# UNITED STATES PATENT OFFICE.

LOUIS BOUDREAUX, OF PARIS, FRANCE.

## ALLOY.

SPECIFICATION forming part of Letters Patent No. 648,652, dated May 1, 1900.

Application filed May 3, 1897. Serial No. 634,944. (No specimens.)

*To all whom it may concern:*

Be it known that I, LOUIS BOUDREAUX, a subject of the Republic of France, residing at Paris, France, have invented certain new and useful Improvements in or Relating to Dynamo and Like Electrical Contact-Brushes, of which the following is a specification.

The electrical contact-brushes indispensable, for instance, for dynamos must fulfil certain conditions. Their conductivity must be as great as possible in order not to offer resistance to the passage of the current, while their friction on the commutator must be as little as possible. It is obvious that a bar or block of copper, brass, or bronze would satisfactorily answer the first, but would be far from satisfying the second requirement. In order to realize the second condition, it has been found necessary to divide the metal constituting the brushes and construct them in the form of metal strips, plates, wire leaves, netting, and powder. The great tenacity and extreme ductility of copper or its usual alloys render indispensable the latter mode of making the brushes, whereby is avoided the excessive friction between the commutator and brushes when made of a bar or block of copper or alloy of great tenacity and ductility.

I have discovered means quite different from the mechanical division of the metal constituting the brushes which will satisfy the above requirements. This consists in modifying the molecular state of the metals employed, so as to lessen their tenacity and ductility, which is the object of the present invention.

I add to copper or to its alloys a small proportion of bismuth, antimony, or cadmium, the nature of the resulting alloy being quite different from those used hitherto. The fibrous structure of the copper becomes crystalline, a small percentage of bismuth, antimony, or cadmium rendering the copper very brittle. The behavior of such an alloy on a commutator is quite different from that of the alloys used hitherto. While the use of copper results in considerable heating, owing to the great friction, the new alloy behaves in an admirable manner without great frictional gripping or heating. It may be compared to a metallic powder agglomerated by fusion and having its molecules easily detachable by the commutator.

The alloys constituting my new brush can be produced by simply melting the metals together or by placing the pulverized metals of suitable fineness in a mold and heating them under pressure to the temperature required to melt them and produce the alloy.

Although not confining myself to any definite or absolute proportions of the various metals, I prefer to use alloys of the following composition:

For commutators with sectors of red copper, two grams bismuth, three grams cadmium, fifteen grams antimony, with one kilogram of commercial copper.

For commutators with sectors of hard bronze, four grams bismuth, six grams cadmium, thirty grams antimony, with one kilogram of commercial copper.

For commutators with sectors of steel, six grams bismuth, nine grams cadmium, forty-five grams antimony, with one kilogram of commercial copper.

The antimony, bismuth, and cadmium are melted together, and the resulting alloy is added to the copper in the proportions hereinbefore specified.

While an alloy having any of the proportions above recited will operate with a dynamo having any of the peculiarities referred to, I have ascertained by experiment that better results are obtained by varying the proportions of the constituent ingredients according to the character of the commutator in connection with which the brush is to be used.

I claim as my invention—

An alloy for use as described, consisting essentially of copper, bismuth, cadmium and antimony.

In witness whereof I have hereto set my hand in the presence of the two subscribing witnesses.

LOUIS BOUDREAUX.

Witnesses:
LOUIS SULLIGER,
EDWARD P. MACLEAN.