

N° 24,812



A.D. 1902

Date of Application, 12th Nov., 1902—Accepted, 26th Feb., 1903

### COMPLETE SPECIFICATION.

#### Improvements in Detonating Compositions.

I, JOSEF FUHRER, of 24 Mühlgasse, in the City of Vienna, in the Empire of Austria, Clerk 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 No detonating composition has yet been invented, which, without the use of fulminates, chlorates, or picrates, or a nitro-compound, will fire explosives, such as those of the nitrate of ammonium, or picric acid groups, or even compounds of nitro-glycerine, or gun-cotton, in the same thorough manner as can  
10 be done by preparations of fulminate of mercury, which completely decomposes them into their gaseous condition.

For many years military authorities have been seeking such a composition; for at present the powerful explosives which are employed for filling shells, render the use of the extremely dangerous preparations of fulminic acid absolutely necessary as detonating agents.

15 The purpose of my invention is to overcome all the drawbacks above referred to, and to produce a detonating composition absolutely insensible to concussion, percussion and friction. My new composition is more particularly adapted for artillery purposes.

In the year 1648, Glauber, in his work, "Philosophische Oefen," Chapter 48,  
20 writes: "If one part of tartaric acid and  $1\frac{1}{2}$  parts of sulphur are ground up with 3 parts of potassium nitrate, there results a composition which fulminates. Such a mixture explodes with a loud detonation, and with tolerable force—though not equal to that of fulminating-gold—if it is slowly heated to about  
25 "450° C. If ignited in cold condition, the fulminating-powder is scarcely to be recognized as an explosive, and if added to gun-powder, weakens the force  
"of the latter."

This fulminating powder is but seldom recommended by later authorities. (cp. Romocki's "Geschichte der Explosions-stoffe," 1895, vol. I, p. 350.)

30 Instead of tartaric acid, potassium carbonate has also been tried; the chemical change which here takes place is, that the sulphur unites with the potassium carbonate to form potassium sulphite, which at a high temperature is suddenly oxidised by the potassium nitrate, nitrogen being liberated.

Potassium carbonate is of a highly hygroscopic nature, so that a preparation of the above kind, apart from its deficient force, would be unsuitable for storing  
35 for any length of time. I therefore replace the carbonate by bicarbonate of potash, with the addition of aluminium.

By the admixture of aluminium, the chemical decomposition of the compound mentioned is rendered much more energetic, the temperature being greatly increased.

40 In order to enable the above mentioned explosives to be detonated in practice with the same success as with preparations of fulminate of mercury, my detonating composition must be employed in a particular manner.

Its use in free space, it would appear, is impracticable, but when confined in an air-tight chamber it can be caused to exert a strong detonating effect. For  
45 this purpose the composition must be heated by a slow-burning ignition-agent

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such as ordinary black gun-powder, or a mixture resembling such, Baumé's fusion-powder, with or without the addition of aluminium, or by Goldschmidt's preparations. In this manner the temperature of the composition is raised to that requisite for its thorough detonation.

For the purpose in view, I take a detonating composition consisting, for 5 instance, of;—

Nitrate of Potash - - - -	45.5 parts.
Bicarbonate of Potash - - - -	30.0 "
Sulphur - - - - -	16.0 "
Aluminium - - - - -	8.5 "

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This I submit to pressure till the specific gravity is from 1—2. Next I granulate it in well-known manner; and then press from it plates or wafers, some two millimetres thick. These are inserted as bottom layer into the projectile-fuse, in appropriate manner, depending upon the diameter of the latter. Upon such a plate I prefer to place a thin layer of tinfoil, or other suitable medium, though such partition is not absolutely necessary. Hereupon I fill up the remaining space in the fuse with gun-powder, or another of the heating-agents of the kind already referred to.

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Or instead of a plate, as stated above, I may employ the composition merely in granulated state, which in the case of pressed charges, may also be filled into the fuse-hole, or the projectile-charge, for the purpose of promoting more complete chemical decomposition.

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Or the detonating composition may be employed in the form of powder; or in pulverised or granulated form, mixed or pressed with the projectile-charge, in which case naturally a heating-agent, as above specified, must also be employed.

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The admixture of about 12 *per cent.* of my detonating composition is sufficient to effect complete chemical decomposition of the ammonium preparations, which are well known to be extremely difficult to fire.

This simple manner of ignition can be readily adapted to any projectile, whilst ensuring the highest degree of safety.

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The detonating composition may be compounded in various ways, depending upon the kind of explosive employed. For example the percentage of aluminium may be increased or diminished, accordingly as to whether a lower or higher temperature is required.

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My new preparations, as already stated, are perfectly proof against concussion, percussion and friction.

By the sudden application of heat, or by direct contact with fire, they burn with a quiet flame, without detonation. They keep for any length of time without decomposing.

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Thus by means of my new detonating composition I have attained what military authorities have long sought, *viz.*, a safe detonating composition for shells and projectiles, which on the addition of a small quantity of powder, or other slow-burning composition, possesses the same detonating effects as the dangerous fulminates, chlorates, or picrates hitherto in use.

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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. A detonating composition consisting of potassium nitrate, bicarbonate of potash, sulphur and aluminium, substantially as described.

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2. A detonating composition as claimed in Claim 1, to which is added a slow-burning heating-agent of the nature specified and for the purposes set forth.

3. In the manufacture of projectile fuses, primers, and the like, the employment of a detonating composition consisting of potassium nitrate, bicarbonate of potash, sulphur and aluminium, and of a slow-burning heating-agent, such

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as black powder (with or without aluminium), mixtures resembling such, Goldschmidt's preparations, or the like, in such manner that for the purpose of securing direct detonating action, of the said composition, it is heated by means of the said heating-agent substantially as hereinbefore set forth.

5 Dated this Tenth day of November 1902.

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Agent for Applicant.