N° 13,679 A.D. 1905

Date of Application, 3rd July, 1905—Accepted, 28th Sept., 1905

COMPLETE SPECIFICATION.

"Improvements in Aerials for the Transmission and Receipt of Electromagnetic Wave Energy."

I, REGINALD AUBREY FESSENDEN, of 1737 Riggs Place, City of Washington, District of Columbia, United States of America, Electrical Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

The invention described herein relates to certain improvements in aerials for transmission and receipt of electromagnetic waves over long distances. Heretofore in the transmission of power by electromagnetic waves great difficulty has been met in providing a suitable antennae, more especially in obtaining one of suitable height, with suitable mechanical and electrical strength. The invention described herein has for its object a construction of antennae or aerials embodying the desirable features of such an element. The invention is hereinafter more fully described with reference to the accompanying drawings, in which Fig. 1 is a top plan view of the improved aerial; Fig. 2 is a side elevation of the same; Figs. 3, 4 and 6 illustrate two forms of constructions of joints or connections between adjacent sections; Fig. 5 is a sectional detail view illustrating the manner of connecting temporary or auxiliary guys to the aerial; Fig. 7 is a view partially in section and partly in elevation illustrating the manner of connecting the permanent guys to the aerial; Fig. 8 is a sectional plan view on a plane indicated by the line VIII—VIII Fig. 7; Fig. 9 is a sectional detail view of a suitable means for connecting the guys to the aerial, and to the anchorage; Fig. 10 is a transverse section on line X—X of Fig. 9; Figs. 11 and 12 are detail views illustrating the manner of connection intermediate sections of the guys; Figs. 13 and 15 are views partly in section and partly in elevation illustrating modifications of the constructions shown in Figs. 11 and 12; Fig. 14 is a view showing several sections of the guys connected together by the constructions shown in Figs. 13 and 15; Fig. 16 is a view partly in section and partly in elevation of the foundation of the aerial; Figs. 17 and 18 are detail views of parts of the foundation; Figs. 19 and 20 illustrate a manner of applying dynamometers to the guys for equalizing the strains thereof; and Figs. 21 and 22 are sectional elevations and plans of a desirable form of condenser to be used in connection with the improved aerial.

The aerial is formed of sections 1, connected together in the manner hereinafter described and provided at the top with a crown or collection of wires 2 radiating from the aerial at points near the top of same, and having their ends connected to a hoop or band 3, which is supported by gaffs 4. The sections 1 are secured together by suitable joints with or without suitable insulation between the sections or members of the joints. In Fig. 3 is shown a form of joint in which each section of the aerial is insulated from adjacent sections. The cylindrical sections are riveted or bolted to the castings 5 and 6 which are adapted to be held together by bolts 7. The castings are insulated from each other by a fibre washer 8, preferably extending at its edge beyond the edges of the meeting faces of the casting, so that there will be no liability of moisture forming a bridge from one section to the other. It is preferred to form the castings 5 with extending lips 9 which project over the edges of the

[*Price 8d.*]

insulating disc, and form draining surfaces to carry away moisture from the joints. The nuts and heads of the bolts are insulated by fibre washers 10, from the castings, such washers being preferably interposed between the castings and bearing plates 11 under the heads of the bolts and nuts as shown. Where the sections of the aerial are insulated from each other as described, they may be electrically connected by a suitable means for modifying the resonance. This means may consist of an inductance coil 12, a condenser preferably such as shown in Figs. 21 and 22, or both. By properly proportioning the inductance or capacity, or both, the antenna or aerial may be divided into a number of sections electrically, each section being resonant to any desired periodicity. In Figs. 4 and 6 is shown a suitable joint for connecting the aerial sections where no insulation is required. This joint consists of ring castings 16 and 17, bolted or rivetted to the cylindrical sections and clamped together by means of bolts 18 passing through flanges on the rings. It is preferred that one of the ring castings should be socketed or recessed for the reception of the other casting, and it is also preferred that the vertical wall of such socket or recess should be extended out slightly, as at 19, to form a drainage surface.

A convenient means for attaching temporary or auxiliary guys to the aerials consists of castings 20 secured to the sections at different points around its perimeter. These castings are provided with vertical webs through which pass pins 21 for engagement with the eyes of the clevis 22 to which the guys 23 are secured.

The permanent guys are preferably secured to the mast or aerial in the manner shown in Figs. 7 and 8. As therein shown a spool 24, formed of porcelain or other insulating material, is mounted on the shaft 25, the ends of which are connected by straps 26 and 27 to the sections of the aerials. Where four or more guys extend from the same point, or practically the same point, of the section, the straps 26 and 27 supporting one spool will cross the corresponding straps of another spool, and for the sake of strength and rigidity, crossing straps are clamped together and braced by castings 28. The guys 30 are connected to the spools by straps 29 passing around the same.

While suitable spools of insulating material mounted on the shafts as described may be used, it is preferred that the construction shown in Figs. 9 and 10 be employed. In this construction the shaft 25 is made tapering from its centre, and is provided with journals at its end for the reception of the straps 26 and 27, said straps being held in place by the nuts. This shaft is surrounded by a porcelain sleeve 32 bearing on the shaft along its straight or flattened middle portion, a bushing of fibre or other insulating material being preferably interposed between the shaft and sleeve 32. The sleeve is preferably made of a length equal to the distance between the journals on the ends of the shaft and the ends thereof are protected by leather or fibre bushings from the straps 26 and 27. The spool is made up of a series of overlapping or intercalating porcelain cylinders or shells 33 which may be held in proper relation to each other by cement as shown. A bushing of leather or fibre is preferably interposed between the spool and the strap 29 for connecting the spool to the guys. The connection between the guys and the spool is formed by a block 34 bearing against the spool, and provided with trunnions 35 for the reception of the eyes of the clevis 36. The strap 29 passes around this block firmly clamping it to the spool.

In order to connect the sections on the guys, a double saddle 37 is provided, formed with transverse passages 38 and 39 therethrough for the passage of the guys as shown in Figs. 11 and 12, and formed of porcelain or other suitable insulating material. While this construction forms an effective union between adjacent sections of the guys, it is preferred to employ the construction shown in Figs. 13 and 15. In this construction one part or member consists of a yoke 40 having a socket for attachment to the wire guy, and a pin 41 passing transversely through the arms of the yoke. On this pin is mounted a wheel 42,

preferably metal and surrounded by a sleeve 43 of porcelain or other insulating material, a fibre or leather bushing 44 being interposed between the sleeve and the wheel. This sleeve is preferably grooved to form a seat or bearing for the guy passing around it and in practice it is preferred to interpose a bushing of leather or fibre or other suitable material between the guy and the bearing sleeve. To protect this joint or connection from rain, sleet, *etc.*, a hood or shield 45 is attached to the guys, and extends around and over the joint, as shown in dotted lines.

As it is preferred that the aerial or antenna should have some freedom of movement independent of the foundation, a ball and socket, or rocking joint, is provided at the lower end of the lowest section. This joint consists of a cup shaped portion 46 and a ball portion 47, one of which is secured to the aerial and the other to the foundation. In the construction shown the cup portion is secured to the lowest section of the aerial, and the ball portion is formed on the top of the pedestal 48 embedded in the upper cement portion of the foundation. Between the upper and lower cement portions of the foundation is interposed a suitable insulation. A desirable construction of insulation consists of one, two or more series of cones 49 formed of porcelain or other suitable insulating material. When two or more series of cones are employed, the cones of one series have their bases embedded in a cement in a pan 50 having upturned edges, and their upper ends embedded in cement in similar but inverted pan. When two or more series of this insulating means are employed, adjacent pans are secured together by bolts and rivets as shown.

In order to regulate the strain on the several guys around the aerial, means are provided for attaching dynamometers 51 thereto. This means consists of two blocks having transversely tapering arms extending therefrom, over the ends of which are passed the rings 53 connected to the dynamometers. The position of these rings on the arms is determined and regulated by means of wedges 54 passing through the arms. As the arms are tapered as described, an inward or outward movement of the rings along the arms will cause the latter to move up or down, thus providing for a very fine adjustment of the strains. When the dynamometers have been applied, the turn buckle 55 normally connecting these blocks is loosened so that the strain will come upon the dynamometers and the turn buckles 56 adjusted so as to bring the proper strain upon the guys.

In Figs. 21 and 22 is shown a form of condenser suitable for use in connection with the improved aerial. This condenser consists of a tank or shell 57 in which are arranged two series of plates or members 58 and 59. The plates of one series are secured at their peripheries to posts 60 and the plates of the second series, which alternate with those of the first series, are secured to posts 61. The main dielectric is formed by gas under pressure.

Provision may be made for access to any part of the aerial preferably by an internal ladder or by any suitable hoisting mechanism. By using cylindrical sections of suitable diameter, say three feet, a great height, as for example four or five hundred feet, may be obtained.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. An aerial for the transmission and receipt of electromagnetic wave energy, consisting of a hollow cylindrical structure insulatingly supported substantially as described.

2. An aerial for the transmission and receipt of electromagnetic wave energy which is constructed in sections insulated from each other, one or more of said sections having means for adjusting the resonance thereof.

3. An aerial for the transmission and receipt of electromagnetic energy consisting of a series of connected hollow cylindrical sections forming a portion

of the antennae, and a group or crown of wires supported by the structure, substantially as described.

4. An aerial for the transmission and receipt of electromagnetic wave energy constructed substantially as herein described and illustrated.

Dated this 3rd day of July 1905.

ABEL & IMRAY,
Agents for the Applicant.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1905.

A.D 1905. JULY 3. N° 13,679.

FESSENDEN'S COMPLETE SPECIFICATION.

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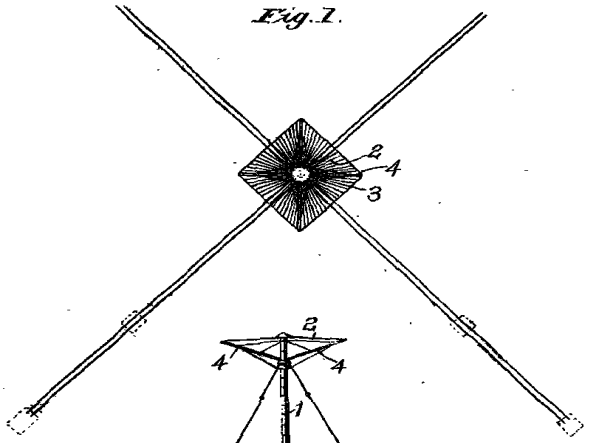

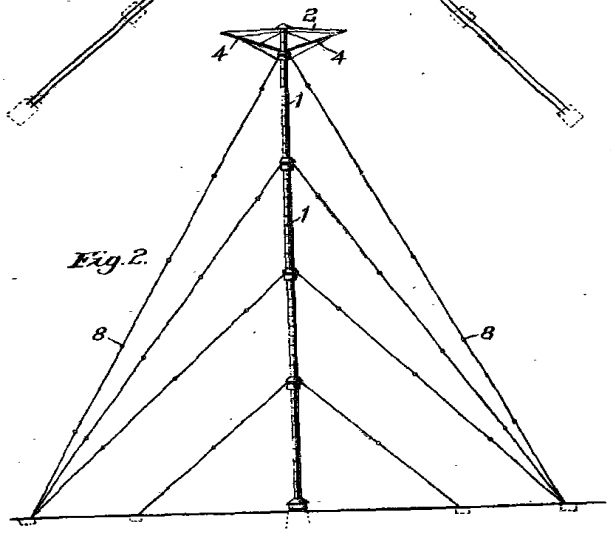

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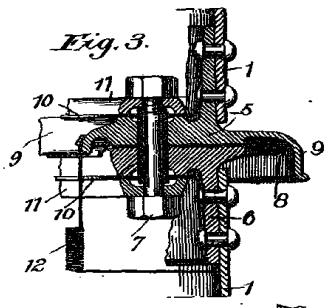

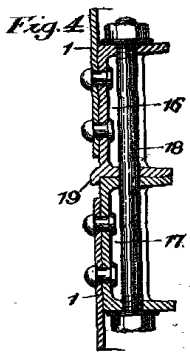

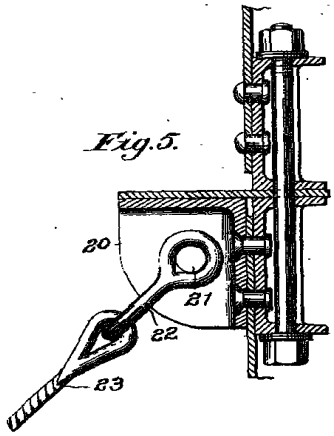

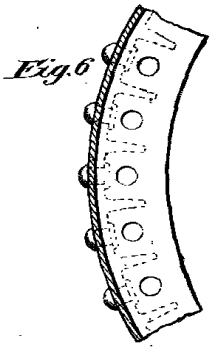

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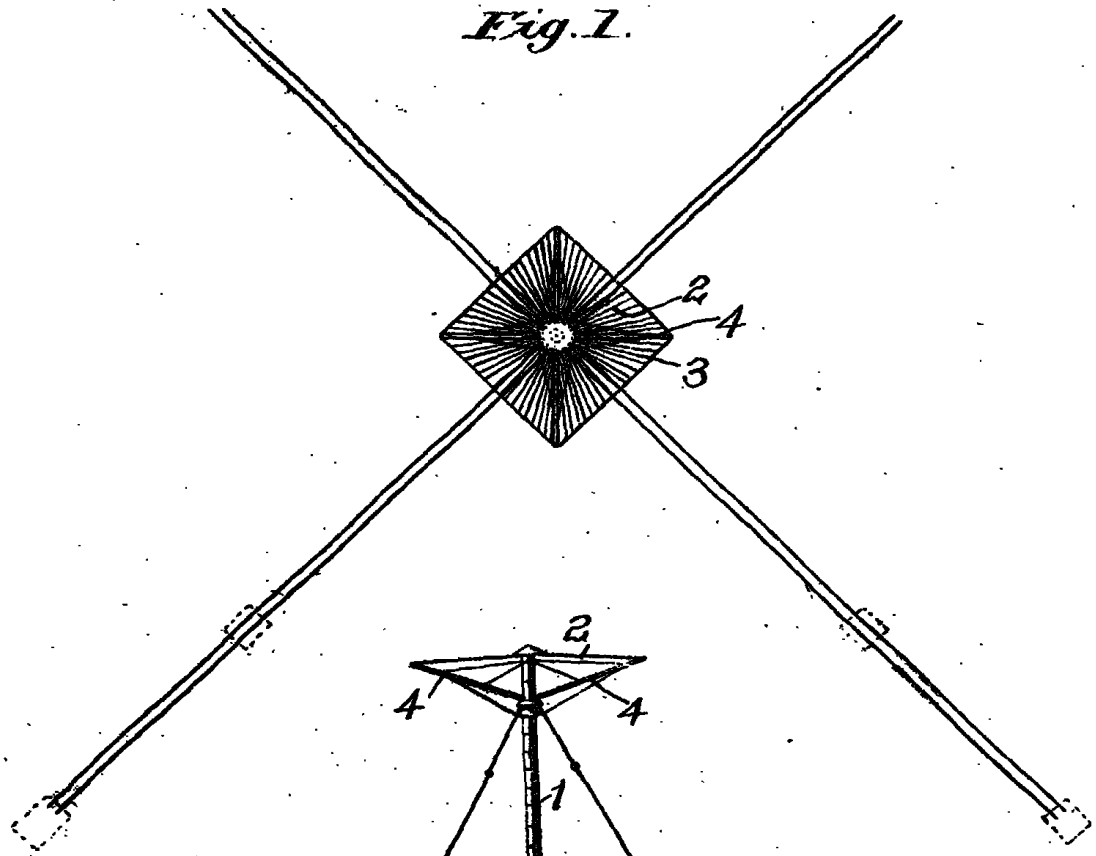
Fig. 1.



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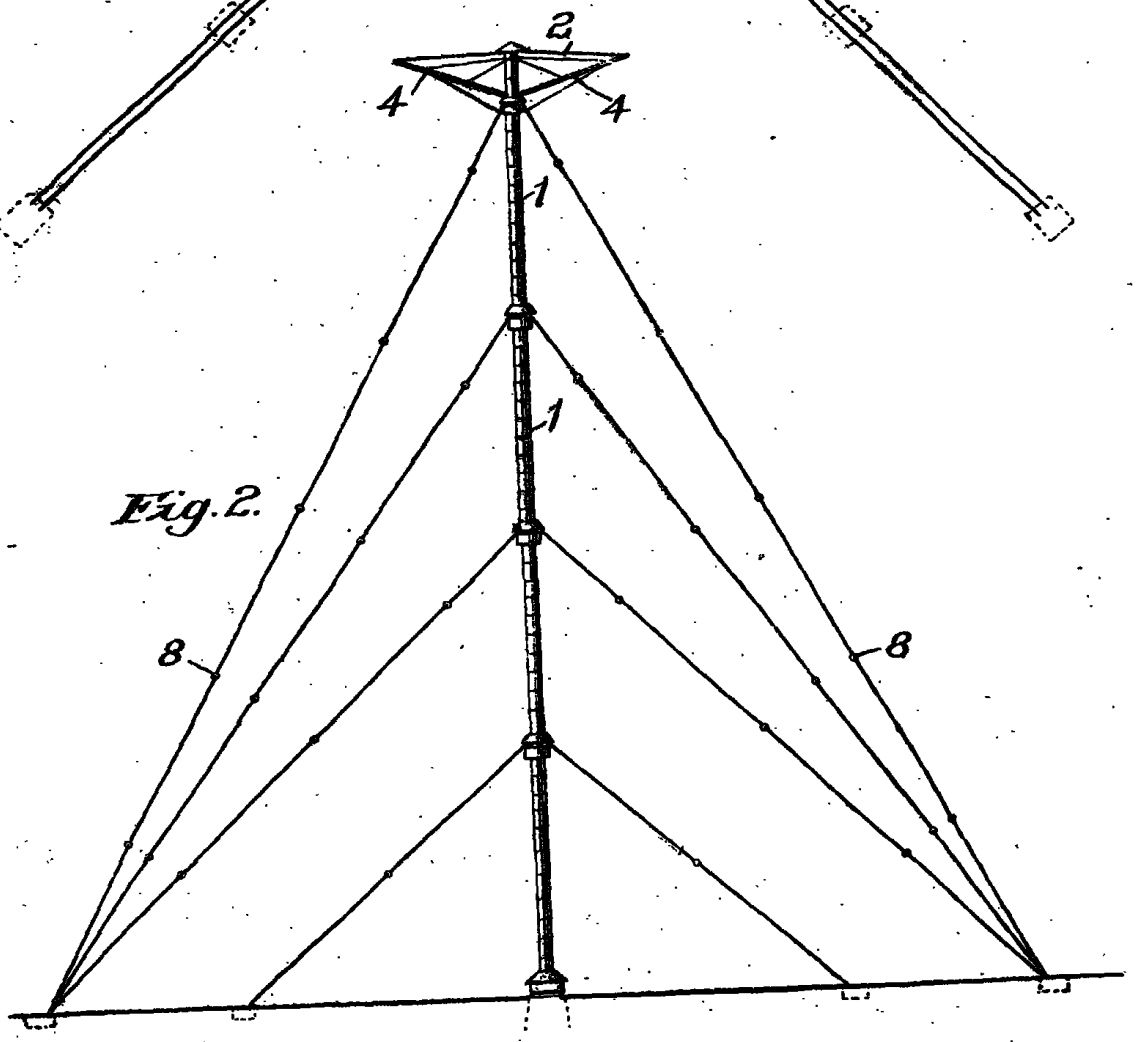

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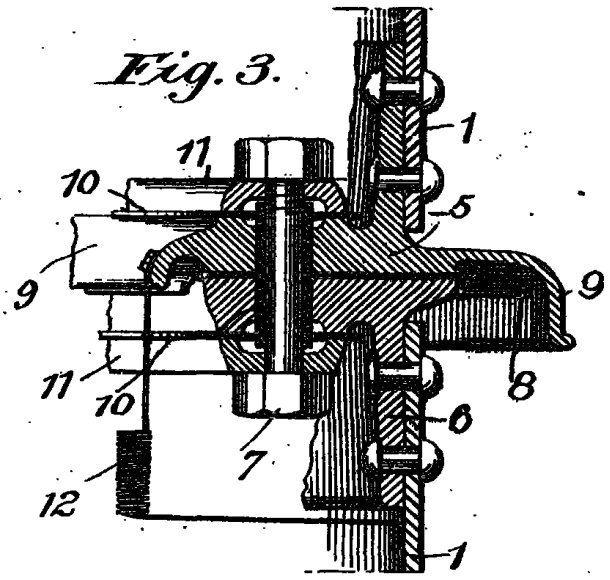

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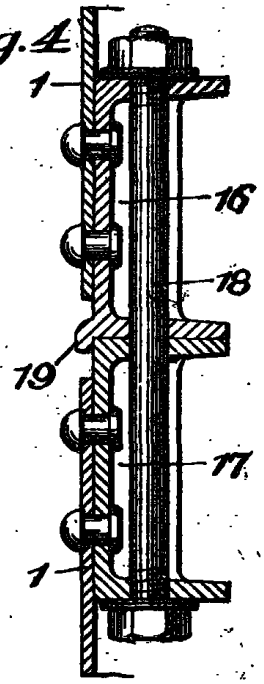

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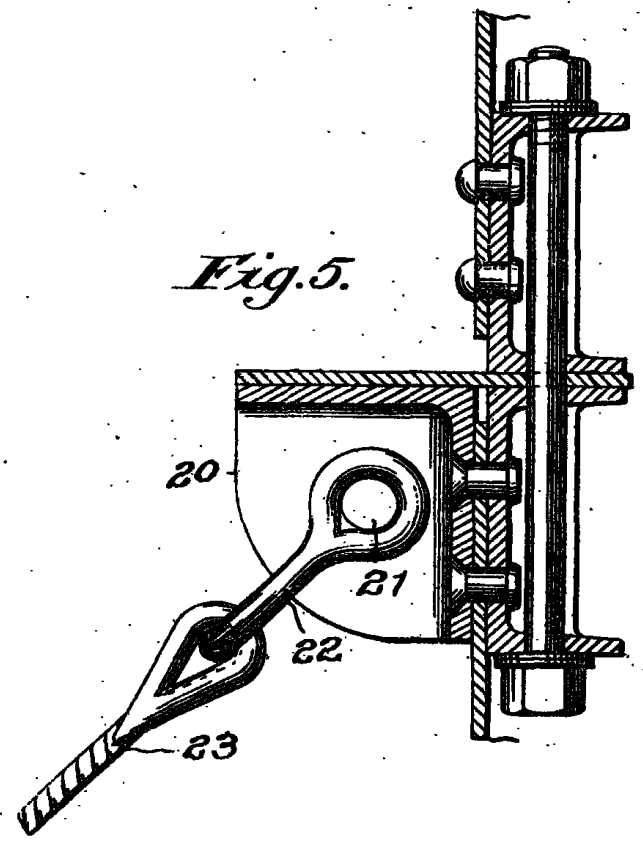

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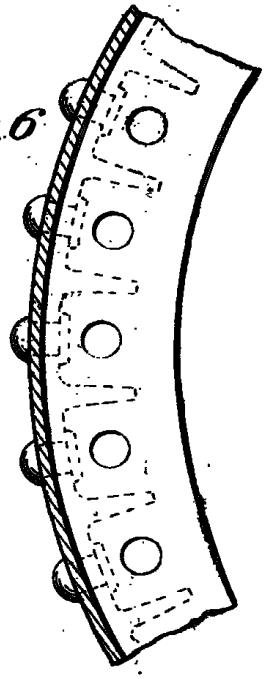

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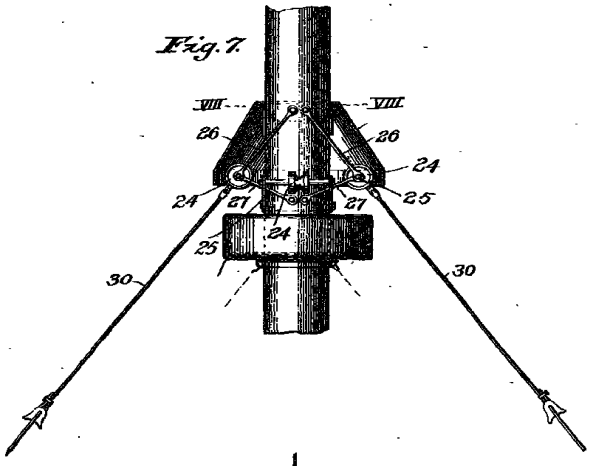

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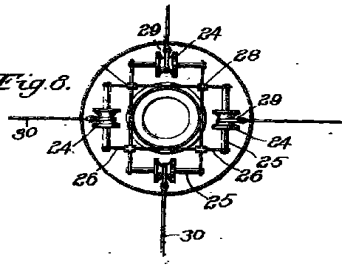

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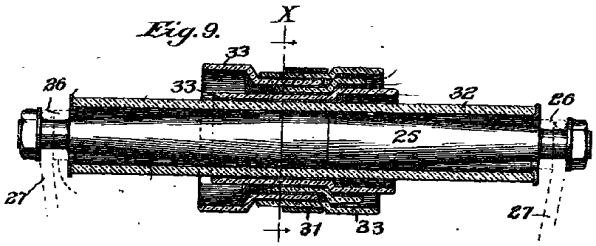
Fig. 9.



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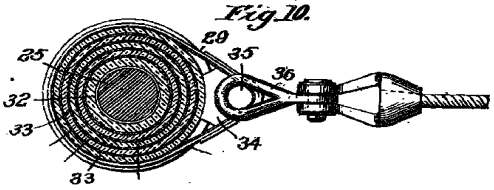

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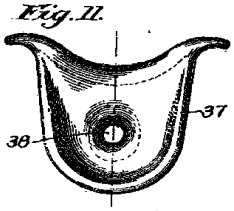

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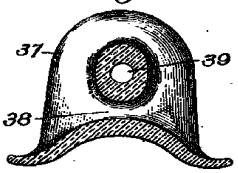

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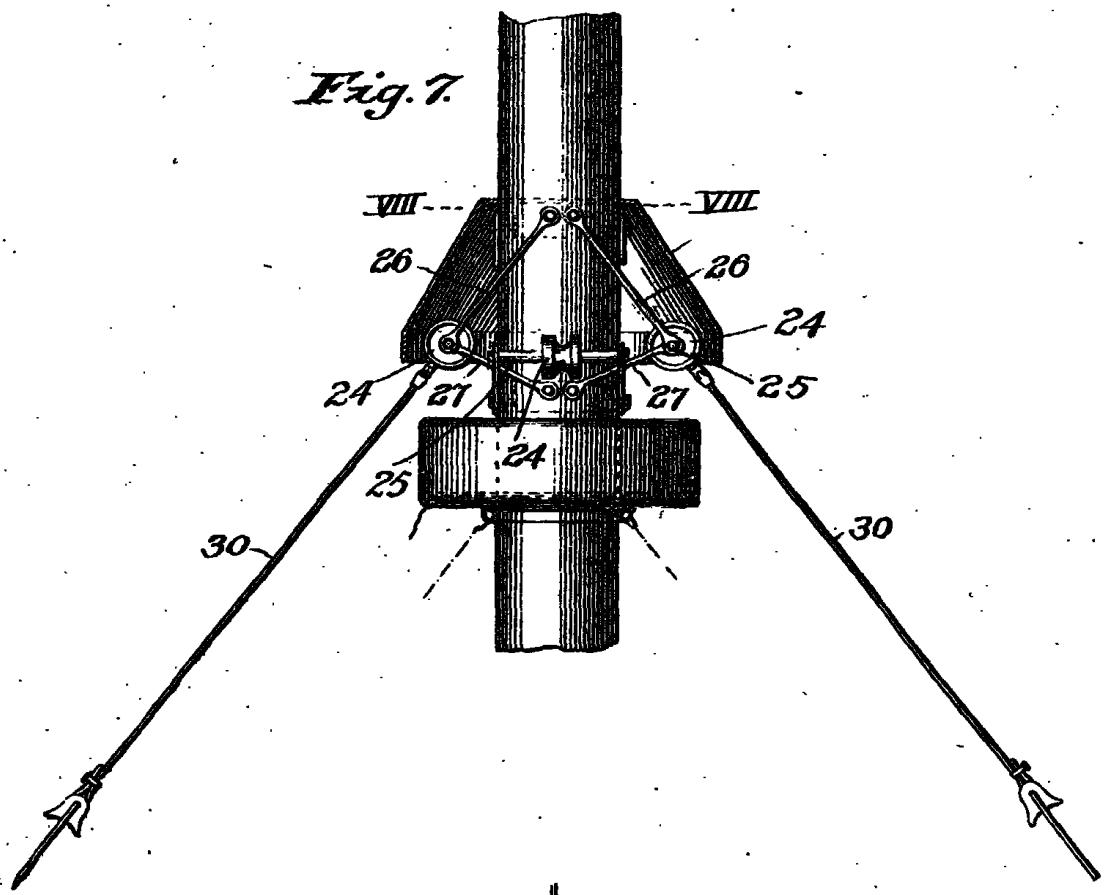

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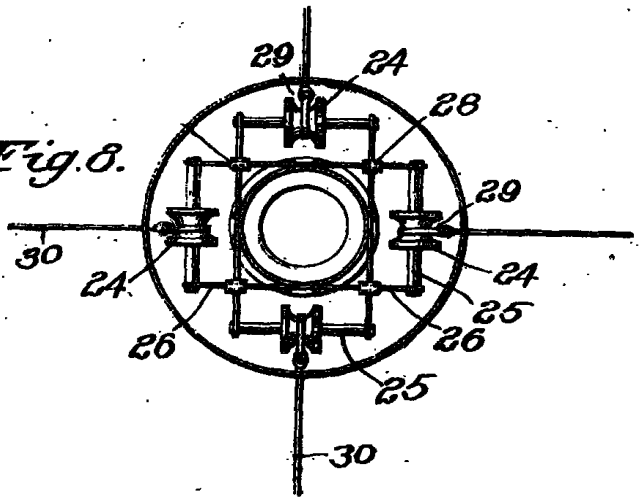

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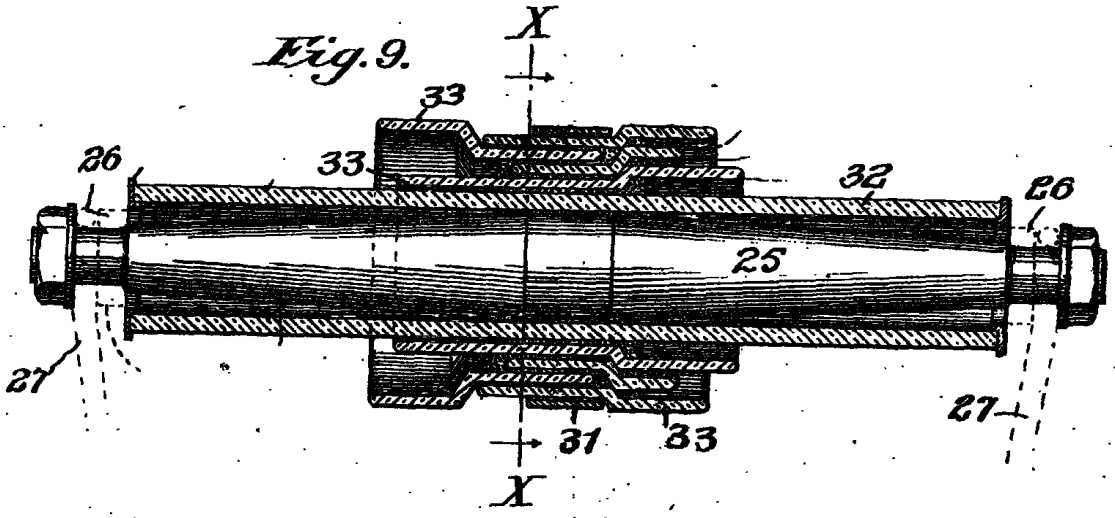

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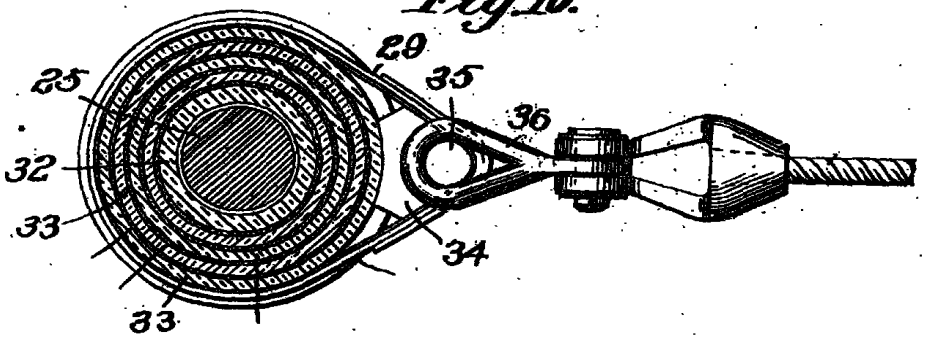

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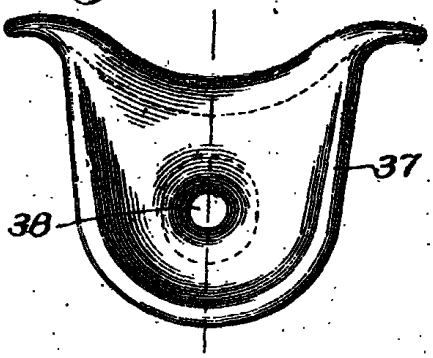

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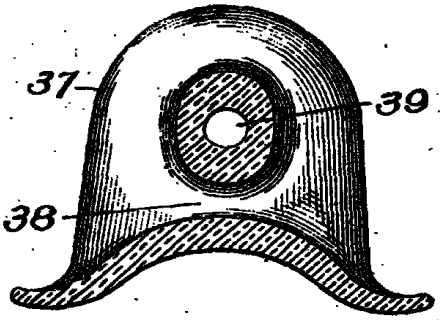

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FESSENDEN'S COMPLETE SPECIFICATION.

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Fig. 13.

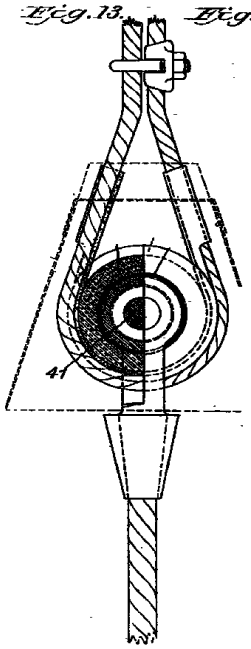

Fig. 14.

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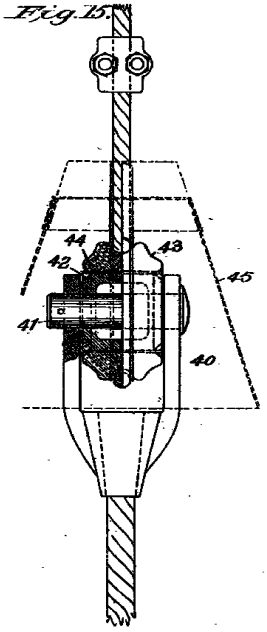

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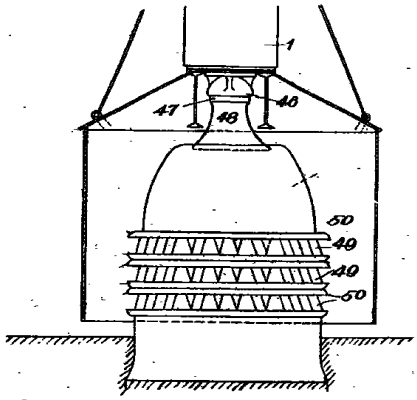

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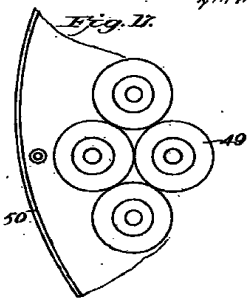

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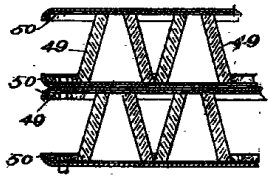

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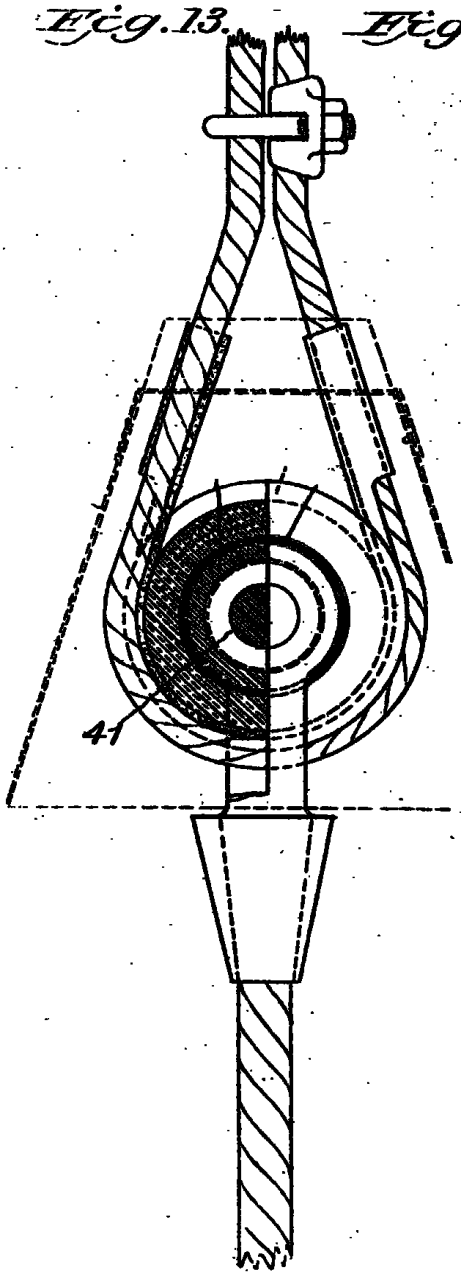

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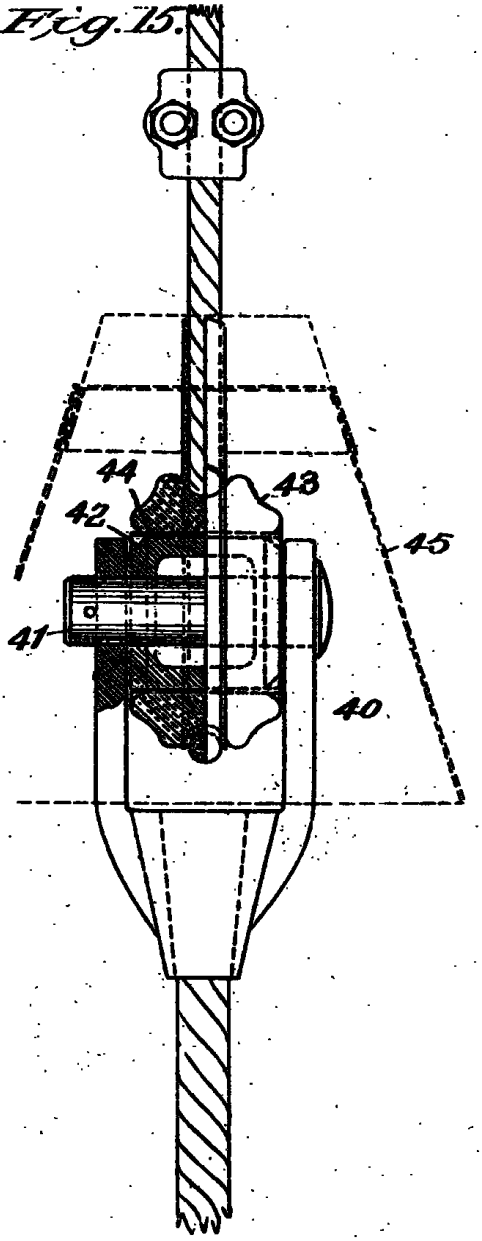

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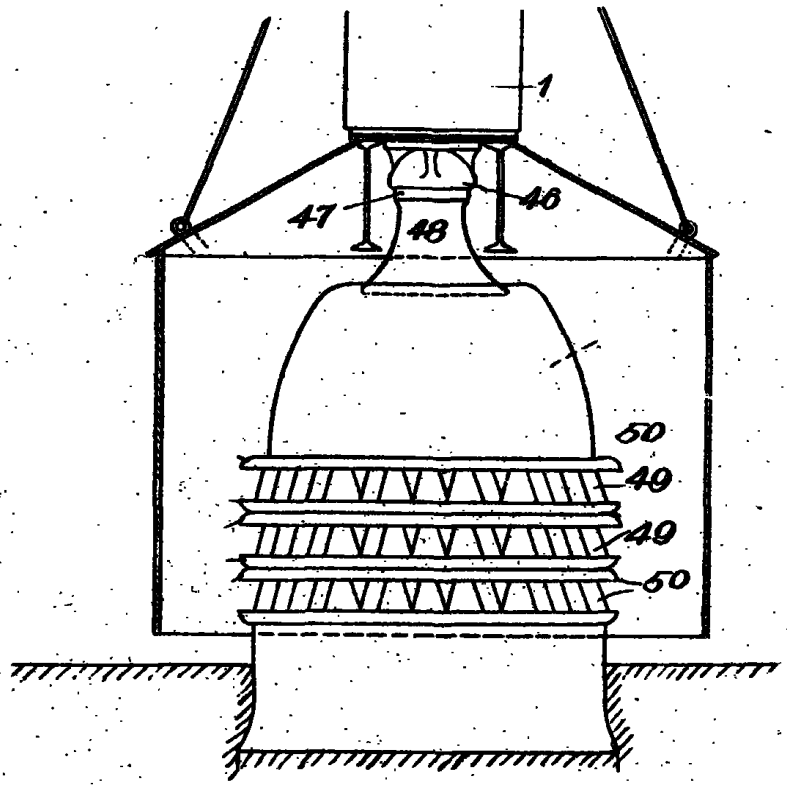

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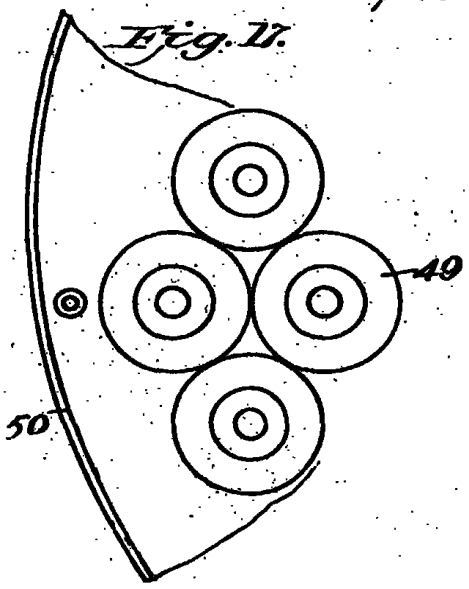

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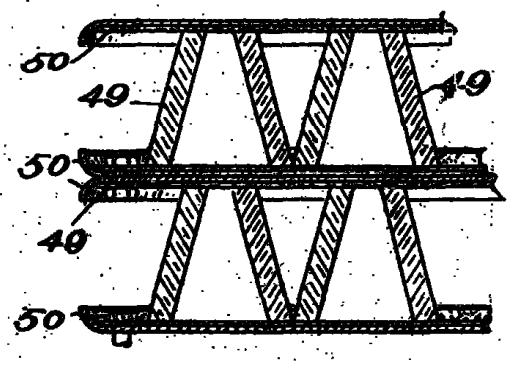

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FESSENDEN'S COMPLETE SPECIFICATION.

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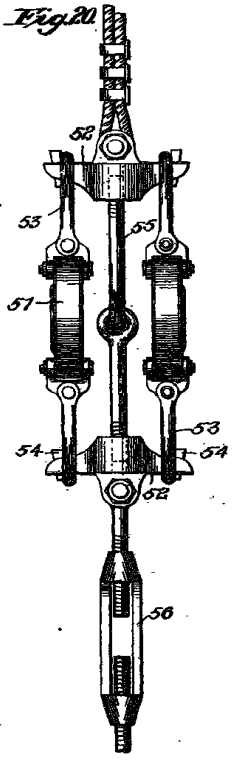
Fig. 19.

Fig. 20.



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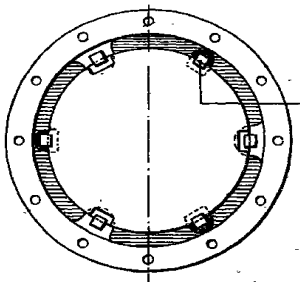

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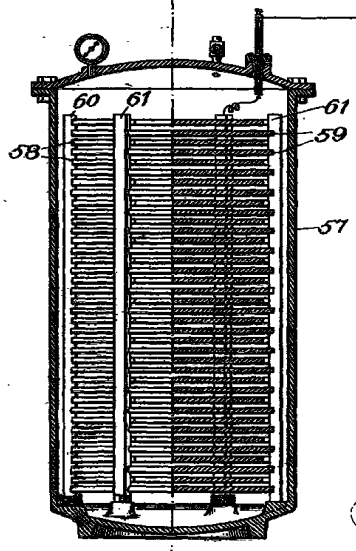

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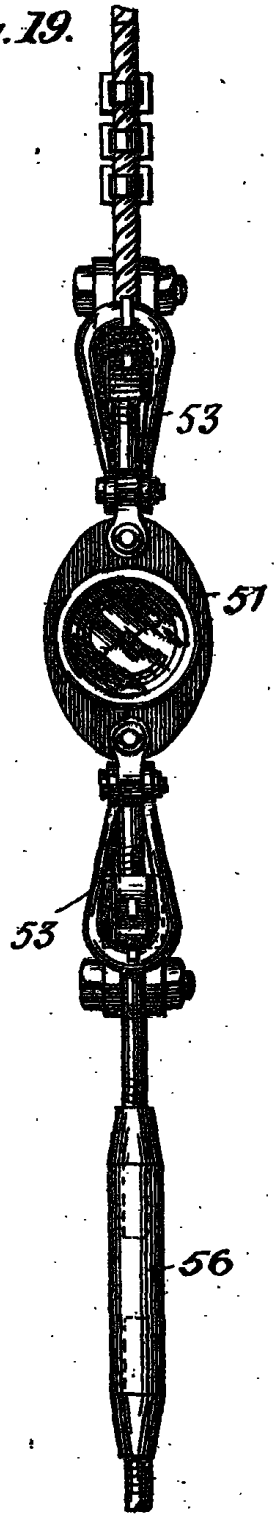
Fig. 19.



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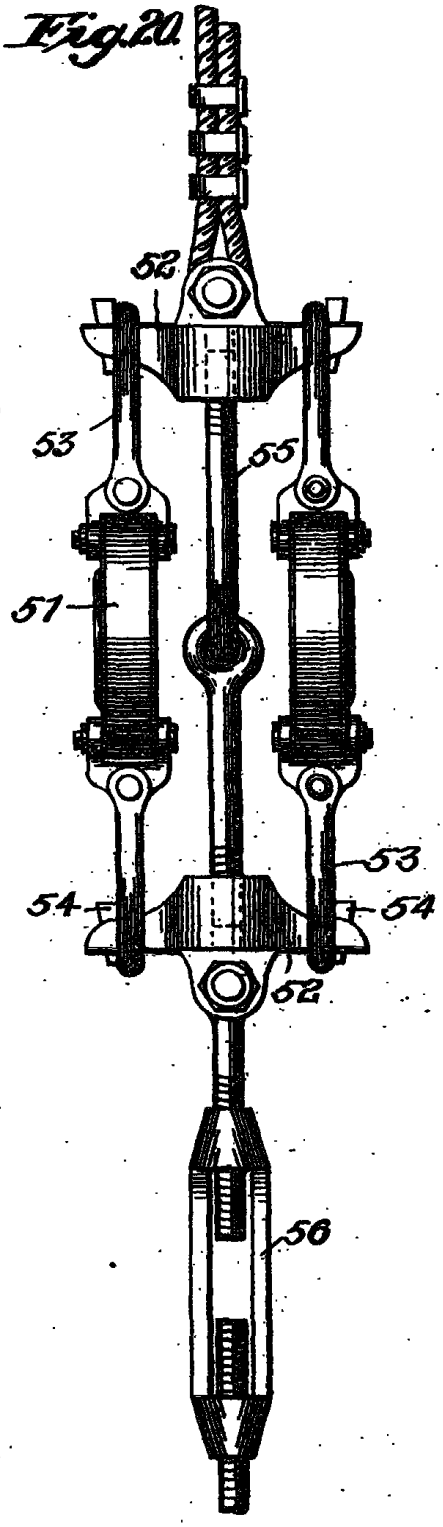


Fig: 22.

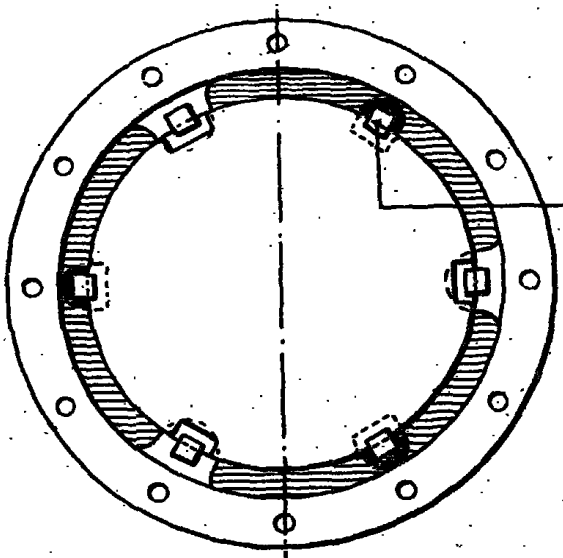
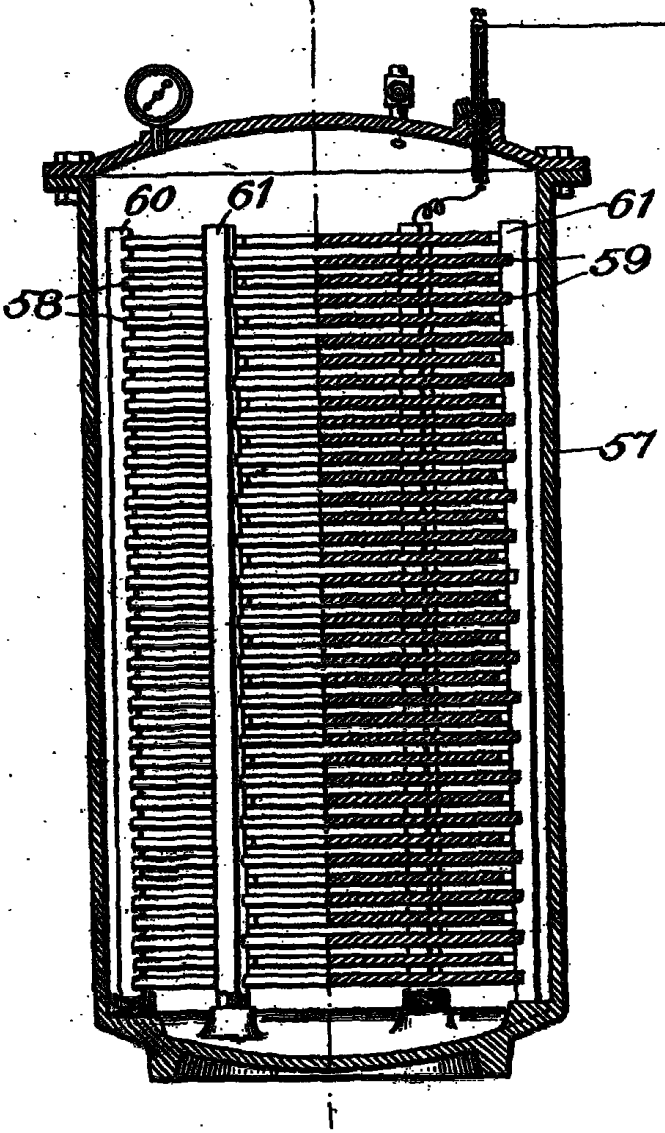


Fig: 21.



Malby&Sons, Photo-Litho.