

UNITED STATES PATENT OFFICE.

LOUIS S. ROSS, OF NEWTONVILLE, MASSACHUSETTS.

TIME-BURNING RAILWAY SIGNAL-FUSEE.

1,059,214.

Specification of Letters Patent.

Patented Apr. 15, 1913.

No Drawing.

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To all whom it may concern:

Be it known that I, LOUIS S. ROSS, a citizen of the United States, and a resident of Newtonville, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Time-Burning Railway Signal-Fusees, of which the following description is a specification.

This invention relates to improvements in compounds for time burning railway signal fusees, the primary object thereof being to produce a compound which is not only substantially immune from tendency to spontaneous ignition or combustion, but which burns efficiently without tendency toward incandescence and within predetermined time limits and that can be ignited at a lower temperature than the so-called perchlorate fusee heretofore made.

A further object of the invention is to produce a fusee that will burn without leaving an objectionable residue and which is devoid of adulterants, and therefore is of minimum bulk and minimum length, thus adapting the fusee more easily to transportation and storage, while rendering it less liable to break in use, owing to the decreased leverage when thrown.

In most compositions for railway signal fusees produced prior to my invention there have been certain recognized characteristics of the ingredients constituting the fusees that rendered the latter extremely susceptible to spontaneous ignition, particularly in the presence of heat or moisture.

The so-called chlorate time burning signal fusee is composed of chlorate, sulfur, carbohydrate and metallic nitrate in suitable proportions, and the so-called perchlorate fusee is composed of perchlorate, sulfur, carbohydrate and metallic nitrate in suitable proportions.

In my tests and experiments to eliminate the known objections of the perchlorate fusee and to perfect such fusee, I have ascertained that the employment of a carbohydrate in a perchlorate fusee is gravely and peculiarly objectionable. That is to say, I have ascertained that although a carbohydrate may be employed satisfactorily in a so-called chlorate fusee, its presence in a perchlorate fusee is objectionable owing to the combined presence of carbohydrate and perchlorate. A serious objection to the so-called perchlorate fusee is due to the in-

creased oxidizing power of perchlorate which differs from chlorate only in that it contains an added atom of oxygen. This objection is a particularly serious one in the use of fusees of combined colors, for the tendency to incandescence and excessive brilliancy causes the red, yellow and green fusee flames to lose their characteristic colors and gradually to merge nearer a whiter light. I have discovered in the course of long experimentation that this objection is very materially overcome by the elimination of carbohydrate and by the employment of hydrocarbon or carbon, or both, or in other words, by the employment of carbonaceous material that is devoid of oxygen. The overcoming of the said objection I attribute largely to the fact that the carbohydrate contains oxygen, which is not present in the hydrocarbon or in the carbon. The added oxygen present in the perchlorate is to a very considerable extent compensated for by the absence thereof in the hydrocarbon and carbon, even though the amount of hydrocarbon or carbon, or both, is less than that of the perchlorate. A further objection to the so-called perchlorate fusee is that it burns too quickly; that is, with a decreased burning interval after a short period following manufacturing. As a result of my said experiments, I attribute this defect in part at least to the added oxygen present in the perchlorate. The absence of oxygen in the hydrocarbon and in the carbon compensates therefor, and hence there is less tendency of my fusee to burn for a shorter period than the minimum time limit. The so-called perchlorate fusee is also objectionable in that it requires a temperature of substantially 310° C. to ignite, this being considerably higher than the 250° C. required by the bureau for the safe transportation of explosives. I have discovered that by eliminating carbohydrate and by employing hydrocarbon or carbon, or both, substantially as herein set forth, I am enabled to make a fusee containing perchlorate, which fusee is somewhat more readily inflammable than the perchlorate-carbohydrate fusee.

Not only does the carbohydrate heretofore employed in the manufacture of perchlorate fusee leave an objectionable residue and also prevent the proper burning of the perchlorate fusee, but the carbohydrate has been

objected to by engineers of tests and chemists upon the ground that certain forms thereof, such as sawdust, constitute an adulterant, the presence whereof in the fusee composition is readily shown by subjecting the composition to the action of gasoline. Moreover, the addition of the carbohydrate in the form of sawdust, starch, flour, etc., not only has the objections heretofore pointed out, but such addition makes the fusee more bulky and hence of increased length for a predetermined burning time, thus rendering it more liable to breakage when it is thrown from a train in use. The so-called perchlorate fusee is also objectionable in that it is more easily extinguished when thrown from a moving train than a fusee of the so-called chlorate type, and it is harder to ignite than a fusee of the said chlorate type.

In my experiments as heretofore set forth, I have eliminated the carbohydrate and have employed carbonaceous material that is devoid of oxygen and preferably either in the form of a hydrocarbon or of a carbon, or both. In making such elimination and in employing hydrocarbon or carbon, or both, to the exclusion of a carbohydrate, I have been compelled to make many tests under commercial conditions before obtaining a perchlorate fusee wherein such carbonaceous material is present in the proper proportions with respect to the other ingredients, namely, the perchlorate, the sulfur and the metallic salt or metallic nitrate. I have, however, secured satisfactory results with the elimination of the carbohydrate and by the employment of a hydrocarbon or of a carbon or both; that is, of a carbonaceous material devoid of oxygen. Moreover, I have found that a perchlorate fusee containing such carbonaceous material devoid of oxygen is not so readily extinguished as is a perchlorate fusee containing carbohydrate, and that it is not so hard to ignite as is a perchlorate fusee containing carbohydrate. In other words, I have not only, in the elimination of the carbohydrate, eliminated certain objections which my experiments have convinced me were due to the carbohydrate, but I have eliminated certain objections heretofore supposed to be inherently and necessarily characteristic of a perchlorate fusee, and due solely to the presence of the perchlorate; namely, the relative ease with which it is extinguished when thrown from a moving train, the relative difficulty of igniting the same, the tendency of the flames toward incandescence, and the high temperature required for ignition. I have furthermore discovered that by using hydrocarbon or carbon, or both, the perchlorate fusee when properly made will not only not be so easily extinguished when thrown, and will not be so hard to ignite,

but it will burn with the production of proper colors.

I have discovered that in certain cases the perchlorate fusee burns with somewhat dulled or muddy colors, although approaching incandescence, and my tests and experiments have convinced me that this is largely, if not wholly, owing to the employment of a carbohydrate, which has heretofore been regarded as essential. The employment of a hydrocarbon or of a carbon, or both,—that is, of carbonaceous material devoid of oxygen, without the presence of a carbohydrate,—has eliminated this objectionable coloring of the flames.

The proportions of the ingredients employed in the making of the fusee may be varied within the scope of my invention. I have, however, obtained the best results by employing the ingredients in substantially the following proportions: metallic salt (preferably nitrate) 72 parts, sulfur 12 parts, hydrocarbon 6 parts, potassium perchlorate 12 parts.

While it is possible to vary the proportions of the ingredients,—and I am not to be limited to the variations of the proportions herein set forth,—I have also obtained excellent results by using from ten to sixteen parts of sulfur, and by using from four to eight parts of hydrocarbon. I have also obtained excellent results by employing substantially the following proportion of parts: metallic salt (preferably nitrate) 64 parts, sulfur 10 parts, carbon 4 parts, perchlorate of potassium 20 parts. Good results may also be obtained by increasing the metallic nitrate to seventy-six parts or less, by increasing the sulfur to eighteen parts or less, by increasing the carbon to ten parts or less and by decreasing the perchlorate of potassium to ten parts or more. I have also obtained good results by employing hydrocarbon and carbon in suitable admixtures or proportions of the said two ingredients. For example, instead of employing four parts of carbon, I may employ three parts of hydrocarbon and one of carbon, or two parts of hydrocarbon and two of carbon, or such other combination of the two ingredients as desired. Moreover, instead of employing ten parts of carbon, I may employ a suitable admixture of hydrocarbon and carbon, such, for example, as seven parts of carbon and three parts of hydrocarbon. In no case, however, do I employ a carbohydrate. The hydrocarbon in the use of which I have obtained the best result is petroleum, which I preferably employ in the form of grease. I have also obtained excellent results by the use of naphthalene. The carbon preferably employed by me is charcoal. All of the above ingredients are preferably in a finely powdered state, excepting the petroleum grease. Any suitable per-

chlorate may be employed, such, for example, as perchlorate of potassium, of sodium, or of barium.

Having thus described one embodiment of my invention, I desire it to be understood that although specific terms are employed, they are used in a generic and descriptive sense and not for purposes of limitation, the scope of the invention being set forth in the following claims.

Claims.

1. An improved time burning railway signal fusee composed of the following ingredients, viz; sulfur, perchlorate, metallic nitrate, and carbonaceous material that is devoid of oxygen, in such proportions as thereby to produce a fusee for the purpose stated burning with brilliancy and force of flame within predetermined time limits and without incandescence, and that is not subject to spontaneous ignition or combustion.

2. An improved time burning railway signal fusee composed of the following ingredients, viz; sulfur, perchlorate, metallic nitrate, and hydrocarbon, in such proportions as thereby to produce a fusee for the purpose stated burning with brilliancy and force of flame within predetermined time limits and without incandescence, and that is not subject to spontaneous ignition or combustion.

3. An improved time burning railway signal fusee composed of the following ingredients, viz; sulfur, perchlorate, metallic nitrate, and hydrocarbon and carbon, in

such proportions as thereby to produce a fusee for the purpose stated burning with brilliancy and force of flame within predetermined time limits and without incandescence, and that is not subject to spontaneous ignition or combustion.

4. An improved time burning railway signal fusee composed of the following ingredients, viz; sulfur, perchlorate of potassium, metallic nitrate, and hydrocarbon, in such proportions as thereby to produce a fusee for the purpose stated, burning with brilliancy and force of flame within predetermined limits and without incandescence, and that is not subject to spontaneous ignition or combustion.

5. An improved time burning railway signal fusee composed of the following ingredients, namely, sulfur, perchlorate, metallic salt burning with color, and carbonaceous material that is devoid of oxygen, in such proportions as thereby to produce a fusee for the purpose stated burning with brilliancy and force of flame within predetermined time limits and without incandescence, and that is not subject to spontaneous ignition or combustion.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

LOUIS S. ROSS.

Witnesses:

JOHN R. MOULTON,
IRVING U. TOWNSEND.