

# UNITED STATES PATENT OFFICE.

ALEXANDER HEMSLEY, OF PHILADELPHIA, PENNSYLVANIA.

## COMPOUND FOR PRODUCING FLASH-LIGHT

SPECIFICATION forming part of Letters Patent No. 407,851, dated July 23, 1889.

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*To all whom it may concern:*

Be it known that I, ALEXANDER HEMSLEY, a citizen of the United States, residing in the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a certain new and Improved Compound for Producing an Instantaneous Artificial Flash-Light Applicable to Photography, of which the following is a specification.

My invention has relation to the manufacture of an ignitable compound for producing an incandescent flash or other light especially applicable to instantaneous photographic purposes.

It is well known that photographs can be taken without the presence of natural or day light by means of an artificial light produced by burning metallic magnesium either in the shape or form of wire, ribbons, or filings in oxygen, whether supplied in the form of gas or by means of the decomposition of chlorate of potassa, the light being of sufficient intensity or actinic power for producing a photograph. In practice I have found that other chlorates of the metals—such as strontium, magnesium, barium, copper, &c.—may be used to produce by ignition an orthochromatic effect similar to that produced by a specially-prepared plate used with an interposed colored screen. The main objection to the use of the chlorates of the metals is their liability to explode violently by friction or concussion, thereby making it exceedingly dangerous to use such for producing a light in photography.

The principal object of my invention is to provide an improved compound or mixture that may be handled with perfect safety and without the danger of explosion by friction or concussion, while at the same time readily ignitable for producing an instantaneous flash-light especially applicable to photography, whereby pictures of persons in evening costumes may be readily obtained, and for use as an illuminator for dull daylight exposures, the duration of exposure by its use being but the fractional part of a second. Then in its use harsh lights and abrupt shadows may be entirely obviated. Furthermore, it becomes possible in the use thereof to reproduce engravings and pictures in

white and black with most excellent results due to the sharp and distinctive character of the illumination produced. Then, furthermore, the various colors—such, for instance, 55 as the reds and the yellows or other tints—usually translated black may be represented in their proper or true relations in the photograph, and also making it possible to reproduce oil-paintings with result not heretofore 60 obtained.

My invention consists in mechanically or otherwise mixing amorphous phosphorus and one or more of the nitrates of the metals or of the alkaline earths in variable proportions, as 65 lead, potassium, sodium, barium, lithium, calcium, strontium, magnesium, &c., after reduction to an impalpable powder or pulverized mass, with metallic magnesium or other metal or metals in a powdered or finely divided 70 state or condition, and then compressing the mixture or compound into a pastil, pellet, pill, or other desired figure or form for use in the production by ignition of an instantaneous flash or other light capable of effecting a photo- 75 graphic action upon sensitive surfaces.

In order that my invention may be fully understood by those skilled in the art to which it appertains, I will now proceed more particularly to describe its characteristic features 80 and the results incident to the use thereof.

In carrying out my invention the following formula may be given for the preparation of the compound as a good working one. Still I do not wish to be understood as limiting my- 85 self to the exact proportions of the materials given, as each may be varied and still obtain good results in the compounding of them.

I take, say, seventy parts, by weight, (more or less,) of a nitrate or nitrates—such as barium, 90 strontium, lead, &c.—either alone or in the form of an admixture of one or more of them, and ten parts, by weight, (more or less,) of amorphous phosphorus reduced to a powdered state, and twenty parts, by weight, (more 95 or less,) of metallic magnesium or other suitable metal reduced to a finely-divided state in the form, for instance, of an impalpable powder, and these materials I then mechanically mix together in either a dry or wet state 100 or condition by the use of alcohol or other suitable liquid not containing oxygen, be-



cause rapid oxidation of the metals takes place when in a finely-divided state or powdered condition in the presence of oxygen.

The materials composing the compound when mechanically mixed together in a wet state may in a suitable appliance be compressed into pastils, pellets, or pills for use by ignition to produce an incandescent flash-light.

I desire it to be understood that my invention comprehends the use of the compound either in the form of a powder or in a compressed form, as pastils, pellets, pills, &c.

The amorphous phosphorus is principally used in the compound to promote rapid ignition and thorough or complete combustion, and consequently a diminution of the smoke or fumes arising from the combustion of the compound.

The "red" or amorphous phosphorus I have found in practice better adapted for the purpose than the ordinary yellow phosphorus.

The main object of employing amorphous phosphorus in combination with the nitrates of the metals or alkaline earths in preference to the chlorates or other substances capable of yielding oxygen is that it liberates with rapidity the oxygen from the nitrates, thereby furnishing a copious supply of oxygen gas essential for the ignition of the metallic magnesium to cause the resultant magnesium oxide to be brought to a high state of incandescence, and which is necessary for the production of a continuous spectrum rich in those chemical rays or vibrations which have the power of uniting photographic action upon specially-prepared surfaces.

The amorphous phosphorus could be replaced by sulphur, but not advantageously, because while its action is the same the ignition is less rapid, although more so than if neither sulphur or amorphous phosphorus was used in the compound. The simple admixture of a nitrate and a metal in a state of minute division to form a compound would produce one that would explode when ignited.

Then the chlorates I prefer not to use for the same reason that they are not used in the manufacture of gunpowder, which is principally because of their liability to explode by friction or concussion.

In the preparation of a compound composed of cadmium nitrate and metallic magnesium I have found in practice that such a compound will explode spontaneously and in a few moments after the admixture of them and without the introduction of either sulphur or phosphorus.

The best results I have obtained by mixing as hereinbefore described, amorphous phosphorus and one or more of the nitrates of the metals or the alkaline earths with metallic magnesium, and have produced a compound which could be handled with safety, and at the same time be readily ignited to cause a flash-light of very high intensity or incandescence, and one which has given excellent results in its application to instantaneous photography, and especially for bringing out orthochromatic effects in the picture.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A compound for producing a momentarily intense flash-light, composed of magnesium, one or more oxygen-yielding salts of the metals or alkaline earths, and phosphorus, substantially as and for the purposes set forth.

2. A compound for producing a flash-light for photographic purposes, composed of powdered or granulated metallic magnesium, one or more nitrates, and amorphous phosphorus, substantially as described.

In witness whereof I have hereunto set my signature in the presence of two subscribing witnesses.

ALEXANDER HEMSLEY.

Witnesses:

HERMANN BORMANN,  
EDW. E. CULLEN.