

# UNITED STATES PATENT OFFICE.

CARL AUER VON WELSBACH, OF VIENNA, AUSTRIA-HUNGARY.

## PYROPHORIC ALLOY.

No. 837,017.

Specification of Letters Patent.

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*To all whom it may concern:*

Be it known that I, CARL AUER VON WELSBACH, chemist, of IV Wiedner-Hauptstrasse 57, Vienna, and of Rastefeld, Austria-Hungary, have invented certain new and useful improvements in Pyrophoric Alloys, of which the following is a specification.

My invention relates to a manufacture of metallic alloys having pyrophoric action and their application to the purposes of ignition and illumination.

It has been variously asserted that the rare earth metals have the property of giving off particles that are self-igniting in the air when scratched with a hard sharp substance. Experiments which I have made in this direction show, however, that these statements are erroneous, as I have found that the rare earth metals when pure do not show this peculiar property and that the non-ignition of the said detached particles under certain circumstances rather indicate the purity of the earth metal. I have discovered, however, that the rare earth metal cerium becomes pyrophoric if alloyed with certain other metals, in particular iron. Even with a very small percentage of iron the alloy gives off sparks on being rubbed with a file. As the percentage of iron is increased the sparking becomes more intense, eventually becoming a shower and resulting in a very luminous development of light. With about thirty per cent. of iron the alloy attains its maximum of pyrophoric energy. It is in this condition so sensitive that it only requires to be slightly touched with a file to give off an intense shower of sparks, though somewhat less luminous than with a lower percentage of iron.

In these alloys the iron can be partially replaced by nickel or cobalt; but if the iron be entirely replaced by these the pyrophoric property is considerably diminished. I have furthermore discovered that the exceedingly small particles separated by friction, the burning of which takes place with exceeding rapidity and without any development of heat appreciable to the hand, are capable of igniting in a very prompt and reliable manner combustible gases mixed with air.

The preparation of the said alloys can be readily carried out if iron in a finely-divided

condition be added to the cerium while the latter is still in a molten state in the decomposing cell (wherein it has been reduced from its compound in the well-known manner) and while the passage of the electric current through the molten metal is still maintained. The iron under these circumstances readily dissolves in the cerium and the alloy produced can be run into molds under the exclusion of air.

The sparking can be produced not only by abrasion, but also by concussive action.

It will be understood that instead of using cerium alone as the metal to be alloyed with the iron or its equivalent I may use in conjunction therewith one or more of the other metals usually known as "rare earth metals," such as lanthanum and the like; but for the purposes of this invention the presence of the cerium is relied upon as essential for the development of the pyrophoric properties of the resultant alloy. In other words, it is practically essential for the production of the commercial results contemplated by this invention that where any other of the rare earth metals is used in making up the iron alloy it shall be associated with cerium and that unless cerium is present the pyrophoric properties of the alloy are insufficient for the uses herein contemplated. Commercial lanthanum, for instance, is frequently associated with cerium as an incident to its mode of manufacture, inasmuch as it is generally produced from sources containing cerium, and it is the presence of the cerium in the final alloy that is essential in every case to the invention herein claimed.

What I claim is—

1. A pyrophoric alloy, containing cerium, alloyed with iron; substantially as and for the purposes described.

2. A pyrophoric alloy, containing cerium alloyed with thirty per cent. of iron; substantially as and for the purposes described.

In witness whereof I have hereunto signed my name, this 10th day of November, 1903, in the presence of two subscribing witnesses.

CARL AUER VON WELSBACH.

Witnesses:

ALVESTO S. HOGUE,  
LEML. HILTS.