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LEAD ALLOY.

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This invention relates to alloys of lead containing a small quantity of a metal which is immiscible with lead, such as copper, nickel, cobalt, manganese, chromium or aluminium, and has for its object to provide an alloy having lead as a base, but having better physical properties.

This invention also comprises a lead alloy containing, besides one of the said immiscible metals, a small quantity of bismuth.

Lead excels all the other metals of daily use in its resisting power against chemical corroding actions, but the practical merit thereof is very much decreased owing to its inferior physical properties. According to my invention, not only the superior chemical properties have been enhanced, but the physical properties thereof, especially those relating to hardness and tensile strength, were greatly improved, enabling lead to be most advantageously used for covering galvanized wires and plates, for covering telephone and telegraph cables, and also for the manufacture of the pipes for conveying water and other chemical liquids.

According to my experiments, the physical properties of lead can greatly be improved by adding to it a small quantity of a metal immiscible with lead, such as copper, nickel, cobalt, manganese, chromium or aluminium. Hardness and especially tensile strength of lead can be increased considerably, without appreciable loss in maleability, by the addition of a small quantity, below 10 per cent, of one or several of the metals above mentioned.

If a small quantity of bismuth is added to the lead alloy just mentioned, the same forming a solid solution of one phase with lead up to about 10 per cent content, it will bestow very beneficial effects on the alloy in the way of reducing the coefficient of friction and of increasing mobility in molten state, thereby facilitating casting of the same or shaping to any desired form. As to the coefficient of friction, I found that it decreases with the percentage content of bismuth and attains a minimum at 0.25 per cent.

In the following are given some of the results of experiments conducted by me with regard to a test piece of a bar six inches long, the central portion of which consisted of a circular rod of length 2¼ inches and diameter 12 mm.

Lead-content (per cent)	Copper-content (per cent)	Bismuth-content (per cent)	Tensile strength (kgs. per cm.²)	Elongations
100	----------	----------	122	100
99.9	0.1	----------	204	94.3
99.65	0.1	0.25	214	93.4
98.75	1.0	0.25	214	91.6

Remark: Elongations are given in percentage, that of pure lead being taken as 100.

My lead alloy, especially that containing a small quantity of bismuth, besides a small quantity of a metal immiscible with lead, such as copper, for example, has very excellent physical properties, especially with regard to tensile strength, while it retains every desirable chemical property of lead, such as resistance to corrosion. Thus my alloy, when used as a water pipe, owing to its smoothness of surface, will offer less resistance to the flow of water, and consequently it will require less power at the pumping station, as compared with ordinary lead pipe. If used for the covering of telephone cables, a considerable saving in the covering material may be effected due to its increased strength. Or more precisely, its tensile strength being nearly twice that of pure lead, the cross sectional area of the lead covering may be reduced by one half an amount.

In my invention, the percentage content of a metal immiscible with lead may widely vary according to the circumstances. However, it will not very much exceed one per cent and in any event it will not exceed 10 per cent.

What I claim is:

1 An alloy consisting of lead, bismuth and a metal immiscible with lead of the group: copper and nickel, wherein the bismuth content lies between 0.025% and 4.0% and the content of the metal immiscible with the lead lies between 0.025% and 5.0%.

2. An alloy consisting of lead, bismuth and at least one of the metals immiscible with lead and of the group: copper, nickel, cobalt, manganese, chromium and alumin-

ium, wherein the bismuth content lies between 0.025% and 4.0% and the content of the metal immiscible with lead lies between 0.025% and 5.0%.

3. An alloy consisting of lead, bismuth and a plurality of the metals immiscible with lead and of the group: copper, nickel, cobalt, manganese, chromium and aluminium, wherein the bismuth content lies between 0.025% and 4.0% and the aggregate content of the metals immiscible with lead lies between 0.025% and 5.0%.

4. An alloy consisting of lead, bismuth and copper, wherein the content of bismuth lies between 0.025% and 4.0% and that of copper between 0.025% and 5.0%.

In testimony whereof, I affix my signature.

HIROSHI YOSHIKAWA.