UNITED STATES PATENT OFFICE.

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CHEMICAL HEAT-PRODUCING MEANS.

1,312,840. Specification of Letters Patent. Patented Aug. 12, 1919.

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To all whom it may concern:

Be it known that I, WILLIAM ELBORNE, a subject of the King of Great Britain and Ireland, residing at Peterborough, in the county of Northampton, England, have invented Chemical Heat-Producing Means, of which the following is a specification.

This invention relates to chemical means for producing a high temperature in technically useful manner of the kind wherein a combustible metal in a finely divided condition is mixed with another substance with which on the mixture being ignited it combines, the combustion being self-supporting.

Now the present invention has for its object a chemical production of heat in the manner referred to, adapted to be utilized in an incendiary shell, and to yield on combustion an incandescent more or less fluid mass that in contact with water, including atmospheric moisture, evolves a poisonous inflammable gas which on burning is converted into a suffocating gas, thereby combining in a single shell the advantages as an offensive weapon heretofore separately residing respectively in incendiary shells and poison-gas shells.

According to the invention a finely divided metal, as for example aluminium is suitably incorporated with sulfur or a sulfur yielding compound as for examples iron pyrites, copper pyrites or galena and the mixture provided with igniting means.

Preferably the selected substances are mixed in molecular proportions namely, in the case of aluminium, 54.2 parts by weight of that metal and 96 parts by weight of sulfur or of sulfur content so that each is completely used up to produce the sulfid of the metal employed. When using sulfur both substances may either be in a finely divided condition or the sulfur can be melted and the appropriate quantity of metal added and stirred in, care being taken to prevent local heating at any point sufficient to cause ignition. The mixing can be effected in any suitable container which if intended for a shell may be the shell itself.

By incorporating the ingredients with the sulfur in molten condition and molding the mass while still warm the product is obtained in convenient block like condition easy of transport as such and it may be of suitable size and shape to constitute for instance a charge or part of a charge of a shell or the like.

Conveniently the heat production is started by a small portion or pellet of barium peroxid and magnesium powder placed in contact with the mass and which in the case of a shell is itself ignited by say an ordinary fuse, for instance a time use. When the sulfurous composition becomes once ignited the heat produced by the reaction is so intense that the combustion then proceeds spontaneously and yields a white hot more or less molten mass capable of acting very efficiently as an incendiary substance. This substance on cooling in the open and under usual atmospheric conditions will immediately commence to decompose at the expense of the moisture in the atmosphere or of any water in surrounding material, liberating, if the sulfur be incorporated as free sulfur, two-thirds of its weight as sulfureted hydrogen gas, possessing a most noxious odor and poisonous character. The liberated gas if ignited, for example by a spark or heated fragment of shell, burns to form the suffocating gas, sulfur dioxid.

In some cases say, the activity, of the mixture may be increased by addition of barium peroxid or chromium peroxid.

The reaction temperature which is exceedingly high is particularly effective for incendiary purposes when the sulfur containing composition is so contrived that the molten mass will include free metal which being a good conductor constitutes a heat carrier from the less conductive constituents to combustible matter with which the mass may be in contact. Thus, a molten mass derived from iron pyrites and aluminium will, due to the free iron liberated, be more conductive than one derived from free sulfur and aluminium but free sulfur produces a higher temperature. A useful means is obtained by using say half of the sulfur in the free state and the other half as sulfid. Alternatively all the sulfur may be free and the source of conductive metal be a metallic compound other than a sulfur compound but reducible in the reaction, iron oxid for instance, the alkaline earth metal being needfully increased for the reduction. Or, the metal may be added as such.

Very good results are obtained from mixtures of aluminium, free sulfur and ferric

oxid, or ferrosoferric oxid, the temperature of reduction being higher than if sulfur were absent and thus correspondingly increasing the temperature of the molten mass, the reduced metal serving as the heat carrier. Obviously other compositions will suggest themselves without departing from the invention using besides an alkaline earth metal, metal or metals free or combined (oxids and sulfids) or both, so as finally to occur in the free state in the molten mass and sulfur in suitable form and quantity to form alkaline earth sulfid.

The combustible material in a loose or pressed condition can be employed either unconfined in the open or confined in an open or closed container, which in the latter case as already referred to may be a shell, together with an igniter and with provision for a bursting charge.

What I claim is:—

1. A shell adapted to serve as a combined incendiary and poison-gas shell containing a charge comprising aluminium, sulfur in combustible form, and igniting means, said charge being capable, upon ignition and disruption of the shell, of shedding a fluid incandescent mass from which, upon contact with water a noxious gas is evolved.

2. In a shell designed for use as a combined incendiary and poison-gas shell, a charge comprising comminuted aluminium, free sulfur and igniting means.

3. In a shell designed for use as a combined incendiary and poison-gas shell, a charge comprising comminuted aluminium, sulfur in combustible form, iron, and igniting means.

4. In a shell designed for use as an incendiary and poison-gas shell, a charge comprising aluminium, iron combined as sulfid, and igniting means.

5. In a shell designed for use as an incendiary and poison-gas shell, a charge comprising aluminium, sulfur, iron combined as sulfid and oxid and igniting means.

6. In a shell designed for use as an incendiary and poison-gas shell, a charge comprising aluminium, sulfur and barium peroxid and magnesium powder as igniting means.

Signed at London, England, this thirtieth day of September, 1918.

WILLIAM ELBORNE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."