

W. W. HUBBELL.

Shell.

No. 14,133.

Patented Jan. 22, 1856.

Fig. 1.

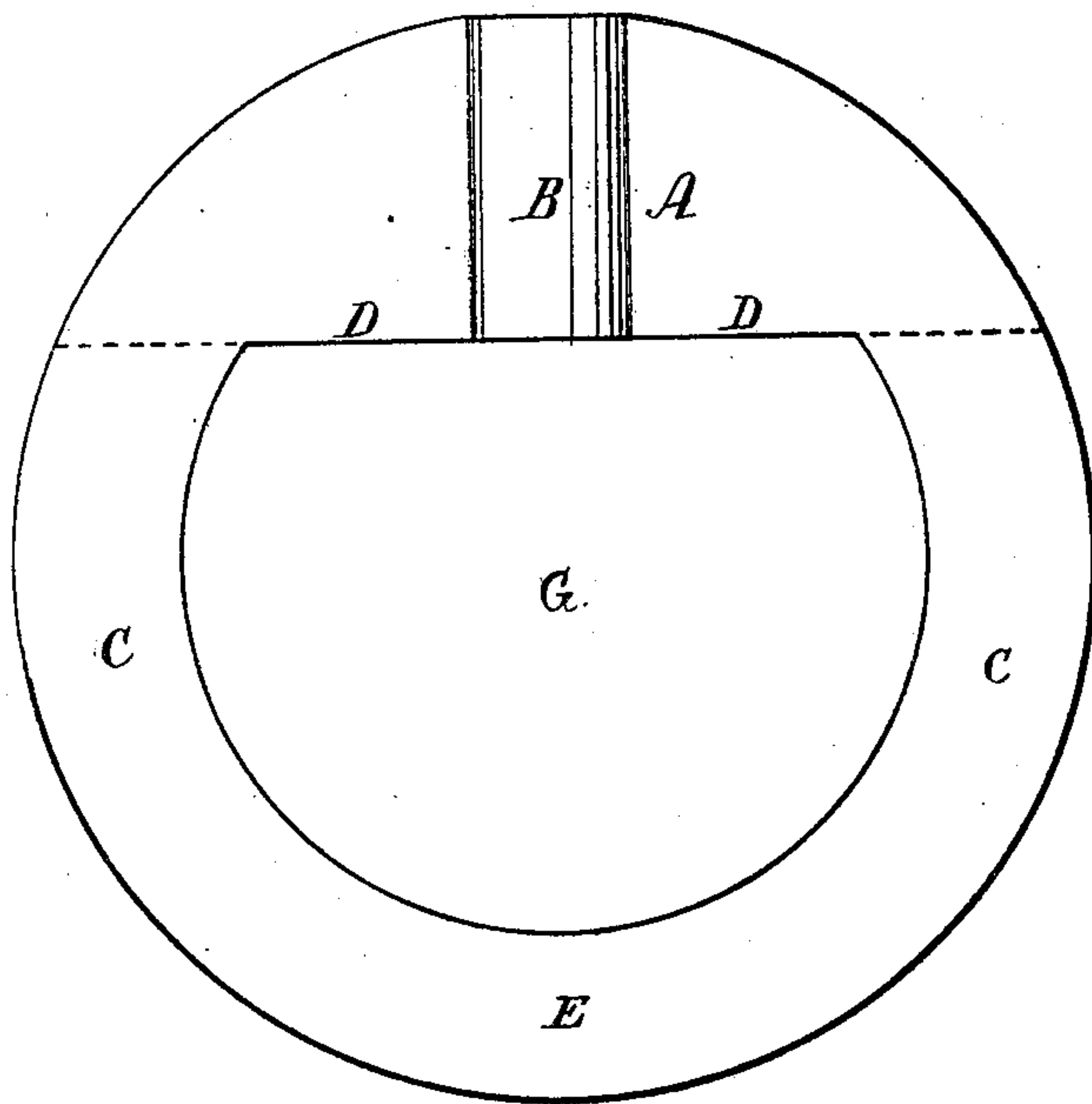
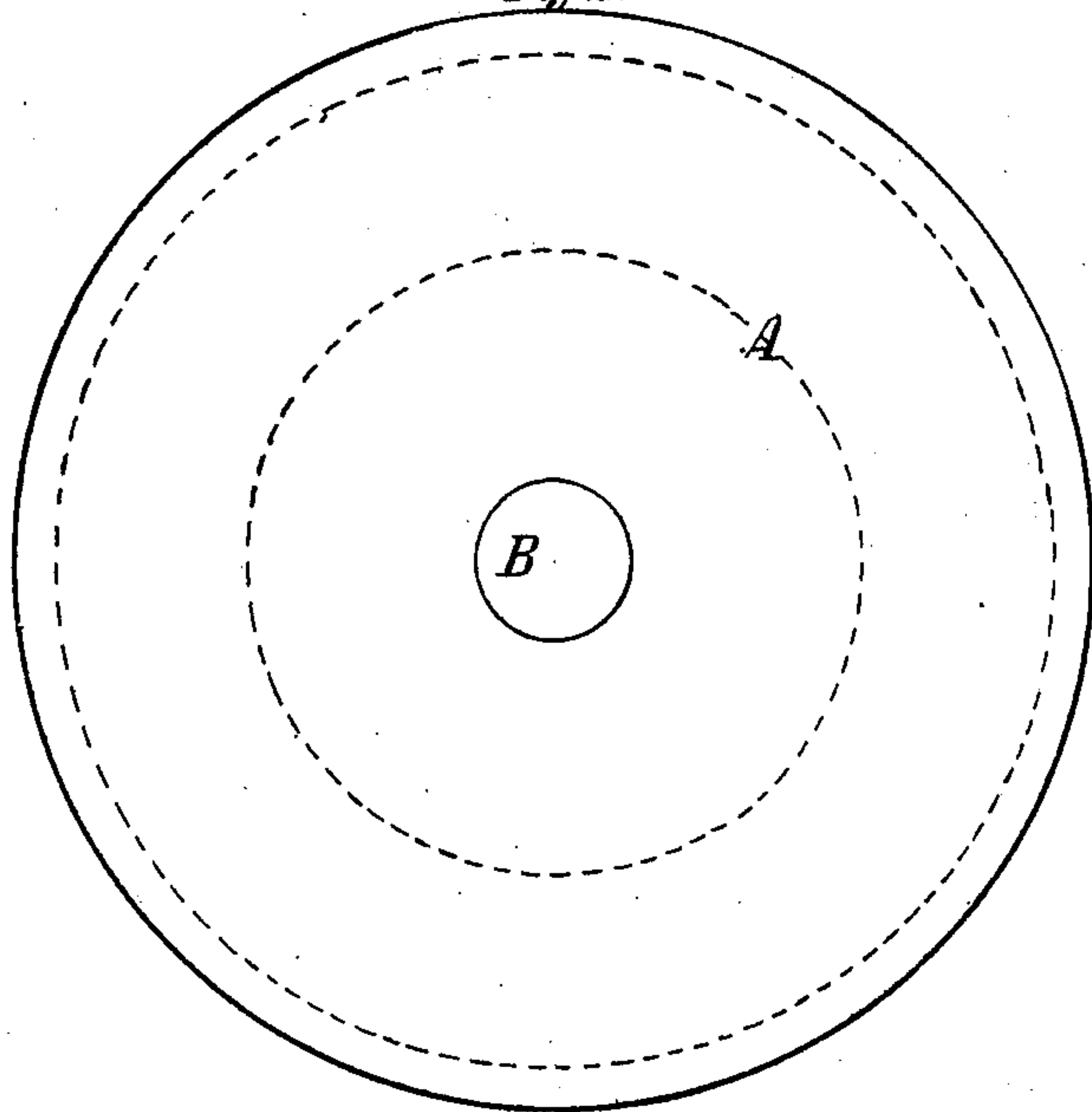


Fig. 2.



Witnesses
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IMPROVEMENT IN ECCENTRIC EXPLOSIVE SHELLS.

Specification forming part of Letters Patent No. 14,133, dated January 22, 1856.

To all whom it may concern:

Be it known that I, WILLIAM W. HUBBELL, of the city of Philadelphia, and State of Pennsylvania, now counsellor at law, have made new and useful Improvements in Explosive Shells to fire from Cannons, Howitzers, or Paixhan Guns; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the annexed drawings, making part thereof.

The nature of my invention consists in combining centrally around and with the fuse-hole the flat based segment of a solid sphere, the thickness of which through the fuse-hole is at least twice as much as the thickness of the hindmost part of the hollow portion of the shell, and in this relation of metal combining this head with the segment of the hollow sphere, cast in one piece therewith, forming a spherical shell with this fuse side or front of the shell much greater in amount of weight around the fuse-hole than any other side, and the weight most distant from the center of the sphere with the least proportional displacement of powder in the shell, and preserving the smooth spherical external form, in order to compel the fuse most certainly to be foremost in the flight of the shell, its burning be subject to uniform pressure of the air in one position, to burn uniformly in different shells, and exert the reactive force of its burning composition coincident with the line of flight, not to disturb the line of flight, to present uniformly the strongest side of the shell to the shock of penetration, and most certainly to explode the shell on penetrating a vessel or object by causing the burning particles and fuse-powder to fly forward in the fuse hollow or tube, owing to the arrest of the momentum backward of the main body of the shell and fuse to admit the fire most certainly and readily to the internal explosive powder, the ordinary metallic fuse coned or contracted inside the tube toward the bottom being used, and the hindmost portion of the shell secured on a wooden sabot and loaded and fired in the usual manner from the gun.

In the accompanying drawings, Figure 1, which is a section through the fuse-hole, head, and center of the shell, A is the flat-based segment of the solid sphere, having the fuse-hole B through its center, cast onto the segment C C of the hollow sphere, in one piece

therewith. D D is the flat base of the head. E is the metal of the hindmost part of the shell. G is the hollow to contain the exploding-powder.

In Fig. 2, A is the external front surface of this head, and B is the fuse-hole in the center of it. The thickness of the head through the fuse-hole is twice as great as the thickness of the hindmost part of the sphere, and the head is best to be down when casting, which will make its metal most dense, and the thickness of the hollow portion to enlarge slightly toward the head, as shown in the drawings, owing to the strong tendency of the core to rise, it being set in the mold to a uniform thickness of the hollow portion. This relative arrangement of the metal composing the shell gives much the greatest attainable weight and predominance of momentum to preserve the forward position of the fuze and the head consistent with the smooth external spherical form and the least proportional displacement of the powder-space. I have ascertained by experiment that this segment of the solid sphere or head must be at least twice as thick through the fuse-hole as is the thickness of the segment of the hollow sphere to insure the most uniform and efficient flight and action of the shell and fuse, and the tendency of the head to retain the forward position in the flight is increased by the increase of its proportional thickness, the base always being flat, and also it is increased by increase of the velocity of flight of the shell.

The drawings exhibit a thirty-two-pounder's shell, and even down to a six-pounder's shell. The head double as thick as the hindmost part is the best. In shells larger than thirty-two pounders, and which move with less velocity for long ranges, the thickness of the head may be increased to advantage more than double that of the hindmost part, in the proportion of one-tenth of an inch to every two inches increase of external diameter. In order to explain the importance of this form or arrangement of metal or weight of the shell and prevent error, I specify from actual experiment, that there must not be a metallic tail or lug or oblique wings on the hindmost surface of the shell to give it a rotary motion perpendicular to the line of flight, or for other purpose. If there be, the weight of its metal tends to counteract the weight of the head in front,

and the atmospheric action on a metallic tail is comparatively insignificant to the momentum due to its weight. The hindmost surface must be smooth and semi-spherical; also, the fuse must not be set on one side of the center of the head. If so set the reactive power of the escaping gas during its combustion disturbs the true line of flight of the shell. The metal of this head must uniformly surround the fuse-hole.

In long ranges, if the external form of the shell be oblong or cylindrical between the two semi-spheres, a cross-wind disturbs the hinder and lighter portion much more than this head or the heavier front part, and materially affects the true flight. Therefore it is best to have the external form spherical, though at short ranges with this head the oblong form will give more space for internal powder and more explosive force, and not materially disturb the principles of action of this head and the fuse, provided the fuse takes fire, which latter is

made uncertain by the long sides of the shell and cylindrical windage formed thereby in the gun.

I am aware that shells having eccentric hollows and re-enforcements around the fuse-hole have been used before my invention, but in different arrangement of the metal and with different effects from those discovered by me, and I do not claim such arrangements of metal nor their effects.

What I claim therefore as my invention is—

The combination of the head or segment of the solid sphere with flat base uniformly around the fuse-hole, with the segment of the hollow part forming a spherical shell with flat-based head and externally smooth, as described.

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Witnesses:

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