No. 707,024. Patented Aug. 12, 1902.

J. B. SEMPLE.

PROJECTILE.

(Application filed Aug. 12, 1901.)

(No Model.)

FIG. 1.

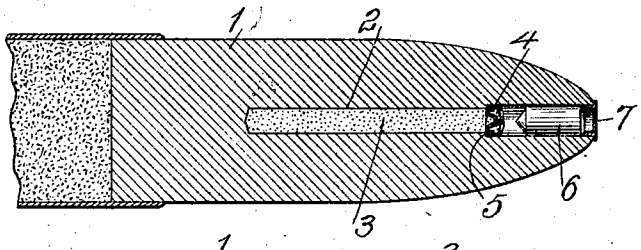


FIG. 2.

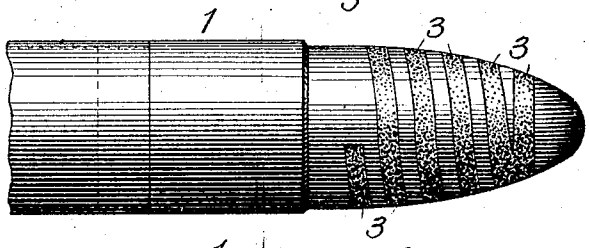


FIG. 3.

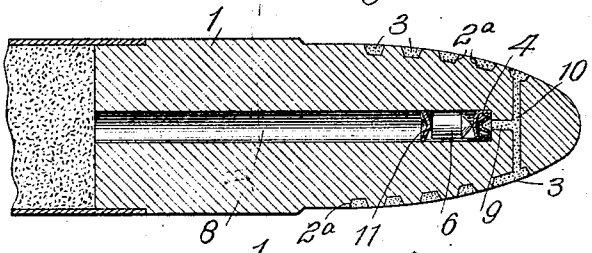


FIG. 4.

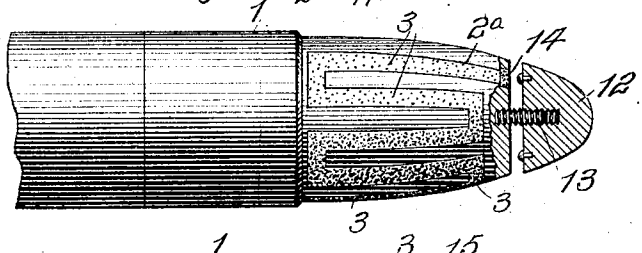


FIG. 5.

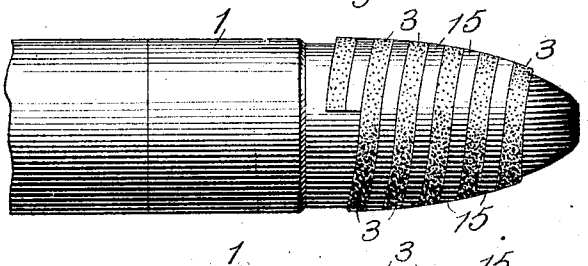
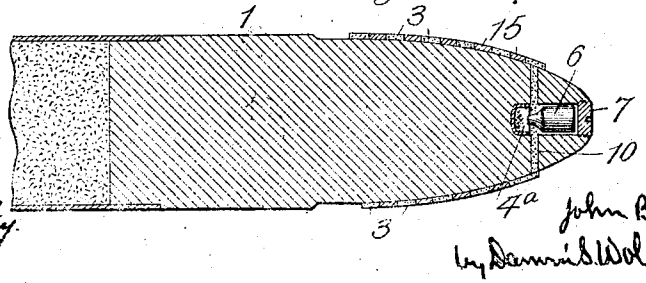


FIG. 6.



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UNITED STATES PATENT OFFICE.

JOHN B. SEMPLE, OF SEWICKLEY, PENNSYLVANIA.

PROJECTILE.

SPECIFICATION forming part of Letters Patent No. 707,024, dated August 12, 1902.

Application filed August 12, 1901. Serial No. 71,868. (No model.)

To all whom it may concern:

Be it known that I, JOHN B. SEMPLE, a citizen of the United States, residing at Sewickley, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Projectiles, of which improvements the following is a specification.

The invention described herein relates to certain improvements in projectiles of the class or kind forming the subject-matter of Letters Patent No. 581,946, granted to me May 4, 1897, having for its object the carrying by the projectile of a non-explosive pyrotechnic compound adapted to be ignited on the discharge of the projectile from the gun and to burn with the production of a bright light at night and smoke during the day, so as to plainly show the trajectory of the projectile. In the form shown in said Letters Patent the pyrotechnic compound is arranged in a cavity or chamber in the rear of the projectile. When so arranged, considerable difficulty is encountered in preventing the destruction or injury of the compound by the intense pressure and heat of the explosive charge of the gun.

The object of the present invention is to so arrange the pyrotechnic compound that it will not be liable to injury by the pressure or heat resulting from the combustion of the driving charge in the gun.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a sectional view of a projectile having my improvement applied thereto. Figs. 2 and 3 are an elevation and section, respectively, showing a modification in the arrangement of the pyrotechnic compound and the means for igniting the same. Fig. 4 is a sectional view illustrating a further modification of the arrangement of the compound and the igniting mechanism. Figs. 5 and 6 are an elevation and section, respectively, of further modifications of my improvement.

In the practice of my invention the pyrotechnic compound is arranged in front of the sabot or of that portion of the projectile which forms the seal between the projectile and the bore of the gun to prevent the escape of gases past the projectile. The pyrotechnic compound is made in the form of a strip or rod and is so arranged on the projectile that the combustion will be progressive along the strip or rod, which is made sufficiently long relative to its rate of combustion and the flight of the projectile as to insure the visibility of the projectile during such flight.

In the construction in Fig. 1 a cavity 2 is formed in the projectile 1, extending from a point at or near the front end of the projectile into the body of the same. A rod or strip 3, formed of a combustible non-explosive or pyrotechnic compound, is placed in the cavity, closely filling the same, so as to prevent the compound from being ignited at a point or points in the rear of its front end, and thereby forming two or more points of combustion. The pyrotechnic compound can be conveniently formed of a mixture of magnesium or aluminium, gunpowder, and an oxidizing agent, with a binder, as shellac or glue. In order to ignite the compound, a percussive primer or cap 4 is supported at the front end of the rod or strip 3 by a suitable anvil 5, which may consist of a shoulder formed by enlarging the outer end of the cavity. This cap or primer is exploded to ignite the compound by a firing block or pin 6, fitting loosely in the outer end of the cavity, in which it is retained by cover 7. As the projectile is forced suddenly forward by the explosive charge the cap or primer will be driven with sufficient force to produce explosion or ignition against the pin or block, which, by reason of inertia, will remain stationary until struck by the cap or primer.

In the construction shown in Figs. 2 and 3 the cavity 2^a for the reception of the pyrotechnic compound is formed externally around the front portion of the projectile, starting from a point at or near the front end of the projectile and extending spirally toward the rear end thereof a sufficient distance, dependent upon the rate of burning of the compound and the flight of the projectile to render the path of the projectile visible until it strikes. The rod or strip 3, formed of the pyrotechnic compound, is laid in this spiral cavity, and the outer surface thereof

overed with a suitable material, as shellac, revent the transverse igniting of one por- of the strip from another portion by the t or flame passing transversely across the tions of the projectile intermediate of two tions of the groove or cavity. The strip y be ignited by the mechanism shown in . 1, or the igniting mechanism may be anged within a cavity 8 in the projectile, l cavity being connected to the external ity containing the pyrotechnic compound a fuse 9, arranged within a passage 10 in projectile. In this construction the cap primer 4 is arranged at the end of the in- al cavity or chamber, and the fuse 9 ex- ds into suitable igniting proximity to such . The firing block or pin 6 is loosely ar- ged within this cavity, which is open at rear end of the projectile, so that the ng block or pin will be forced forward by gases of the exploding charge within the to explode or ignite the primer or cap. linarily the cap or primer or the block 6 ld seal the outer end of the cavity 8 to pre- t the escape of gases and the forcing out the fuse; but it is preferred, in order to ure the perfect sealing of the cavity, to ar- ge a metal washer or disk 11 in the rear he firing-block, said washer tightly fitting cavity or chamber.

n lieu of arranging the cavity containing pyrotechnic compound spirally around front portion of the projectile it may be med of a series of longitudinal back-and- h grooves or cavities, and in lieu of using ercussive primer to ignite the pyrotechnic mpound a frictional igniter may be em- yed for that purpose. A convenient means his end consists of a block 12, carried by projectile and adapted when the project- is caused to move by the explosive charge gitudinally or spirally by the rifling to re- in stationary a sufficient length of time to ng the adjacent faces of the projectile and ck into rubbing contact against each other, thereby subject a suitable material in- posed between them to sufficient friction ause its ignition. It is preferred that the ck 12 should be made of such a shape as form the front end of the projectile. A eaded pin 13 is secured to the front end of body of the projectile, and the block is vided with an internally-threaded cavity bore for the reception of the end of this ew. The diameters of the screw and the e in the block are so proportioned that the ck will screw freely onto the pin. In the l of the body of the projectile is formed a ess or groove 14 for the reception of a ma- ial adapted to be ignited by friction, and inner face of the block 12 is also provided h a similar material or with a surface which l rub against the material in the body of the jectile when the latter is rotated by the ing. As the projectile is forced out of the the rifling thereof will impart a rotation to the projectile and the pin will screw into the block, which by reason of inertia will remain stationary, or relatively so, thereby bringing the adjacent faces of the block and projectile close together with the rubbing motion and ignite the friction material.

As shown in Figs. 5 and 6, the band or strip 3 of pyrotechnic compound may be arranged on the surface of the projectile and caused to adhere thereto by any suitable material, as shellac, &c. The band or strip is so arranged that the coils or turns thereof are separated from each other a sufficient distance to prevent the flame or heat from one coil, while the strip is burning, passing across to the next adjacent coil or turn, or the coils may be covered or coated with a material which will prevent an ignition from one to the other. It is preferred, however, to arrange between each turn or coil a strip or band of non-combustible material, which will insulate one coil or turn from the others as against transverse ignition. A desirable means for igniting the strip or band 3 consists of a cap or primer 4^a, arranged within the cavity in the front end of the projectile, from which extends a passage containing a fuse 9. The cap is exploded by a firing block or pin 6, arranged in the front portion of the cavity and held in position by a cover or plug 7. The operation of this igniting device is the same as that shown in Fig. 1.

It will be understood by those skilled in the art that other means than those shown may be employed for igniting the pyrotechnic band or strip and that any one of the forms of igniting devices may be employed with any of the arrangements of the pyrotechnic band or strip.

It is characteristic of the invention herein that the pyrotechnic compound is so arranged as to be protected entirely from the heat and pressure incident to the explosion of the driving charge and that the combustion thereof is progressive along the band or strip, thereby insuring a continuous combustion during the entire flight of the projectile. It is further characteristic of the invention that the pyrotechnic compound is ignited by a part or member capable of movement independent of the projectile.

I claim herein as my invention—

1. The combination of a projectile, a progressively-combustible and non-explosive pyrotechnic compound carried by the projectile in front of the sabot or bearing portion thereof and having its point of combustion during the flight of the projectile in front of the sabot or bearing portion thereof, and a part or member capable of movement independent of the projectile for igniting said compound, substantially as set forth.

2. The combination of a projectile, a strip or band of combustible non-explosive or pyrotechnic compound extending from a point at or near the front end of the projectile toward

the rear end thereof and having the point or points of flame exposure or illumination in advance of the rear end of the projectile and means carried by the projectile for igniting said compound, substantially as set forth.

3. A projectile provided with a cavity extending from a point at or near the front end of the projectile toward the rear end thereof and having the point or points of flame exposure or illumination in advance of the rear end of the projectile, a combustible non-explosive or pyrotechnic compound arranged in said cavity, a movable part or member for causing ignition of said compound, substantially as set forth.

4. A projectile provided with an external groove at or near its front end, a combustible non-explosive or pyrotechnic compound arranged in said groove, a movable part or member to ignite the compound, substantially set forth.

5. A projectile provided with a cavity e tending from a point at or near the front e of the projectile toward the rear end of t same and having the point or points of fla exposure or illumination in advance of t rear end of the projectile, a combustible nc explosive or pyrotechnic compound arrang in said cavity, and a movable part or me ber arranged within the projectile to igni the compound, substantially as set forth.

In testimony whereof I have hereunto s my hand.

JOHN B. SEMPLE.

Witnesses:
DARWIN S. WOLCOTT,
F. E. GAITHER.