

R. C. GOWDY.
 SIGNAL ROCKET.
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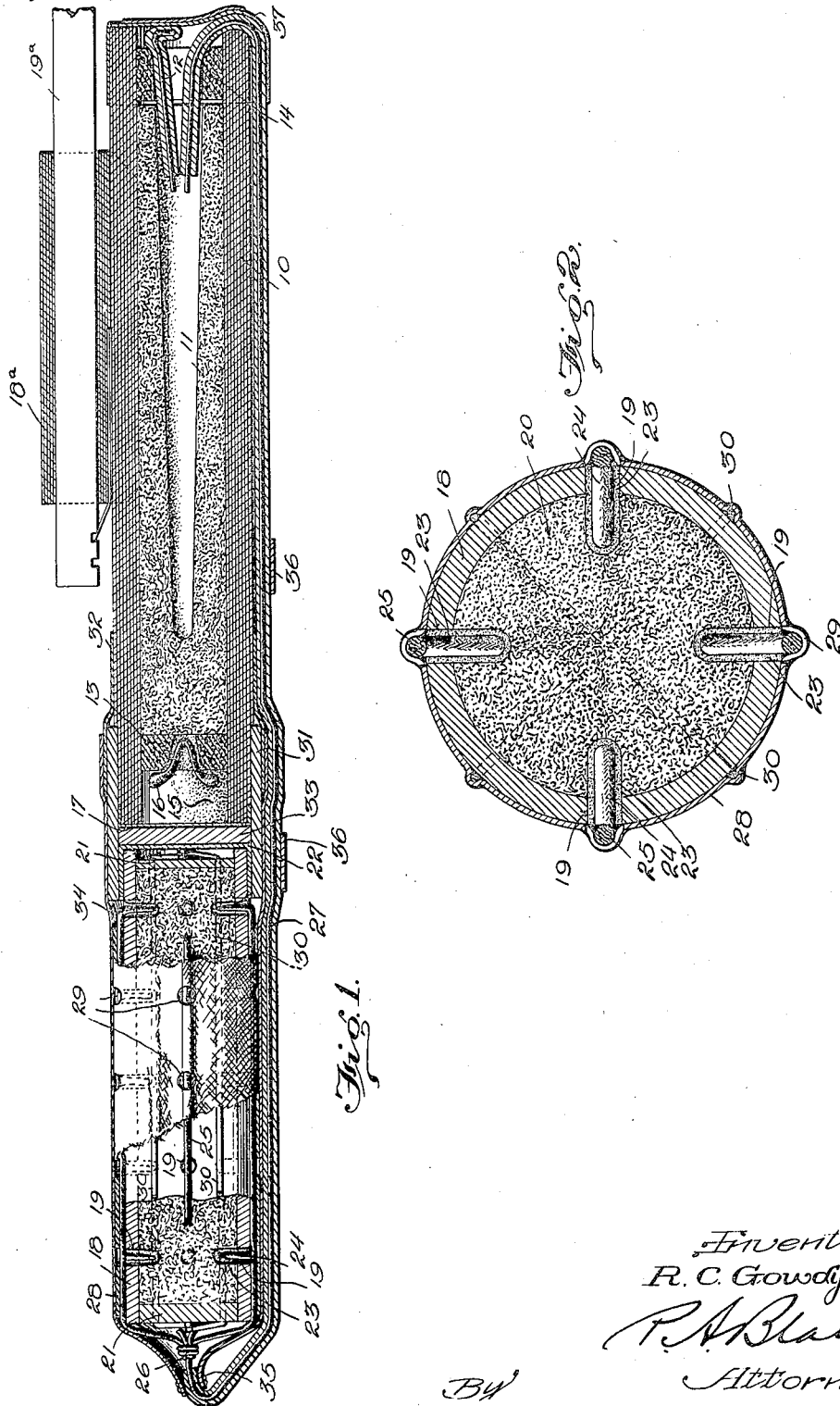


Fig. 1.

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SIGNAL-ROCKET.

1,326,493.

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To all whom it may concern:

Be it known that I, ROBERT CLYDE GOWDY, a citizen of the United States, residing at Cincinnati, Ohio, have invented new and useful Improvements in Signal-Rockets, (Case A.) of which the following is a specification.

This invention relates to pyrotechnic signals and has particular reference to signals adapted to be employed in military operations for communicating orders and conveying intelligence generally such, for instance, as the location of an enemy battery, a call for a barrage, etc.

It is the aim of the present invention to provide an improved device which, when set in operation in the air, will emit colored smoke rapidly and smoothly so that a cloud or trail of smoke of the desired color is produced which may be employed to advantage in signaling military and like information or instructions.

Specifically, it is the aim of my invention to provide a rocket having a smoke producing body or cartridge, hereinafter also referred to as the "trailer," which is discharged from the rocket at the proper height in the trajectory of the latter, preferably at the maximum height, and which, while falling through the air, emits smoke at a uniform rate so that the trail of smoke so formed is of sufficient size and depth of color to be readily seen at considerable distance for an appreciable space of time. The present construction is such that the chemical reactions, which result upon ignition of the smoke composition, will proceed at a proper rate without burning or decomposing the coloring matter and without developing excessive pressures which would tend to burst the case containing the smoke producing composition.

It is a further object of the invention to provide smoke producing compositions characterized by a high degree of dispersion of the colored particles resulting in a colored cloud of good visibility; stability of the coloring materials, they being not easily decomposed when volatilized; their comparative insensibility to shock, thus permitting them to be handled without great danger of exploding; and the uniformity and rapidity at which the rate of reaction between the various ingredients, when ignited, proceeds.

The above objects of my invention are ob-

tained in the compositions and structure described in the following specification, a preferred embodiment of my improved rocket being depicted in the accompanying drawing but it is to be understood that the present disclosure is by way of illustration of my invention and it is not to be taken as restrictive of my conception.

In the said drawing:—

Figure 1 is a sectional view taken longitudinally through my improved device, parts being in elevation.

Fig. 2 is a transverse sectional view through the trailer.

Referring to the drawings, wherein like reference characters indicate like parts in the several views, the rocket portion proper of my improved device comprising, in part, a tubular laminated casing 10 of paper, or the like, and a body of rocket composition 11, the latter having a recess at its rear end for the reception of the firing fuse 12. Adjacent the front and rear ends of the casing 10 are centrally apertured clay disks 13 and 14, respectively, and beyond the disk 13 is placed a bursting charge 15 having a fuse 16 extending into the aperture of the disk 13 so that this fuse is ignited when the burning of the rocket composition 11 has proceeded to the forward end of such composition and at which time the rocket has substantially reached the highest point in its trajectory. The forward end of the casing 10 is closed by a paper cap 17 which is burst open when the bursting charge 15 is exploded. The numerals 18^a and 19^a designate the usual stick socket and stick, respectively.

My improved smoke producing cartridge or trailer, which is attached to the forward end of the rocket as hereinafter described, comprises, in part, a container having a case 18 of tubular form and of slightly less external diameter than the external diameter of the rocket casing 10. The case 18, which may be rolled from rope paper, is provided with a plurality of series of holes or apertures 19 in the present instance there being shown four such series with each series or row having five apertures disposed longitudinally of the case. The case 18 contains a body of smoke producing composition 20, and while this composition may be a mixture of any suitable ingredients to produce the desired colored smoke, I preferably em-

ploy a composition having the characteristics pointed out herein, examples of compositions having these characteristics being hereinafter specified.

5 The ends of the case 18 are closed by the disks 21 which may be glued or otherwise secured in place and to insure that these disks will not become displaced during the burning of the smoke producing composition, fabric caps 22 are pasted on the opposite ends of the cartridge. The openings 19 receive portions of the fuses or quickmatches which are employed for causing ignition of the smoke composition. As the smoke composition 20 when packed, is not easily ignitable by a spark or flame, a starting composition 23 is placed in each of the openings 19 so that the fuses will ignite this composition and the starting composition, in turn, will ignite the smoke composition.

The manner in which the quickmatches or fuses are arranged may be varied as desired but preferably, when assembling the smoke cartridge, the smoke composition is first placed within the case 18 and the end disks 21 and caps applied. The smoke case is then held in a horizontal position with one row or series of holes 19 uppermost. A suitable implement of the correct diameter is forced into each of the holes to the proper depth to form recesses within the body of smoke composition and a small amount of igniting or starting powder 23 is then placed in each opening and slightly compressed. Short pieces of quickmatches 24 are then inserted in the four holes of each series toward what is to be the top end of the cartridge and ignition powder 23 is packed around these pieces of quickmatches. One end of a long piece of a fuse 25 is then inserted in the fifth or rearmost hole of each series and each is brought forwardly of the case 18 so as to engage the outer ends of the short pieces of fuses 24. The forward ends of the several long fuses 25 are bound, together with the forward end of a covered fuse 27, by a piece of twine or cord 26. The starting fuse 27 is of sufficient length to reach to the rear end of the rocket body 10 when the cartridge and rocket have been assembled.

After the fuses or quickmatches are assembled in the manner heretofore described, a cover of cloth 28 having openings 29 adapted to register with the openings 19, is wrapped about the case 18 and glued in place. For the purpose of reinforcing the smoke container, two pieces of wire 30 are wound thereabout.

60 For the purpose of attaching the smoke trailer to the forward end of the rocket body 10, a sleeve 31 is secured to the forward end of the body 10 by a paper strip 32. In assembling the trailer on the rocket, a felt pad 65 33 is inserted into the projecting portion of

the sleeve 31 and then the rear end of the trailer is inserted in the sleeve, there being a close fit between the trailer and the sleeve to prevent accidental displacement of the former. A paper wrapping 34 is then pasted around the case 18 and the sleeve 31, the forward end of the wrapper being tied to the covered quickmatch 27 by means of a piece of twine 35. The covered quickmatch 27 is then led longitudinally of the trailer and rocket body and pasted in position by cloth strips 36. The free end of the fuse 27 is inserted into the rear end of the rocket and this end of the rocket is covered by a paper cap 37.

80 The composition which upon ignition produces highly colored smoke, of course, will vary with the color of smoke desired. I have found that to produce a satisfactory smoke the coloring matter must be volatilized and not merely mechanically dispersed. The vapor, of course, condenses as soon as it cools but the volatilization is a prerequisite for the high degree of dispersion of the color particles necessary for good visibility of a cloud produced by a small weight of material. In accordance with the present invention, each of my improved smoke producing compositions consists of a combustible agent, an oxidizing agent and an organic dye which serves as the color producing material when, upon combustion of the combustible and oxidizing agents, sufficient heat is produced to volatilize the organic dye. Preferably the dye should be cheap and available in the desired quantities. It should be volatile either by sublimation or by passing through the liquid phase, but in case it should pass through the liquid phase, the melting and boiling points of the dye should be close together so that large quantities of liquid which would have a tendency to stop the combustion, are not present during combustion. Chemically the dye must not be easily decomposed when volatilized and should not be affected to any great degree by the burning of the mixture.

As illustrations of the compositions which may be used and which are within the spirit of this invention, the following are noted.

To produce a yellow smoke, auramin is employed as the color producing material. This material is mixed with potassium chlorate which serves as the oxidizer and lactose which serves as the combustible. The use of lactose in this composition is of advantage as it burns smoothly, the gaseous product therefrom is comparatively cool, and no undesirable products result from its burning. The materials may be employed in the following proportions by weight:—

Potassium chlorate.....	33%
Lactose.....	24%
Auramin.....	34%
Chrysoïden.....	9%

To produce a red smoke, the following composition is employed:—

5	Paranitranilin red -----	60%
	Potassium chlorate -----	20%
	Lactose -----	20%

For a green smoke the following composition may be employed:—

10	Auramin -----	15%
	Indigo (synthetic) -----	26%
	Potassium chlorate -----	33%
	Lactose -----	26%

It is understood, of course, that the above 15 percentages or proportions of the ingredients are merely approximate, and they may be varied depending on the depth of color of smoke desired.

The ignition powder which is employed 20 for starting the smoke composition, may comprise a mixture of six parts by weight finely powdered potassium chlorate, and one part of finely powdered hard wood charcoal. Of course, other ignition mixtures 25 may be employed.

The operation of my improved device, when it is fired in the air to give a signal, will be readily understood. The cap 37 at the rear end of the rocket is torn open and the fuses 12 and 27 are withdrawn from 30 the recess within the rocket composition and ignited. The rocket having been set at the right angle, preferably at an angle to the perpendicular, it will shoot up due to the 35 burning of the composition 11. When the rocket composition 11 has been almost entirely consumed, at which time the rocket is substantially at the maximum height of its trajectory, the fuse 16 is ignited where- 40 upon the bursting charge 15 is exploded and this explosion will burst open the cap 17 and the trailer together with the pad 33 is discharged from the sleeve 31, the force of the explosion of the bursting charge being 45 sufficient to tear the paper wrapper 34 on a line just forwardly of the forward end of the sleeve 31.

While the rocket is shooting upwardly, the trailer is getting into action so that 50 smoke begins to appear a short while before the rocket reaches the highest point of its trajectory. The fuse 27 burns toward its upper end and ignites the fuses 25 which in turn ignite the shorter fuses 24. The 55 starting powder 23 is ignited and thereupon the smoke composition is caused to burn. The smoke issues through the registering openings 19 and 29 of the case 18 and cover 28 respectively and as the trailer falls 60 through the air it leaves behind a heavy trail of colored smoke. By causing the smoke composition to burn through the many holes provided, the combustion is regulated, so that the reactions proceed

smoothly and rapidly and without any 65 flaming through these holes and thus the coloring matter or dye is not burned and no high pressures, which might cause bursting of the container or smoke case 18, are developed. While sufficient heat is pro- 70 vided to keep condensed material from stopping the holes, there is no swelling of the materials or residue.

What I claim is:—

1. A rocket comprising a body portion, a 75 composition in the body portion for propelling the rocket, a fuse at the rear end of the rocket for igniting said composition, a cartridge secured to the forward end of the rocket body, a cartridge starting fuse 80 leading from the cartridge to the rear end of the rocket, and means for discharging the cartridge from the rocket at the maximum height of the trajectory of the rocket.

2. A rocket comprising a rocket casing, 85 a composition therein for propelling the rocket, a bursting charge at the forward end of the rocket body, a fuse ignitable from the rocket composition for exploding said bursting charge, a sleeve surrounding the 90 forward end of the rocket body and extending beyond the same, a smoke producing cartridge having one end within the protruding end of the said sleeve and a paper wrapper about said cartridge and secured 95 to said sleeve.

3. A smoke producing cartridge comprising a case having a plurality of apertures, a smoke producing composition adapted when 100 ignited to emit smoke through said apertures, and fuses extending into said apertures for igniting said composition.

4. A smoke producing cartridge having a case provided with a plurality of apertures, a body of smoke producing composition 105 within the case and adapted when ignited to emit smoke through said apertures, a starting composition in each of said apertures, and fuses for igniting said starting composition, said fuses leading to a common 110 point of ignition.

5. A smoke producing cartridge having a case provided with a plurality of series of longitudinally spaced apertures, a smoke producing composition within the case and 115 adapted when ignited to emit smoke through said apertures, a starting composition in each of said apertures, a short fuse in each aperture of each series excepting those at one end, a long fuse for the end aperture 120 of each series and in contact with said short fuses, the long fuses of the several series of apertures being led to a common point of ignition.

Signed at Washington, District of Co- 125 lumbia, this 12th day of November, 1918.

ROBERT C. GOWDY.