

# UNITED STATES PATENT OFFICE.

HENRY GRIFFITH, JR., OF BIRMINGHAM, ENGLAND, AND ARTHUR EDWARD KEMPLER, OF BÉCON-LES-BRYÈRES, AND VICTOR COPPÉE, OF LEVALLOIS-PERRET, FRANCE.

## PROCESS OF PURIFYING AND HARDENING ALUMINIUM.

SPECIFICATION forming part of Letters Patent No. 612,161, dated October 11, 1898.

Application filed September 23, 1897. Serial No. 652,729. (No specimens.) Patented in France February 18, 1897, No. 264,161.

*To all whom it may concern:*

Be it known that we, HENRY GRIFFITH, JR., a subject of the Queen of Great Britain, residing at Warstone Lane, in the city of Birmingham, England, ARTHUR EDWARD KEMPLER, a subject of the Queen of Great Britain, residing at 61 Rue de la Sabbière, Bécon-les-Bryères, France, and VICTOR COPPÉE, a citizen of France, residing at 6 Rue de Dequin-gand, Levallois-Perret, (Seine,) France, have invented certain new and useful Improvements in Processes of Purifying and Hardening Aluminium, (for which we have obtained Letters Patent in France, No. 264,161, dated February 18, 1897,) of which the following is a specification.

This invention consists of improvements relating to aluminium, the object being to strengthen or increase the resistance of ordinary or commercial aluminium and to render the same suitable for cycle parts and for other purposes.

The aluminium to be treated in accordance with this invention is placed in a steel crucible and subjected to a melting temperature in a furnace of such construction that the flame will not come into contact with the surface of the metal. When the metal in the crucible is completely melted, there is added a small quantity of powdered gray wolfram (or ore of tungsten) mixed with a little borax, the proportion of wolfram to the aluminium varying from five to twenty grams to the kilogram, according to the intensity of resistance required from the metal, such resistance being increased in proportion to the quantity of wolfram employed. The mixture of wolfram and borax before introduction to the molten metal is kneaded into a stiff paste, being rendered sufficiently plastic for such purpose by the addition of a little water, and is then made into a small cake, in which form it is placed into the molten metal in the crucible. On the cake being pushed to the bottom of the crucible and held there by means of a suitable rod gases are generated which in rising through the molten metal and escaping therefrom produce a violent agitation of the whole contents of the crucible.

The aluminium before treatment by this process is of good ordinary commercial quality, containing ninety-eight per cent. of metallic aluminium, the remaining two per cent. consisting of the ordinary impurities found in aluminium. After the treatment of the above process an analysis of the metal shows 98.47 per cent. of aluminium; but no trace of tungsten can be found. Particular attention is called to the fact that the tungsten ore is not added for the purpose of obtaining an alloy of aluminium and tungsten.

The very small quantity of ore and borax added (from one-half to two per cent.) is for the purpose of purifying and hardening the aluminium. The exact nature of the reactions which occur cannot be stated, but great improvement in the strength and purity of the metal is secured.

In the production of a hard metal when it is necessary to add the hereinbefore-named maximum or nearly the maximum quantity of wolfram we introduce the mixture in two or more cakes at different times, as otherwise, if the whole quantity were introduced at one time, the agitation or bubbling of the liquid would be so severe as to displace some of the molten metal from the crucible.

When the agitation or bubbling of the molten metal has ceased, the whole of it is well stirred within the crucible, and it is then ready for pouring into the required molds.

The composition of the wolfram employed by us is as follows: iron, 6.30; manganese, 9.15; tin, 13.40; copper, .06; alumina, .30; magnesia, 2.35; tungstic acid, 48.20; phosphoric acid, traces; sulfur, traces; earthy insoluble matter, 12.50; oxygen and loss, 7.74; total, 100.

Having now described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The herein-described process of purifying and hardening aluminium consisting in introducing into the molten aluminium tungsten ore, in such small percentage as to give a product containing no tungsten, substantially as described.

2. The herein-described process of purify-

ing and hardening aluminium consisting in introducing into the molten aluminium tungsten ore, in such small percentage as to give a product containing no tungsten, and borax,  
5 substantially as described.

3. The herein-described process consisting in introducing into the molten aluminium tungsten ore, in such small percentage as to give a product containing no tungsten, near  
10 the bottom of the mass to cause a violent agi-

tation of the mass as the gases rise, substantially as described.

In witness whereof we have hereunto set our hands in presence of two witnesses.

HENRY GRIFFITH, JUNR.

ARTHUR EDWARD KEMPLER.

VICTOR COPPÉE.

Witnesses:

EDWARD MARKS,

HERBERT BOWKETT.