

No. 835,714.

PATENTED NOV. 13, 1906.

J. B. SEMPLE.  
PROJECTILE.

APPLICATION FILED SEPT. 3, 1904.

FIG. 1.

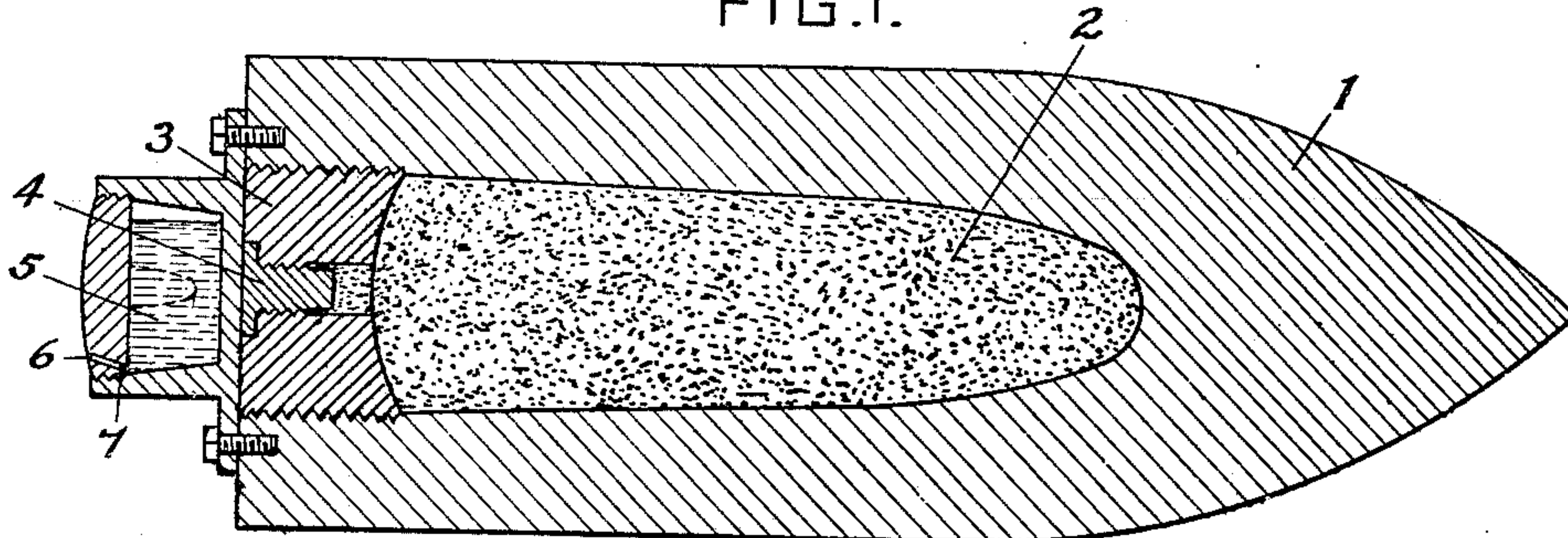


FIG. 2.

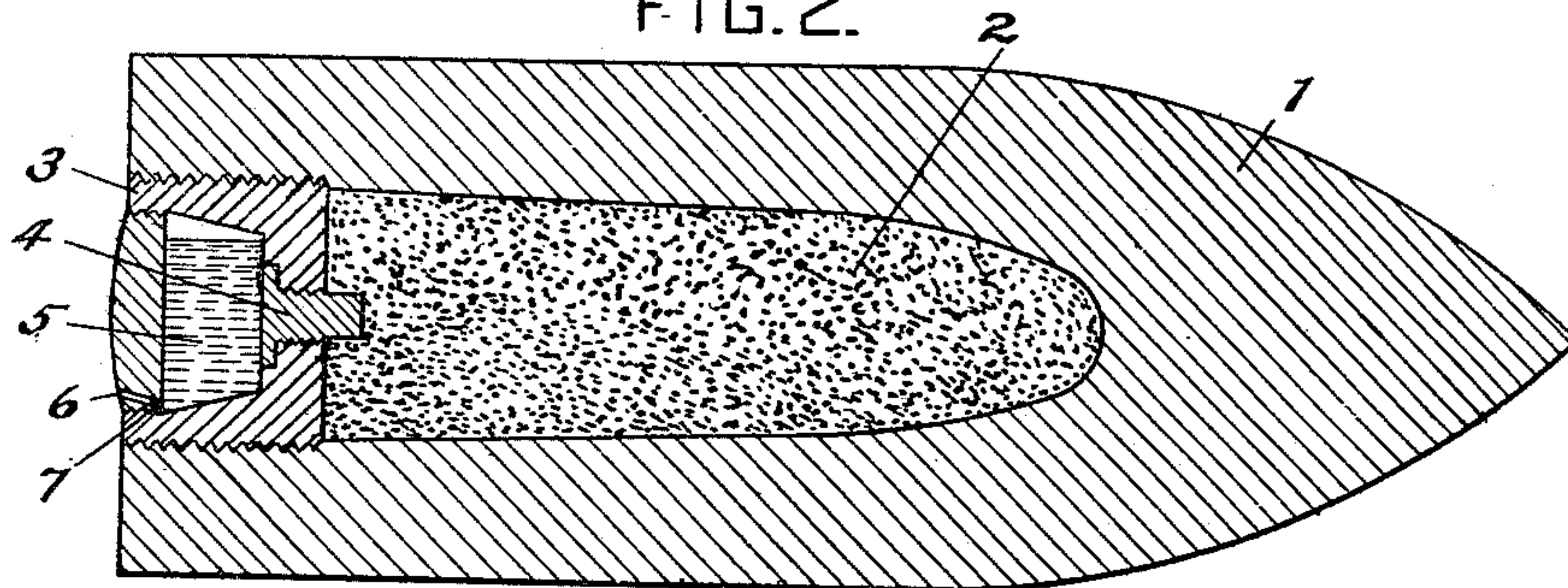


FIG. 3.

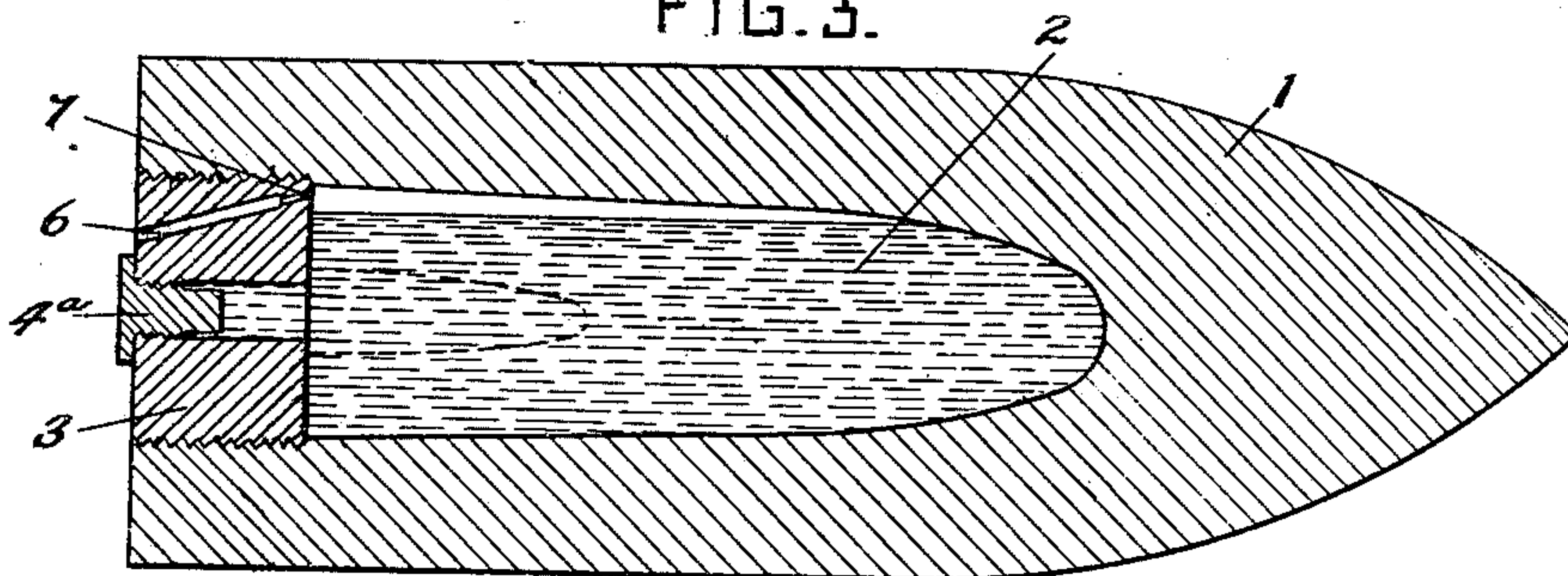
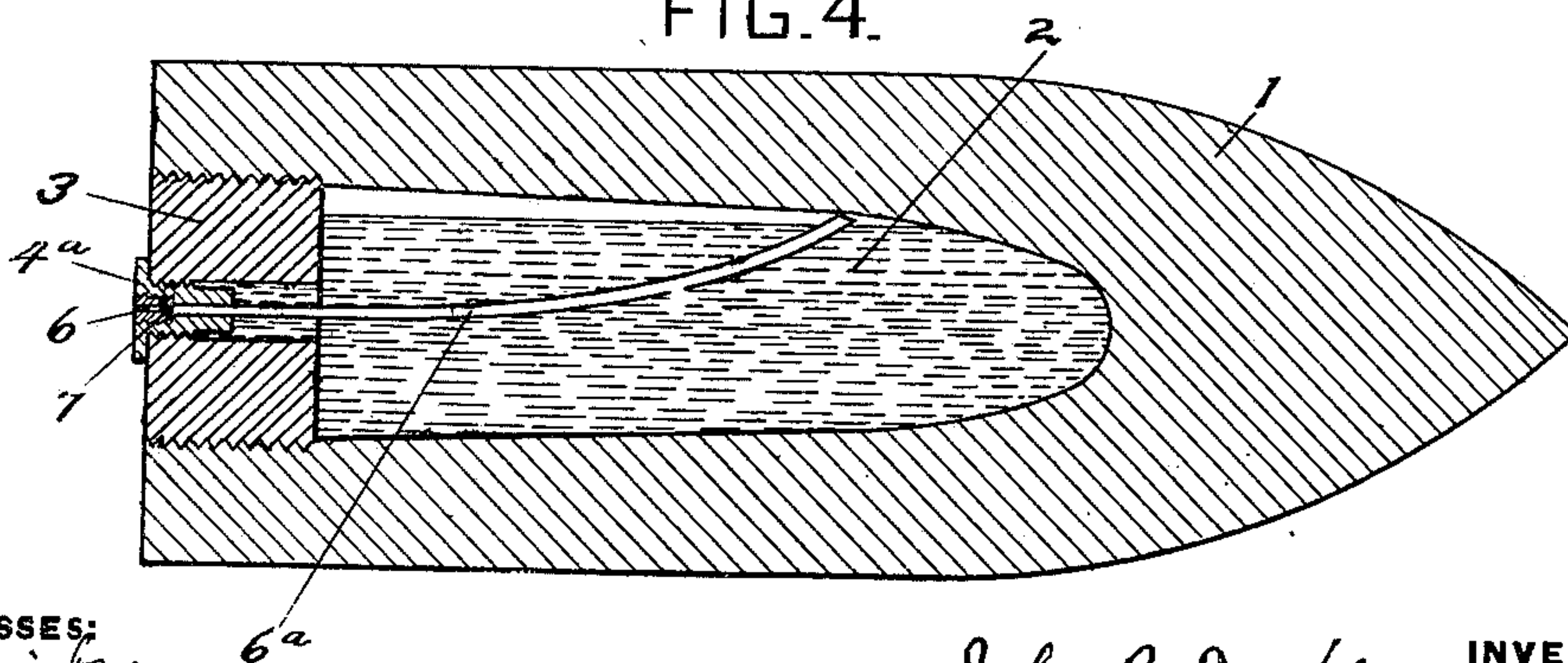


FIG. 4.



WITNESSES:

*F. E. Smith.*  
*Fred Kirchner.*

INVENTOR.

*John B. Semple*  
*by Christy and Christy*  
ATTY'S.



# UNITED STATES PATENT OFFICE.

JOHN BONNER SEMPLE, OF SEWICKLEY, PENNSYLVANIA.

## PROJECTILE.

No. 835,714.

Specification of Letters Patent.

Patented Nov. 13, 1906.

Application filed September 3, 1904. Serial No. 229,232.

*To all whom it may concern:*

Be it known that I, JOHN BONNER SEMPLE, a citizen of the United States, residing at Sewickley, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Projectiles, of which improvements the following is a specification.

My invention concerns means for visually detecting the trajectory of projectiles; and the object of my improvements is a projectile which in flight can readily be observed by day and also by night.

In general terms my invention consists in providing in a suitably-arranged cavity in the projectile a quantity of substance which while the projectile flies through the air will by suitable means be gradually expelled into the air and a substance of such properties that when so expelled it will form a visible trail behind the projectile either of cloud or of light.

In the accompanying drawings, which form part of this specification, Figure 1 shows in longitudinal section an explosive projectile equipped with a structure embodying my invention. Fig. 2 is a similar view showing a modification in the manner in which such a projectile may be equipped. Fig. 3 is a similar view showing my invention applied to a "blind" shell; and Fig. 4 is a view, also in longitudinal section, showing a modification in application to a blind shell.

Parts which are repeated in the several figures bear the same reference-numerals in each case.

Referring to Fig. 1, the body of the projectile is indicated by 1, and 2 represents the burster-cavity, represented as filled with a burster charge. This burster cavity and charge are immaterial to my invention in its broader terms. The figure, however, illustrates the adaptability of the invention and shows it in a practical combination. This explosive projectile is equipped in usual manner with a base-plug 3 and a fuse 4.

I provide a chamber 5, adapted to receive a tracer substance, and I provide means for ejecting or expelling the tracer substance from such containing-chamber while the projectile is in flight. My preferred construction involves the use of a tracer substance in liquid form. Chamber 5 is preferably and conveniently arranged at the rear and in the

axis of the projectile. It is preferably circular in cross-section and preferably tapered from rear to front. As shown in Fig. 1, it is in form a frustum of a cone. A port 6 leads from chamber 5 to the exterior of the projectile. It is of such size as to permit the gradual escape of the fluid in the manner presently to be described and to that end is of relatively minute diameter. This port 6 is arranged so as to permit the expulsion of all or a substantial part of the liquid contained in chamber 5 and also to be subject to the pneumatic pressure of firing. To these ends port 6 leads from a point in or near the edge of the base of the conical chamber and extends rearward, opening behind the projectile, as shown in the drawings. Cavity 5 is partially filled with the tracer fluid, and port 6 is closed in such manner that the liquid will not escape in the ordinary usage which the projectile receives before firing; but when fired the port will be opened for the purposes to be described. I preferably close port 6 with a plug of lead 7, which when the projectile is fired will be driven forward into chamber 5, leaving the port open.

The only necessary character of the liquid aside from its properties as a liquid is that it shall be adapted to visual detection when expelled. If for daylight use, the fluid may be a solution of cheap asphaltum in benzene or water containing common red pigment or chalk in suspension. For night use I employ a liquid which on exposure to the atmosphere will ignite and produce light. Such a liquid is zinc ethyl; another is a solution of phosphorus in carbon bisulfid. The substances last named in igniting produce both light and smoke and are accordingly adapted for use either by night or by day.

The operation of this device is as follows: A projectile equipped with it is fired. The great pneumatic pressure of the explosion of the firing charge is exerted through port 6. It drives plug 7 forward into chamber 5. An inrush of highly-compressed gas into chamber 5 follows, and so much of chamber 5 as is not occupied by the tracer liquid is occupied by highly-compressed gas. As the projectile traverses the gun-barrel it receives its rotary movement, and the effect of this rotary movement in chamber 5 is to carry the liquid centrifugally to the walls of the chamber, leaving the compressed gas as a centrally-



disposed bubble. This bubble will as the projectile loses speed in consequence of the inertia of the liquid occupy a rearward position in the chamber, and I have indicated in dotted lines in Figs. 1 and 3 a hypothetical position of the bubble. When the projectile leaves the barrel of the gun, the pressure through port 6 from without is at once reduced to that of the atmosphere. The gas bubble in chamber 5 being subject to a much greater pressure will expand and drive the surrounding liquid through port 6, and in consequence of the relatively minute size of port 6 the outrush of the liquid will be slow and will continue as the projectile flies. The liquid thus dispersed in the air will form a visible mark of the path of the projectile.

Figs. 1 and 2 show my device applied to an explosive projectile. In one case it forms a distinct member, suitably secured to the rear face of the projectile. In the other case the base-plug is modified and chamber 5 is formed within it. My invention is equally present in each instance. Fig. 1 is, however, preferable to the extent that the tracer device cannot encroach upon and reduce the size of the burster-cavity.

In Figs. 3 and 4 I have shown in alternative form my invention applied to a blind shell—i. e., a shell provided with a burster-cavity, but lacking a burster charge. Such a blind shell is commonly employed in target practice. In such case I find it convenient instead of forming a separate and independent chamber for the tracer substance to employ the burster-cavity itself to that end. The burster-cavity is ordinarily approximately conical in form, and its axis coincides with the axis of the projectile. Its circular base is formed by the base-plug 3, and its side walls converge anteriorly to a rounded apex. In such case I carry port 6 inward through the rear wall of the projectile and conveniently through the base-plug 3 in the manner shown in Fig. 3 to the burster-cavity 2 at a point in or near the edge of the base of the cavity. The point of opening into cavity 2 may of course be varied to meet practical conditions.

The walls of the burster-cavity of a shell as ordinarily constructed converge very gradually, and since in the practice of my invention the position of the last remnant of liquid in the chamber is a resultant of varying forces port 6 may be prolonged into the chamber to any desired point that it may carry out the last dregs of the liquid. In Fig. 4 I have shown such a prolongation of port 6 in a tube 6<sup>a</sup>. In this figure I have also shown port 6 passing centrally through the base-plug 4<sup>a</sup>, which in a blind shell takes the place of an operative fuse.

In the formation of port 6, particularly when carried through the base-plug of an ordinary blind shell, it may be necessary to drill a hole of some length. It will be un-

derstood that only a portion of this prolonged hole need be of the minute diameter essential to successful use of the invention.

Although I have shown a device embodying my invention applied to explosive projectiles, its application to all projectiles, whether explosive or not, is obvious.

The invention described herein is to be distinguished from projectiles used for distributing oil on water, such projectiles being provided with a liquid-containing chamber having a port for the inflow of a displacing liquid and another port for the escape of oil.

I claim as my invention—

1. A projectile provided with a chamber adapted to contain a liquid, and provided with an opening adapted to control the escape of liquid during the flight of projectile, said chamber being closed except as regards the discharge.

2. A projectile provided with a chamber adapted to contain a liquid and provided with an opening for the escape of liquid, said chamber being closed except as regards the escape-opening, means for closing said opening removable on the discharge of the projectile from the gun, substantially as described.

3. A projectile provided with a chamber adapted to contain liquid, said chamber being provided with an outlet leading therefrom, said chamber being closed except as regards said outlet and a plug normally closing said port and removable by external pressure.

4. An explosive projectile having a burst or cavity and provided with an auxiliary chamber adapted to contain a liquid, said liquid having a port or outlet adapted to control the escape of liquid during the flight of the projectile substantially as described.

5. The combination of a projectile having a fuse in its rear end, of a tracer device connected to the rear end of the projectile and forming a gas-check for the fuse, said tracer device having a liquid-containing chamber and means for maintaining a continuous discharge of the liquid from the projectile during its flight.

6. The combination with a projectile, of a tracer device comprising a casing secured upon the rear end of the projectile, said casing having one or more openings in its periphery for the discharge of tracer material under centrifugal force.

7. In a projectile, the combination of a fuse having a connection with the base thereof, and a tracer device also having a connection with the base of said projectile but independent of the connection of said fuse, said device extending across the base of said fuse, thereby forming a gas-check therefor, and having a recess or chamber for tracer material.

8. The combination with a projectile hav-



ing a fuse in its rear end, of a tracer device connected to the rear end of the projectile independently of the fuse and forming a gas-check for the fuse, said tracer device having a  
5 recess or chamber for tracer material.

9. The combination with the projectile having the fuse at its rear end, of a tracer device connected to the rear end of the projectile forming a gas-check and supplemental  
10 support for the fuse, said tracer device having a recess or chamber for tracer material.

10. The combination with a projectile having a fuse at its rear end, of a tracer device connected to the rear end of the projectile  
15 independently of the fuse and forming a gas-check and supplemental support for the fuse,

said tracer device having a recess or chamber for the tracer material.

11. The combination with a projectile having at its rear end a fuse provided with an  
20 expanded base or flange at its outer end, of a tracer device connected to the projectile and abutting against said base or flange and forming a gas-check and supplemental support for the fuse.

In testimony whereof I have hereunto set  
25 my hand.

JOHN BONNER SEMPLE.

Witnesses:

BAYARD H. CHRISTY,  
F. E. GAITHER.