Jan. 29, 1924. 1,481,798

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PROJECTILE

Original Filed June 27, 1917

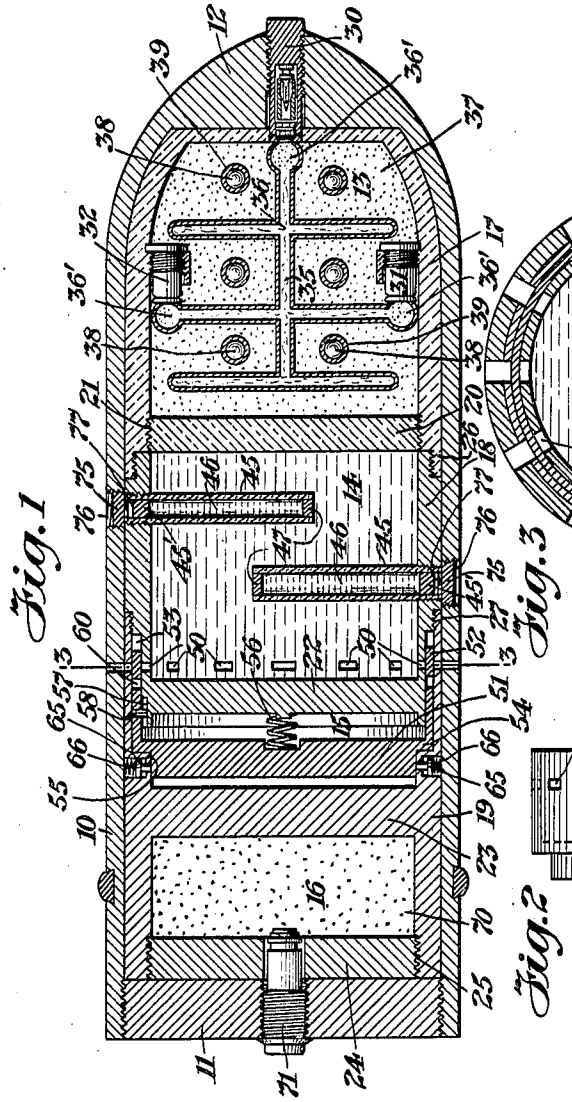


Fig. 1

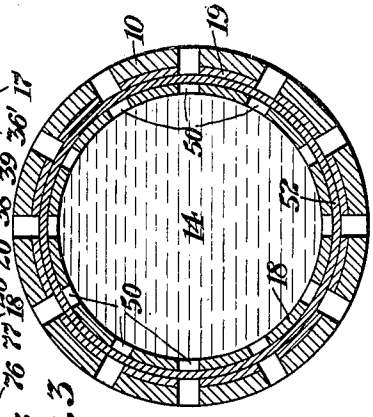


Fig. 3

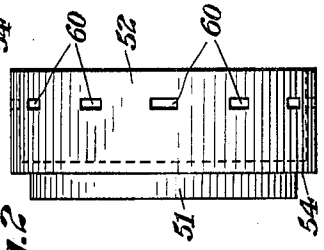


Fig. 2

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UNITED STATES PATENT OFFICE.

JOHN HAYS HAMMOND, JR., AND HENRY L. F. BUSWELL, OF GLOUCESTER, MASSACHUSETTS; SAID BUSWELL ASSIGNOR TO SAID HAMMOND.

PROJECTILE.

Application filed June 27, 1917, Serial No. 177,425. Renewed July 11, 1922. Serial No. 574,284.

To all whom it may concern:

Be it known that we, JOHN HAYS HAMMOND, Jr., a citizen of the United States, and a resident of the city of Gloucester, county of Essex, and State of Masachusetts, and HENRY L. F. BUSWELL, a subject of the King of Great Britain, and a resident of the city of Gloucester, county of Essex, and State of Massachusetts, have invented certain new and useful Improvements in Projectiles, of which the following is a specification.

Some of the objects of this invention are to provide an improved explosive projectile adapted to be discharged from a gun and constructed to emit poisonous or destructive gases or vapors upon impact with a target; to provide an improved explosive projectile adapted to be discharged from a gun and containing various devices and materials which will co-act in predetermined sequence to perform various functions after the projectile has been thrown from a gun and has hit its mark; and to provide other improvements as will appear hereinafter.

In the accompanying drawings:

Fig. 1 is a longitudinal central section of a projectile constructed in accordance with this invention; Fig. 2 a side elevation of a detail of the same; and Fig. 3 a transverse section of the same on line 3—3 of Fig. 1.

Referring to the drawings, one embodiment of this invention comprises a projectile including an elongated outer casing or shell 10 substantially cylindrical throughout the major portion of its length and provided with a flat base closed by a base plug 11 threaded therein and having a tapered front end forming a head 12.

To adapt the projectile to perform various functions the interior of the shell 10 is divided into four main compartments including a front compartment 13, an intermediate compartment 14, an auxiliary compartment 15 and a rear compartment 16, by an inner sectional casing which fits snugly in the shell 10 and which comprises a hollow front portion 17, a hollow intermediate portion 18, and a rear portion 19. The hollow front portion 17 is provided at its rear end with a flat closure 20 threaded therein as at 21 and forming a partition between the front compartment 13 and the intermediate compartment 14. The hollow intermediate portion 18 is provided at its rear end with a flat closure 22 integral therewith and forming a partition between the intermediate compartment 14 and the auxiliary compartment 15. The hollow rear portion 19 is provided intermediate of its ends with a flat closure 23 forming a partition between the auxiliary compartment 15 and the rear compartment 16, and is provided at its rear end with a flat closure 24 threaded therein as at 25. The front end of the hollow intermediate portion 18 is threaded into the rear end of the hollow front portion as at 26 and the front end of the hollow rear portion is threaded around the intermediate hollow portion 18 intermediate of its ends as at 27.

For incendiary purposes both the hollow front portion 17 of the inner casing, and its closure 20 are formed of refractory or heat resisting materials, for example, of magnesite, magnesia tar or silicate of soda. The closure 20 may be composed in part of some substance having special heat insulating properties, for instance of asbestos, or an asbestos compound. A concussion fuse 30 arranged axially in the head 12, and two concussion fuses 31 and 32 fixedly secured within the front compartment 13 are connected by and communicate with a hollow conductor 35 made of stiff paper, pasteboard, or some other light and easily combustible material, which is arranged in the front compartment 13. The main portion of the conductor 35 is filled with any suitable material which will ignite and react quickly, for instance with a mixture 36 of red oxide of iron and aluminum. The portion of the conductor adjoining the concussion fuses 30, 31 and 32 are preferably filled with a suitable ignition material for instance with a mixture 36^1 of barium peroxide and aluminum. The space within the front compartment 13 surrounding the concussion fuses 31 and 32 and the conductor 35 is filled with an exothermic reaction mixture 37, for instance with thermit, composed of iron oxide and aluminum. Metal shrapnel balls 38 each covered with a refractory coating 39 may be embedded in the exothermic mixture 37.

For the purpose of generating a poisonous gas or vapor within the projectile immediately after the projectile has been discharged from a gun, a plurality of glass tubes 45 are arranged transversely of the

projectile and fixedly secured within the intermediate compartment 14, one end of each tube being preferably permanently sealed by a glass closure 45^1 and threaded into or otherwise rigidly secured in the wall of the hollow intermediate portion 18 of the inner casing, and the remaining portion of each tube projecting freely into the intermediate compartment 14. Each of these tubes 45 is filled with concentrated sulphuric acid (H_2SO_4) 46, and the free inner end of the tube is sealed by a closure 47 of lead or other material which will not be eaten away by the acid. The glass tubes 45 are made of such proportions as to remain normally intact but to break when the projectile is thrown from a gun. The space within the intermediate compartment surrounding the tubes 45 is filled with a solution of potassium ferro cyanide.

To permit of the discharge of the poisonous gases or fluids from the projectile into the sourrounding atmosphere immediately after the projectile has hit a target, the projectile is provided with a plurality of radially arranged ports 50 extending through the overlapping walls of the hollow intermediate portion 18, the hollow rear portion 19 and the shell 10. These ports 50 are normally kept closed by a piston valve arranged within the projectile and extending coaxially therewith, and comprising a flat circular head 51 and a cylindrical tubular portion 52 integral with the head 51. The head 51 is arranged to reciprocate longitudinally of the projectile in the auxiliary compartment 15, and the cylindrical tubular portion 52 is arranged to reciprocate snugly in an annular cylindrical passage 53 provided therefor between the forward part of the rear hollow portion 19 and the rear part of the intermediate portion 18 of the sectional inner casing. This valve is provided with an external, rearwardly facing annular shoulder 54 which is normally pressed against a corresponding annular shoulder 55, provided therefor on the inner surface of the hollow rear portion 19 of the inner casing, by means of a spiral spring 56 compressed between the fixed partition 22 and the head 51 of the valve. The valve is held against rotation with respect to the projectile by a pin or key 58 arranged radially in the intermediate portion 18 of the inner casing and riding in a slot 57. The cylindrical portion 52 of the valve is provided with a plurality of ports 60 which are arranged to register with the ports 50 respectively when the valve is in its foremost or operative position with the head 51 of the valve in contact with the rear end of the hollow intermediate portion 18 of the inner casing. For retaining the valve 52 in its foremost or operative position a plurality of plungers 65 are radially arranged in apertures provided therefor through the rear hollow portion 19 and are normally pressed into engagement with the cylindrical surface of the head 51 of the valve when the valve is in its rearmost position by springs 66 respectively as shown in Fig. 1. These plungers 65 are so arranged that when the valve is thrown into its foremost or operative position the plungers are released by the valve and are pressed radially inwardly limited distances by the springs 66 and into the path of the valve, preventing the valve from being moved rearwardly, and thus the valve is retained in an operative position.

For exploding the projectile, the rear compartment 16 is filled with any suitable explosive material 70, for instance with trinitrotoluol which is arranged to be acted upon by a time fuse 71 or other suitable fuse for detonating the explosive material 70 a predetermined time after the projectile has hit its target.

In the operation of this improved projectile the discharge of the projectile from the gun causes the concussion fuses 30, 31 and 32 to function in a well known manner and to ignite the ignition powder 36^1 which in turn ignites the mixture in the conductor 35 which burns very rapidly, and since the conductor 35 is made of combustible material, the whole mass of the thermit or other substance surrounding the conductor is quickly ignited and reaction occurs nearly simultaneously throughout the mass. Within about five seconds after the projectile has left the gun the front compartment is filled with molten iron and aluminum slag at a temperature of about 5000° F. When thermit is used, the reaction which has occurred is one in which oxygen leaves the iron oxide and combines with the aluminum resulting in aluminum oxide and iron. Also, when the projectile is discharged from a gun the glass tubes 45 are broken by the sudden movement of the projectile, and the sulphuric acid contained in the tubes combines with the solution of potassium ferro cyanide in the intermediate compartment 14 and fills the intermediate compartment with hydrocyanic acid and poisonous fumes or gases under pressure. This reaction is facilitated and expedited by the rotary movement of the projectile about its longitudinal axis while in flight.

When the projectile hits a target the sudden stoppage of the projectile causes the valve 51 to move into its foremost position where it is held by the plungers 65, and the hydrocyanic acid and poisonous gases or fuses are discharged from the projectile through the ports 50 to kill or render insensible any persons in the vicinity of the projectile.

Finally, and after a predetermined inter-

val of time following the impact of the projectile against its target, the time fuse 71 performs its function and ignites the explosive material 70 in the rear compartment 16 and the projectile is exploded and entirely broken up and the molten or the semi-molten incendiary material in the front compartment 13 is widely scattered.

By delaying the explosion of the projectile until after the poisonous fumes or gases have been expelled from the projectile through the ports 50, the disassociation of the fumes or gases into the harmless constituents, hydrogen and nitrogen is avoided. The glass tubes 45 filled with concentrated sulphuric acid are not placed in the projectile until just before it is to be placed in a gun, the outer shell 10 being provided with a suitable aperture having a removable steel closure 75 threaded into the walls thereof opposite the outer end of each tube 45 to permit of the convenient insertion or removal of the tubes 45 through the outer shell 10. The outer closure 45^1 of each tube and the corresponding steel closure 75 may be provided in their outer surfaces with slots 76 and 77 respectively adapted to receive a screw driver to position these parts. By delaying the placing of the glass tubes 48 in the projectile until just before the projectile is put into operation, the liability of destruction or damage of persons or property due to a premature explosion of the projectile before the glass tubes have been placed in the shell is minimized.

The fuses 30, 31 and 32 may be of the percussion type so that the aluminothermic reaction does not occur until after the projectile strikes the target. In this way, when the charge 16 is detonated the mixture 37 will be found at a maximum temperature.

Having thus fully described this invention, we claim and desire to protect by Letters Patent of the United States:

1. A projectile including a shell, a plurality of substances contained in said shell and adapted to combine chemically to produce a given substance, means normally maintaining said substances separated but operative as a result of the sudden discharge of said shell from a gun to cause said first mentioned substances to combine to produce said given substance, and means operative to explode said shell a predetermined time after impact.

2. A projectile including a shell, a plurality of substances contained in said shell and adapted to combine chemically to form a poisonous fluid, means normally maintaining said substances separated but operative as a result of the sudden discharge of said shell from a gun to cause said substances to combine chemically to form said fluid, and means operative by impact to release said poisonous fluid gradually from said shell.

3. A projectile including a shell, a plurality of substances contained in said shell and adapted to combine chemically to form a poisonous gas, means normally maintaining said substances separated but operative as a result of the sudden discharge of said shell from a gun to cause said substances to combine chemically to form said gas, and means operative by impact to release said gas gradually from said shell.

4. A projectile provided with a compartment, a fragile container in said compartment, a substance in said compartment outside of said container, a substance in said container adapted to combine chemically with said first mentioned substance to produce a poisonous gas, said container being adapted to be fractured as the result of the discharge of said projectile from a gun to cause said substances to commingle and combine to produce said gas, and means operated by impact to release said gas gradually from said shell.

5. A projectile comprising a shell provided with a compartment, a fragile container in said compartment, a salt and an acid in said compartment and normally separated by said container, said container being constructed and arranged to be fractured as a result of the discharge of said projectile from a gun to cause said acid to commingle with said salt, and means operative to explode said shell a predetermined time after impact.

6. A projectile comprising means providing a plurality of compartments, an exothermic reaction mixture in one of said compartments, a plurality of normally separated substances for generating a poisonous gas arranged in another of said compartments, and time controlled means for exploding said projectile arranged in a third one of said compartments.

7. A projectile comprising means providing a plurality of compartments, an exothermic reaction mixture in one of said compartments, concussion means operative to ignite said mixture as said shell is expelled from a gun, a plurality of normally separate substances arranged in another of said compartments to operate to combine to form a poisonous gas as a result of the discharge of said projectile from a gun, means operative to permit the discharge of said gas from said projectile as a result of the impact of said projectile against a target, and means operative to explode said projectile a predetermined time after said impact.

8. A projectile comprising a compartment for containing poisonous matter injurious to living beings, a second compartment containing explosive matter injurious to property, and means responsive to the impact of said projectile for quickly releasing the contents of the first named compartment and

means for subsequently exploding the contents of the second compartment.

9. A projectile comprising poisonous matter injurious to living beings, and explosible matter adapted to injure property, means responsive to the impact of the projectile for first releasing the poisonous matter and means to thereafter explode the explosive matter.

10. A projectile comprising a shell having a plurality of compartments each adapted to impart injury to differently characterized elements of an enemy front, and means responsive to the impact of the shell for quickly releasing the contents of one of said compartments and means for subsequently releasing the contents of the remaining compartments.

11. A projectile comprising a shell having two compartments each adapted to impart injury to differently characterized elements of an enemy front, and means responsive to the impact of the shell for quickly releasing the contents of one of said compartments and a time fuse for discharging the contents of the other compartment.

12. A projectile comprising a compartment for containing poisonous matter injurious to living beings, a second compartment containing explosive matter injurious to property, and means responsive to the impact of said projectile for quickly releasing the contents of the first named compartment and means operable at a different time for exploding the contents of the second compartment.

In witness whereof, I have hereunto set my hand this 11th day of June, 1917.

JOHN HAYS HAMMOND, JR.

In witness whereof, I have hereunto set my hand this 11th day of June, 1917.

HENRY L. F. BUSWELL.