

# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN TELEGRAPH-WIRES FROM ALLOYS.

Specification forming part of Letters Patent No. 130,702, dated August 20, 1872.

Specification describing certain Improvements in Telegraph-Wires, invented by CHAS. J. A. DICK, formerly of Hesse Darmstadt, Germany, but now residing in Pittsburg, Allegheny county, State of Pennsylvania.

My invention consists of improvements, described hereafter, in wires for conducting electrical currents and other wires for telegraph purposes.

I have discovered that copper alloyed with tin in limited proportions, and treated as hereinafter fully described, is a valuable substitute for the electrical conductors hitherto used. I have furthermore discovered that by adding a certain limited quantity of phosphorus to alloys of copper and tin in limited proportions the resulting product acquires additional tensile strength and elasticity without material detriment to its conductive capacity; and also that by adding a further proportion of tin, or of phosphorus, or of both these ingredients, within certain limits, to copper, the wire drawn from such phosphorized alloys can be used with advantage as a support for copper or other similar good conductors of insufficient tensile strength, replacing the steel-wire supports now in use for like telegraph purposes.

The nature of copper permits its use for telegraph purposes (except for short lengths or connections) only when supported by other materials of greater strength and elasticity.

The object of this invention is to produce wire which has greater conductibility than the iron wire now in use, and which has great tensile strength and elasticity, and is, therefore, self-supporting; and, moreover, is not as liable to corrode and deteriorate as iron wire, and in fact offers all the advantages of a good and permanent conductor having great strength and toughness. The object of this invention is furthermore to produce wires of phosphorized alloys of copper and tin for supports of copper or other like good conductors of insufficient tensile strength, as hereafter stated, which wires have approximately the same resistance as the steel wire now used, and which are not subject to rusting or rapid deterioration.

By treating the metals composing the alloy of copper and tin in such a way as to prevent

the presence of oxides in the perfected alloy—be it by the mode of smelting and protecting the molten materials from contact with the atmospheric air, or be it by the addition to the molten alloy of a reducing agent, such, for instance, as phosphorus—the wire drawn from such alloy will be found to be tougher and more rigid and more elastic, and not so liable to be stretched and lengthened as wires of alloys in which oxides are present.

I use alloys of copper containing from two to five and a half per cent. of tin, free from oxides. I roll and draw them into wire in the usual way. I prefer to cast the alloy into chill molds, as the homogeneity and other qualities of the metal are thereby improved.

Phosphorized alloys of copper and tin are stronger and more elastic than those containing no phosphorus. The conductibility of the alloy is somewhat impaired by the presence of phosphorus; but I have found that valuable compounds for electrical wires may be made of phosphorized alloys of copper and tin within the following proportions:

First, when not more than two per cent. of tin is used, the component quantity of phosphorus may amount to not more than one-half per cent. Second, when not more than four per cent. of tin is used, the component quantity of phosphorus may amount to not more than two-tenths per cent. Third, when five and a half per cent. of tin is used, the component quantity of phosphorus must not exceed one-eighth per cent. Intermediate proportions may be adopted without departing from my invention.

For wire in the application of which conductibility is a less important consideration than great strength and resistance, I use four to five and a half per cent. of tin with from two-tenths to six-tenths per cent. of phosphorus, or five and a half to six and a half per cent. of tin with a maximum quantity of three-tenths per cent. of phosphorus, the remainder of the alloy being copper.

These wires are particularly well adapted to the support of conductors of insufficient tensile strength, and, as such supports, may be insulated from the conductors, as in telegraph cables, or may be in metallic contact with conductors.

I claim as my invention—

1. Telegraph-wire of alloys free from oxides, and composed of copper with from two to five and a half per cent. of tin.
2. Wire for telegraph purposes composed of phosphorized alloys of copper and tin, restricted to the proportions substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

C. J. A. DICK.

Witnesses:

WM. A. STEEL,  
HARRY W. DOUTY.