2 Sheets—Sheet 1.

E. ESTABROOK.

Shell-Fuse.

No. 45,986. Patented Jan. 24, 1855.

Fig. 1.

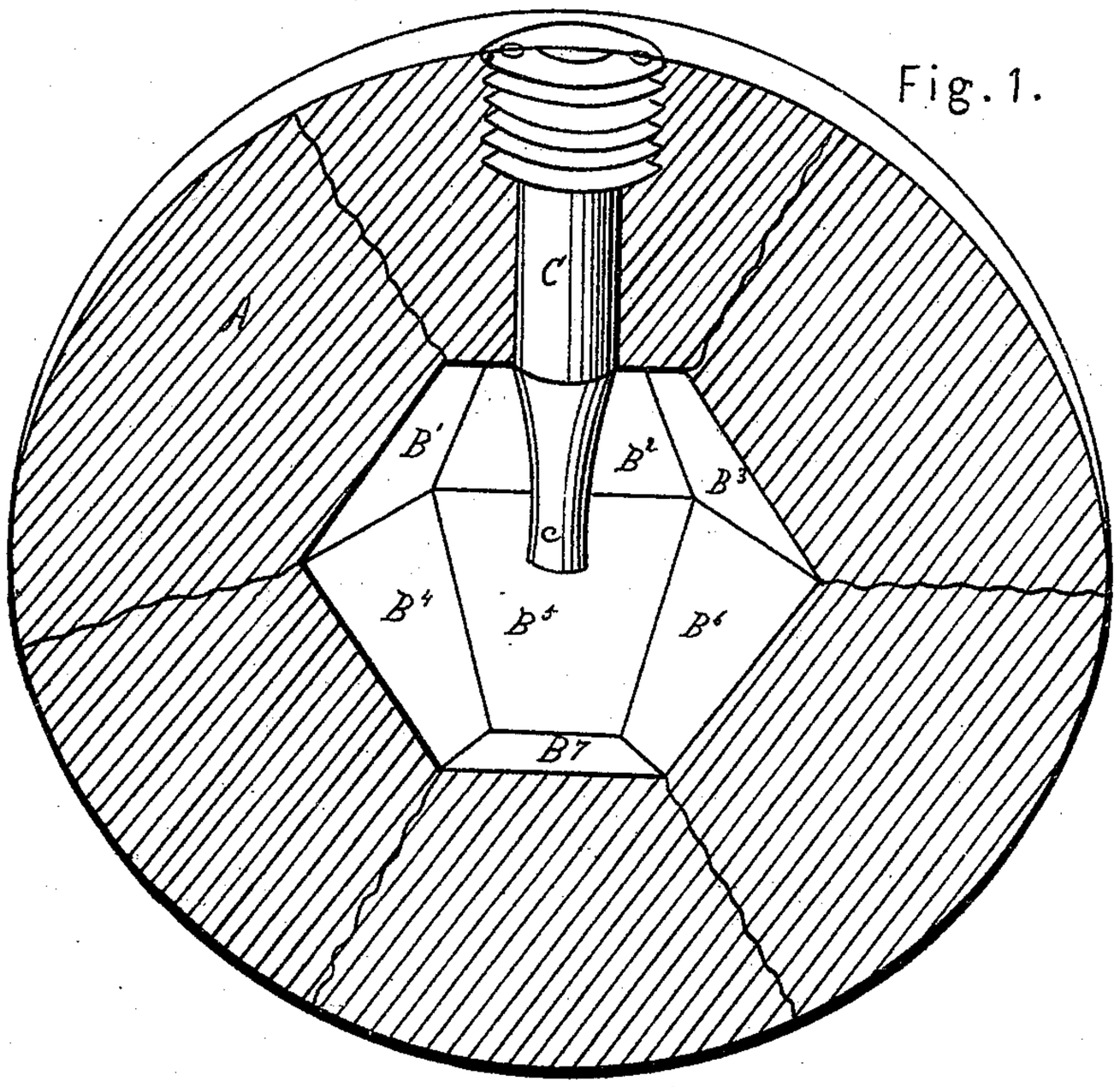
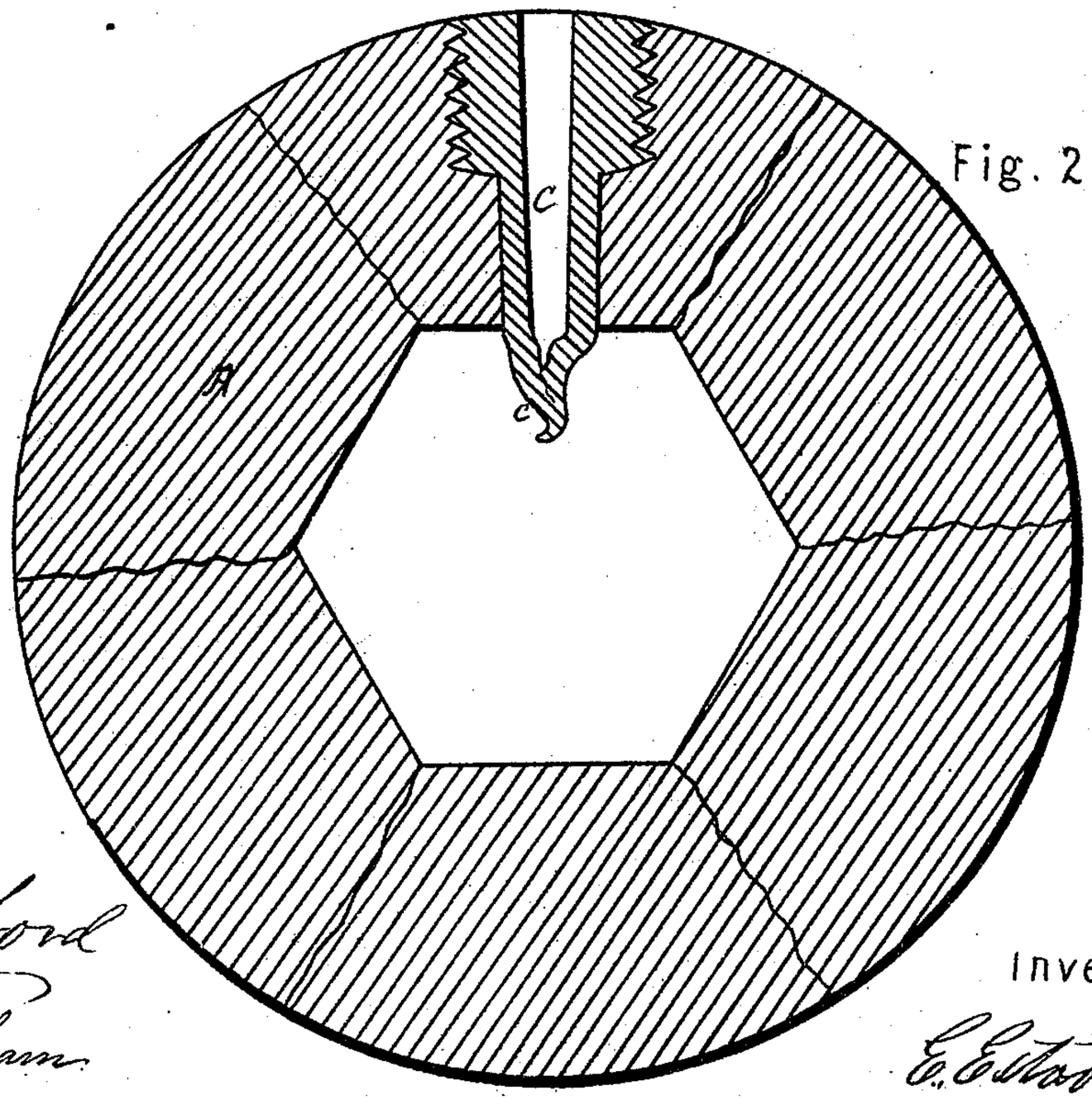


Fig. 2.



Witnesses:

S. Hosford

S. N. Burnham

Inventor.

E. E. Estabrook

2 Sheets—Sheet 2.

E. ESTABROOK.

Shell-Fuse.

No. 45,986. Patented Jan. 24, 1865.

Fig. 6.

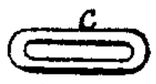


Fig. 4.

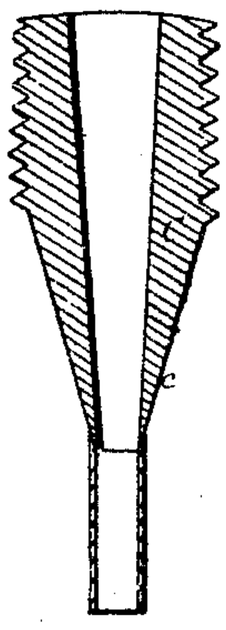


Fig. 5.

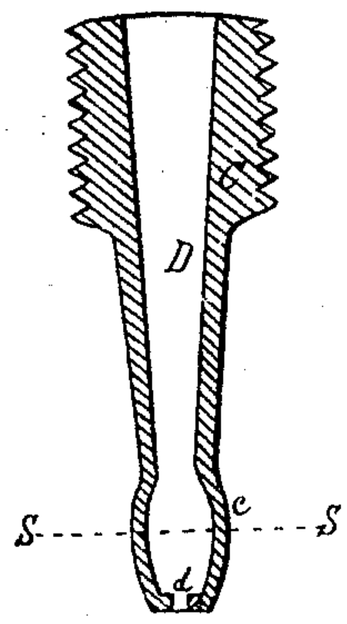
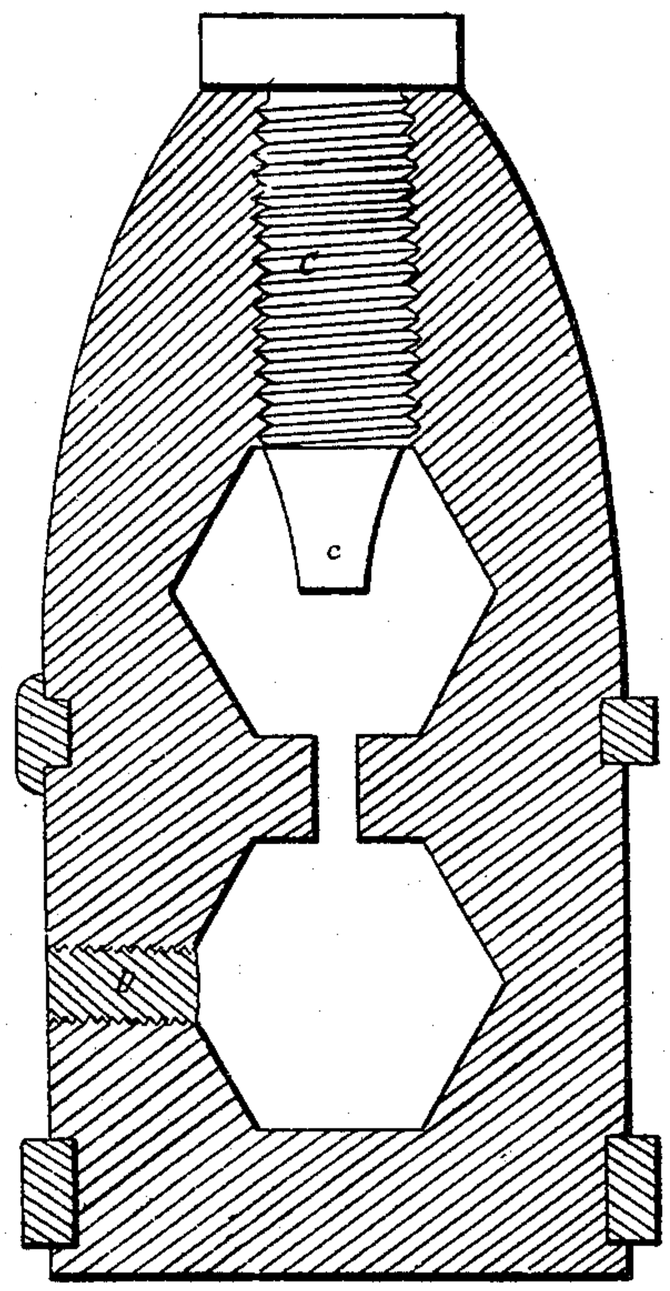


Fig. 3.



Witnesses.

S. Hosford

S. W. Burnham

Inventor.

E. Estabrook

UNITED STATES PATENT OFFICE.

EDWIN ESTABROOK, OF JERSEY CITY, NEW JERSEY.

IMPROVEMENT IN FUSES FOR SHELLS.

Specification forming part of Letters Patent No. 45,986, dated January 24, 1865.

To all whom it may concern:

Be it known that I, EDWIN ESTABROOK, of Jersey City, in the county of Hudson, in the State of New Jersey, have invented certain new and useful Improvements in Time-Fuses for Explosive Shells for War Purposes; and I do hereby declare that the following is a full and exact description thereof.

The accompanying drawings form a part of this specification.

Figure 1 is a section, partly in perspective, through the center of a spherical shell. Fig. 2 is a corresponding view of the shell, with red lines showing the fractures. Fig. 3 is a section through the elongated shell. (The exterior form and the furnishing thereof with the projections or tetons represented, is intended to be similar to the French rifle-cannon projectile generally known as the "Beaulieu" or the "Napoleon" projectile.) Figs. 4 and 5 are central longitudinal sections, showing modifications of the construction of the fuse. Fig. 6 is a cross-section on the line S S in Fig. 5.

Similar letters of reference indicate like parts in all the figures.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation by the aid of the drawings.

The exterior of my shell A is similar to that of an ordinary spherical shell. The chamber or interior cavity is formed by coring in a manner well known to molders; but the form of the core is peculiar. It is a regular or nearly regular polyhedron, the several faces being represented by B′ B², &c.

The material which I have employed with success in casting my shell is ordinary gray iron. In the crystallization of this material, under the conditions presented by my invention, there are planes of weakness extending outward from the lines formed by the intersection of the planes B′ B² on the core, as indicated by the red lines in Fig. 2. These weak places are well known to exist in castings under certain conditions; but these conditions have never, as I am aware, been before realized in explosive shells so as to produce the effect of my invention. In my invention the areas of the plane faces B′ B², &c., of the cavity being about equal each to the other, and their arrangement being such that they form equal or nearly equal angles the planes of weakness, by yielding to the force of the explosion cause the shell to divide itself into pieces of a nearly uniform size, and corresponding in number to the number of the faces of the cavity. I have tested this feature of my invention and found the shell to divide itself with great regularity, so as to insure a much more destructive effect than is produced by ordinary shells. The direction of the pressure of the gases upon the several plane faces tend to rend the shell along the lines of fracture desired irrespective of the difference of the crystallization, and in my invention the two forces conspire to insure the division in the manner shown. The crystallization in the planes indicated by red lines in Fig. 2 in my shell is so much different from that in other portions of the shell as to be plainly visible to the eye when the metal is cut open and properly polished.

My fuse-plug C, I prefer to make of brass. I prolong it into the center of the cavity of the shell, as indicated, and reduce the thickness of metal at the inner end, *c*, so that it collapses and closes the communication so soon as the powder commences to ignite in the cavity of the shell. By its termination in the center of the cavity it ignites the charge first at that point, and the combustion extends itself from thence in all directions uniformly, there being a complete stratum or inclosure of unignited powder surrounding the ignited portion until the whole is on fire. The explosion is for this reason more rapid and energetic, and also more uniform in its effect on the several faces of the interior of the shell.

Fig. 4 shows the form in which I made the parts C *c*, which succeeded admirably in one of my experiments. The main portion of the plug was made of such length as would probably contain the fuse composition, and its exterior was tapered off to a thin edge, *c*, as represented. To the outer surface of this tapered portion I soldered a thin tube open at both ends, as represented. On the explosion of the shell the thin tube detached and lost, but the inner end, *c*, of the main portion was tightly closed. I conceive it to be important to provide for the collapsing at a point not at the extreme rear of the entire tube. It may not be essential to append, as in Fig. 4, an additional length. In fact, I have succeeded almost or quite as well by other forms. I conceive the

pressure on the interior at the extreme end of the fuse-plug to so nearly balance that on the exterior at that point that the extreme end cannot so readily be induced to collapse as a point a little farther toward the front or outer end of the fuse-plug.

Figs. 5 and 6 indicate the form which I conceive best adapted to carry out my invention. The extreme inner end is contracted, so as to leave a comparatively small orifice, *d*, and the length between *d* and the inner end of the fuse composition is flattened, as indicated in the section. This flatening may be readily effected by means of suitable dies after the fuse-plug has been first made in the ordinary round form. On the occurrence of the explosion the flattened part, being thin and inclosing a chamber, it is of considerable larger sectional area than the orifice *d*. The pressure on the outside is able to very readily overcome the slight pressure on the inside and collapse the metal together, leaving it in the condition indicated in Fig. 2.

By the collapse of the inner end of the fuse-plug, so as to close the aperture through the same at the commencement of the explosion, any considerable loss of force by the escape of gas through the fuse-hole is prevented. I have tested this feature of my invention and find that with a shell and fuse-plug of the proportions and dimensions shown full size in Fig. 1, the fuse-plug being of brass and using gunpowder, the end of the fuse-plug is found very tightly closed after the explosion. The general form assumed by the inner end of the fuse-plug before or at the instant of the division of the shell is indicated by the slight black outline in Fig. 2.

By reason of all the several features of my invention I am enabled to make a thicker shell than the ordinary shell, and to be sure of its division with tolerable certainty into fragments of a proper size. I am also thereby assured of the projection of the several pieces asunder with greater force than usual and with less powder, by reason of the fact that the gases are restrained by the thick shell during the period required to completely ignite the powder, and are thus able to act with more intense elastic force to follow the fragments as they divide and scatter.

Fig. 3, as already remarked, shows a French rifled-cannon projectile in section. The inner end of the fuse-plug is made thin and extended into the cavity of the shell, so as to inflame the powder at the center, instead of at the front of the foremost cavity, and so as to collapse and close by the pressure of the explosion. In these features, therefore, this shell contains my invention. This figure also shows in section the form which I prefer to give to the cores of such projectiles.

Having now fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

The employment, in explosive shells, of a fuse-plug adapted to collapse and crush by the action of the exploding charge and to stop the escape of gas through the fuse-plug, substantially as herein set forth.

E. ESTABROOK.

Witnesses:
S. HOSFORD,
S. W. BURNHAM.