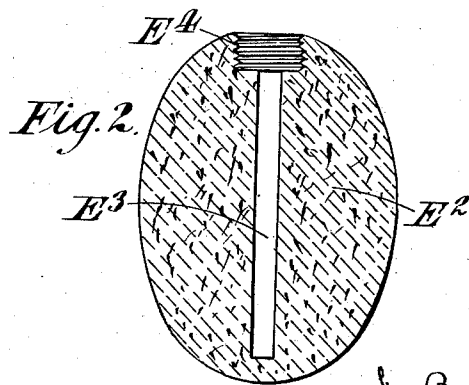
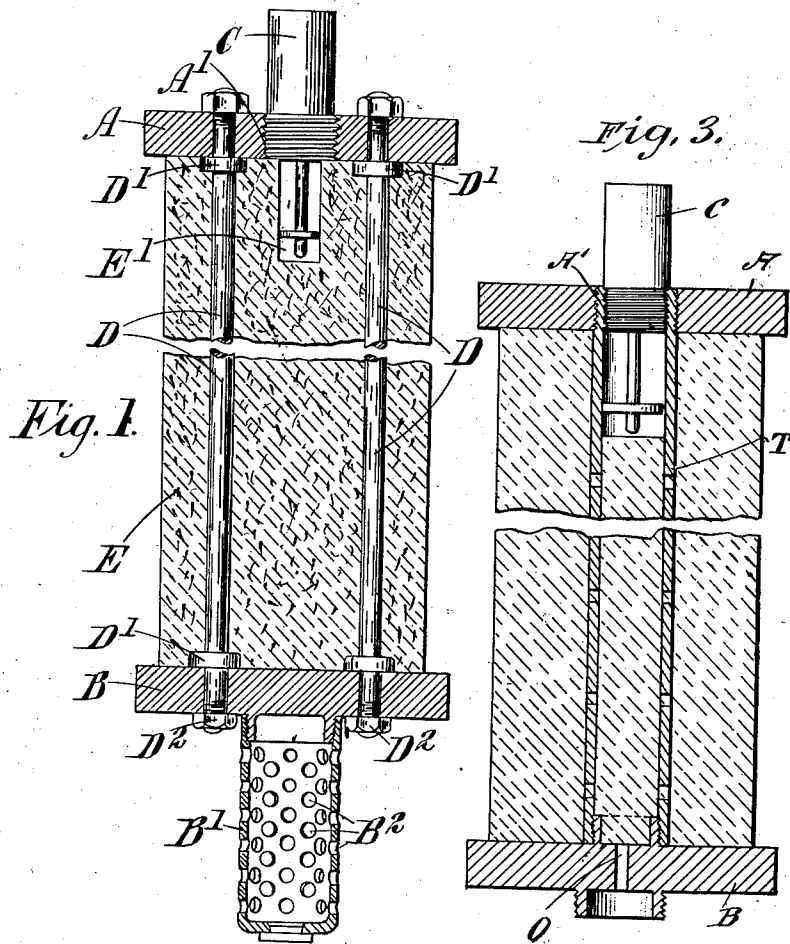


C. T. J. VAUTIN.
INCENDIARY PROJECTILE.
APPLICATION FILED APR. 10, 1919.

1,316,005.

Patented Sept. 16, 1919.



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INCENDIARY PROJECTILE.

1,316,005.

Specification of Letters Patent. Patented Sept. 16, 1919.

Application filed April 10, 1919. Serial No. 289,176.

To all whom it may concern:

Be it known that I, CLAUDE THEODORE JAMES VAUTIN, a subject of the King of England, residing at London, England, have
5 invented certain new and useful Improvements in Incendiary Projectiles, of which the following is a specification.

This invention relates to incendiary projectiles, in particular such as are intended
10 for use in trench-guns or hand-grenades.

Heretofore it has been customary to inclose the incendiary or metallothermic material of such projectiles within an outer casing or shell, usually of steel but sometimes of softer material as in a cartridge
15 case, and to provide the projectile with both an igniting and a bursting charge, the former of which served to ignite the incendiary material, and the latter of which served to burst the said shell and scatter the said material. Sometimes a double-purpose charge
20 that both ignites the incendiary material and bursts the shell or other containing case has been employed. One result of such constructions was that the incendiary material
25 was necessarily scattered with considerable force, owing to the force required to burst the containing vessel or shell, and the incendiary material was consequently subdivided by the burst more finely than was altogether desirable.
30

I have found that the incendiary material is better distributed after it has been ignited if it be not contained in a container or casing which is thus to be opened by a disruptive force.
35

For the purpose of obtaining this improved distribution of the ignited incendiary material, the present invention provides a
40 projectile whose body, or an outer shell thereof, is formed wholly or in part of an ignitable substance that is hard when cold, but becomes soft and fluid when ignited, for example a metallic mixture hardened by
45 mechanical pressure. Such an ignitable substance may be a metallic mixture which comprises a combustible binding material or is rendered hard by incorporation with such a binding material. The said ignitable substance preferably comprises as the binding
50 material either sulfur or sulfur together with a metallic sulfid decomposable by the metal of the mixture.

The projectile provided by this invention

may be prepared so as to be suitable for use
55 in a trench-gun or the like, or as a hand-grenade.

Two embodiments of the invention are illustrated by way of example in the accompanying drawing, wherein—
60

Figure 1 is a vertical sectional elevation showing a projectile according to the invention adapted for use in a Stokes gun, and

Fig. 2 is a like view of a hand-grenade
65 according to the invention.

Fig. 3 is a vertical sectional elevation of a modified form of the present invention.

Referring first to Fig. 1, the projectile comprises a head A and a base B of steel, the former being a disk having a central aperture A¹, and the latter being in the form of
70 a disk with a central tail-piece or stem B¹ which is hollow. The aperture in the head is screw threaded to receive the ordinary fuse C for igniting the mixture, and the tail-piece B¹ of the base is arranged to receive
75 the usual propellant charge and is perforated as shown at B², so that the gases liberated by the charge when fired, can escape into the chamber of the gun. The outside
80 diameters of the base and head are such as to fit the bore of the gun.

Two or more steel rods D are prepared which may have shoulders D¹ at each end, and are of such a length between the shoulders that, when the rods are inserted between
85 the said head and base with their ends passing into holes prepared to receive them in the head and base, respectively, the latter will be spaced apart the distance requisite
90 to give the projectile its desired length. The ends of the rods D are screw threaded and pass, as above stated, through holes in the head and base and receive nuts D² on their projecting ends so as to hold the head and
95 base firmly together at a predetermined distance apart. Alternatively, the rods may be secured in the base otherwise than by shoulders and nuts, for instance by being screwed into the said base so that the outside thereof
100 shall be free from nuts or projecting ends of rods.

A mixture consisting of aluminium powder and sulfur, both in a finely-divided condition and in such proportions that substantially the whole of the sulfur can be
105 taken up by the metal to form a sulfid therewith is made. 1 part of this mixture is in-

incorporated with 2 parts of an aluminothermic mixture or of what is ordinarily known as thermalloy (a mixture of powdered aluminium containing zinc with ferrosulfuric acid, in such proportions that the aluminium powder will be entirely oxidized and the iron entirely reduced by the interchange between them of oxygen).

The above-stated ingredients are intimately mixed together, and then heated to a temperature not exceeding 200° C. with constant stirring, until a plastic material is obtained. This material is then cast on to the frame comprising the base B and head A united by the two or more steel rods D in such a way that a cylindrical block E of the material, cored out at E¹ to provide a chamber for a detonator, fills the space between the head and base and constitutes the body of the projectile. It will be appreciated that the material is thus cast around the said two rods so that the result constitutes a substantially solid unit.

In use, the fuse C is inserted in the head and the propelling charge in the stem B¹ of the base with the result that when it is fired and the fuse is also fired, by impact or otherwise, the whole body E of the projectile ignites and forms a liquid slag of great fluidity together with molten iron, and this slag and iron is scattered by the shock of impact or gravity and in a more desirable manner than if it were scattered by an explosive charge.

As an example of an alternative to the above sulfurous mixture a metallic sulfid such as can be decomposed by the metal constituent of the thermalloy or other aluminothermic mixture may be employed, this sulfid being ground to a fine powder and mixed with finely divided sulfur equivalent to from 15%-50% by weight of the sulfid. In this case the metallic sulfid, such as iron pyrites, after having been finely ground is mixed with say from 15%-50% of its weight of sulfur, and this mixture is heated with constant stirring until the mass becomes fluid. It is then cast and allowed to cool and set hard. This hard product is finely ground and added in the desired proportion to the aluminothermic mixture and the mass heated as above directed for the mixture of sulfur and aluminium with thermalloy. The proportion of aluminium or other reducing metal or alloy is, however, so chosen that the said metal will suffice to combine both with the sulfur of the metallic sulfid and with the free sulfur added thereto.

A modified form of projectile according to the invention comprises a central perforated iron tube T screwed at one end into the aperture in the head plate and secured at the other end to the base plate having a flash-hole O in the center thereof communicating with the interior of the tube. The

former end of the tube may be closed by a screw plug or by an ordinary fuse, and the tube itself is wholly or partially filled with the ignitable mixture which surrounds the tube between the two plates.

Referring now to Fig. 2, the body E² of the hand-grenade having the form of an oblate spheroid is composed of the same material as the body of the projectile described above with reference to Fig. 1, and is cast about a core to provide an axially disposed detonator-chamber E² which is closed at one end and is screw-threaded at the other, as shown at E⁴, to receive the fuse.

Whereas, in the construction described above with reference to Fig. 1, the projectile may be said to be devoid of a metal-casing or shell, it is to be understood that it may be partly inclosed in such a casing. Thus, for example, the head A and the base B may each be provided with a cylindrical flange directed toward the opposite end of the projectile but only of such axial length as will leave in the center of the projectile a band of the body-portion exposed to the air and not encircled by a metallic casing. Furthermore, it is within the scope of this invention to construct a projectile substantially as a hollow body whose wall or casing is formed wholly or in part of one kind of a hard ignitable metallic mixture such as is exemplified above, and to fill the said casing with another kind of incendiary metallothermic material, such for example as one not containing free sulfur. Or again, such a hollow casing may be left unfilled. In addition, instead of heating the above-mentioned mixed ingredients to form a plastic mass which is then cast into the desired shape, the mixed ingredients may be molded under pressure to the desired form without the application of heat, without departing from the scope of the invention.

What I claim as my invention and desire to secure by Letters Patent is:—

1. An incendiary projectile comprising an outer shell composed in part of an ignitable metallothermic material that is hard when cold but becomes soft or fluid when ignited.
2. An incendiary projectile comprising an outer shell composed wholly of an ignitable metallothermic material that is hard and dense when cold but becomes soft or fluid when ignited.
3. An incendiary projectile comprising an outer shell composed in part of an ignitable metallothermic mixture rendered hard by mechanical pressure.
4. An incendiary projectile comprising an outer shell composed wholly of an ignitable metallothermic mixture of powders compressed into a hard solid condition.
5. An incendiary projectile comprising an outer shell composed in part of an ignitable metallothermic mixture which contains as

one ingredient a combustible binder and which is hard when cold but becomes soft or fluid when ignited.

- 5 6. An incendiary projectile comprising an outer shell composed in part of an ignitable metallothermic material which comprises a sulfurous binder and is hard and in a solid condition when cold but becomes soft or liquid when ignited.
- 10 7. An incendiary projectile comprising an outer shell composed wholly of an ignitable metallothermic material which consists of a metallic powder, an oxygen compound of a metal and a sulfurous binder, and which is
- 15 hard when cold but becomes soft or fluid when ignited.
8. An incendiary projectile comprising an outer shell composed in part of an ignitable metallothermic material which contains a
- 20 metallic powder and as a binder sulfur mixed with a sulfid decomposable by the metal, and which is hard when cold but becomes plastic or liquid when ignited.
9. An incendiary projectile comprising an
- 25 outer shell composed wholly of an ignitable metallothermic material which contains powdered aluminium and as a binder sulfur mixed with a sulfid decomposable by aluminium, and which is hard when cold but
- 30 becomes soft or fluid when ignited.
10. An incendiary projectile comprising a

self sustaining body which is exposed to the atmosphere and is composed of an ignitable metallothermic material that is hard when cold but becomes soft or liquid when ignited. 35

11. An incendiary projectile comprising a body which is exposed to the atmosphere and is composed of an ignitable metallothermic mixture of powders that contains a sulfurous substance as a binder, and is hard when cold but becomes soft or fluid when ignited. 40

12. An incendiary projectile comprising a body which is exposed to the atmosphere and is composed of an ignitable metallothermic material that contains an oxygen compound of a metal and sulfur as a binder and is hard and dense when cold but becomes plastic or liquid when ignited. 45

13. An incendiary projectile comprising in combination a frame, and a hard solid mass 50 of metallothermic material constituting the body of the projectile carried thereby with its outer surface exposed to the atmosphere.

14. An incendiary projectile comprising in combination two metal plates and a distance- 55 member holding the same together to constitute a frame, and a hard solid mass of metallothermic material constituting the body of the projectile carried thereby with its outer surface exposed to the atmosphere. 60

In testimony whereof I affix my signature.

CLAUDE THEODORE JAMES VAUTIN.