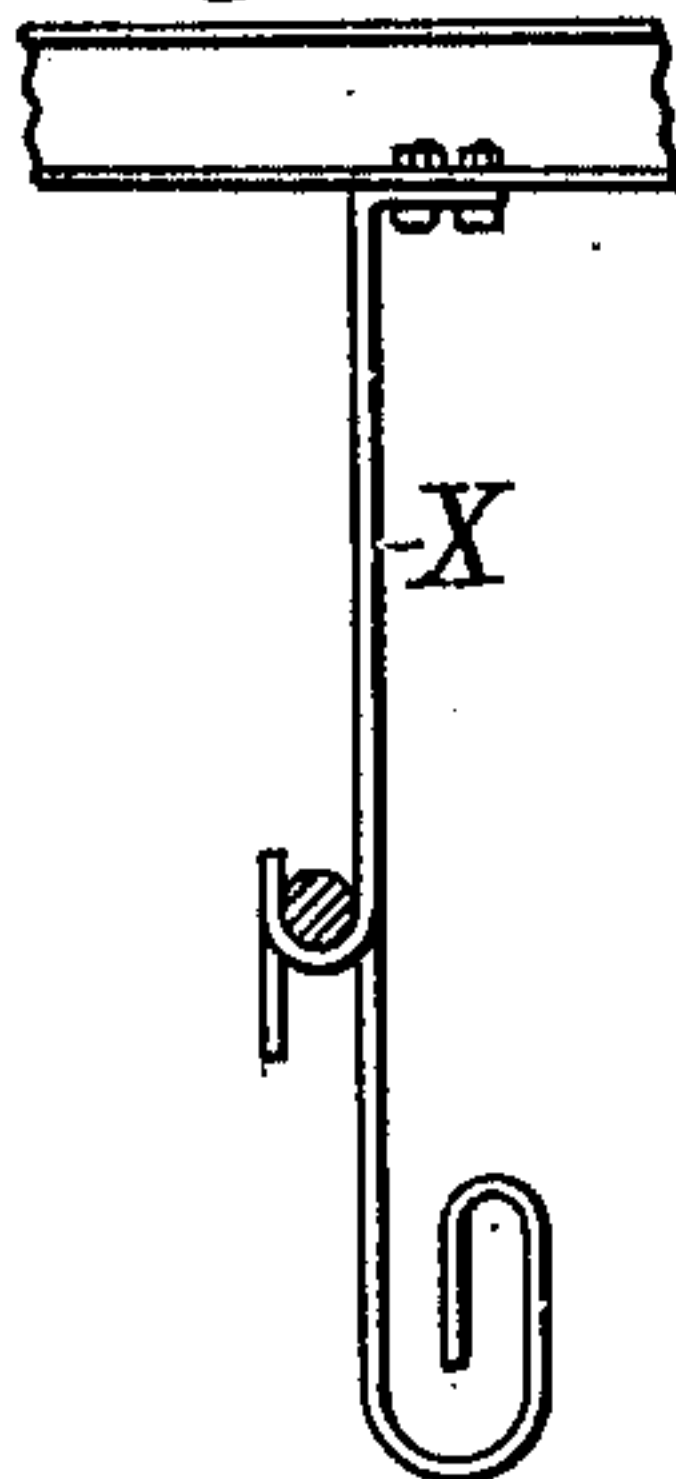
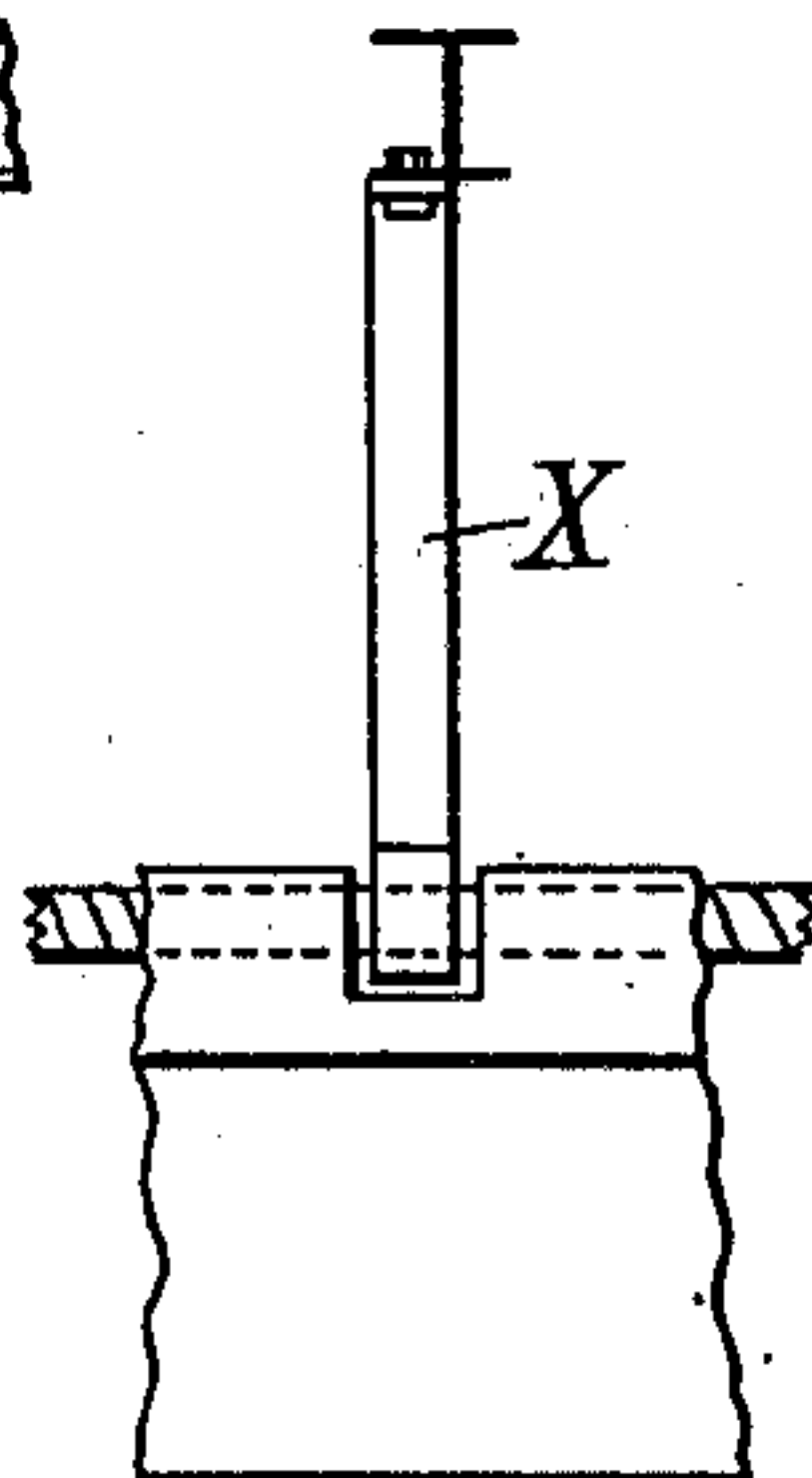


Fig:27



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UNITED STATES PATENT OFFICE.

WILLIAM L. HAMILTON, OF GLASGOW, SCOTLAND.

AERIAL OR SUSPENDED RAILWAY.

978,581.

Specification of Letters Patent.

Patented Dec. 13, 1910.

Application filed August 5, 1910. Serial No. 575,791.

To all whom it may concern:

Be it known that I, WILLIAM LINDSAY HAMILTON, a subject of the King of Great Britain and Ireland, and of 39 Bothwell street, Glasgow, Scotland, have invented new and useful Improvements in or Connected with Aerial or Suspended Railways, (for which I have made applications for patents in Great Britain, No. 886, bearing date January 13, 1910, and No. 10,635, bearing date April 30, 1910,) of which the following is a specification.

In one of its most simple forms an aerial way consists of a single cable suspended between two stations, the top surface of the cable serving as a track for a traveler, for example, the wheels of a carriage, to run upon. In another form it has been proposed to construct an aerial way by suspending a single cable from bracket supports and to mount upon the brackets and the cable suspended therefrom a track of inverted trough section for the wheels of a carriage to run upon, the track deriving its support primarily from the brackets, thus necessitating that the track be comparatively rigid if continuous between the brackets, or if in sections, that the sections be rigidly fixed together. In other forms of construction, a single line of rigid sections of girder character have been provided, each section being mounted upon or suspended from a bracket support, in some cases suspended from its ends, and in other cases suspended at intervals by suspenders depending from a suspended cable; and in aerial ways of this type it has been proposed to construct the track from sheet metal of inverted trough section having two ways formed by turning the bottom edges of the sides of the trough upward, for the wheels of a carriage to run upon.

The object of this invention, which relates to aerial railways, is to provide a track composed of a longitudinal assemblage of sections, and to wholly support the track by a flexible support suspended between points to be connected, the adjacent sections having some freedom of angular movement relative to one another so that the track produced approximates in flexibility to that of a cable way, the track comprising a way or ways of which every portion is directly supported by suspenders depending from the cable.

According to this invention a flexible support is provided, which may consist of a

wire rope, cable, chain or the like, hereinafter referred to as a cable, suspended between the points it is desired to connect, in association with which a track is provided comprising continuous sectional suspenders which depend from the cable and support a sectional way or ways, for a traveler, such, for example, as the wheels of a carriage, to run upon. In construction, the ways of the track, according to this invention, are adapted to be formed so that the wheels of the carriage can be entered to run upon them at what may be termed an entry end of the railway, and when entered to be positively locked against displacement therefrom, the railway being formed with an exit end from which the wheels may be removed.

Some examples of constructions embodying the features of this invention will now be described with reference to the accompanying drawings, in which:—

Figure 1 is a side elevation partly in section, and Figs. 2 and 3 are cross sectional end views of a single cable supported track, and Figs. 4, 5 and 6 are end sectional views of modified forms of tracks to be described. Fig. 7 is a side elevation partly in section and Fig. 8 is a cross sectional end view of a track supported by two cables. Figs. 9, 10, 11, 12, 13, 14, 15 and 16 illustrate in cross sectional end views modifications of tracks to be described. Figs. 17 and 18 are plans of tracks, supported by two cables. Figs. 19 and 20 are respectively a side sectional view and a cross sectional view of cross stays, and Figs. 21 and 22 show modifications thereof. Figs. 23, 24, 25, 26, and 27 illustrate details relating to a railway erected according to this invention.

In the accompanying drawings A designates a single cable suspended between two stations and having its ends secured by means which may comprise tightening gear for putting the cable into tension.

In the forms of construction illustrated at Figs. 1, 2 and 3, a single cable A is arranged to carry a track comprising two suspenders B B depending from a yoke C formed to rest directly upon the cable A, the lower ends of the suspenders being continued to form two ways E E. The two ways E E, which project toward one another from the lower ends of the suspenders B B, are each formed with an upwardly projecting guard F. For use in conjunction with a double track of this description a

carriage may be used having two wheels G G, from the axle of which a hanger H depends between the two ways E E. To prevent the carriage from leaving the track the guards F F project sufficiently high, so that if the carriage should rise, the wheels G G are prevented from leaving the track by coming into contact with the yoke C. The same result may be obtained by providing the hanger H, as shown at Fig. 3, with a cross bar, preferably furnished with rollers H¹, arranged to extend beneath the ways E E, and set sufficiently close so as to prevent the wheels G G from passing over the guards F F. In another form of construction, as illustrated at Figs. 4 and 5, the ways E E of a double track may project outwardly from the lower end of two suspenders B B, the outer edge of each track being formed with a guard F, and in order to prevent the carriage, which may comprise wheels G G and a hanger H, from leaving the track, a projection C¹ may be formed near the upper ends of the suspenders to extend over the wheels G G, or as shown at Fig. 5, the hanger H may be formed with a cross bar preferably furnished with rollers H² arranged to extend beneath the ways E E.

In some cases a track having a single way may be provided according to this invention, an example of which is shown at Fig. 6, and comprises a single cable A, yoke C, suspender B, way E, and guard F, associated with a traveler comprising a wheel G and a hanger H. To prevent the traveler from leaving the track the yoke C may be arranged to project over the top of the wheel, or the hanger may be bent so as to present a shoulder beneath the track B. In another form of construction, an example of which is shown at Figs. 7 and 8, two cables A¹ A² are provided spaced apart, each furnished with a yoke C having a suspender B carrying at its lower end a track E formed with a guard F, associated with a traveler comprising wheels G G and hangers H H connected together by a cross bar preferably furnished with rollers H³ extending beneath the tracks E E for restricting the rise of the wheel and so preventing the traveler from leaving the track.

In the construction of railways according to this invention, each track is composed of a series of sections coupled together, and the sections may be of sheet formation, the yoke, suspender, track and guard, if provided, of each section being formed in one part by stamping from sheet metal, some examples of which will now be described with reference to Figs. 9 to 16.

In one form of construction, as illustrated at Fig. 9, in which a yoke C, suspender B, way E, and guard F are stamped from sheet metal, the way E is fitted with a metal rail

or tread J for the wheels of a carriage to run upon. In some forms of construction, the way for the wheels to run upon may be formed on the crown of the guards instead of at the base as in the forms described, some examples of which will now be described with reference to Figs. 10 to 16, which indicate sections produced from sheet metal, each comprising two portions J¹ J² folded so as to present a bearing way E¹ at the juncture of the fold, each portion J¹ J² being directed downward from the juncture of the fold or way E¹, and preferably set in alinement with the axis of thrust of the traveler. In some cases the presented faces of each portion J¹ J² may be in contact, as shown at Fig. 10; in others they may be distanced apart, as shown at Fig. 11, and the juncture forming the bearing way E¹ may be rounded and the portions which extend therefrom may be set parallel, as shown at Fig. 11, or inclined to one another, as shown at Fig. 12. A rail of this character may be comprised in construction with a suspender B of plate formation, for example, the portion J¹ may be extended to form the suspender B, the juncture K between the lower end of the suspender and the portion J¹ being curved or otherwise formed so that the way E¹ is carried at a distance from the side of the suspender. In constructions of this form, for example, as shown at Fig. 13, where the formation of the way E¹ presents an inverted channel and the formation of the juncture K of the rail portion and suspender presents an upright channel, a filling L may be introduced, conforming to the cross sectional area of the adjoining channels. This filling may consist of wood, metal, or other material, or substance, associated therewith, or not, series of ties M may be introduced to extend from the outer face of the suspender to the outer face of the rail portion, below the tread of the rail at any suitable position conveniently close thereto, say, beneath the edge of the portion J², which, in some cases, may extend downward to, say, midway between the bearing way E¹ and the juncture K at the bottom of the suspender B. In some cases, as shown at Fig. 14, a fold might be adopted turned outwardly from the suspender, associated or not with fillings L¹ L² and furnished with ties M as might be desirable. Ties for this purpose may consist of bolts or rivets. In some cases the upper end of a suspender of the plate form may be turned over so as to produce an inverted trough to fit over the cable and serve as a yoke C. Ways of this character may be furnished with a tread comprising, for example, as shown at Fig. 15, a crown N adapted to present a seating of a concave nature to fit over the top of the way E¹, or the surfaces of the ways E¹, as shown at Fig. 16, may be formed to present

a recessed seating into which a crown N^1 is adapted to be seated. In addition to the support obtained in their seatings the treads may be otherwise fixed.

5 In providing coupled sections with rails such as J or crowns such as $N N^1$, or fillings such as L, L^1 , L^2 , these parts may be arranged to overlap the joints, for example, the parts may, in some cases, be of greater
10 or equivalent length than the sections, preferably meeting at the middle of the sections. For use in conjunction with sections of the character described, with reference to Figs. 10 to 16, traveler wheels may be
15 adopted comprising a main bearing wheel G^1 adapted to run upon the rail, and having a flange G^2 adapted to travel in the channel formed between the rail and the suspender, the face of the flange presented toward the
20 suspender standing clear thereof. In some cases the periphery of the flange may be arranged to bear upon a track, provided, say, on the surface of the filling L or L^1 .

In the construction of tracks comprising
25 a series of sections coupled together, provision may be made whereby the load of a carriage having two or more wheels may be so distributed that as one wheel or any pair are passing over a joint, the complementary
30 wheel or pair are passing over the body of a section or the bodies of sections, preferably, at about the center or centers thereof. Some examples of construction according to this part of the invention, as applied
35 to two tracks set parallel to one another, will now be described with reference to Figs. 17 and 18. In the arrangement indicated at Fig. 17, the joints between the sections P of one track are set midway between
40 the joints of the section P^1 on the opposite track, for use in conjunction with a carriage having, say, two pairs of wheels, the wheels of each pair being co-axial. In an alternative arrangement, as shown at Fig.
45 18, the wheels of a pair are arranged one in advance or arrear of the other, and as shown with a carriage having two pairs of wheels, the wheels on one track are set in advance of the respective wheels on the opposite
50 track so that diagonal pairs of wheels are arranged to bear, say, upon the centers of two sections on opposite tracks $P^2 P^3$, while the other pair pass over joints. Carriages of this kind may be constructed so that a
55 connection is formed between the diagonal pairs, whereby the load may be sustained through connections made by connecting the wheels in diagonal pairs.

The sections of each track may be provided with couplings, and when the joints are directly opposite one another, a pair of couplings may be associated in construction with a cross stay adapted to extend between the two tracks, such, for example, as shown
60 at Figs. 19 and 20, which comprises two

shoulders R R^1 projecting from the inner side of each section, over which an inverted channel shaped connecting bar S is adapted to be placed, extending between the two
70 tracks, thus serving the purpose of a cross stay and also that of a coupling for each pair of shoulders R R^1 . In order to guard against the sections spreading, a bolt T may be passed through each end of the bar S and shoulders R R^1 . In another form, as
75 shown at Fig. 21, the shoulders R R^1 may be spaced apart to permit the fin of a tee section connecting bar S^1 to be inserted, the shoulders and the fin of the bar S^1 at each end being coupled together by a bolt T^1 .
80 In cases where the joints are not opposite, as indicated at Fig. 22, a connecting bar S^2 may be provided for connecting the ends of two sections $P^1 P^1$ of one track, and adapted to extend across to and be connected to an
85 opposite section P, say, at a position midway between the ends thereof.

For electric traction purposes a conductor may be associated with a track according to this invention. For example, as shown at
90 Fig. 20, a conductor W may be suspended from the cross stays S or otherwise supported from the suspenders or cables.

In application, railways constructed according to this invention are particularly
95 adapted to be used for purposes of entertainment, by arranging the railway so that it extends from an elevated to a lower station, the hangers or carriers being furnished with cages or other means for supporting in-
100 dividuals, the arrangement being such that the traveler or travelers of each cage is introduced at the upper end and gravitates down, and may be removed from the other to be elevated in order to travel back by a
105 return track, or returned to the leading end of the original track. The railways are also adapted to be associated with haulage gear and are adapted to be used for transport or commercial purposes.
110

Fig. 23 is a diagram showing an example of a railway of a form which this invention is adapted to take, comprising end supports U U^1 , between which are furnished depression stays V and a suspension support X.
115 A construction of one of the depression stays V is shown in detail at Fig. 24, and two examples of constructions of suspension supports X are shown at Figs. 25 and 26 and 27.

I claim:

1. A cable in suspension, a longitudinal assemblage of sections wholly supported by resting upon the cable, the adjacent sections having some freedom of angular movement relative to one another, each section comprising
125 a suspender extending downward from the cable and a way of which every portion is directly supported by the suspender, for the purposes set forth.

2. A cable in suspension, a longitudinal
130

- assemblage of sections wholly supported by resting upon the cable, the adjacent sections having some freedom of angular movement relative to one another, each section comprising two suspenders extending downward from the cable and two ways of which every portion of each way is directly supported by one of the suspenders, for the purposes set forth.
3. A cable in suspension, a longitudinal assemblage of sheet metal sections wholly supported by the cable, the adjacent sections having some freedom of angular movement relative to one another, each section comprising a continuous yoke to rest upon the cable, a continuous suspender depending from the yoke, and a continuous way supported by the suspender, for the purposes set forth.
4. A cable in suspension, a longitudinal assemblage of sheet metal sections wholly supported by the cable, the adjacent sections having some freedom of angular movement relative to one another, each section comprising a continuous yoke to rest upon the cable, two continuous suspenders depending from the yoke and two continuous ways, each supported by one of the suspenders, for the purposes set forth.
5. A cable in suspension, a longitudinal assemblage of sheet metal sections wholly supported by resting upon the cable, the adjacent sections having some freedom of angular movement relative to one another, each section comprising a suspender extending downward from the cable and an upright channel way of which every portion is directly supported by the suspender, for the purposes set forth.
6. A cable in suspension, a longitudinal assemblage of sheet metal sections wholly supported by resting upon the cable, the adjacent sections having some freedom of angular movement relative to one another, each section comprising a suspender extending downward from the cable, an upright channel way of which every portion is directly supported by the suspender, and a metal tread fitted in the channel way, for the purposes set forth.
7. A cable in suspension, a longitudinal assemblage of sheet metal sections wholly supported by resting upon the cable, the adjacent sections having some freedom of angular movement relative to one another, each section comprising two suspenders extending downward from the cable and two upright channel ways of which every portion of each way is directly supported by one of the suspenders, for the purposes set forth.
8. A cable in suspension, a longitudinal assemblage of sheet metal sections wholly supported by resting upon the cable, the adjacent sections having some freedom of angular movement relative to one another, each section comprising a suspender extending downward from the cable and an inverted channel way of which every portion is directly supported by the suspender, for the purposes set forth.
9. A cable in suspension, a longitudinal assemblage of sheet metal sections wholly supported by resting upon the cable, the adjacent sections having some freedom of angular movement relative to one another, each section comprising a suspender extending downward from the cable, an inverted channel way of which every portion is directly supported by the suspender, and a crown mounted upon the top of the inverted channel way, for the purposes set forth.
10. A cable in suspension, a longitudinal assemblage of sheet metal sections wholly supported by the cable, each section comprising a suspender extending downward from the cable, an inverted channel way of which every portion is directly supported by the suspender, a filling within the inverted channel way and ties connecting the outer side of the channel way with the suspender, for the purposes set forth.
11. A cable way in suspension, a longitudinal assemblage of sheet metal sections wholly supported by the cable, each section comprising a suspender extending downward from the cable, an upright channel and an inverted channel way turned toward the suspender, a filling within the upright and inverted channels, and ties extending from the outer side of the inverted channel to the suspender, for the purposes set forth.
12. A cable in suspension, a longitudinal assemblage of sheet metal sections wholly supported by the cable, each section comprising a suspender extending downward from the cable, an upright channel and an inverted channel way turned away from the suspender, fillings within the upright and inverted channels, and ties extending from the outer side of the inverted channel to the suspender, for the purposes set forth.
13. An aerial railway consisting of two cables in suspension, two longitudinal assemblages of sections each wholly supported by resting on a cable, the adjacent sections having some freedom of angular movement relative to one another, each section comprising a suspender extending downward from the cable and a way of which every portion is directly supported by the suspender, for the purposes set forth.
14. An aerial railway consisting of two cables in suspension, two longitudinal assemblages of sections each wholly supported by resting on a cable, the adjacent sections having some freedom of angular movement relative to one another, each section comprising a suspender extending downward from the cable and a way of which every

portion is directly supported by the suspender, the joints of the sections on one cable being set at intermediate positions, for the purposes set forth.

- 5 15. An aerial railway consisting of two cables in suspension, two longitudinal assemblages of sections each wholly supported by resting on a cable, the adjacent sections having some freedom of angular movement
10 relative to one another, each section comprising a suspender extending downward from the cable and a way of which every portion is directly supported by the suspender, the joints of the sections on one
15 cable being set at positions opposite to those on the other cable, for the purposes set forth.

- 20 16. An aerial railway consisting of two cables in suspension, a longitudinal assemblage of sections wholly supported by each cable, each section comprising a suspender extending downward from the cable and a

way of which every portion is directly supported by the suspender, associated with stays extending between the sections supported by the two cables, for the purposes set forth. 25

17. An aerial railway consisting of two cables in suspension, a longitudinal assemblage of sections wholly supported by each cable, each section comprising a suspender
30 extending downward from the cable and a way of which every portion is directly supported by the suspender, associated with stays extending between the sections supported by the two cables, the stays comprising means for coupling adjoining sections of each longitudinal assemblage, for
35 the purposes set forth.

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Witnesses:

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