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IGNITER POWDER

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This invention relates to an improvement in igniter powder such as is used in connection with ordinary blasting caps, delay caps, etc.

As is well known, ordinary blasting caps, delay caps, etc., are usually fired by electricity which operates to heat a so-called bridge wire, the heat of which, in turn, operates, in the case of ordinary blasting caps, to ignite a primer charge which, in turn, fires the main charge of the cap, or, in the case of delay caps, ignites a fuse or an igniter charge therefor.

In practice, a relatively easily ignited charge, or powder, is placed about the bridge wire in order to insure ignition of the primer charge in the case of ordinary blasting caps and of the fuse in case of delay caps. The powder placed about the bridge wire, and which I term an igniter powder, is desirably of such a character as to be readily loaded to be readily ignited by the bridge wire when it is heated by a wide variety of electric currents and as to throw a hot long flame when ignited in order to insure ignition of the primer charge, or of the fuse.

An igniter powder is required to function under a wide variety of conditions under which the bridge wire may be more or less heated. Thus, for example, the bridge wire will usually be only heated to a dull redness under the influence of a current from, for example, an overloaded blasting machine. On the other hand, the current from a power line will rapidly fuse the bridge wire so that it disappears with almost explosive violence. Again, where a number of caps are placed in series, with certain types of caps the current is interrupted by the shooting of a cap after an extremely short interval of time has elapsed. An igniter powder must flash under any of the various conditions for heating the bridge wire and at the same time it should be of such a character as not to burn with such violence as to immediately break the bridge wire on its ignition, but rather to burn at such a rate that the circuit will be maintained for a short interval to allow the bridge wires of the other caps in the line to be heated for the firing of the other caps.

Now, in accordance with this invention, it has been found that a highly desirable and efficient igniter powder may be provided through the use of zirconium. The igniter powder in accordance with this invention may comprise zirconium with, for example, an oxidizing agent and/or alone, or with sufficient adhesive to keep it in place, or other ingredients as, for example, a detonating or

explosive ingredient, carbonaceous material, etc., etc.

In carrying this invention into practice, the zirconium will be desirably used in finely ground or powdered form. Desirably the zirconium will be held in place by an adhesive which may be combustible or non-combustible and such may, for example, be nitrostarch or nitrocellulose, gum arabic, etc., etc. When an oxidizing agent is used, such may be, for example, potassium chlorate, potassium nitrate, barium peroxide, etc., etc. As a detonating or explosive ingredient, if such be desirably included, there may be used, for example, mercury fulminate, nitrostarch, smokeless powder, etc. While as carbonaceous material charcoal, starch, etc., may be used. The powder may, of course, contain any other desirable ingredients which will function with the zirconium in an efficient manner.

As illustrative of the practical adaptation of this invention, for example, a suitable igniter powder may be produced comprising zirconium with, for example, about 4% of gum arabic to hold it in place.

As further illustrative, for example, a suitable igniter powder may be made up in accordance with the following formula.

	Per cent
Powdered zirconium	53
Potassium chlorate	47

In the above formula the potassium chlorate may, of course, be replaced with any other suitable oxidizing agent. The powder in accordance with the above formula or the zirconium with gum arabic or other adhesive will be found to operate efficiently, under various conditions under which the bridge wire is heated; to ignite a primer charge, or fuse, and at the same time to burn in such a manner as to leave the bridge wire for a sufficient time to enable the firing of other caps connected into the same line.

As a further illustration, for example, an efficient igniter powder may be made up in accordance with the following formula:

	Per cent
Powdered zirconium	50
Potassium chlorate	45
Nitrostarch	5

Powder in accordance with the above formula will be found especially adapted for use in connection with delay caps where the purpose of the powder is to effect ignition of a fuse, since the nitrostarch ingredient may be caused to act as a

binder to hold the powder in the cavity provided for it in the cap after the nitrostarch is wetted with a suitable solvent for nitrostarch and subsequently dried.

- 5 The powder in accordance with the above formula will further be found desirable in cases where the bridge wire is heated with a low current, as where the blasting machine may be overloaded, since the nitrostarch ingredient, which, 10 for example, may be replaced by smokeless powder, will insure ignition of the zirconium.

As indicated in accordance with this invention, the use of zirconium with various and sundry ingredients of ignition powders is contemplated 15 and it is understood that in accordance with this invention, zirconium may be added to igniter powders now in use. Thus, for example, a suitable powder in accordance with this invention may be made up on the following formula.

	Per cent
Powdered zirconium -----	20.0
Mercury fulminate -----	23.5
Potassium chlorate -----	37.6
Nitrostarch -----	11.3
25 Charcoal -----	7.5

What I claim and desire to protect by Letters Patent is:

1. In an electric blasting cap having a detonating charge and a bridge wire, an ignition charge 30 including zirconium, positioned for ignition by the bridge wire.

2. In an electric blasting cap having a detonating charge and a bridge wire, an ignition charge 35 consisting of zirconium as the sole active ingredient, positioned for ignition by the bridge wire.

3. In an electric blasting cap having a detonating charge and a bridge wire, an ignition charge 40 including zirconium and an oxidizing agent, positioned for ignition by the bridge wire.

4. In an electric blasting cap having a detonating charge and a bridge wire, an ignition charge 45 including zirconium and potassium chlorate, positioned for ignition by the bridge wire.

5. In an electric blasting cap having a detonating charge and a bridge wire, an ignition charge 50 including zirconium and a nitrated carbohydrate, positioned for ignition by the bridge wire.

6. In an electric blasting cap having a detonating charge and a bridge wire, an ignition charge including zirconium and gum arabic, positioned for ignition by the bridge wire.

7. In an electric blasting cap having a detonating charge and a bridge wire, an ignition charge including zirconium, a nitrated carbohydrate and an oxidizing agent, positioned for ignition by the bridge wire.

8. In an electric blasting cap having a detonating charge and a bridge wire, an ignition charge including zirconium, nitrostarch and an oxidizing agent, positioned for ignition by the bridge wire.

9. In an electric blasting cap having a detonating charge and a bridge wire, an ignition charge including zirconium, smokeless powder and an oxidizing agent, positioned for ignition by the bridge wire.

10. In a delay electric blasting cap having a detonating charge, a time fuse and a bridge wire, an ignition charge including zirconium, positioned for ignition by the bridge wire and for ignition of the fuse.

11. A thermally fired igniter charge for an explosive charge, comprising zirconium.

12. A thermally fired igniter charge for a detonating cap, comprising zirconium.

13. A blasting cap including a detonating charge, an ignition charge including zirconium, and means for thermally firing the ignition charge.

14. In combination a fuse and a thermally fired igniter charge therefor comprising zirconium.

15. In an electric blasting cap having a detonating charge and a bridge wire, an ignition charge including zirconium and nitrostarch, positioned for ignition by the bridge wire.

16. In a delay electric blasting cap having a detonating charge, a time fuse and a bridge wire, an ignition charge including zirconium, a binder and an oxidizing agent, positioned for ignition by the bridge wire and for ignition of the fuse.

17. In a delay electric blasting cap having a detonating charge, a time fuse and a bridge wire, an ignition charge including zirconium, a nitrated carbohydrate and an oxidizing agent, positioned for ignition by the bridge wire and for ignition of the fuse.

18. In a delay electric blasting cap having a detonating charge, a time fuse and a bridge wire, an ignition charge including zirconium, nitrostarch and an oxidizing agent, positioned for ignition by the bridge wire and for ignition of the fuse.

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