No. 815,498. PATENTED MAR. 20, 1906.

W. D. WEIR.

ELECTRIC CONDUCTOR.

APPLICATION FILED FEB. 15, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

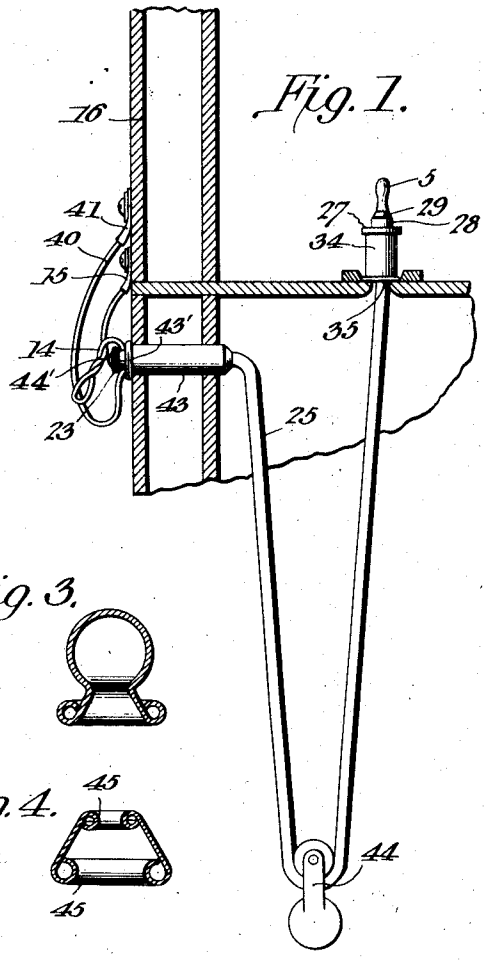


Fig. 2.

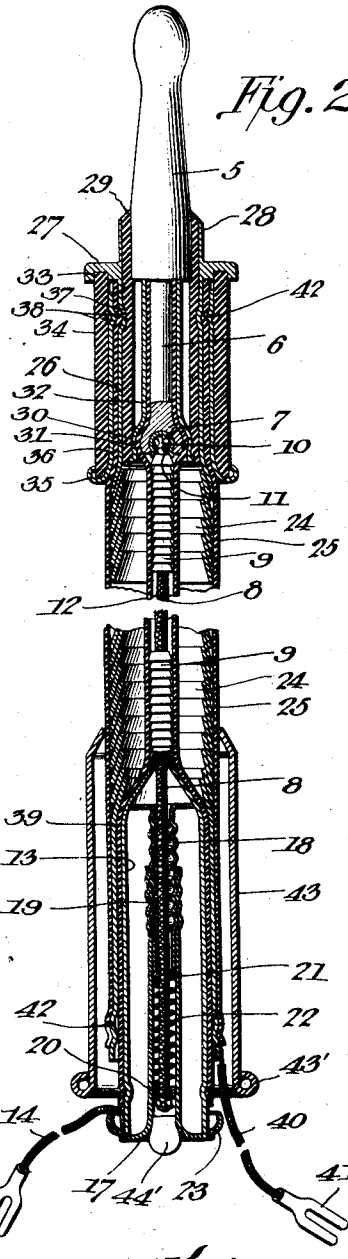


Fig. 3.

Fig. 4.

Fig. 5.

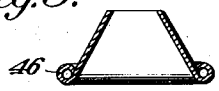


Fig. 6.

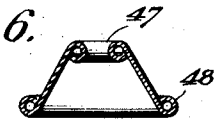
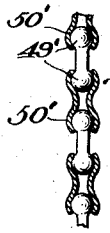


Fig. 7.



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2 SHEETS—SHEET 2.

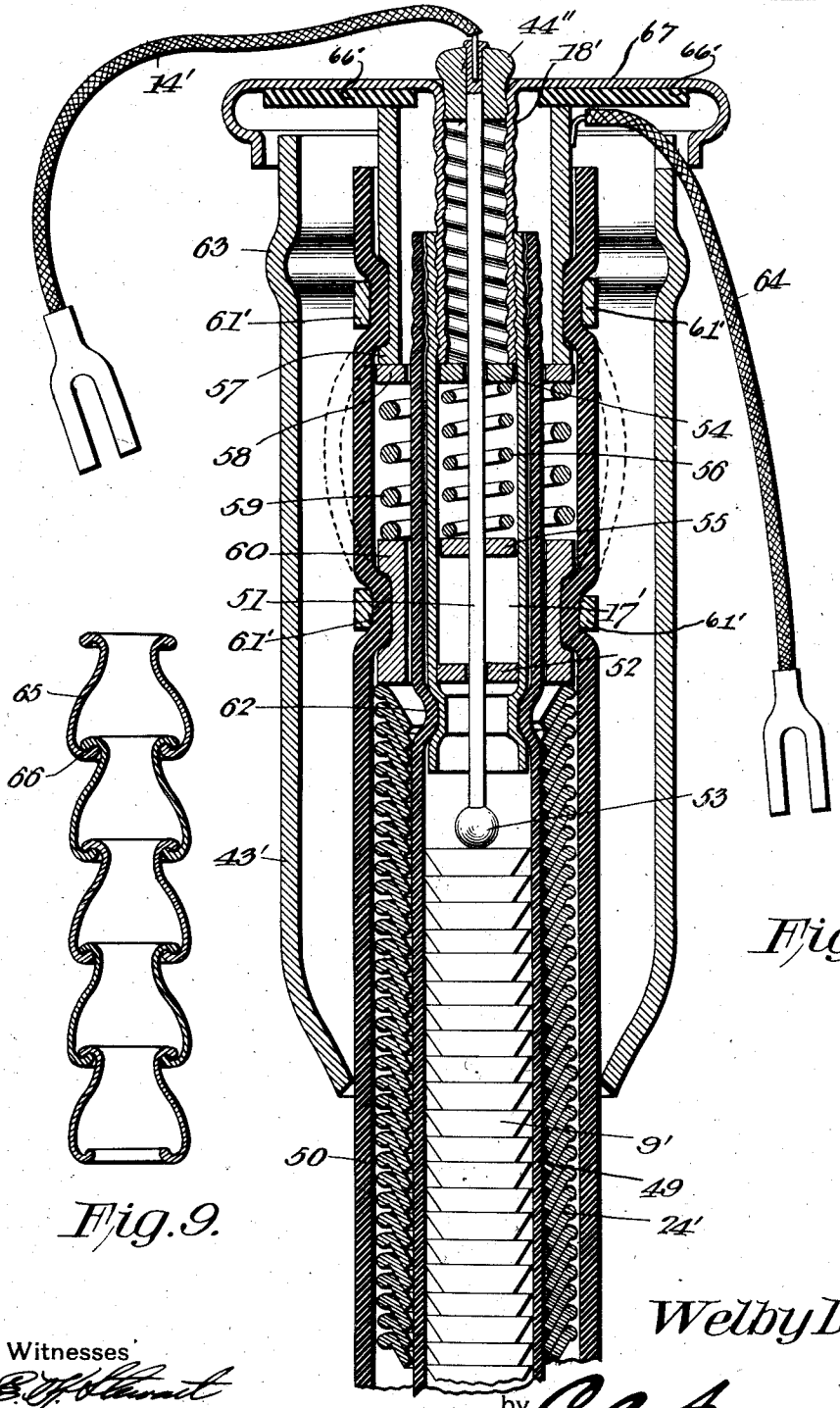


Fig. 8.

Fig. 9.

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UNITED STATES PATENT OFFICE.

WELBY D. WEIR, OF WINNSBORO, TEXAS.

ELECTRIC CONDUCTOR.

No. 815,498. Specification of Letters Patent. Patented March 20, 1906.

Application filed February 15, 1905. Serial No. 245,748.

To all whom it may concern:

Be it known that I, WELBY D. WEIR, a citizen of the United States, residing at Winnsboro, in the county of Wood and State of Texas, have invented a new and useful Electric Conductor, of which the following is a specification.

This invention relates to certain improvements in electric conductors, and more particularly to a novel form of switch cord and plug especially designed for use on switchboards of telephone-exchanges or wherever one or more electrical circuits are to be connected to each other.

In flexible conductors as heretofore used on switchboards and the like the individual wires used as conductors frequently become fractured or severed owing to the continuous bending and kinking of the conductor; and the primary object of the invention is to obviate this difficulty by forming the switch-cord proper of a plurality of superposed overlapping rings or contact members which have the same conducting property as wire and are much more flexible than the latter and less liable to break.

A further object of the invention is to provide means for regulating the tension of the central supporting cord or chain to thereby insure positive electrical contact between the several conducting members and also to vary the degree of flexibility of switch-cord.

A still further object is to provide a novel form of terminal tip for the cord, the latter being extremely efficient in operation and possessing the superior advantages of durability and flexibility.

With these and other objects in view the invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended, it being understood that various changes in form, proportions, and minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

In the accompanying drawings, forming a part of this specification, Figure 1 is a transverse sectional view of a portion of a switchboard, showing a conductor-cord and plug constructed in accordance with my invention in position thereon. Fig. 2 is a longitudinal sectional view of the conducting-cord and the opposite terminals thereof. Fig. 3 is a vertical sectional view of the tension-cord cap detached. Fig. 4 is a similar view illustrating a modified form of conductor member or ring. Fig. 5 is a similar view of a further modification of the conductor member or ring. Fig. 6 is a vertical sectional view illustrating a still further modification of the ring. Fig. 7 is a vertical sectional view showing a modified form of the tension-cord. Fig. 8 is a transverse sectional view of one terminal of the conductor, illustrating a modified form of tension device. Fig. 9 is a longitudinal sectional view of a modified form of tension cord or chain.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

The device consists of a plug 5, the head of which may be of any desired shape or configuration to adapt the same to any of the approved forms of spring-jacks in general use on switchboards of telephone-exchanges. The plug 5, which is constructed of metal and forms one terminal of the switch-cord, is provided with a reduced extension 6, having a terminal socket formed therein for the reception of a spring-cap 7. Fastened within the cap 7 is one end of a central tension cord or member 8, upon which are strung a plurality of telescopic metal conducting-rings or contacting members 9, which when properly positioned on said cord form a continuous metal conductor extending from one end of the switch-cord proper to the other, as shown. The tension cord or member 8 may be formed of metal, cotton, flax, silk, or other suitable material and is preferably secured within the cap 7 by tying a knot 10 in one end thereof and forcing the same through the contracted neck 11 of said cap, after which the latter is inserted in the terminal socket of the plug, being securely retained therein by the spring clamping action of the cap against the interior walls of the socket or by compressing the walls of said socket around and against the cap. The conducting-rings or contacting members may be cast, spun, stamped, or otherwise formed from sheet metal—such as copper, brass, or the like—and each member is preferably in the form of a hollow truncated cone, being preferably arranged on the tension-cord, with the enlarged lower end of one

ring overlapping the reduced or contracted upper end of the adjacent ring, so as to insure positive electrical contact between the several rings or members and at the same time give the desired flexibility to the switch-cord. If desired, however, the conducting-rings may be strung in reverse order on the tension-cord—namely, with the enlarged upper end of one ring overlapping the reduced lower end of the next ring, the result accomplished being the same in both instances.

Surrounding the chain of conducting-rings 9 is an insulating-sheath 12, one end of which engages the reduced extension of the plug, while the other end thereof surrounds a metallic conducting-tube 13, which forms the opposite terminal of the switch-cord. One end of the tube 13 is in electrical contact with the chain of conducting-rings 9, and soldered or otherwise secured to the opposite end thereof is a wire 14, provided with a terminal clip 15 for attachment to the rear of the switchboard 16. It will thus be seen that when the plug is inserted in the spring-jack (not shown) of the switchboard the current will flow through the wire 14, tube 13, conducting-rings 9, and plug 5 to the spring-jack and thence to the line-wire, thereby forming a continuous metallic path through the switch-cord.

As a means for regulating the tension of the central cord or chain 8, so as to insure positive electrical contact between the several conducting rings or members and also to vary the flexibility of the switch-cord, a suitable tension device is provided, the same consisting of a pair of telescopic tubes 17 and 18, which are arranged within the tube 13 and have their interengaging ends threaded, as indicated at 19. The tension-cord 8 passes through the threaded tubes 17 and 18, and the end thereof engages a grooved block 20, slidably mounted in the tube 17, while interposed between said block and a similar block 21, engaging the tube 18, is a coil-spring 22, the normal tendency of which is to exert a longitudinal pull on the cord 8. The free end of the threaded tube 17 extends beyond the free end of the conducting-tube 13 and is flanged laterally to form a terminal head 23, the periphery of which is preferably milled or otherwise roughened to permit the same to be readily turned in adjusting said tube to vary the tension of the spring.

Surrounding the chain of conducting-rings or contacting members 9 is a similar chain of conducting-rings 24, while surrounding this second chain of rings is an insulating sheathing 25 to prevent the conductors from coming in contact with any foreign material which may prove injurious to the same.

A metal-conducting sleeve 26 engages the upper ring of the outer or second chain of rings, and secured to said sleeve is a metal cap 27, provided with an upwardly-extending flange 28, which forms a second terminal for the plug end of the switch-cord. Interposed between the flange 28 and the plug 5 is a sleeve 29, formed of gutta-percha or other insulating material, the lower end of which extends a short distance below the reduced extension 6 and is provided with an annular recess 30, adapted to receive the laterally-projecting flange 31 of a sheath-retainer 32. A groove 33 is formed in the bottom of the metal cap 27, and seated in said groove is an outer casing or insulating-sheath 34, said casing being retained in the groove 33 by engagement with the laterally-flared terminal portion 35 of outer sheath-retainer 36. The sleeve 29 is provided with an annular groove 37, while the sheath-retainer 36 and the conducting-sleeve 26 are stamped or otherwise formed with corresponding ribs 38, so that when the end of the insulating-sheathing 25 is interposed between said sleeve and retainer the same will be securely held against accidental displacement.

A conducting-sleeve 39 is arranged in contact with the lower ring of the outer series of contacting members 24, and connected to said sleeve is a wire 40, also provided with a clip 41 for attachment to the back of the switchboard, the current flowing from the clip through the sleeve 39, conducting-rings 24, sleeve 26, and flange 28 to the spring-jack and thence to the line. The sheathing 25 and conducting-sleeve 39 are also preferably crimped or corrugated, as indicated at 42, to retain the several parts in position. Surrounding the rear terminal of the switch-cord is a casing or housing 43, adapted to be inserted in an opening in the switchboard, said housing being provided with a terminal flange 43′, which engages the back of the board, as shown. The switch-cord is provided with the usual pulley and weight 44 for returning the plug-terminal of the cord to position on the switch-stand after the plug has been withdrawn from the spring-jack. A cap 44′ may also be inserted in the end of the threaded tube 17 to prevent the entrance of dust, dirt, and other foreign matter.

In Fig. 4 I have illustrated a modified form of conducting-ring in which the upper and lower edges thereof are turned inwardly, as indicated at 45, to give them additional strength and also to present a smooth bearing-surface to the tension-cord. In Fig. 5 there is illustrated a further modification in which the lower edge of the ring is flared outwardly, as at 46, while in Fig. 6 the upper edge of the ring is flared inwardly, as indicated at 47, and the lower edge outwardly, as shown at 48.

In Fig. 8 of the drawings there is illustrated a modified form of conductor in which the tension cord or chain is dispensed with. In this case the inner chain of conducting-rings 9′ are disposed within an insulating-

casing 49, around which are arranged the second chain or conducting-rings 24′, the latter being in turn covered by an insulating-casing 50. The upper end of the casing 49 is secured to a tube 17′, which latter engages the threaded end of the tube 18′. Disposed within the tubes 17′ and 18′ is a metal rod or plunger 51, one end of which engages a guide-block 52 and is provided with a spherical head 53, while the opposite end thereof passes through an opening in the cap 44″, being connected to one terminal of the conductor 14′. Slidably mounted on the rod or plunger 51 is a block 54, and interposed between said block and a similar block 55, fixed to the rod, is a coil-spring 56, which tends to force the spherical head in contact with the adjacent ring or contact member 9′. Surrounding the casing 49 is a movable sleeve 57, the lower end of which bears against a slidable collar 58, which in turn rests on a coil-spring 59, interposed between said collar and a vertically-movable sleeve 60, the latter being adapted to engage the adjacent ring of the outer chain of contacting members, as shown. The contiguous walls of the casing 50 and the sleeves 57 and 58 are forced or pressed inwardly to form annular recesses 61, in which may be seated securing bands or clips 61′, which serve to retain the several parts in their relative positions while the adjacent walls of the casing 49 and the tube 17′ are also pressed inwardly, as indicated at 62. The housing 43′ in this form of the device is preferably constructed with an annular rib or shoulder 63, adapted to engage the edge of the rackboard at the rear of the switchboard. (Shown in Fig. 1.) A disk 66′, formed of rubber or other suitable insulating material, is also interposed between the head 67 and the upper end of the sleeve 57 in order to prevent a short circuit through said head and sleeve. When the housing is in position on said rack, the current flows from the conductor or wire 64 to the sleeve 57, thence through the collar 58 and spring 59 to the sleeve 60, and thence through the conducting-rings 24′ and spring-jack to the line-wire. The current also flows from the opposite conductor 14′ through the rod or plunger to the contact-rings 9′, and thence through the spring-jack to the line-wire. By rotating the head of the tube 18′ the terminal head of the rod or plunger will be forced into engagement with the contact-rings 9′, and at the same time the sleeve 60, through the medium of the spring 59, collar 58, and sleeve 57, will be forced into engagement with the chain of contact-rings 24′. The housing 43′ is preferably spaced a sufficient distance from the casing 50 to allow for buckling of said casing when the terminal head is being adjusted to regulate the pressure on the contact-rings, the buckling of the casing being represented by dotted lines in Fig. 8 of the drawings. It will thus be seen that turning the terminal head of the tube 18′ in one direction increases the compression of two or more sets of contact-rings, while turning the head in the opposite direction decreases the compression. When the rings or contact members, (shown in Fig. 8,) are disposed within the casing 49 with their reduced ends extending in the direction of the terminal cap, the head of the plunger will be concaved, so as to engage the side walls of said rings, as will be readily understood.

In Fig. 9 there is illustrated a further modified form of contact member or conducting-ring, in which the several members 65 are interlocked, as indicated at 66, thereby producing a desirable chain, which may be employed in some cases in place of the central conductor or tension cord.

Any of the different forms of conducting-rings above described may of course be substituted for the rings shown in Fig. 2 of the drawings. In some cases the central tension-cord and the inner series of conducting-rings 9 may be dispensed with and the metallic chain (shown in Fig. 7) or any other style of chain formed of metal links used instead. The chain shown in Fig. 7 is preferably formed of alternate links having terminal spherical heads 49′, which fit the sockets 50′ of adjacent links; but a chain of any other pattern or design may be used with equally good results.

From the foregoing description it will be seen that there is provided a simple, inexpensive, and efficient switch cord and plug capable of being readily attached to or detached from the switchboard and which is admirably adapted for the attainments of the ends in view.

Having thus described the invention, what is claimed is—

1. A flexible conductor comprising a flexible supporting element, a plurality of contact members carried by the supporting element, and means for regulating the tension of the latter to thereby compress the contact members and maintaining the same in constant engagement with each other.

2. A flexible conductor formed of a plurality of overlapping contact members, an adjustable sleeve carried by the conductor, and a spring disposed within the sleeve for maintaining said members in electrical contact with each other.

3. A flexible conductor formed of an inner and an outer series of contact members, and means for maintaining the members of each series in electrical contact with each other.

4. A flexible conductor formed of a plurality of rings disposed in electrical contact with each other, and a series of rings surrounding the first-named rings and arranged concentric therewith.

5. A flexible conductor formed of an inner

and an outer series of contact members, means for maintaining the members of each series in electrical contact with each other, and an insulating material separating the two sets of contact members.

6. A conductor comprising a flexible supporting element, a series of overlapping contact members carried by the supporting element, a second series of members surrounding the first series, and an insulating-sheathing covering the latter.

7. A flexible conductor formed of an inner and an outer series of overlapping contact members, an insulating material separating the two, and a covering for the outer series of members.

8. A conductor comprising a flexible supporting element, a series of overlapping contact members carried by the supporting element, a second series of contact members surrounding the first series and spaced from the latter, and means for regulating the tension of the supporting element to thereby compress said members.

9. A flexible conductor formed of a plurality of overlapping rings having their side walls tapered and arranged in electrical contact with each other, said conductor being provided with oppositely-disposed contact-terminals.

10. A flexible conductor comprising a contact-plug provided with a terminal socket, a supporting member having one end thereof seated in said socket, and a plurality of overlapping rings carried by the supporting member and arranged in electrical contact with each other.

11. A conductor comprising a central flexible supporting element, a plurality of overlapping conical rings carried by the cord and arranged in electrical contact with each other, means for adjusting the tension of the supporting element to compress the rings, a second series of rings surrounding the first series and arranged concentric therewith, and a casing covering the second series of rings.

12. A flexible conductor formed of a series of members arranged in electrical contact with each other, a second series of members surrounding the first series and arranged concentric therewith, and a switch-plug having electrical connection with each set of members.

13. A flexible conductor formed of an inner series of substantially annular members arranged in electrical contact with each other, an outer series of members surrounding the inner series, a switch-plug having electrical connection with each set of members, an insulating material separating the two series of members, and a casing carried by the plug and covering the outer series of said members.

14. A flexible conductor comprising a switch-plug, a cord or chain secured to the plug, a series of overlapping contact members carried by the cord, a second series of contact members surrounding the first series, means for adjusting the tension of the cord or chain to compress said members, an insulating material separating the two sets of members, and a casing covering the outer series of members and carried by the switch-plug.

15. A flexible conductor comprising a switch-plug provided with a terminal socket, a cap seated in said socket, a cord one end of which is disposed within the cap, a series of contact members carried by the cord, a second series of contact members surrounding the first series and having electrical connection with the switch-plug, an insulating material separating the two series of contact members, and a covering for the outer series of said contact members.

16. A flexible conductor provided with a terminal housing and formed of a series of overlapping members having electrical contact with each other, and means arranged within the housing for maintaining said rings in position.

17. A conductor provided at one end with a housing and at the other with a switch-plug, a flexible supporting element extending longitudinally of the conductor and having one end thereof secured to the switch-plug, a threaded sleeve arranged within the housing and supporting the opposite end of the flexible element, a series of contact members carried by the latter, a spring carried by the threaded sleeve for compressing said contact members, and a second series of contact members surrounding the first series and electrically connected with the switch-plug.

18. A conductor provided at one end with a housing and at the other with a switch-plug, a flexible supporting element extending longitudinally of the conductor and having one end thereof connected to the switch-plug, a series of substantially annular contact members carried by the supporting element, a pair of telescopic threaded sleeves arranged within the housing, blocks slidably mounted in the threaded sleeves and adapted to engage the opposite end of the supporting element, a spring carried by the latter and engaging said blocks, and a second series of contact members surrounding the first series and electrically connected with the switch-plug.

19. A flexible conductor formed of a series of overlapping contact members, a second series of overlapping contact members surrounding the first series and arranged concentric therewith, a conducting-strip having electrical connection with one set of contact members, and a switch-plug having electrical connection with the second set of contact members.

20. A flexible conductor formed of a series of overlapping members arranged in elec-

trical contact with each other, a second series of overlapping members surrounding the first series, a terminal forming one end of the conductor and having electrical connection with both sets of contact members, and a plug-tip carried by the opposite end of the conductor and also electrically connected with both sets of contact members.

21. A conductor formed of a plurality of contacting members, and means tending to normally shorten said conductor and maintain the members in constant engagement with each other.

22. A conductor formed of a plurality of contacting members, means for exerting pressure on said members in the direction of the length of the conductor, and means for varying the pressure exerted on said members.

23. A conductor formed of a plurality of overlapping contacting members, and means tending to normally shorten said conductor and maintain the members in constant engagement with each other.

24. A conductor formed of a plurality of sets of contact members, means for exerting pressure on each set of contact members in the direction of the length of the conductor, and means for varying the pressure exerted on said members.

25. A conductor formed of an inner and an outer set of contact members each set comprising a plurality of overlapping members, and means tending to shorten the conductor and maintain the members of each set in engagement with each other.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

WELBY D. WEIR.

Witnesses:
M. D. CARLOCK,
P. Y. POINDEXTER.