(No Model.) 2 Sheets—Sheet 1.

G. B. ROSS.

PROJECTILE.

No. 412,670. Patented Oct. 8, 1889.

Fig. 1.

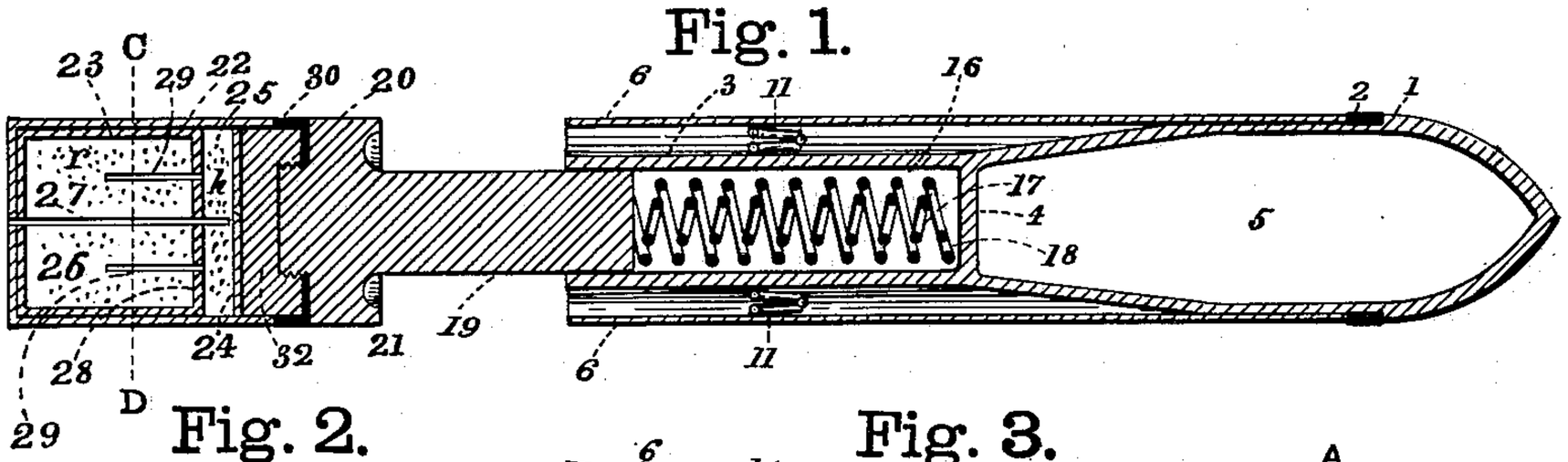


Fig. 2.

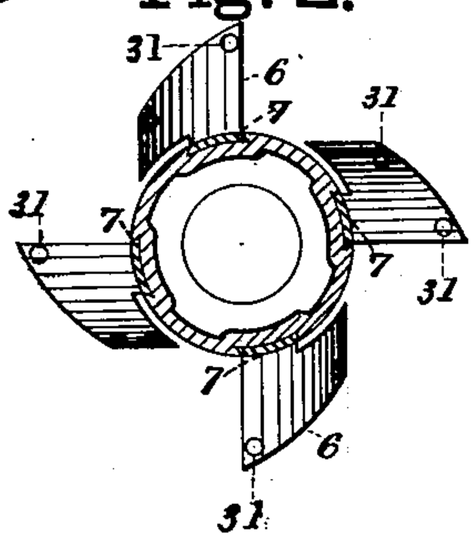


Fig. 3.

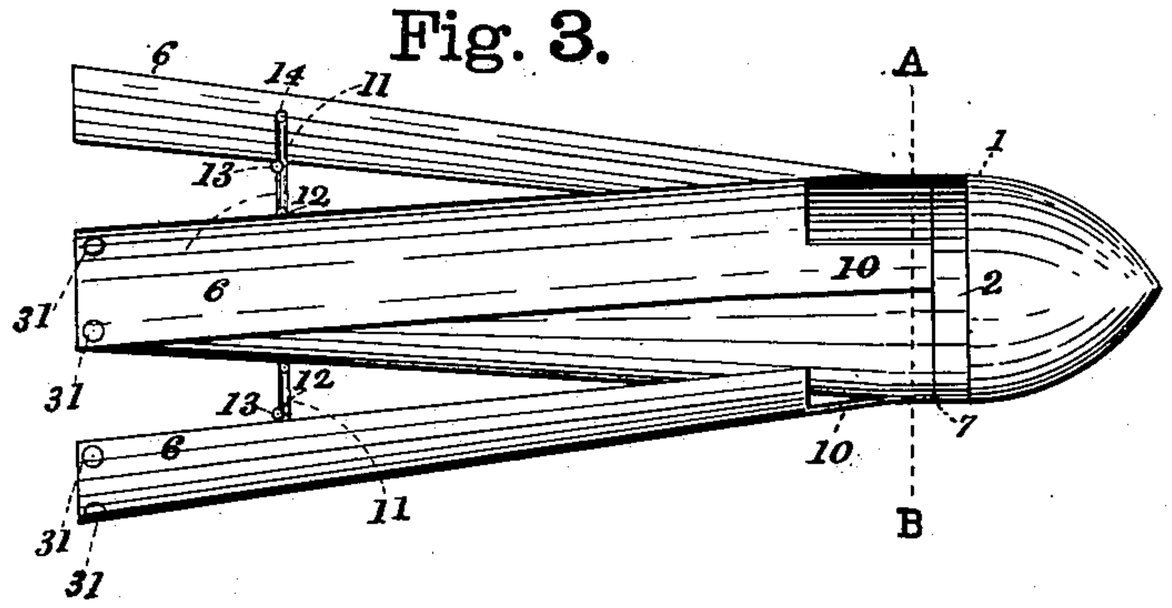


Fig. 4.

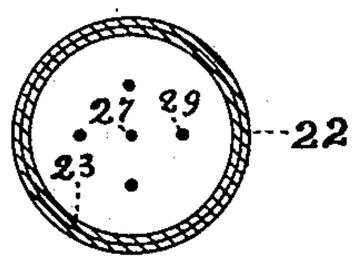


Fig. 6.

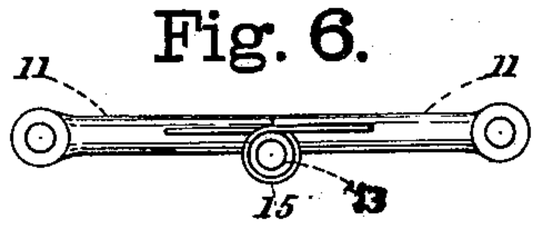


Fig. 5.

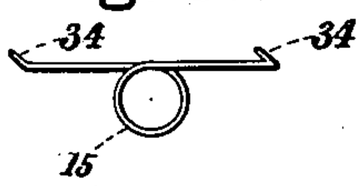
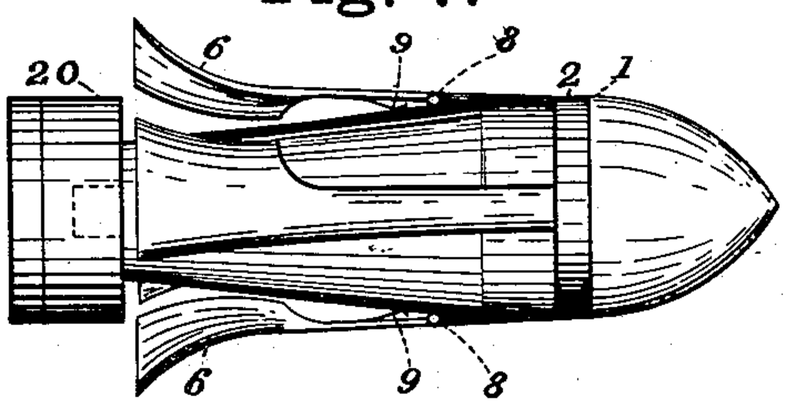


Fig. 7.



Witnesses.

A. E. Thayer

O. M. Daniels.

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Geo. B. Ross

By James Langston

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(No Model.) 2 Sheets—Sheet 2.

G. B. ROSS.

PROJECTILE.

No. 412,670. Patented Oct. 8, 1889.

Fig. 8.

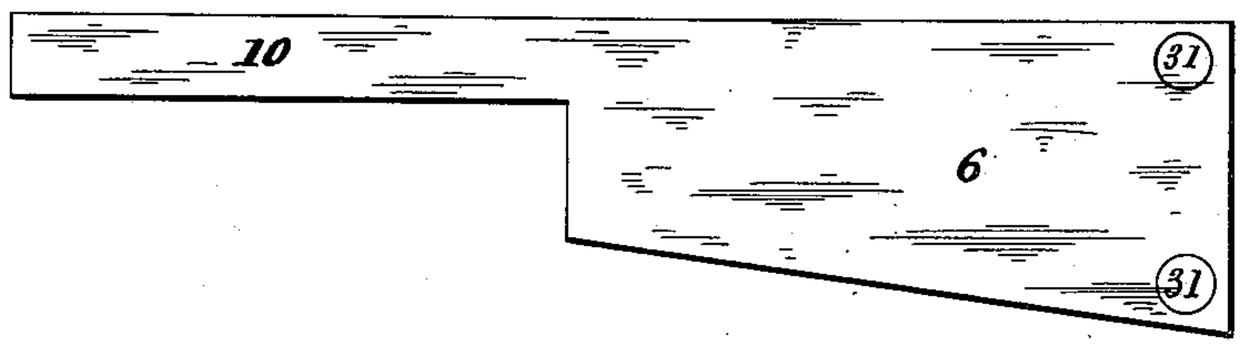
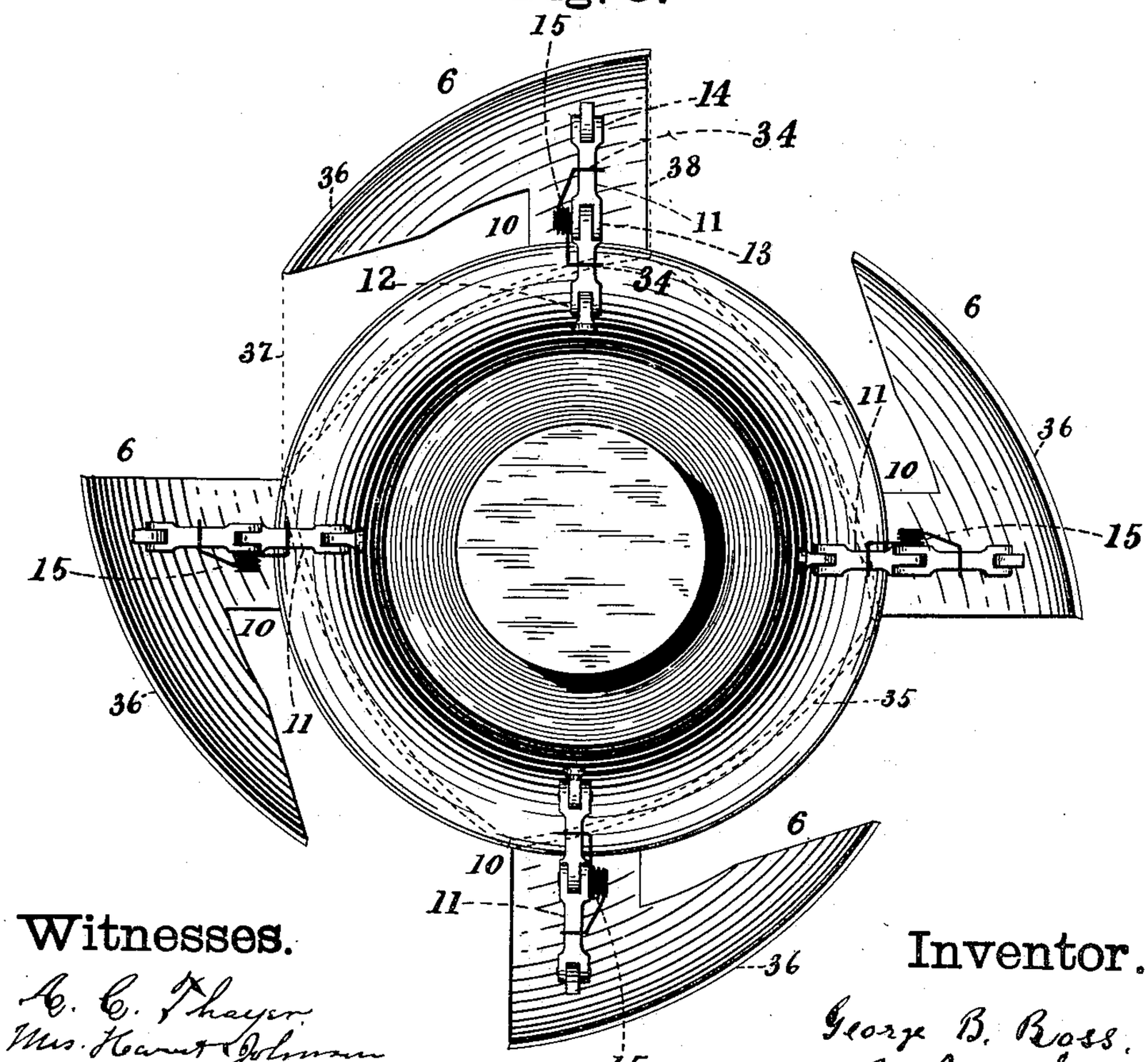


Fig. 9.



Witnesses.

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UNITED STATES PATENT OFFICE.

GEORGE B. ROSS, OF BUFFALO, NEW YORK, ASSIGNOR OF ONE-HALF TO CLAYTON M. DANIELS.

PROJECTILE.

SPECIFICATION forming part of Letters Patent No. 412,670, dated October 8, 1889.

Application filed December 4, 1886. Renewed April 3, 1889. Serial No. 305,912. (No model.)

To all whom it may concern:

Be it known that I, GEORGE B. ROSS, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Projectiles, of which the following is a specification.

The object of the first part of my invention is to combine with a projectile two or more turbine wings adapted to act automatically at the moment the shell or projectile leaves the gun for the purpose of causing its rotation during its passage through the air, and thereby increase its range and accuracy of flight.

The second part of my invention relates to the use in ordinary guns of dynamite or other high explosives which are liable to explode by a sudden concussion; and it consists in a certain means of cushioning the shell, so as to prevent concussion.

The third part of my invention relates to a certain means for preventing the wearing or chafing of the gun, all of which will be fully and clearly hereinafter described and claimed, reference being had to the accompanying drawings, in which—

Figure 1 is a central longitudinal section through the shell complete. Fig. 2 is a cross-section through the shell in the line A B, Fig. 3. Fig. 3 is a side elevation of the projectile, showing the position of the wings just after it leaves the gun. Fig. 4 is a cross-section through line C D, Fig. 1. Fig. 5 is a perspective view of the spring for opening the arms that limit the outward movement of the wings and retains them in position when opened. Fig. 6 is a side elevation of one of the arms for opening the wings, showing its actuating-spring connected to it; and Fig. 7 represents a modification of the invention. Fig. 8 is a detached plan of one of the wings enlarged, and Fig. 9 is an enlarged rear elevation.

The fore part 1 of the shell is provided with a packing-ring 2, of felt or other elastic material combined with plumbago or other lubricating substance, and it tapers backward, as shown, and terminates in a cylindrical portion 3, having a partition 4 between it and the explosive-chamber 5, into which dynamite or other explosive is placed and secured in any well-known way.

The wing 6, of which there may be two or more, (I have shown four as a suitable number,) are secured to the shell by having the connecting ends 7 made of spring metal and the sides beveled, so as to form a dovetail adapted to fit corresponding grooves in the side of the shell, (see Figs. 1 and 2,) into which they are shown as driven and securely fastened, which may be done in any well-known way; but they may be secured by pivoted joints 8, (shown in the modification, Fig. 7,) the springs 9 being used to force them outward. These wings are constructed so as to spring outward when free by means of the spring portions 10. To assist in causing the wings to open when free from the gun, and to prevent them from opening too far and to limit their opening movement and their return movement by any pressure from the outside, I use the jointed arms 11, connected to the sides of the shell by joints 12 and together by joints 13, and to the wings by joints 14. When the wings are closed, these arms are bent together, as shown in Fig. 1. To cause the arms to open when free to act, a spring 15 is connected to each by having the ends driven into the holes adapted to receive them. (See Figs. 5 and 6.) These arms 11 are set so that when opened and the wings expanded the pressure of the air, in addition to the pressure of the springs during the flight of the shell, will tend to keep them open, and as they open out, so that a line passing through the center of their joints would be a straight line, no pressure on the outside of the wings would cause them to close again. In some cases (for instance, with smaller projectiles) these arms 11 may be dispensed with by making the spring portions of the wings sufficiently strong to resist the pressure of the air upon them caused by the movement of the projectile through the air; but in that case it would be necessary to have something to limit their outward movement, so that they cannot at any time move out too far. These wings 6 are made or placed in a parallel position, or nearly

so, on the shell, and their object is to cause its rotation during its passage through the air.

The construction and operation of the wings are better shown in Figs. 1, 3, 8, and 9. It will be noticed that they lie lengthwise of the shell and are secured at one end, and that when closed they lie close to the sides of the same, as shown in Fig. 9 by the dotted lines 35, and that as they expand their outer faces 36 acquire the turbine form or arrangement shown in said Fig. 9, which causes the rotation of the shell during its flight, and they acquire this form without any twisting or lateral movement of the wings—that is, both sides or edges of the free ends of the wings move exactly the same distance when expanding, as shown by the dotted lines 37 and 38 in said Fig. 9, and this turbine form of the expanded wings is caused not by any lateral movement, but by the position in which they are secured to the shell, as will be readily understood by reference to Fig. 9.

The ends of the springs 15 are designated by the numeral 34, and they may be either driven in holes in the arms 11, as above mentioned, or adapted to lie against the arm, as shown in Fig. 9. Either way will answer.

To reduce the concussion of the shell and render it safe to use dynamite or other high explosives, I use a cartridge-shell constructed of an outer shell or tubular portion 22 and inner portion 23 and a disk 24. This construction leaves the chambers 25 and 26.

27 represents a tube passing from the outer end of the shell in and through the opposite end or disk 28 until it nearly touches the disk 24, and from the disk 28 a series of tubes 29 pass into the chamber 26 about half-way, more or less.

In the chamber 25 is placed a slow-burning powder *h*, and a quick-burning powder *r* is placed in the chamber 26. Communication is secured between them by means of the tubes 27 and 29, in which is placed a suitable explosive or powder.

The shell is fired by means of a percussion-cap, or in any well-known way.

To prevent the chafing of the gun or the interior of the barrel while the shell is passing out, a band 2, of soft or elastic material at the forward end, as hereinbefore mentioned, is used, and a cup-shaped band of similar material 30 on the follower at the rear of the shell. This cup-shaped band also prevents the escape of gases from the back toward the front of the shell. The ends of the wings are also provided with small pieces of similar elastic material 31 for the same purpose. To still further reduce the concussion of the shell, the chamber 16 within the cylindrical portion 3 may be provided with one or more spiral springs 17 18, and a plunger or follower 19, adapted to fit the interior cylindrical chamber 16 and press against the springs 17 and 18. The outer end of this plunger is provided with an enlarged portion 20 of the same diameter as the portion 1, having a cup-shaped packing-ring of some elastic material 30 similar to the ring 2. It is secured in place by means of the screw portion 21. (Shown in section in Fig. 1.)

The operation of the invention is as follows: The shell, follower, and cartridge being all together and the wings brought down close to the shell, as shown in Fig. 1, is put into the gun in the usual way. When the charge is fired, it passes forward through the small tube 27 and starts the slow-burning powder *h*, and as it burns back it moves the shell comparatively slow until it reaches the tube 29 and communicates with the quick-burning powder *r*, thereby giving the already moving shell an increased velocity.

A projectile provided with the wings 6 is adapted to be used in any kind of a gun, such as spring, air, or other guns.

If desired, the shell and follower can be used alone separately from the cartridge and be put into a gun with a single charge of common gunpowder, and it would answer for some purposes. The packing-ring 30 is firmly secured in place by a disk or block 32, adapted to screw onto the enlarged head 20 of the plunger 19, as clearly shown in Fig. 1.

By causing the slow-burning powder to burn from front to back I obtain all the advantages it is possible to get from a slow-burning powder, and by firing the quick-burning powder from the center of the charge and from a number of points at once the burning of the whole charge before the shell leaves the gun is insured, and I obtain a more complete combustion and a more rapid discharge than can be got in any other way.

I do not claim, broadly, the combination, with a projectile, of either fixed or jointed opening-wings. Neither do I claim, in a projectile, the combination therewith of springs for overcoming the sudden concussion caused by the firing of the shell from the gun, as that has been done before; but

What I do claim is—

1. A projectile provided with a series of automatically radially-expanding wings having their spring ends rigidly secured to the shell at one side of the longitudinal center of said wings, so that while one side or edge of the free ends of the wings move radially, or nearly so, from the center, the other sides move tangentially from the body of the shell, substantially as and for the purposes described.

2. A projectile provided with automatically-acting wings for imparting a rotary movement to the shell during its flight, a chamber for holding the explosive, and a cylindrical chamber provided with buffer-springs, in combination with a follower adapted to fit said cylindrical chamber and act in conjunction with the springs and having an enlarged portion 20 at its rear, substantially as and for the purposes described.

3. In a shell for firing dynamite or other

high explosives, the combination therewith of a cartridge containing a charge of slow-burning powder for giving the shell a comparatively slow start, and a charge of quick-burning powder at the back of the slow-burning powder for increasing its velocity through the gun, with a priming-tube 27, extending from the rear of the cartridge through the quick-burning powder to near the front of the slow-burning powder *h*, and a series of priming-tubes extending back from the rear of the slow-burning-powder chamber to or near the center of the quick-burning-powder chamber, whereby the slow-burning powder is discharged from front to rear, and a more rapid discharge of the quick-burning powder is obtained by firing it from the center, substantially as described

4. In a shell provided with automatically-expanding wings, the combination, with said wings, of the soft elastic packing-pieces 31, located on the outside of the rear ends of the wings, as and for the purposes described.

5. In a projectile, a series of automatically-expanding wings having their spring ends rigidly secured to the forward portion of the shell, in combination with the jointed arms 11, secured to or near the rear ends of the wings by joints 12 and 14 and to the body of the shell, as and for the purposes described.

GEO. B. ROSS.

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A. C. THAYER.