F. I. DU PONT.

EXPLOSIVE PROJECTILE.

APPLICATION FILED JULY 7, 1911.

1,015,944. Patented Jan. 30, 1912.

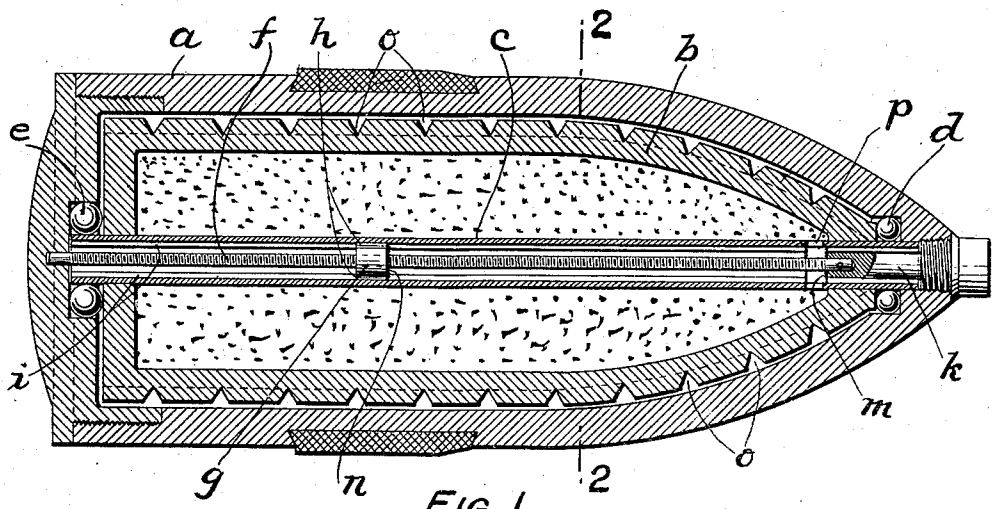

FIG. 1.

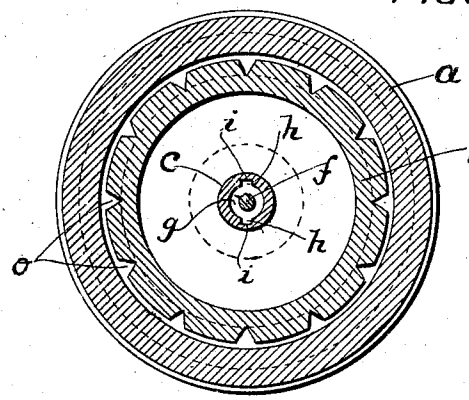

FIG. 2.

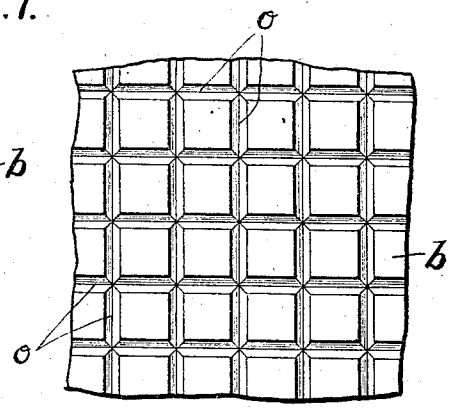

FIG. 3.

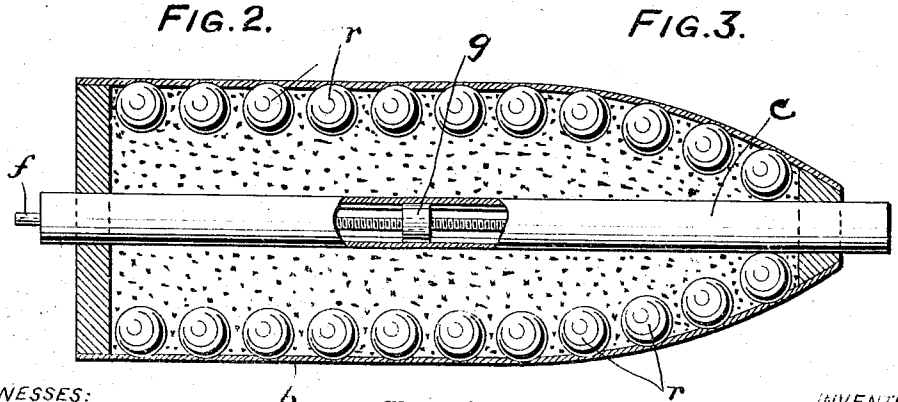

FIG. 4.

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EXPLOSIVE PROJECTILE.

1,015,944. Specification of Letters Patent. Patented Jan. 30, 1912.

Application filed July 7, 1911. Serial No. 637,308.

To all whom it may concern:

Be it known that I, FRANCIS I. DU PONT, a citizen of the United States, residing at Wilmington, county of Newcastle, and State of Delaware, have invented a new and useful Improvement in Explosive Projectiles, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

The object of my invention is to provide means for exploding a projectile, for instance a shrapnel shell, as soon as it has traveled a given distance from the gun.

In a patent issued to me June 20, 1911, No. 995,635, I have set forth and claimed a projectile embodying a fly-wheel within the shell and rotatable on its longitudinal axis, and means geared to and operable by the fly-wheel adapted to effect the operation of firing mechanism after a predetermined number of revolutions of the shell around the fly-wheel. As the projectile, in traveling a given distance, will rotate a given number of times, the gearing may be adjusted so that the parts will function after such number of revolutions, and therefore the firing mechanism will operate after the projectile has traveled such given distance. In said Patent No. 995,635, the specific embodiment of the invention disclosed consists of a screw secured to the fly-wheel, a nut on the screw rotating with the shell and therefore constrained to travel along the screw, and firing mechanism rotating with the shell and adapted to be released by the nut and caused to function after the prescribed number of revolutions of the fly-wheel and screw. In a later application filed by me May 29, 1911, Serial No. 630,009, I have set forth an improvement or modification of the specific embodiment described and illustrated in said Patent No. 995,635, in which the functioning parts of the firing mechanism are carried respectively by the fly-wheel and the shell; or, to be more specific, opposing friction surfaces are carried respectively by a disk on the screw secured to the fly-wheel and by a nut that, as in said Patent No. 995,635, rotates with the shell and is therefore constrained to move along the screw until its primed face contacts with the primed face of the disk.

The object of the present invention is identical, in a broad sense, with that of my prior inventions referred to.

Specifically the object of the present invention is to modify the construction of the fly-wheel so that it may inclose substantially the entire contents of the shell or any desired fraction thereof, and particularly that the explosive material itself may be carried by the fly-wheel, whereby is secured a fly-wheel of maximum weight and momentum without material sacrifice of space.

Another object of the invention is to facilitate the adjustment of the gearing for the purpose of determining the distance from the gun at which the bursting shall take place.

In the drawings: Figure 1 is a longitudinal section through the projectile; Fig. 2 is a transverse section on the line 2—2 of Fig. 1; Fig. 3 is a plan of a section of the internal casing; Fig. 4 is a longitudinal sectional view of a modification.

a is the shell. Within the shell is a casing *b* arranged concentrically with the shell and spaced therefrom. Arranged concentric with the longitudinal center or axis of the shell is a tube *c* secured to the casing *b*. At the front and rear ends of the shell are ball bearings *d* and *e* between the shell *a* on the one hand and the casing *b* and tube *c* on the other hand. Thus the casing *b* and tube *c* are freely rotatable relatively to the shell on an axis coincident with the longitudinal center line of the projectile.

Within the tube *c* and extending along the axis of the shell is a screw *f*, on which is a nut *g* having projections *h* engaging longitudinally extending recesses *i* formed in the internal wall of the tube *c*. The upper end of the screw *f* is attached to an end plug *k*, which is threaded in the point of the projectile. The plug *k* is provided with a primed rear face, and the nut *g* with a primed front face. For example, these opposing surfaces may carry friction materials, *m* and *n*, respectively, such as red phosphorus and a chlorate mixture, which upon sliding contact with each other fire, as described in my prior application No. 630,009, or one member may carry a match head composition while the other contacting member may be roughened by grooving, as also described in the same application. The rear end of the screw extends into a cen-

tral hole in the inner wall of the base of the shell. The plug *k* may be unscrewed and the screw *f* and nut *g* withdrawn and the nut adjusted on the screw to any desired distance from the primed face of the plug.

The space within the casing *b* may be filled with explosive material. The cast iron casing *b* is provided with intersecting grooves *o*, whereby, when the explosive material detonates, the casing is ruptured into a number of small pieces which themselves act as projectiles.

Previous to firing the projectile, the plug *k* is unscrewed and the screw *f* and nut *g* withdrawn, and the nut positioned on the screw at a point determined by the desired distance from the muzzle of the gun at which the bursting is to take place. When the projectile starts its flight the plug *k* and screw *f* rotate with the shell *a*, but the casing *b* and the tube *c* secured thereto do not get started by the force that determines the rotation of the shell, and therefore remain stationary, or nearly so. Hence, as soon as the projectile starts to rotate, the nut *k*, which is held from rotation by the tube, is fed forward by the rotation of the screw *f*. After a certain number of revolutions, corresponding to the numbers of turns in the screw thread between the opposing faces of the nut *g* and plug *k*, the primed face of the nut contacts with the primed face of the plug. This occurs at a time when the shell *a* with the plug *k* are rotating at a high velocity and the casing *b*, tube *c* and nut *g* are substantially not rotating. The result will be that the opposing faces of the nut and plug will slide one upon the other and ignite the priming material. The fire will flash through the holes *p* in the tube *c* and ignite the explosives within the casing *b*, which is thereupon ruptured as before described.

In Fig. 4, instead of grooving the casing wall, it is made comparatively thin and confines a number of balls *r* which are scattered when the explosive within the casing explodes.

It will be observed that the internal casing *b* is in fact a "fly-wheel", being the full equivalent of the fly-wheel described in my two previous applications; but as it also performs the function of a container for the explosive, it obviates the necessity of providing a fly-wheel which does nothing except act as such.

By means of my present construction, virtually the entire contents of the shell, or any desired fraction thereof, may be caused to act as the fly-wheel, thereby gaining increased weight and momentum for this member without a corresponding sacrifice of space.

Another advantage of the present invention is that the adjustment of the nut upon the screw is much facilitated, as it is only necessary for this purpose to unscrew and withdraw the plug *k* and then replace it.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:

1. In a projectile, the combination with the outer shell, of an internal casing, adapted to contain explosive material, mounted in bearings in the shell so that the rotary motion of the shell is not imparted to the casing, and firing mechanism, controlling the detonation of the explosive material, connected with and actuated by the casing and adapted to operate to detonate the explosive after a predetermined number of revolutions of the shell around the casing.

2. In a projectile, the combination with the outer shell, of an internal casing adapted to contain explosive material, freely rotatable on the longitudinal axis of the shell, means respectively rotatable with the shell and with the casing and geared together, and firing mechanism controlled in its operation by said means.

3. In a projectile, the combination with the outer shell, of an internal casing, adapted to contain explosive material, freely rotatable on the longitudinal axis of the shell, mechanism rotatable with the shell and mechanism gearing therewith rotatable with the casing, and firing means carried by each of said mechanisms and arranged to function with each other after a predetermined number of revolutions of the shell around the casing.

4. In a projectile, the combination with the shell, of means positioned wholly within the shell and rotatably mounted therein on the shell's longitudinal axis, other means rotatable with the first named means and gearing with, and movable longitudinally of, the shell, and firing mechanism controlled in its operation by the longitudinally movable means.

5. In a projectile, the combination with the shell, of mechanism positioned wholly within the shell and rotatable therein on the shell's longitudinal axis, a removable plug in the point of the shell, and gearing engaging said mechanism and carried by said plug whereby the plug may be withdrawn and the gearing adjusted, and priming means operable by the gearing.

6. In a projectile, the combination with the shell, of a member within the shell freely revoluble relatively to the shell's longitudinal axis, a removable plug in the point of the shell, a screw secured to the plug, a nut on the screw rotatable with said member, and priming means operable by the nut after a predetermined movement of the same along the screw.

7. In a projectile, the combination with the outer shell, of an internal casing, adapted

to contain explosive material, freely rotatable on the longitudinal axis of the shell, and primer exploding means within the casing and operable thereby in its relative movement of rotation.

8. In a projectile, the combination with the outer shell, of an internal casing, adapted to contain explosive material, freely rotatable on the longitudinal axis of the shell, and means extending within the casing and respectively rotatable with the shell and with the casing and geared together, and firing mechanism controlled in its operation by said means.

9. In a projectile, the combination with the outer shell, of an internal casing, freely rotatable on the longitudinal axis of the shell, a longitudinally extending tube within and secured to the casing, means within the the tube and operable thereby including gearing and a primer exploding device.

10. In a projectile, the combination with the outer shell, of an internal casing, freely rotatable on the longitudinal axis of the shell, a longitudinally extending tube within and secured to the casing, means within the tube, respectively rotatable with the shell and tube and geared together, and firing mechanism within the tube and controlled in its operation by said means.

11. In a projectile, the combination with the outer shell, of an internal casing, freely rotatable on the longitudinal axis of the shell, a longitudinally extending tube within and secured to the casing, a removable plug in the point of the shell, a screw secured to said plug and extending within the tube along the shell's longitudinal axis, a nut on the screw, there being longitudinally-extending guides on the tube engaged by the nut, and priming means carried respectively by the nut and plug and adapted to function after a predetermined longitudinal movement of the nut along the screw.

12. In a projectile, the combination with the outer shell, of an internal casing adapted to contain the explosive material and freely rotatable relatively to the longitudinal axis of the shell, a longitudinally extending tube within the casing, whereby there is formed between the inner wall of the casing and the outer wall of the tube a container for explosives, and primer exploding means within the tube, geared to the shell and casing and arranged to function after a predetermined number of revolutions of the shell around the casing.

13. In a projectile, the combination with an outer shell, of mechanism rotatably mounted in bearings within the casing on the longitudinal axis of the projectile so as not to partake of the rotary movement of the shell, mechanism gearing therewith rotatable with the shell, firing means controlled in its operation by said mechanism, and means operable from the point of the projectile permitting a quick adjustment of the gearing to predetermine the number of revolutions that the shell shall make before functioning of the firing means.

In testimony of which invention, I have hereunto set my hand, at Philadelphia, on this 3rd day of July, 1911.

FRANCIS I. DU PONT.

Witnesses:
M. M. HAMILTON,
A. J. MAGUIRE.