

N° 27,268



A.D. 1904

Date of Application, 14th Dec., 1904—Accepted, 19th Jan., 1905

COMPLETE SPECIFICATION.

“Improvements in and relating to Powders or Compositions for use in Artificial Lighting especially for Photographic purposes.”

I, GORTLIEB KREBS, Doctor of Philosophy, of the “Helios” Chemical Factory, Offenbach-on-Main, in the Empire of Germany, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

5 This invention relates to powders, mixtures or compositions for use in producing artificial illumination for photographic purposes. Flashlight powders now usually employed consist of mixtures of finely powdered metallic magnesium and aluminium with chlorates and perchlorates of potassium or alkali metals, persulphate of potassium, picric acid, peroxide of barium and so forth. Such
10 mixtures are, however, very explosive and they develop large quantities of smoke during combustion which seriously impairs the intensity of the light given. Attempts have been made to avoid these disadvantages, but up to the present no completely satisfactory powder has been produced.

According to the present invention an almost smokeless non-explosive powder
15 is produced by mixing together metallic magnesium or aluminium, or both, with silicic acid, boric acid, nitrates of alkali or alkaline earth metals or of rare earths; with amorphous phosphorus or silica where quicker combustion is desired; or with carbonates of alkali, alkaline earth or rare earth metals or silicic acid and so forth for slower combustion. By the additions of oxides
20 and carbonates of the alkalies or alkaline earths respectively, the amorphous phosphorus and the nitrates may be prevented from burning with the evolution of a large quantity of smoke which contains phosphorus acid and phosphoretted hydrogen which are injurious to health; this fact has been mentioned in American Patent No. 528515. The addition of suitable oxides of carbonates
25 prevents the development of smoke and of noxious fumes. These additions cause the respective phosphates and nitrates to form a sandy deposit.

It may be mentioned that it is known to use silicic acid and boric acid in flashlight powders, as for instance in the powder patented in Germany under
30 No. 101528, but this powder contains neither amorphous phosphorus or nitrates and therefore the silicic acid and boric acid serve a quite different purpose. The following is an example of a flashlight powder made in accordance with the present invention; it is understood, however, that the proportions may be varied. The powder consists of

100 parts of magnesium or 50 parts of magnesium and 50 parts of aluminium.
35 200 parts of an alkaline nitrate.
5 parts of amorphous phosphorus.
5 parts of magnesium silicate or carbonate, aluminium carbonate, glass-powder, or the like.

Such flashlight powders may be transformed into slow burning “time”
40 powders by the use of well known substances (glass-powder and so forth)

[Price 8d.]



Improvements in Powders or Compositions for use in Artificial Lighting.

and they may serve for giving monochromatic, orthochromatic, and panchromatic lights for use in photography. They are principally employed therefore, firstly, as an artificial source of photographic light, and secondly as a substitute for light filters for use with monochromatic, orthochromatic and panchromatic plates.

The desired effects may be obtained by adding to the above described powders certain metals, metallic salts, alkalies, alkaline earths, *etc.* as for instance the following: copper, zinc, silica, barium, strontium, lithium, nickel, thalium, calcium, iridium, thorium, *etc.*, whereby red, yellow, green or blue lights may be obtained.

As examples of the proportions to be used in making the additions, the following may be given:

a. In preparing a substitute for yellow light filters, 4 grammes of the flashlight powder are mixed with 1 gramme of a sodium or calcium salt.

b. To produce a substitute for a blue light filter absorbing yellow light rays, 4 grammes of the flashlight powder are mixed with 0.5 grammes of copper-bronze, a copper salt or of another metal capable of colouring the light blue together with metallic salts or substitutes and 0.5 gramme of zinc dust.

c. In preparing a substitute for a green light filter absorbing red rays, nitrate of barium should be added to the flashlight powder instead of strontium nitrate, and oxide of barium, carbonate of barium or other substance capable of colouring the light green should be added in place of oxide and carbonate of magnesium. Such substitute substances are barium carbonate, barium chlorate, *etc.*

d. In preparing a substitute for a red light filter which will absorb the blue rays, the magnesium, magnesium oxide or magnesium carbonate in the flashlight powder is to be replaced by the same quantity of strontium oxide, lithium, or by other substances which will give a red colour to the light.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. An improved process for the manufacture of a smokeless non-explosive mixture or powder for use in flashlight or "time" illumination especially for photographic purposes, said process consisting in the mixture of magnesium with or without aluminium with silica, with or without boric acid, with nitrates of the alkalies or alkaline earths, amorphous phosphorus and oxides, carbonates or silicates of alkalies together with silicon or other metals with or without light-colouring substances, substantially as described.

2. As an article of manufacture the improved mixtures for producing artificial light containing magnesium with or without aluminium, silica with or without boric acid, nitrates of the alkalies or alkaline earths, amorphous phosphorus and silicates, oxides or carbonates with or without the addition of metals or substances capable of imparting colours to the light emitted, substantially as described.

Dated the 14th day of December 1904.

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