UNITED STATES PATENT OFFICE.

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SMOKE-PRODUCING COMPOUND.

1,244,940. Specification of Letters Patent. Patented Oct. 30, 1917.

No Drawing. Application filed December 9, 1916. Serial No. 135,943.

To all whom it may concern:

Be it known that I, WALTER ARTHUR, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Smoke-Producing Compounds, of which the following is a specification.

The present invention relates to a composition for the production of colored smoke. In military operations it is frequently advisable to indicate, either by the use of lights at night or smoke in the day time, the position of troops, and the course taken by shells, by the combustion of materials capable of producing distinctive colors. Smoke which is white or black or grayish cannot ordinarily be employed, since such smoke is likely to be confused with the smoke produced by various explosives employed. It has been proposed to employ aluminum, magnesium and similar metals, but these are open to the objection that they produce a white smoke, instead of a smoke having a particular color, more readily distinguishable from the smoke of explosives employed, and also in the bright sunlight, white smoke is not clearly visible from a distance. I have found that cadmium, either in the form of finely-divided metal, or in the form of an oxidizable compound, such as sulfid, is capable of producing a brownish smoke, which from a distance has a bright orange appearance. The cadmium metal or cadmium compounds employed are preferably mixed with oxidizing agents, such as nitrates, chlorates, perchlorates, specific examples being barium nitrate, potassium chlorate, ammonium nitrate, potassium perchlorate, sodium nitrate, or mixtures such as potassium nitrate and barium nitrate. The mixture containing the cadmium material and the oxidizing agent can be burned in a variety of ways, as fusee torches, or in some cases merely packages of the powdered material. The rate of combustion of the fusee will depend upon a number of conditions, such as the particular composition, both qualitative and quantitative, the amount of compression employed in putting up the same and other conditions. For use as tracers for shells and the like, it sometimes is advisable to employ a small tube attached to the base of the shell, filled with the smoke producing mixture (for use in day time) or with a light producing compound (for use at night). By the use of the materials herein specified, it is possible to watch the course of the shells, both during the day time and at night.

In some instances, it is preferable to employ the cadmium material and the oxidizing agent in substantially chemical equivalent proportions, while in other cases, an advantage is produced by the use of different proportions. I may in some cases use only a small quantity of cadmium, such as 4 or 5% whereas in other instances I may use (for example with potassium nitrate) as much as 52% of cadmium metal, or 37% with barium nitrate, or 47% with potassium chlorate. These are the molecular proportions, and hence produce the greatest amount of the colored smoke. For a slow burning fusee, I have had good results with 50% of powdered metallic cadmium, 25% of potassium nitrate and 25% of barium nitrate. It may happen in the combustion of such a fusee that some of the melted particles of cadmium would be blown off into the air, but in this case they would immediately burn to produce oxid.

I have produced excellent results with the use of powdered metallic cadmium in combination day and night tracers for shells. In this connection the substitution of metallic cadmium for a portion of the powdered aluminum, magnesium or zinc previously employed, has given good results, the cadmium producing highly colored smoke, and the aluminum producing a bright colored flame.

In some instances it is advisable to produce rapidly burning mixtures, for example I may mix finely powdered metallic cadmium with ordinary black powder, to produce a mixture, which upon burning produces a yellowish or brownish smoke. In this example also I may substitute cadmium sulfid.

While I have given in detail a number of specific instances of the use of cadmium, or mixtures containing the same, I do not limit myself to the exact details which are given for the purpose of illustration only.

What I claim is:

1. A smoke producing mixture comprising a solid oxidizable cadmium-containing material and a solid oxidizing agent.

2. A smoke producing mixture comprising a solid oxidizable cadmium-containing

material and a solid oxidizing agent, said mixture being compressed in the form of a fusee.

3. A smoke producing mixture comprising a mixture of pulverulent cadmium and a solid oxidizing agent.

4. A smoke producing mixture comprising a solid oxidizable cadmium-containing material, aluminum and a solid oxidizing agent.

5. A smoke producing mixture comprising a solid oxidizable cadmium-containing material, a metal which burns with the production of a bright light and a solid oxidizing agent.

6. A mixture comprising a finely divided solid oxidizable cadmium-containing material and a nitrate capable of supporting the combustion thereof.

7. A smoke producing mixture comprising a cadmium-containing combustible material and other combustible material and a plurality of oxidizing salts capable of furnishing oxygen for the combustion thereof.

8. A smoke producing mixture comprising a cadmium-containing combustible material and aluminum and a plurality of oxidizing salts capable of furnishing oxygen for the combustion thereof.

9. A smoke producing mixture comprising pulverulent cadmium and a plurality of oxidizing salts capable of furnishing oxygen for the combustion thereof.

10. A smoke producing mixture comprising pulverulent cadmium and aluminum and a plurality of oxidizing salts capable of furnishing oxygen for the combustion thereof.

In testimony whereof I affix my signature.

WALTER ARTHUR.