R. GRAHAM.

Explosive Shell.

No. 41,960. Patented Mar. 15, 1864.

Fig. 1.

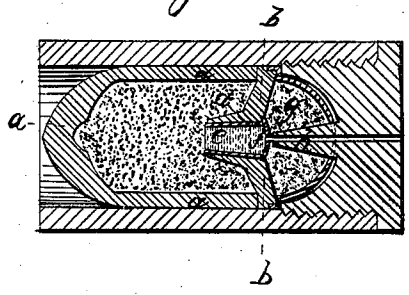


Fig. 2.

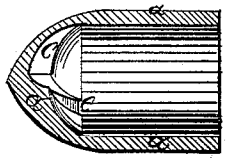


Fig. 3.

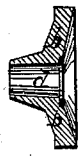
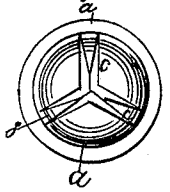


Fig. 4.

Fig. 5.



Witnesses.

Lemuel W. Serrell

Thos. Geo. Harold.

Inventor

Ralph Graham.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

RALPH GRAHAM, OF BROOKLYN, NEW YORK, ASSIGNOR TO HIMSELF AND SAMUEL BOOTH, OF SAME PLACE.

IMPROVEMENT IN EXPLOSIVE SHELLS.

Specification forming part of Letters Patent No. **41,960**, dated March 15, 1864.

To all whom it may concern:

Be it known that I, RALPH GRAHAM, of Brooklyn, in the county of Kings and State of New York, have invented, made, and applied to use a certain new and useful Improvement in Projectiles; and I do hereby declare the following to be a full, clear, and exact description of the said invention, reference being had to the annexed drawings, making part of this specification, wherein—

Figure 1 is a section of my projectile as ready for use in an arm adapted to its propulsion. Fig. 2 is a section of the cast shell. Fig. 3 is a section of the base of the shell. Fig. 4 is a section of the metallic cartridge-case, and Fig. 5 is a cross-section of the metallic shell.

Similar marks of reference denote the same parts.

The nature of my said invention consists in a mode of making hand-grenades or small bombs by casting the shell in two pieces, and then soldering the two pieces together prior to their being filled with powder at the fuse-hole. I also make use of grooves at the end of the shell, in the inside thereof, which cause the heavy end of the projectile to separate into several pieces when the explosion takes place. I protect the fuse from the action of the explosion, that otherwise might drive the fuse into the bomb, by the use of a metallic perforated disk or cap over the end of such fuse, and I provide a hemispherical cartridge-case with a hole in the center, which case contains the powder, and the hole passing over the nipple or tige that conveys the fire allows sufficient gases from the explosion to pass behind this shell, and by their expansion throw said shell out of the barrel after the projectile has been fired.

In the drawings, *a* is the shell of my projectile, cast in one piece, as seen in Fig. 2. This may be cast in a metallic mold of any hard or brittle composition that will split to pieces when the contents of the shell explode. *b* is a base-piece to the projectile, of similar metal to the shell *a*, and of a size and shape to fit the open end of that shell. The shell and base are to be placed together and soldered at the point of contact. By this construction the difficulty heretofore experienced of removing the core from the shell, particularly with small grenades, is removed, and metallic molds may be used in which to cast the parts. In the forward end of the shell *a* grooves *c* are formed, (see Figs. 2 and 5,) which so cut into the metal at the end of the ball that it will break at these points and the pieces be scattered around at the time the bomb explodes. In the center of the base *b* is an opening, *d*, receiving a piece of fuse, *e*, Fig. 1, and I place in a countersink in *b*, around *d*, a disk of metal, *f*, having a hole in the middle. Between the end of the fuse and the under side of this disk ordinary powder, or powder mixed into a paste, is introduced, the object being that the fuse shall be protected from the force of the explosion, and that it may be ignited with certainty when the explosion takes place.

The powder is contained in the metallic case *g*, Fig. 4, and this is retained upon the rear edge of the projectile and provided with an opening in the center to pass the cone or tige *h*, through which the projectile is discharged, and the gases from the explosion passing between the metallic case and chamber cause the case to be ejected from the barrel. A piece of paper is to be secured over the hole in *g* to prevent the powder falling out, which paper is perforated by the tige *h* as the projectile is pressed down into the barrel *k*. I here remark that this barrel *k* is to be mounted on a suitable stock and provided with a nipple for a percussion-cap. This arm, however, does not form a part of this present invention.

I do not claim retaining the separate parts of a shell together by soft metal cast into grooves; neither do I claim grooves for the purpose of causing fracture at given places in the shell; neither do I claim a metallic case containing the powder; and I do not claim a disk protecting the fuse from the pressure caused by the explosion; but

What I claim, and desire to secure by Letters Patent, is—

1. Forming the shell of two parts, *a* and *b*, in the manner specified, and soldering them together, whereby the parts of said shell can be cast of type-metal or similar alloys in molds with facility, and when united by sol-

dering said shell becomes as solid as if cast in one piece, for the purposes and as specified.

2. The case *g*, formed as specified, and connected to the rear end of the projectile, when said shell is of such a shape as to allow a space between the shell and chamber sufficient for the gases in the explosion to pass in and eject said shell after the projectile has passed out of the barrel, as specified.

In witness whereof I have hereunto set my signature this 8th day of December, 1863.

RALPH GRAHAM.

Witnesses:
LEMUEL W. SERRELL,
THOS. GEO. HAROLD.