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FLINT ALLOY

Henry Kent, Englewood, N. J.

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The invention relates to flints and more in particular to metal alloys for flints such as used in lighters, miners' lamps and the like. The conventional alloys employed for the indicated purpose contain an appreciable quantity of magnesium, i. e. normally up to about 2% in weight or approximately between 4 and 8% in volume of the composition which in addition thereto comprises misch-metal, iron and copper. The misch-metal conventionally used in the production of flints is a mixture of rare-earth metals containing cerium, lanthanum and didymium. The magnesium is added for various purposes, for instance in order to purify the melt, mainly from carbides, the formation of which cannot, or at least not readily, be prevented. Such carbides if present in the product tend to combine with the atmospheric moisture so as to form acetylene, with the result that the product readily disintegrates to powder. The magnesium may be added also to improve the fineness of the grain of the finished product, and to render the spark a white color.

However, the use of magnesium is accompanied by certain inconveniences. In the production of a flint alloy, it is imperative that, on the one hand, oxidation is avoided during the melting and mixing of the various components, and, that on the other hand, the desired relative percentage of the components is maintained in very narrow limits. Usually, the melting of the metals is accomplished under a protective layer of a suitable salt or salt mixture in such a manner that first the misch-metal is molten, then, the magnesium is added, and finally the iron and copper are charged into the crucible containing the molten misch-metal and magnesium. In the adding of the magnesium, difficulties are encountered, owing to the fact that its specific gravity is only about a third that of the misch-metal and even lower than that of the salt layer whose specific gravity is about 2.6. It is necessary to hold the required quantity of magnesium by means of iron tools, such as tongues, so deep in the liquid misch-metal that the melting particles of magnesium tending to rise will be taken up by the misch-metal during their upward movement. Nevertheless, it frequently happens that drops of molten magnesium reach the surface where they immediately start to burn with an intense flame. Although such flame can be easily extinguished by suitable means, some indefinite quantity of magnesium will be lost with the result that the metal mixture will be poorer in its magnesium contents than desired, and that the forming magnesium oxide is apt to impair the quality of the finished alloy. Also, during the time the magnesium is held by the above-mentioned tools in the melt, the misch-metal readily attacks, i. e. dissolves the iron of the tools. In consequence, a certain additional quantity of iron will enter into the mixture, which quantity can be estimated only roughly, and which may render the composition incorrect.

It is true that the producers of flint alloys are used to dealing with the mentioned difficulty. However, in times like the present when magnesium is not readily available, there is an additional reason why magnesium should not or only sparingly be used in flint alloys. Desirable savings in magnesium can be made if either none or at least less magnesium is used than hitherto, or if the usefulness of a given quantity of the product is increased.

The invention aims, therefore, to provide an alloy which is free from magnesium, and which, nevertheless, has such qualities as are required in order to render it useful for flints, particularly for lighters and the like.

Another object of the invention is to provide a flint alloy wherein magnesium is present in an amount up to that of the conventional product, which alloy, however, will stand a greater number of lighting operations than an equal quantity of the conventional alloy.

Now, I have found that not one of the readily obtainable metals alone is useful to replace the magnesium as to its purifying effect, that, however, a combination of several metals can be effective as a satisfactory substitute for magnesium if added to the basic components of the alloy, i. e. to the misch-metal, iron and copper. In selecting such metals I limit myself to the members of the group of those which have a specific gravity of not less than approximately 6 in order to avoid difficulties in the melting as hereinbefore mentioned with respect to the melting of magnesium. Considering the various metals as to their effect in purifying the alloy from carbides, I found silver to be satisfactory and only little less active than magnesium. Its purifying effect proved to be sufficient to prevent disintegration of the alloy for a reasonable length of time. Coincidentally, however, the silver renders the flint alloy softer and its grain coarser, both of which qualities being undesirable because they increase the wear. In order to improve the fineness of the pores in the final product, I add some nickel, which, however, has no influence on the hardness. A greater hardness can be obtained by the addition of one of various metals, such as man-

ganese, vanadium and chromium. Manganese and vanadium are not recommended for the purpose here in consideration, owing to the fact that the hardening effect of these two metals is generally too strong, meaning that the product becomes too hard with the result that the steel used in producing sparks from the flint will be worn rather than the latter. Contrary thereto, chromium has just the desired quality of hardening the flint alloy as required.

Thus, a satisfactory flint alloy can be obtained by adding suitable quantities of silver, nickel and chromium to the usual components, viz. misch-metal, iron and copper, and a composition is recommended in which the various metals are present in the following approximate relation as to weight:

Misch-metal	300
Iron	75–100
Copper (About)	5
Silver	2– 4
Nickel	1
Chromium	1

This alloy gives hot sparks, its hardness is well-balanced with respect to the abrasive action of the steel in a lighter, and it does not readily disintegrate.

If it is desired to increase the resistance of the flint alloy to disintegration, or to obtain sparks of a more whitish color, magnesium may be added in a relative quantity up to that present in the conventional flints. This means that magnesium up to 2% in weight may be added to the components of the alloy whose analysis has been hereinbefore stated. However, in most instances where magnesium will be added, very small quantities will be sufficient in view of the purifying effect of the silver.

I have found that my new alloy with or without magnesium is much less readily consumed in use than the conventional alloys. In testing flint rods of equal diameter in a lighter in which the pressure between the flint and steel was maintained constant, a certain length of rods of conventional alloys was consumed by 3000 to 3500 lighting operations, whereas an equal length of rods of my novel alloy stood 4500 to 5000 operations. Hence, even if magnesium is present in my alloy up to the full amount used in the conventional alloys there will be a very considerable saving from the viewpoint of consumption.

In preparing the alloy without magnesium, the misch-metal is first molten under a salt layer. While raising the temperature the iron is added which will dissolve, depending on its relative quantity, at a temperature below the general melting point of iron, owing to the presence of the misch-metal. Then the silver, nickel and chromium, and finally the copper may be added and stirred into the mixture at a suitable temperature so that the various metals form a homogeneous alloy. Although I prefer the mentioned sequence in the adding of the metals, I have not found appreciable differences if the copper is added prior to one of the other metals. Contrary to the preparation of conventional magnesium-containing alloys, no particular means or measures need be applied in producing the novel alloy in order to keep one of the components in contact with the others. Furthermore, it will be clear that each component quantity can be accurately adjusted and, consequently, an alloy can be obtained which has exactly the required composition.

If it is desired to add magnesium, this has to be done in the manner usual in the preparation of the conventional alloys. It is advisable to add the magnesium before the iron has been molten in the mixture.

When the melting and mixing is completed the melt may be cooled to a casting temperature slightly above the solidifying point and may be cast in a pre-heated mould having a temperature slightly below that point so as to obtain flints in the form of rods which later may be cut to pieces of marketable size.

I claim:

1. An alloy for flints consisting of approximately 300 parts in weight of misch-metal, 75 to 100 parts of iron, about 5 parts of copper and small quantities of silver, nickel and chromium, said quantities of silver, nickel and chromium together being less than 2% in weight of the alloy.

2. An alloy for flints consisting of approximately 300 parts in weight of misch-metal, 75 to 100 parts of iron, about 5 parts of copper and 4 to 6 parts in weight of silver, nickel and chromium, wherein the weight of the nickel is approximately equal to that of the chromium, and the weight of the silver approximately 2 to 4 times that of the nickel.

3. An alloy for flints consisting of approximately 300 parts in weight of misch-metal, 75 to 100 parts of iron, about 5 parts of copper, 2 to 4 parts of silver, 1 part nickel and 1 part chromium.

HENRY KENT.