J. H. HAMMOND, JR.

INCENDIARY SHELL.

APPLICATION FILED DEC. 21, 1914. RENEWED OCT. 4, 1922.

1,435,228. Patented Nov. 14, 1922.

2 SHEETS—SHEET 1.

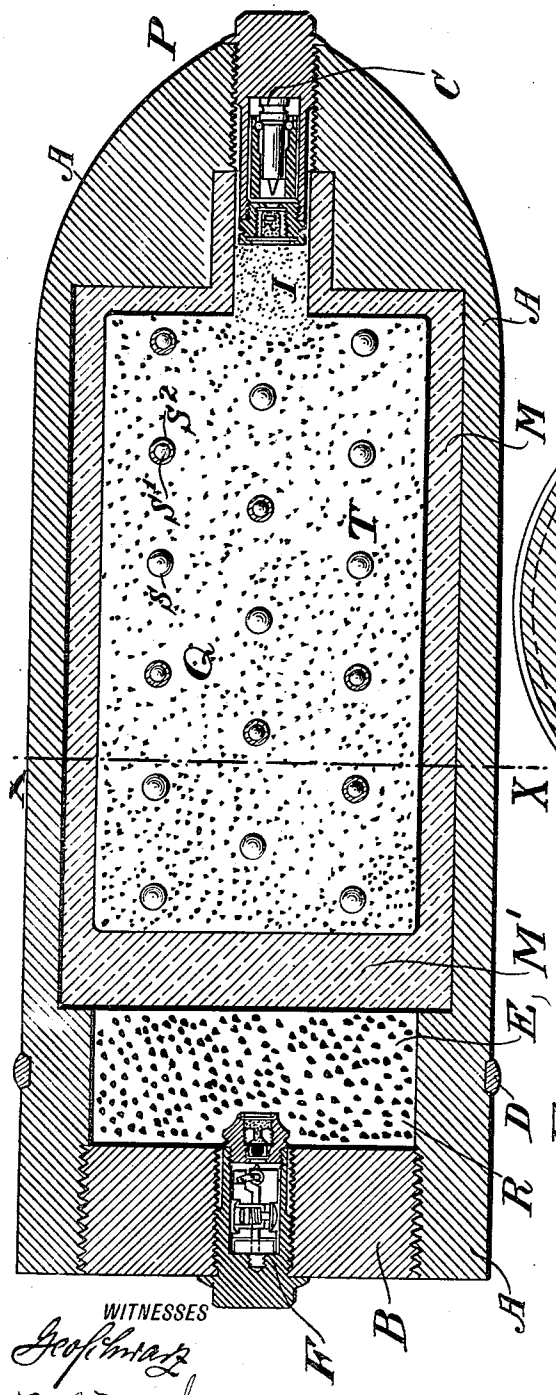


Fig. 1.

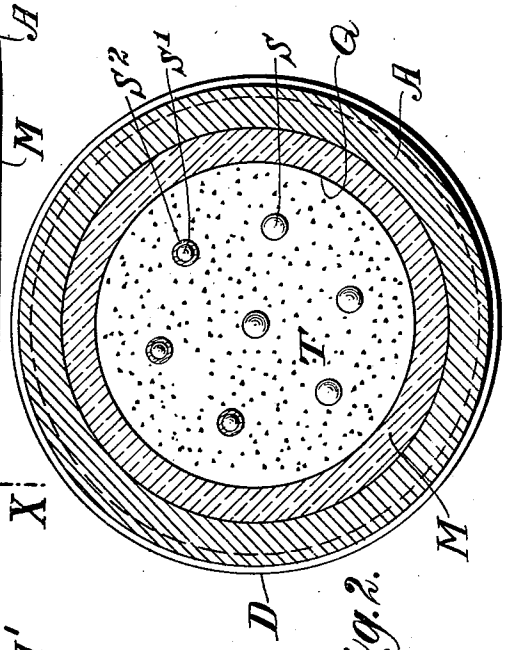


Fig. 2.

WITNESSES

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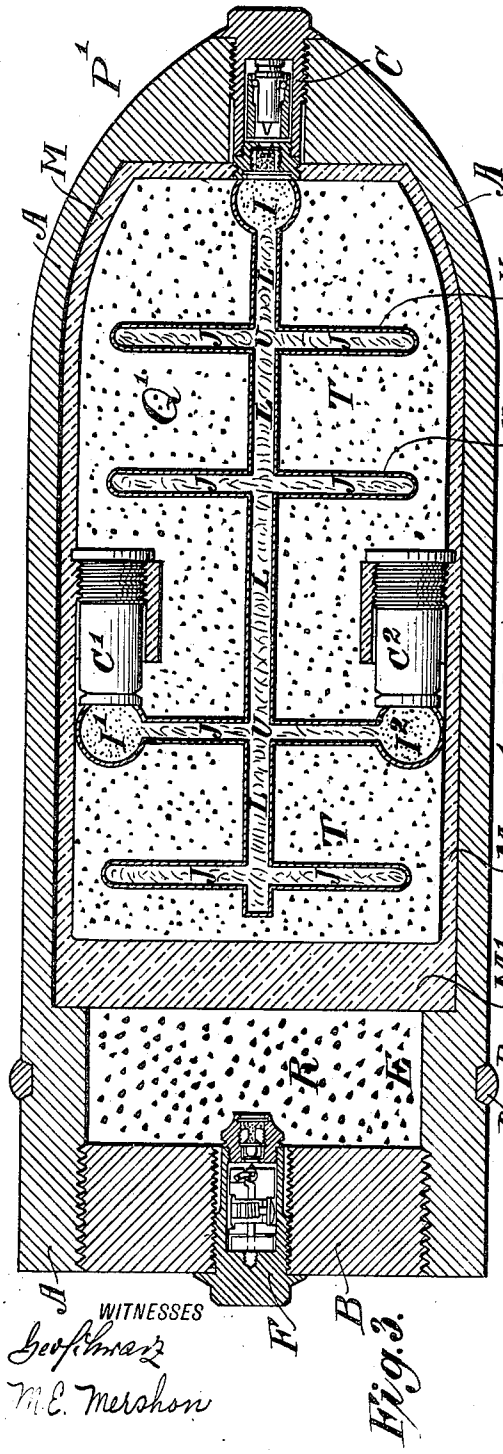


Fig. 3.

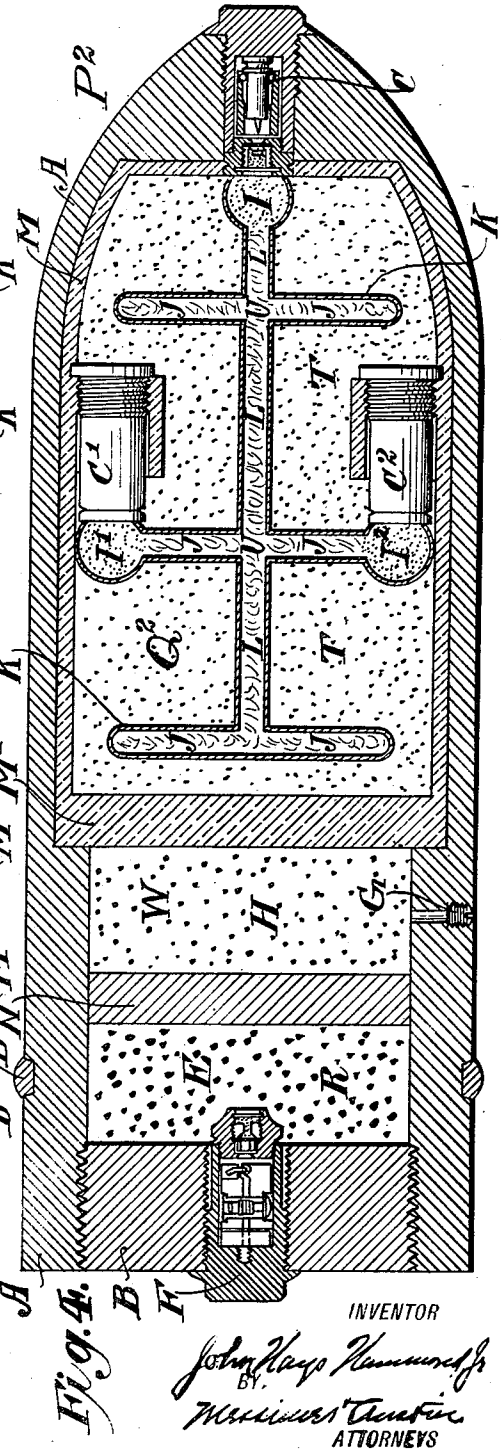


Fig. 4.

WITNESSES

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1,435,228

UNITED STATES PATENT OFFICE.

JOHN HAYS HAMMOND, JR., OF GLOUCESTER, MASSACHUSETTS.

INCENDIARY SHELL.

Application filed December 21, 1914, Serial No. 878,248. Renewed October 4, 1922. Serial No. 592,393.

To all whom it may concern:

Be it known that I, JOHN HAYS HAMMOND, Jr., a citizen of the United States, residing at Gloucester, in the State of Massachusetts, have invented certain new and useful Improvements in Incendiary Shells, of which the following is a specification.

My invention relates to shells or projectiles to be discharged from cannons or guns, and relates more particularly to incendiary shells which contain substances that will undergo chemical reactions with the evolution of great heat and high temperatures, and which will be scattered when the shell explodes, thus burning all combustible substances in the neighborhood of the point of explosion. Furthermore, some forms of my shells also contain substances which will generate poisonous gases or vapors when the shell explodes and so prevent persons from approaching to extinguish the fires started by the incendiary substance.

I provide means for starting the reaction in the incendiary substance when the shell leaves the gun, and means for detonating the explosive also contained in the shell when the latter hits its mark, preferably after it has penetrated to the interior of the building or ship which it strikes.

A more complete disclosure of my invention is contained in the following description together with the accompanying drawings to which reference is made.

In the drawings:

Figure 1 shows a longitudinal section of a shell having two main compartments, one containing a non-explosive reaction mixture and shrapnel balls and the other containing an explosive substance.

Figure 2 shows a cross section of the same shell taken on the line X X of Fig. 1.

Figure 3 shows a longitudinal section of a shell with two main compartments, one containing a non-explosive reaction mixture having a rapidly-igniting substance distributed therethrough, and the other compartment containing an explosive substance.

Figure 4 shows a longitudinal section of a shell having three main compartments, one containing a non-explosive reaction mixture having a rapidly-igniting substance distributed therethrough, a second compartment containing a poisonous substance, and a third compartment containing an explosive substance.

In Figures 1 and 2, P is a shell or projectile, having an outer wall or case A, and containing two main compartments or chambers Q and R. Compartment Q has a refractory or heat-resisting lining M, composed, for example of magnesite, magnesia tar or silicate of soda, and a partition, M′, of the same refractory substance separates it from the compartment R. The partition M′ may be composed in part of some substance having special heat insulating properties, such as asbestos or an asbestos compound. Chamber Q contains an exothermic, non-explosive reaction mixture T, such as thermit, composed, for example, of iron oxide and aluminum, and imbedded in this mixture are shrapnel balls, S, the metal part of these balls, S′, being covered with a refractory substance S^2.

I is a substance for igniting the reaction mixture, and is composed, for example, of a mixture of barium peroxide and aluminum. C is a concussion fuse for igniting the ignition substance I.

The chamber R contains an explosive substance E such as trinitrotoluol. In the base plug, B, of the shell is a centrifugal percussion fuse F, or other suitable fuse for detonating the explosive substance E after the projectile has penetrated the target. D is a soft metal band, for instance of copper, which is forced into the rifling grooves when the projectile is fired.

In Figure 3, P′ is a projectile or shell having an outer wall or case A, and comprising two main chambers or compartments Q′ and R. Compartment Q′ has a refractory or heat resisting lining M; and a partition M′, composed of a refractory and heat insulating substance, separates it from the compartment R. Chamber Q′ contains a non-explosive reaction mixture, T, such as thermit, and it may also contain shrapnel balls such as are shown in Fig. 1.

C, C′ and C^2 are concussion fuses, which function when the gun is discharged, and ignite the ignition powder at I, I′ and I^2. Connected with I, I′ and I^2, and imbedded in the thermit T is a system of hollow disks, J, and connecting channels, L, made of stiff paper, pasteboard or some other light and easily combustible substance, K, and filled with a mixture, U which will ignite or react quickly, for example, a mixture of red oxide of iron and aluminum.

The chamber R contains an explosive substance E. In the base plug, B, of the projectile is a fuse F, for detonating the explosive E after the shell has penetrated the target. D is a soft metal band.

In Figure 4, P^2 is a projectile or shell having an outer wall or case A, and comprising three principal chambers Q^2, W and R. Chamber Q^2 has a refractory and heat-insulating partition M′ between it and the adjoining chamber W. Chamber Q^2 contains a non-explosive reaction mixture, T, such as thermit, and it may also contain shrapnel balls, such as are shown in Fig. 1. C, C′ and C^2 are concussion fuses for setting fire to the ignition powder at I, I′ and I^2. Connected with the ignition powder chambers I, I′ and I^2 is a system of hollow disks, J, and connecting channels, L, made of pasteboard or some other easily combustible substance, K, and filled with a substance, U, which will ignite or react quickly.

The chamber W contains a poisonous substance, H, such, for instance, as hydrocyanic acid, which will vaporize or scatter when the shell explodes. There is an opening, G, for introducing the poisonous substance into chamber W, which can be tightly plugged.

Chamber R contains an explosive substance E. In the base plug, B, of the projectile is the fuse F for detonating the explosive E, after the target has been struck or penetrated. D is a soft metal band for engaging with the rifling in the bore of the cannon.

The operation of my projectile of the form shown in Fig. 3 is as follows:

When the projectile is fired from the muzzle of the gun, the concussion fuses C, C′ and C^2 set fire to the ignition powder at I, I′ and I^2. The ignition powder ignites the mixture in the channels L and disks J, which burns very rapidly, and since the channels and disks are made of a combustible substance, the whole body of the thermit, or other substance filling chamber Q′, is quickly ignited and reaction occurs nearly simultaneously throughout the mass. Within about five seconds after leaving the gun, the chamber Q′ is filled with molten iron and aluminum slag at a temperature of about 5000° Fahrenheit. When thermit is used, the reaction which has occurred is the one in which oxygen leaves the iron oxide to combine with the aluminum, resulting in aluminum oxide and iron. On account of the thickness and the material of the wall M′ between chambers Q′ and R, and the shortness of time between the discharge of the projectile and striking of the target, sufficient heat will not pass through the wall M′ to cause decomposition. On striking and perforating the target, which may be a building or a ship, the fuse F functions in a well known manner and detonates the explosive E, which may be any suitable explosive. If trinitrotoluol is used as the explosive, a violent detonator must be employed with the fuse. The explosion will break up the whole projectile and cause the white hot contents of chamber Q′ to scatter. The centrifugal force due to the rotation of the projectile will cause the molten metal in chamber Q′ to be forced against the outer walls, forming a cylindrical shell of white hot metal, and there will be some vacant space near the axis of the cylinder, as the volume of the materials after the reaction will be less than before. As the center of the chamber Q′ will thus be empty, the gases resulting from the explosion in chamber R, after breaking down the partition M′, will enter this space, and cause the chamber Q′ and its contents to explode outwardly, with complete fragmentation and resulting wide-spread distribution of the incendiary material.

Shrapnel balls may be imbedded in the mixture in chamber Q′, as shown at S in chamber Q of Fig. 1, each ball being covered with suitable refractory material to protect it from melting, but allowing it nevertheless to reach a red heat. The force of the explosion will break the refractory covering of the balls, leaving the red hot balls to scatter and add to the incendiary effect, besides having their usual destructive effect on personnel and material. If the refractory covering of the balls is not broken by the explosion, it will be broken when the balls strike any hard object.

When the form of projectile shown in Fig. 4 is used, and explosion occurs, the hydrocyanic acid or other poisonous substance H in chamber W is vaporized and sprayed or scattered in the vicinity of the explosion, so that anyone attempting to put out the fires caused by the incendiary shell will be rendered insensible or killed by the fumes or gases. The hydrocyanic acid or other poisonous material in chamber W should be protected from the heat of the thermit reaction by the heat insulating wall M′.

The shrapnel balls shown in Fig. 1 may be used in the forms of shell shown in Figs. 3 and 4, and the chamber containing poisonous substance shown in Fig. 4 may be used with the form of shell shown in Fig. 1. Any suitable substances for the ignition powder, the reaction mixture, the explosive and poisonous material may be employed, and I may use any fuses or other igniting and detonating means suitable for my purposes. The form and shape of the shell or projectile may be any that is suitable, and in general, I do not confine myself to the particular apparatus and materials here shown, but various changes and modifications, within the knowledge of those skilled in the art, may be made in the particular apparatus and materials shown and described herein, with-

out departing from the spirit of my invention, provided the means set forth in the following claims be employed.

Having thus described my invention, I claim:—

1. In a projectile, the combination with a suitable casing, of an enclosed charge comprising an exothermic, non-explosive reaction mixture, and an explosive substance, and successively acting means for igniting the non-explosive component and for detonating the explosive component of the charge.

2. A bomb having two separate chambers, one chamber containing a non-explosive reaction mixture, and the second chamber containing an explosive substance, means for igniting the non-explosive mixture, and means for subsequently exploding the explosive substance.

3. A projectile comprising a chamber lined with fire-resisting material, a non-explosive reaction mixture contained in said chamber, a second chamber, an explosive substance contained in said second chamber, means for igniting said non-explosive mixture, and means for subsequently exploding said explosive substance.

4. In a shell, a chamber lined with fire-resisting material, a non-explosive reaction mixture contained therein, an igniting substance distributed through the mixture, a second chamber separated from the first chamber by a heat-proof partition, an explosive substance contained in said second chamber, means for igniting the non-explosive mixture, and means for subsequently exploding the explosive mixture.

5. An incendiary projectile, comprising two separate compartments, the larger of said compartments being nearer the point of the projectile and containing a non-explosive, reaction mixture, the smaller of said compartments being nearer the base of said projectile and containing an explosive substance, and independent means for igniting the reaction mixture and detonating the explosive substance.

6. In combination, a shell comprising a casing and plurality of chambers, one of said chambers having a lining of refractory material and containing a non-explosive reaction mixture, means for rapidly igniting said reaction mixture, poisonous substances contained in a second of said chambers, explosive substances contained in a third of said chambers, and means for detonating said explosive substances.

7. In combination, a shell comprising a casing and a plurality of compartments, one of said compartments having a refractory lining and containing a non-explosive reaction mixture, shrapnel balls imbedded in said reaction mixture, said balls having a refractory coating, means for causing said mixture to react rapidly, an explosive substance contained in another of said compartments, a heat-insulating partition between said compartments, an independent means for igniting said reaction mixture and for exploding said explosive substance.

8. In combination, a shell comprising a suitable casing and a plurality of chambers, one of said chambers having a refractory lining and containing an exothermic, non-explosive reaction mixture, shrapnel balls imbedded in said reaction mixture, said balls being composed of metal and having a refractory coating, means for igniting said reaction mixture and means for rapidly spreading the reaction throughout the mass of the mixture, a plurality of fuses for said igniting means, a refractory and heat-insulating partition between said first chamber and the other chambers, a poisonous substance contained in a second of said chambers, an explosive substance contained in a third of said chambers, and means for detonating said explosive substance subsequent to the ignition of said reaction mixture.

9. A method of incendiarism which consists in causing a non-explosive reaction mixture contained in a shell to react during the flight of the shell, in exploding said shell after striking a target and in scattering the hot products of the reaction.

10. A method of producing fires by means of incendiary shells which consists in causing a non-explosive reaction mixture contained in a shell to react at a high temperature, in exploding said shell after it has penetrated its target, and in scattering the resultant products of the reaction.

11. A method of incendiarism in warfare which consists in causing a non-explosive reaction mixture contained in a shell to react at a high temperature during the flight of the shell, in exploding said shell after it has penetrated its target, in scattering the resultant products of the reaction, and in generating poisonous gases at the point of explosion.

12. In a projectile, the combination with means providing a plurality of compartments, explosive means in one of said compartments, exothermic reaction means in another of said compartments, and means for igniting said exothermic means and exploding said explosive means.

13. In a projectile, the combination with means providing a plurality of compartments, explosive means in one of said compartments, non-explosive exothermic reaction means in another of said compartments, and means for igniting said exothermic means and exploding said explosive means.

14. In a projectile, the combination with means providing a plurality of normally closed compartments, explosive means in one of said compartments, non-explosive exothermic reaction means in another of said compartments, and means for igniting said

exothermic means and exploding said explosive means.

15. In a projectile, the combination with means providing a plurality of compartments, of exothermic reaction means in one of said compartments, explosive means in another of said compartments and means for successively initiating the reaction of said exothermic means and exploding the said explosive means.

16. In a projectile, the combination with means providing a plurality of compartments of non-explosive exothermic reaction means in one of said compartments, explosive means in another of said compartments and means for successively initiating the reaction of said exothermic means and exploding the said explosive means.

17. In a projectile, the combination with means providing a plurality of normally closed compartments, of non-explosive exothermic reaction means in one of said compartments, explosive means in another of said compartments and means for successively initiating the reaction of said exothermic means and exploding said explosive means.

18. In a projectile, the combination with means providing a plurality of separate compartments, of non-explosive exothermic reaction means in one of said compartments, explosive means in another of said compartments, and means for initiating the reaction of said exothermic means and for exploding said explosive means.

19. In a projectile, the combination with means providing a plurality of normally closed separate compartments, of non-explosive exothermic reaction means in one of said compartments, explosive means in another of said compartments, and means for initiating the reaction of said exothermic means and for exploding said explosive means.

20. In a projectile, the combination with means providing a plurality of compartments, of non-explosive exothermic reaction means in one of said compartments, explosive means in another of said compartments, means rendered active as the result of the projection of said projectile for initiating the reaction of said exothermic means, and means for exploding said explosive means.

21. In a projectile, the combination with means providing a plurality of compartments, of non-explosive exothermic reaction means in one of said compartments, explosive means in another of said compartments, means rendered active as the result of the projection of said projectile for successively initiating the reaction of said exothermic means and means for exploding said explosive means.

22. In a projectile, the combination with means providing a plurality of compartments, of non-explosive exothermic reaction means in one of said compartments, explosive means in another of said compartments, means rendered active as the result of the projection of said projectile for initiating the reaction of said exothermic means, and means rendered active as the result of the striking of a target by said projectile for exploding said explosive means.

23. In a projectile, the combination with a normally closed container of non-explosive exothermic reaction means and explosive means in said container, and means for initiating the reaction of said exothermic means and for exploding said explosive means.

24. In a projectile, the combination with a normally closed container of non-explosive exothermic reaction means and explosive means in said container, and means for successively initiating the reaction of said exothermic means and exploding said explosive means.

25. In a projectile, the combination with a normally closed container of non-explosive exothermic reaction means and explosive means in said container, means for initiating the reaction of said exothermic means as a result of the projection of said projectile, and means for exploding said explosive means as a result of the striking of a target by said projectile.

26. In a projectile, the combination with a normally closed container of non-explosive exothermic reaction means in said container, means to initiate the reaction of said exothermic means, and means operative to cause the discharge of said exothermic means from said container an appreciable time after the initiation of said reaction.

27. In a projectile, the combination with a normally closed container of non-explosive exothermic reaction means in said container, means rendered active as a result of the projection of said container for initiating the reaction of said exothermic means, and means rendered active as a result of the striking of a target by said container for discharging said reaction means from said container.

28. A method of incendiarism which consists in causing a non-explosive reaction mixture contained in a shell to react during the flight of the shell and in exploding said shell an appreciable time after the initiation of said reaction.

29. In a projectile, the combination with a hollow body portion provided with a compartment, heat insulating material forming a lining for the inner surface of said compartment, a non-explosive exothermic reaction material contained in said compartment, a combustible container arranged in

said compartment, readily ignitable material arranged in said container, means for igniting said readily ignitable material as a result of the projection of said projectile from a gun, an explosive substance for exploding said hollow body portion arranged within said body portion but outside of said compartment, and means carried by said projectile for detonating said explosive material upon impact of said projectile with a target.

30. In a projectile, the combination with a hollow body portion provided with a normally closed compartment, heat insulating material forming a lining for the inner surface of said compartment, a non-explosive exothermic reaction material contained in said compartment, a combustible container arranged in said compartment, readily ignitable material arranged in said container, means including a plurality of fuses arranged in said compartment for igniting said readily ignitable material as a result of the projection of said projectile from a gun, an explosive substance for exploding said hollow body portion arranged within said body portion but outside of said compartment, and means carried by said projectile for detonating said explosive material upon impact of said projectile with a target.

31. In a projectile, a container provided with a plurality of chambers, an explosive means in one chamber, a metallic substance in another chamber, means operative after the projection of said projectile for reducing said substance to a molten condition and means for exploding said explosive means.

32. In a projectile, a container provided with a plurality of chambers, an explosive means in one chamber, a substance in solid form in another chamber, means operative after the projection of said projectile for reducing said substance to a hot fluid condition, and means for exploding said explosive means.

33. In a projectile, the combination with a container, of thermit arranged in said container, and means for exploding and igniting said thermit also arranged in said container.

34. In a projectile, the combination with a normally closed container, of thermit arranged in said container, and means for igniting said thermit and exploding said container also arranged in said container.

35. In a projectile, the combination with means providing a plurality of normally closed compartments, explosive means in one of said compartments, and thermit in another of said compartments, and means for causing the explosion of said explosive means, and for causing the ignition of said thermit.

36. In a projectile, the combination with a normally closed container, of non-explosive exothermic reaction means which may be ignited only at a comparatively high temperature in said container, and means in said container for igniting said exothermic means and for exploding said container.

37. In a projectile, the combination with a normally closed container, of aluminothermic material arranged in said container and means carried by said container for igniting said material.

38. In a projectile, the combination with a container, of aluminothermic material arranged in said container, and means carried by said container for igniting said material as a result of a sudden change in the movement of said projectile.

39. In a projectile, the combination with a container, of aluminothermic material ignitable only at a comparatively high temperature arranged in said container, material ignitable at a low temperature arranged in said container to ignite said aluminothermic material, and means carried by said container for igniting said second mentioned material.

40. In a projectile, the combination with a container, of aluminothermic material ignitable only at a comparatively high temperature arranged in said container, material ignitable at a low temperature arranged in said container to ignite said aluminothermic material, and means carried by said container and rendered effective as a result of a sudden change in the motion of said projectile for igniting said second mentioned material.

Signed at New York, in the county of New York, and State of New York, this 18th day of December, A. D. 1914.

JOHN HAYS HAMMOND, Jr.

Witnesses:
THOS. T. TRAPNELL,
RAYMOND LYNCH.