

A. ORR.
 MEANS FOR AND METHOD OF FASTENING CABLE ENDS.
 APPLICATION FILED FEB. 17, 1916.

1,214,709.

Patented Feb. 6, 1917.
 2 SHEETS—SHEET 1.

Fig. 1.

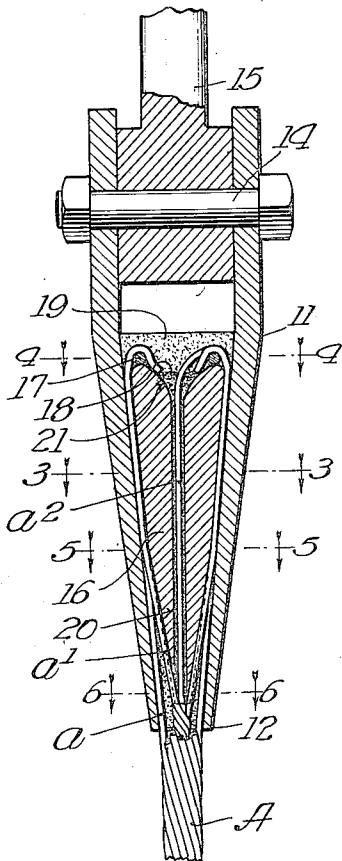


Fig. 2.

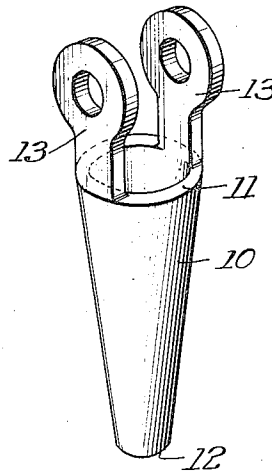


Fig. 4.

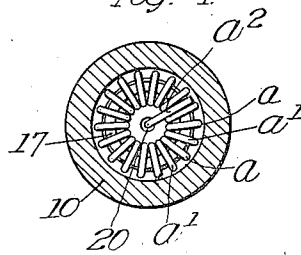
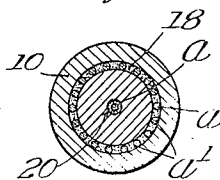


Fig. 3.



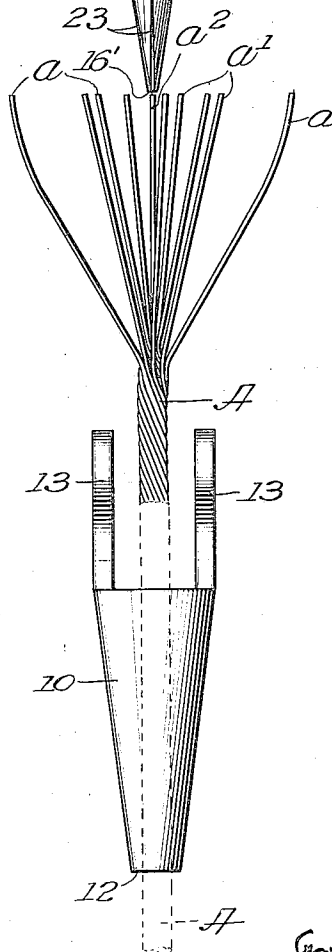
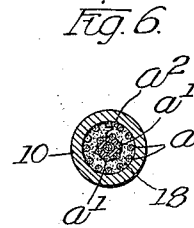
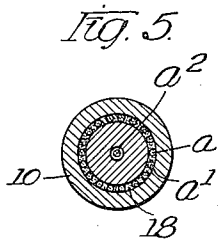
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UNITED STATES PATENT OFFICE.

ARTHUR ORR, OF ST. CHARLES, ILLINOIS.

MEANS FOR AND METHOD OF FASTENING CABLE ENDS.

1,214,709.

Specification of Letters Patent.

Patented Feb. 6, 1917.

Application filed February 17, 1916. Serial No. 78,941.

To all whom it may concern:

Be it known that I, ARTHUR ORR, a citizen of the United States, residing at St. Charles, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Means for and Methods of Fastening Cable Ends, of which the following is a specification.

My invention relates to means for and method of fastening cable-ends.

It has for its salient object to provide satisfactorily for fastening the end of a cable that is composed of strands of steel, or other metal, of high tensile strength, in a manner developing a very large percentage of the cable strength.

Other objects of my invention are to effect such cable fastening or anchorage by a method that may be simply and inexpensively practised, and by construction that is light, small, readily applied, and efficient and reliable in operation.

In utilizing cables under conditions where no strains calling for high tensile strength are to be encountered, a solder-filled socket fastener for the cable end has been employed. Such usual socket takes the form of a flaring or conoidal shell through the small end of which the cable is led, the extremity of the cable, within the socket, being untwisted to separate its strands, and a molten metal being poured in to embed the strands so that, when hardened, the solder will measurably secure the wire structure in the shell. As a type of fastening, this socket-arrangement has advantages in matter of relatively small size, economy of cable requirements, and the like; but the usual socket fastening-means and method has no place in the securing of cables of high tensile strength for various reasons. Primarily, such socket fastenings, as heretofore employed, have been incapable of developing a sufficient percentage of the tensile strength of a hard-steel cable to make practicable their use in such connection. If the retaining body of metal, poured in molten condition into the socket, is of relatively low melting point, (as a usual lead-tin alloy) the individual wires of the cable pull out of it, under strain, as if the soft metal were merely a heavy solid lubricant, such separation being possible long before the breaking point of the cable is reached. And conversely when a harder metal of high melting point (as zinc) is sought to be employed the

increased degree of heat of the molten mass tends to draw the temper of the steel wires, thus greatly reducing their initial strength at or near the entrance to the socket, and consequently the joint will break under a strain that is far below the normal tensile strength of the cable. Furthermore, while, theoretically, it is obvious that even employing a relatively soft filling metal, the connection may be made reasonably effective in developing an adequate percentage of the cable strength by sufficiently increasing the length of the connection; it is equally obvious this expedient is impractical in many instances because of the extension of the inflexible connector interfering with functions of the cable, and because the increased size and necessary increased weight of an elongated connection are highly objectionable.

My present invention produces, as a result of the method and means employed, a socket fastening which, though as light and small as the usual socket fastenings for low-tension cables of the same diameter, is capable of developing a higher percentage of the tensile strength of a tempered steel cable than any fastener of the socket type heretofore produced, and as high as or higher than an expertly made looped-eye fastening.

In the drawings wherein I have illustrated an embodiment of my invention Figure 1 is a vertical cross section of a complete joint; Fig. 2 is a perspective view of a socket shell; Fig. 3 is a section on line 3—3 of Fig. 1; Fig. 4 is a section on line 4—4 of Fig. 1. Fig. 5 is a section on line 5—5 of Fig. 1. Fig. 6 is an enlarged section on line 6—6 of Fig. 1; and Fig. 7 is a view showing the mechanical parts in condition for assembly.

In my improved structure I employ a steel socket member 10 in the form of a hollow truncated cone, the walls thereof tapering in thickness from base 11 to tip 12, and the interior surface tapering uniformly to the tip. The base portion is provided with suitable anchorage means, herein illustrated as the perforated ears 13, by which the structure may be bolted at 14 to any suitable support 15. Other mountings obviously may be employed, in lieu of such ears 13.

The aperture in the tip 12 is of diameter equal to the outside diameter of the cable A to be secured, such cable, in commercial practice usually being composed of a plurality of spirally wound courses of wire,

herein indicated as the outer strands a intermediate strands a' and core wire a^2 . The cut end of the cable is passed through the shell as shown in Fig. 7, and then the terminal portion of the cable is separated into its component strands, the wires all being spread apart to lie side by side except that the core wire a^2 (where a core wire, single or stranded, is employed) is preferably left in its initial axial position.

In securing the spread wires in the socket I employ, preferably combinatively, a novel arrangement of embedding the wires in a retaining metal, and a novel pre-formed clutch-wedge element. Thus, in the specific construction shown, (wherein there are combined several features of my invention that may, however, be separately used for their own advantages) I employ, in conjunction with the tapered shell and the spread cable strands, a pre-formed wedge 16, (preferably) a complementary ring 17, and soldering bodies 18 and 19 of metal emplaced while fluid. The wedge element 16 I insert within the spread wire strands $a-a'$, preferably threading the core wire a^2 through a somewhat oversized bore 20, that is made axially through the wedge and that opens, at the larger end of the wedge, into a space 21, constituting a recess to receive the wire ends as hereafter described. Over the wedge base I apply the ring 17, and the extremities of the wire I inbend, as shown in Fig. 1, uniformly to lap across the ring and extend into the recess 21, accuracy in this operation being facilitated by the positioning of the wedge on the axial core portion of the cable. After so bending the cable strands to approximately their intended ultimate position, I draw the cable body A taut with respect to the shell, so that the hooked wire ends carry the wedge down into the shell until it clutches the wires between its outer surface and the inner surface of the shell, the wires in this operation (in which the strain imposed is considerable) tending to slip over the ring to such extent as will distribute the strain uniformly to the numerous separated strands. The final hook-bending of the wires may be effected while the wires are thus under strain, so insuring that each of the spread wire-strands may bear its proportionate part of the strain.

Externally the body portion of the wedge is similar in contour to the uniformly tapered interior of the shell, so that the clutch action as between wedge and shell is distributed uniformly over a material length (preferably about half) of each peripheral wire within the socket, but to avoid imposing any cutting or crushing strains on the wires near the entrance to the socket, and in order to give adequate clearance for the separation of all of the wire strands so that they may be laid in appropriate non-crossing, spread

relation, the tip or smaller end 16' of the wedge is tapered much more abruptly than its body portion, so as to lead the inner layer of wires a' out to the radius of the shell-contour without interference with the spread outer-layer strands a . To facilitate the accurate direction of the inner layer wires, grooves 23 may, if desired, be formed in the tip-portion 16' of the wedge. The ring 17, supplementing the wedge 16 in its action, is not indispensable, for the wire ends may be hooked over the edge of the wedge 16 but the ring is an advantageous refinement that facilitates assemblage and that, by its movability with respect to the body of the wedge, gives to the portion of the structure receiving the hook bends of the wires a capability to "come and go" that is valuable in insuring the uniform distribution of strain to the wire strands.

When the pre-formed parts above referred to have been thus positioned, strain on the cable of course tends to enhance the clutch action between the wedge and the shell, thereby to retain the wires, and this mechanical coördination alone will develop a goodly percentage of the strength of the cable, making such a structure, without solder filling, available for many cable fastening purposes, although not for attainment of the maximum benefits that I seek.

In the preferred practice of my invention I utilize molten metal to solder the spread wires together and to the contiguous pre-formed metallic parts, preferably employing a relatively soft metal of lower melting point to embed the lower portion of the wire strands, and a harder metal, of higher melting point, to embed the extremities of the strands. In the specific construction shown the body 18 of metal, filling all of the spaces between the wire strands and the contiguous pre-formed metallic parts, from the tip 12 of the socket to approximately the base of the wedge 16, is a body of relatively soft metal or alloy, such as lead-tin alloys, such metal being poured in while molten to fill the spaces between the wires and through the center hole 20 of the wedge; the desideratum being that the solder thus employed to be of such low melting point that, in the quantity used in so partially filling the socket, not enough heat will be transmitted to the separated cable strands to affect their temper. The body 19 of metal is then applied while fluid to invest the hook ends of the cable wires completely to seal them. This metal, preferably, is harder than the body 18 having a higher melting point, such for instance as zinc, and it is my preference to employ a metal or alloy having sufficiently high melting point that, in the quantity employed, it acts substantially to draw the temper of the hooked wire ends. At this point in the construction, the annealing effect

upon the wire strands is desirable, rather than detrimental, because of the presence of the abrupt bends in the wire; and furthermore it will be apparent that the relatively hard metal body 19 acts mechanically as a resistant to straightening of the wire hooks so efficaciously that they are substantially anchored in their bent condition as by a rigid plug intervening between the inturnd ends.

As a further refinement of my invention, I prefer that the socket shell 11 and wedge member 16 shall be of more ductile quality at the tip than toward the enlarged base, for while the larger portion of the shell or wedge may, without detriment, be as hard as the cable wire, it is very desirable that their tips shall be softer than the cable wire. This graduation in hardness may readily be effected in various ways, as by first tempering the metal of the part and then drawing the temper of the tip thereof by heating the part with a quick, high heat sufficient substantially to draw the temper of the thin tip, but insufficient, within the time of heating, so to anneal the thicker base portion of the part. And as a further desirable refinement of method, this soldering may be done while the cable is maintained under material strain, so insuring that the spread wires are initially positioned in the investing solder in exactly the positions assumed under strain and with each strand bearing its proportion of the load.

It will be apparent to those skilled in the art that the investing of different portions of the separated wires, progressively remote from the tip of the shell, in solders of increasing hardness is advantageous *per se*, and also in conjunction with the employment of a shell of varying hardness increasing from the tip portion to the base portion, and it has particular advantage in a construction wherein the wires are hook-formed at their terminal ends with the hooks embedded in the harder solder body. Also it will be apparent that further advantage is gained by hooking the ends of the wires over a pre-formed part, whether ring or wedge-base, that will under strain press the spread wires against the shell. In practice all of the features hereinbefore described combine in the production of a very efficacious fastening in which not only is the wedge member (or its complementary ring) in cooperative relation with the hooked ends of the wires, but a hard solder body acts as one available means within the area of the hooks maintaining the hooks against straightening, while a softer solder body, incapable of reducing the temper and tensile strength of the individual wires, invests the exposed portions of the spread wires between the wedge and shell, and below the wedge, to position them against displace-

ment, and to take a portion of the compressing or clutching force of the wedge member, as well as to add the strengthening qualities due to the soldering grip between the various parts.

It will be understood by those skilled in the art that while I have herein described in some detail a particular embodiment of my invention for purposes of full disclosure thereof I do not intend to limit myself in the broader aspects of my invention to full association of all of the features described, or the details of embodiment thereof, as many changes in form and structure may be made without departure from my invention and within the scope of the appended claims.

Having described my invention, what I claim is:

1. In a device of the character described the combination of the spread strands of a high tension, hard tempered cable and an encompassing shell, of a body of relatively soft metal of relatively low melting point, soldering the strands together and to the shell adjacent to the tip of the shell, and a body of harder metal of higher melting point soldering the strands within the larger portion of the shell.

2. In a structure of the character described the combination of a cable having portions of its strand wires separated and inbent at their extremities, a tapering shell encompassing the separated portions of the wires, a body of relatively soft metal having a relatively low melting point, soldering the portions of the strands adjacent to the shell tip to each other and to the contiguous pre-formed structure, and a body of harder metal having a higher melting point similarly soldering the inbent portions of the strands.

3. The method of anchoring the cable ends in a conical socket which consists in passing the cable through the small end of the socket, spreading its wires, hook-bending the ends thereof, engaging said hooked ends with a member that will pass into the socket, applying tension to the cable to position its wires in the socket under strain, and solder-filling the open areas of the socket.

4. The method of anchoring the cable ends in a conical socket which consists in passing the cable through the small end of the socket, spreading its wires, hook-bending the ends thereof, engaging said hooked ends with a member that will pass into the socket, applying tension to the cable to position its wires in the socket under strain, and filling the socket below the hook bends with a molten solder of relatively low melting point as described, and filling the area containing the wire hooks with a solder of higher melting point as described.

5. In a device of the character described

the combination with a cable end having its wire courses spread and hook-formed at their ends and a conical shell receiving such spread wires, of a pre-formed member engaged by the hooked ends of the wires, and a solder body filling the spaces between the pre-formed parts and embedding said hooked ends.

6. In a device of the character described the combination with a cable end having its wire courses spread and hook-formed at their ends and a conical shell receiving such spread wires, of a pre-formed member engaged by the hooked ends of the wires, and a relatively soft solder body filling the portions of the shell adjacent the tip thereof and a harder solder body investing the hooked ends of the wires.

7. In a fastening of the character described the combination of a conoidal shell, a cable end having its spiral strands separated within the shell and a core portion in substantially axial position, a wedge member having a longitudinal passage engaging the core portion and having its periphery similar to the tapered interior of the shell, clutching the spread cable wires to the shell and a solder body filling the spaces within the shell from below to above the wedge member.

8. In a device of the character described the combination of a conical shell, a cable end having its strands separated within the shell, a wedge member clutch engaging the separated strands to the shell wall, a ring resting on the wedge base, the extremities of the separated wires being in bent over the ring, and a metal body filling the spaces within the shell between the stated parts.

9. In a device of the character described the combination of a tapered shell having a relatively soft tip and relatively hard base, a cable end having wires spread within the shell, and a solder body filling the spaces within the shell between the pre-formed parts, said solder body being relatively soft within the tip and relatively hard within the base.

10. In a device of the character described the combination of a tapered socket shell, a cable end having wires spread within said

shell, and a metallic wedge within said spread wires, said wedge being relatively soft at its tip and harder at its base.

11. In a device of the character described the combination of a socket shell having a uniformly tapered interior, a cable end having strands spread within the opening, a wedge within the spread wire ends, said wedge being of conoidal form, its upper portion having a taper substantially the same as the interior of the socket to clutch the wires to the shell and its lower portion having a taper less than that of the socket, and a solder body filling the shell adjacent the lower end portion of the wedge.

12. In a device of the character described the combination of a socket shell having a uniformly tapered interior, a cable end having its spiral strands separated within the shell and a core portion in substantially axial position, a wedge within the spread wire ends and having an axial passage receiving the core portion and having a greater cross sectional area than the core, said wedge being of conoidal form, its upper portion having a taper substantially the same as the interior of the socket to clutch the wires to the shell wall and its lower portion having a taper less than that of the socket, and a solder body filling the axial passage in the wedge and the shell adjacent the lower portion of the wedge.

13. The method of securing the spread end of a high tension, hard-tempered cable in a socket shell, which consists in filling in the lower portion of the shell with molten metal, of relatively low melting point, in quantity and heat insufficient to substantially affect the temper of the cable strands adjacent the tip of the socket, and thereafter similarly filling in an upper portion of the socket with molten metal of higher melting point partially drawing the temper of the engaged portion of the cable strands.

In testimony whereof I hereunto set my hand in the presence of two subscribing witnesses.

ARTHUR ORR.

In the presence of—
MARY F. ALLEN,
STANLEY W. COOK.