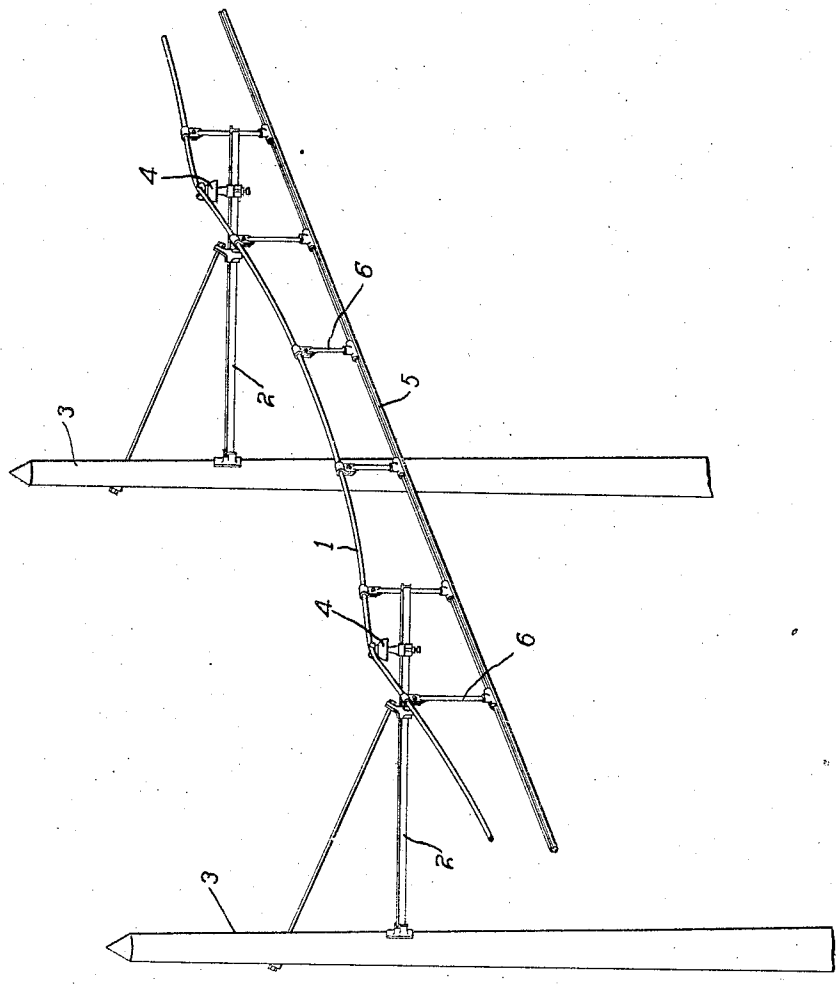
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MATERIAL FOR CATENARY CONSTRUCTION

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WITNESSES:

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UNITED STATES PATENT OFFICE.

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MATERIAL FOR CATENARY CONSTRUCTION.

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My invention relates to catenary structures, more especially, to structures of this general character employed for suspending trolley lines and the like.

It is among the objects of this invention to provide an improved catenary construction for electric railways and other applications which shall be stable with respect to temperature changes, which shall be rigid and mechanically strong and which shall be protected against corrosion caused by changing atmospheric conditions.

The usual type of catenary trolley line suspension comprises a messenger wire which hangs in a catenary loop between supporting arms secured to poles or other suitable supporting structures. The trolley wire is suspended from the messenger wire by a plurality of hangers of varying lengths corresponding to the deviation of the loops from the horizontal to provide a line substantially parallel with the roadbed.

In the accompanying drawing constituting a part hereof and in which like reference characters designate like parts, the single figure is a perspective view of a catenary construction suspended between a pair of supporting poles.

The structure comprises a messenger wire 1, which hangs in a catenary loop between supporting arms 2, secured to poles 3 and insulated therefrom by suitable insulators 4. The trolley wire 5 is suspended from the messenger wire 1 by a plurality of hangers 6 of varying lengths to provide a line substantially parallel with the roadbed (not shown).

The catenary or messenger wire 1 is subjected to changes in length due to temperature or load changes, which subsequently affects the alinement of the trolley wire, resulting in operating difficulties.

My present invention obviates these difficulties in that I utilize a material for the catenary or messenger loop which is stable with respect to temperature changes, both as to length and elasticity. I have found that, by employing an iron-nickel alloy for the catenary loops containing suitable quantities of carbon, chromium, manganeze, tungsten, cobalt, silicon or the like, to produce desired physical properties, these difficulties will be overcome, resulting in a structure that is stable with respect to temperature changes, both as to length and elasticity.

Certain alloys of iron and nickel have a relatively low or negative coefficient of thermal expansion and have a temperature coefficient of elasticity, the value of which is negative and small compared to that of steel, or which may even be positive. They have a tendency to become more rigid with rising temperature and it is this characteristic that makes them especially adapted for use on catenary-loop suspensions.

I have found that iron-nickel alloys containing from 20 to 40% of nickel are suitable for my purpose and I prefer to use an alloy having a nickel content of about 30%. The temperature coefficient of expansion of such alloys is about $\frac{1}{10}$th to $\frac{1}{5}$th of that of steel. The alloys may contain small amounts of other ingredients which are present as impurities or which are added to modify the characteristics of the alloys. Among such substances are carbon, chromium, manganese, tungsten, cobalt and silicon.

The messenger wire, when formed of an iron-nickel composition, may be sheathed with a non-ferrous metal, such as copper or copper alloys, or by any other suitable protective material, to protect it from corrosion effected by atmospheric conditions.

It is obvious, from the above description, that catenary-loop suspensions formed in accordance herewith provide a stable and lasting structure which is particularly desirable for electrical-street railway application, and that such a structure provides uniform operating conditions.

Although I have described a specific embodiment of my invention, it will be obvious to those skilled in the art that various modifications may be made; for instance, the iron-nickel alloy may be of any suitable proportion to obtain the desired physical characteristics, and other suitable elements may be added in varying quantities. The structure may also be applied to applications other than trolley-line suspensions. These and other changes may be made without departing from the principles herein set forth.

I claim as my invention:

1. In a catenary structure, a trolley wire, means for supporting said trolley wire and a messenger wire comprising an alloy of nickel and iron having a low coefficient of thermal expansion.

2. In a catenary structure, a trolley wire,

means for supporting said trolley wire and a messenger wire comprising an alloy of nickel and iron having a low coefficient of thermal expansion and a small temperature coefficient of elasticity.

3. In a catenary structure, a trolley wire, means for supporting said trolley wire and a messenger wire comprising an alloy of nickel and iron having a low coefficient of thermal expansion and a small positive temperature coefficient of elasticity.

4. In a catenary structure, a trolley wire, means for supporting said trolley wire and a messenger wire comprising an alloy of nickel and iron containing about 30% nickel.

5. In a catenary structure, a trolley wire, means for supporting said trolley wire and a messenger wire comprising an alloy of nickel and iron containing 20 to 40% nickel.

6. In a catenary structure, a trolley wire, means for supporting said trolley wire and a messenger wire comprising an alloy of nickel and iron containing comparatively small amounts of carbon, chromium, manganese, tungsten, cobalt and silicon.

7. In a catenary structure, a trolley wire, means for supporting said trolley wire and a messenger wire comprising an alloy of nickel and iron containing about 40% of nickel.

8. An electrical transmitting system, which comprises a conductor wire having a relatively large temperature coefficient of expansivity, said wire being suspended in a substantially straight line, hangers for supporting said wire and a looped carrier wire for supporting said conductor and hangers, said looped wire having a low temperature coefficient of expansion whereby the distortion of said conductor wire is minimized.

9. An electrical transmitting system which comprises a looped wire suspended from a plurality of supports, a conductor wire, a plurality of hangers attached to said looped wire for supporting said conductor wire in a substantially straight line in the plane of said looped wire, said looped wire being an alloy having a temperature coefficient of from zero to about one-fifth that of steel whereby the distortion of said conductor is minimized or prevented with changes in the temperature of said wires.

In testimony whereof, I have hereunto subscribed my name this 11th day of July, 1922.

PORTER H. BRACE.