Jan. 10, 1933. A. F. SPRING 1,894,203

FIRING DEVICE

Filed Sept. 28, 1932

Fig. 1.

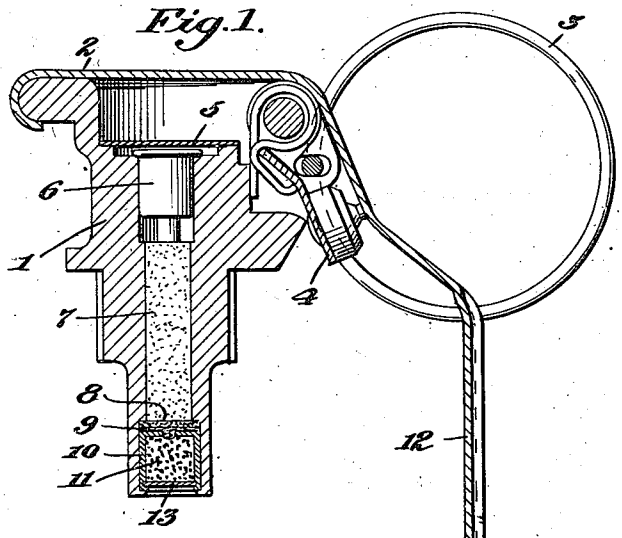


Fig. 2.

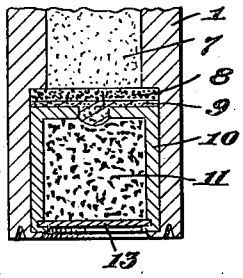


Fig. 3.

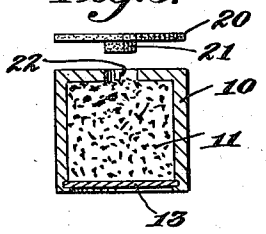


Fig. 5.

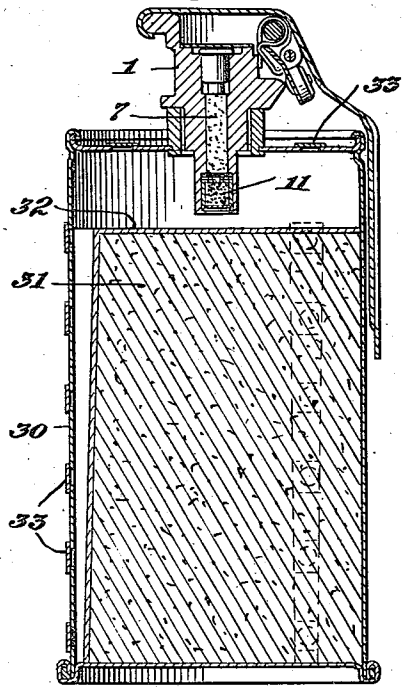


Fig. 4.

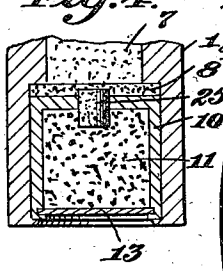
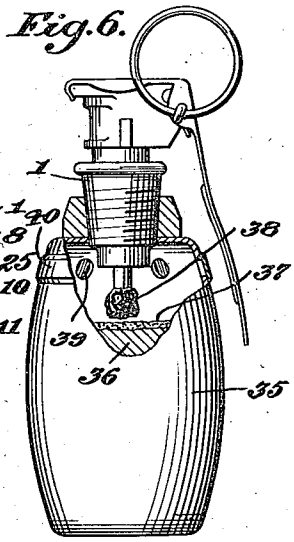


Fig. 6.



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UNITED STATES PATENT OFFICE

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FIRING DEVICE

Application filed September 28, 1932. Serial No. 635,257.

This invention relates to firing devices, of the type which are generally attached to "gas generating candles", "gas grenades", and similar devices, such as are used for the generation of such disabling and incapacitating gases, such as tear gas, etc., for the suppression of mobs, riots, the capture of criminals, also in warfare, and for similar purposes.

An object of the invention is to provide a firing device which will be reliable in its action, and positively ignite the explosive charge which latter sets off the gas generating chemicals.

A further object is to provide a means which will positively carry the explosive flame from the fuse in the firing device to the charge of explosive powder therein.

Other objects of the invention will be apparent to those skilled in the art upon reading the specification.

In the accompanying drawing,

Fig. 1 represents in section a complete bouchon head, provided with a time-delay fuse, the explosive charge, the "match" to ignite the explosive charge, a layer of powder between the fuse and the match, and the usual firing pin and primer.

Fig. 2 is an enlarged sectional view of the lower portion of the bouchon head showing the fuse, the layer of igniting powder, the match, and the explosive charge in the bouchon head.

Fig. 3 is an enlarged view partly in section, and partly in elevation of a relay cup containing the explosive charge, and also a preformed match provided with a lug which projects into the relay cup and contacts with the explosive charge therein.

Fig. 4 is an enlarged view partly in section and partly in elevation of the lower portion of a modified type of bouchon head, otherwise resembling Fig. 2, but containing the match formed as a plug, which plug is in direct contact with a layer of igniting powder and also with the explosive charge.

Fig. 5 is a sectional view of a "gas candle" in which the bouchon head shown in Fig. 1 is secured; and

Fig. 6 is a view partly in section and partly in elevation of a "gas grenade" containing a charge of gas generating chemicals, and which is provided with a bouchon head shown in Fig. 1, and to which is attached a "firing match" to ignite the starting mixture upon the layer of gas generating chemicals.

In practice, it has been found that the explosive candles, grenades, and similar devices do not always "fire" when thrown, or may not "fire" promptly. The difficulty was finally located in the bouchon head, the fuse and the igniting powder failing to ignite, or to properly ignite, the explosive charge at the lower end of the bouchon head. After considerable research, it has been found that when a positive means of insuring a transfer of the explosive flame from the fuse and the igniting powder to the explosive charge was provided, as described herein, the trouble was overcome, and a one hundred percent efficiency was obtained in a very large number of tests by adopting the means described below.

In Fig. 1, a standard type of bouchon head 1 is provided with the usual cap 2 and handle 12, and also the ring handle 3 which is normally held when the candle or grenade is thrown, and which releases the firing pin 4; a metal foil 5 is secured within the bouchon head to maintain the contents waterproof. Below the foil 5 is a primer 6, and below the primer is a time delay fuse 7; the time delay fuse will naturally vary with the use to which the firing device is applied; with gas candles, a fuse 7 generally has a delay of about one and three-quarters seconds, while with gas grenades the delay of the fuse is generally longer, and may be from four to seven seconds, according to circumstances. Below the fuse 7 is a layer of igniting powder 8, which powder may consist of "Army black powder, Grade A No. 7", or any equivalent fine powder. Below the layer of fine powder 8 is a "match" consisting of a mixture of Grade A No. 7 fine powder, or equivalent fine powder mixed with a binding solution, the binding solution preferred consists of a solution of three and one-half percent of celluloid dissolved in acetone, or any other inflammable binding solution may be used; the fine powder may be mixed with said binding solution

in the proportions of from about twenty-five percent to about forty percent by weight of powder, and about seventy-five percent to about sixty percent of the inflammable binding solution. Below the match 9 is a relay cup 10 which contains an explosive charge 11, said explosive charge being retained in the cup 10 by the layer of metal foil 13; the upper surface of the cup 10 is provided with a hole 22, and the match 9 is so applied or constructed as to enter the hole 22 and contact with the igniting powder 8 and the charge 11 in the cup 10, so as to positively transfer the explosive flame from the fuse 7 to the explosive 11. The explosive charge 11 generally consists of "grain black powder Army Grade A No. 4", or any equivalent explosive powder.

Fig. 2 illustrates in section on an enlarged scale the lower portion of the bouchon head 1 showing in greater detail the position of the match 9; in Fig. 2, the composition of the match 9 is applied to the upper surface of the relay cup 10 while the match composition is still plastic, and is applied in a manner so that a portion of the match composition enters the hole 22 and contacts with the charge 11 in the cup 10; after applying the plastic mass of the match composition to the relay cup 10, it is allowed to dry, and the coated cup 10 is then assembled in the bouchon head in such a manner that the upper surface of the match composition 9 is in contact with the layer of igniting powder 8, in order to positively transfer the explosive flame from the fuse 7 and the igniting powder 8 through the hole 22 in the relay cup 10 to the charge of explosive powder 11 therein.

In Fig. 3, which illustrates on an enlarged scale a relay cup 10 with its charge of explosive powder 11, is also shown a pre-formed match disc 20 with an integral lug 21, the match disc and lug consisting of a dried body of the mixed Grade A No. 7, or equivalent powder with the inflammable binder described above, in assembling the bouchon head with this modification the disc 20 and lug 21 are placed upon the relay cup 10 in such a manner that the lug 21 enters the hole 22 and is in positive contact with the explosive charge 11 in the cup. Otherwise this construction resembles that described under Fig. 1.

In Fig. 4, an enlarged view of the lower portion of the bouchon head is shown; in this modification the match 25 consists of a plug of the composition of Grade A No. 7 powder, or equivalent powder which may be compressed dry in a suitable mold under about 50,000 pounds per square inch, or may be mixed with the inflammable binder solution as described above, and suitably compressed. The upper surface of the plug 25 is in positive contact with the layer of fine powder 8, and its lower surface is in positive contact with the explosive charge 11 in the cup 10.

In Fig. 5, is illustrated in section a type of "gas generating candle" 30, containing a charge of gas generating chemicals 31, which chemicals are covered with a suitable starting mixture 32; the candle 30 is provided with suitable openings which are covered with fusible discs 33, said discs being blown off when the candle is "fired" permitting the tear gas to escape through the opened holes. The candle is provided with a bouchon head shown in Fig. 1, but the "match" therein may consist of any of the modifications shown in Fig. 1, at 9; or in Fig. 3, at 20 and 21; or in Fig. 4 at 25.

In Fig. 6 is shown a standard type of gas grenade 35, provided with a mass of gas generating chemicals 36, which chemicals are covered with a starter composition 37. The grenade body is provided with openings 39, which openings are covered with a fusible seal 40, which seal is destroyed when the grenade is "fired" to permit the tear gas or other disabling gases to escape. The grenade 35 is provided with a bouchon head shown in Fig. 1, in which the match may consist of any of the modifications shown at 9 in Fig. 1; 20 and 21 in Fig. 3; or at 25 in Fig. 4; in addition the lower extremity of the bouchon head may be provided with an explosive match composition shown at 38 to aid in setting off the starting composition 37.

I claim:

1. A firing head, comprising a firing pin, a primer, a fuse, a layer of igniting powder, a relay cup, and a charge of explosive in said relay cup, said cup provided with an opening in its upper end, and a match comprising a mass of compressed powder projecting through said opening and contacting with the layer of igniting powder and the charge of explosive within said cup.

2. A firing head, comprising a firing pin, a primer, a fuse, a layer of igniting powder, a relay cup, and a charge of explosive in said relay cup, said cup provided with an opening in its upper end, and a match consisting of mixed powder and binder projecting through said opening and contacting with the layer of igniting powder and the charge of explosive within said cup.

3. A firing head, comprisng a primer, a fuse, a layer of igniting powder below said fuse, a charge of explosive, and a thin layer of a mixture constituting a match consisting of an explosive powder and an inflammable binder located between and contacting with said igniting layer and said charge of explosive.

4. A charged relay cup consisting of a container, a charge of explosive powder therein, and a layer constituting a match consisting of a mixed mass of explosive powder and an inflammable binder over the ignition end of

said relay cup and contacting with the charge of the explosive therein.

5. A gas generating candle comprising the combination of chemicals to generate a disabling gas, said chemicals coated with a starting composition, a firing head, a primer, a fuse, a layer of igniting powder, a relay cup, said relay cup containing an explosive charge, and a match comprising a mass of compressed explosive powder contacting with said layer of igniting powder and said explosive charge.

6. A gas generating candle comprising the combination of chemicals to generate a disabling gas, said chemicals coated with a starting composition, a firing head, a primer, a fuse, a layer of igniting powder, a relay cup, said relay cup containing an explosive charge, and a match comprising a mixed mass consisting of explosive powder and an inflammable binder contacting with said layer of igniting powder and said explosive charge.

7. A gas generating grenade, comprising a receptacle containing an explosive and chemicals to generate gas, said chemicals coated with a starting composition, a firing head, a primer, a fuse, a layer of igniting powder, a relay cup, said relay cup containing an explosive charge, and a match comprising a mass of compressed explosive powder contacting with said layer of igniting powder and said explosive charge.

8. A gas generating grenade, comprising a receptacle containing an explosive and chemicals to generate gas, said chemicals coated with a starting composition, a firing head, a primer, a fuse, a layer of igniting powder, a relay cup, said relay cup containing an explosive charge, and a match comprising a mixed mass consisting of explosive powder and an inflammable binder contacting with said layer of igniting powder and said explosive charge.

In testimony whereof I hereby affix my signature.

ALVA F. SPRING.