This invention relates to alloys of nickel, silver, tin and copper. Alloys of copper with nickel, silver, and tin are already well known, particularly under the name of German silver ("Alpaka"). The addition of silver and in a lesser degree of nickel is for the purpose of producing a silver-like appearance. For the same reason these alloys generally contain also considerable quantities of zinc.

The hitherto known nickel-tin-copper alloys are similar to the above mentioned alloys when the nickel content is great, whereas when the nickel content is slight they are principally used as a material for constructional purposes, on account of their great strength and hardness.

The present invention relates to nickel-silver-tin-copper alloys and has for its object in the first place to increase the strength or to raise the yield point and elastic limit of the finished worked up material beyond those values hitherto attainable with nickel-tin-copper alloys, and secondly to render the structure of the alloys a priori more finely divided, so as to facilitate mechanical working-up.

The invention consists essentially in the addition of silver to copper, tin, and nickel in a certain definite molecular weight ratio.

Practical tests have shown that the purpose of the invention can be attained if the ratios of the weights lie between the following limits:—3% to 12% tin, 0.1% to 6% nickel, 0.1% to 5% silver in pure copper. An example of an alloy determined according to this principle is indicated by the formula Cu_{93}Sn_{3}Ni_{5}Ag. If desired two alloys determined in this manner according to molecular weights may be combined. Experience has shown that alloys in accordance with the invention possess particularly valuable properties, in that with the particular percentages used of each metal, a true eutectic point is reached with a resulting increased density and improved structural composition and a corresponding increase in strength, yield point and elastic limit of the alloys. Alloys formulated in accordance with the invention show an absolute strength of over 60 kg./mm.² (i.e. 38 tons/in.²) and a correspondingly raised yield and elastic limit, viz. at an elongation of over 10%, contraction 50% and ball hardness (Brinell's method) 200.

The alloys can be produced in accordance with generally practised methods in reverberatory, crucible or other suitable types of furnaces, provided the above stated principle of composition is carefully followed. For purely foundry purposes a further metal, e.g., zinc, may be added to the extent of 2% for the purpose of hardening the alloy.

The ingots of these alloys show a more finely divided structure than the usual nickel-tin-copper alloys, so that the treatment by hot forging can be reduced. Under certain conditions, in particular in the case of work pieces of small dimensions, this treatment can be dispensed with entirely, since the treatment in the cold state is often sufficient. The addition of silver further effects the reduction of the degree of hardness of the ingots, and thereby reduces their sensitiveness on the one hand to hot forging, and on the other hand to fracture as a result of the heat generated by rapid cold hammering. This again means a reduction in spoiled pieces, and thus an increase of economy.

I claim:

1. An alloy comprising copper, nickel, tin and silver, the copper predominating and being over ninety percent by weight, the nickel 0.1—3.5 percent by weight, the tin 6—9 percent by weight, and the silver 0.1—1.8 percent by weight.

2. An alloy of copper, nickel, tin and silver, the copper predominating and being over 90 percent by weight, the nickel 0.1—3.8 percent by weight, the tin 6—9 percent by weight, the silver 0.1—1.8 percent by weight, and zinc not to exceed 2 percent by weight.

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