

C. PUFF.  
BURSTING SHRAPNEL WITH GRENADE CHARGE.  
APPLICATION FILED MAY 26, 1909.

1,006,875.

Patented Oct. 24, 1911.

2 SHEETS—SHEET 1.

FIG. 3.

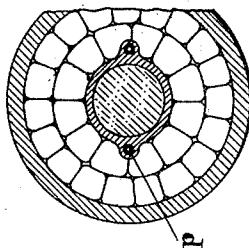


FIG. 2.

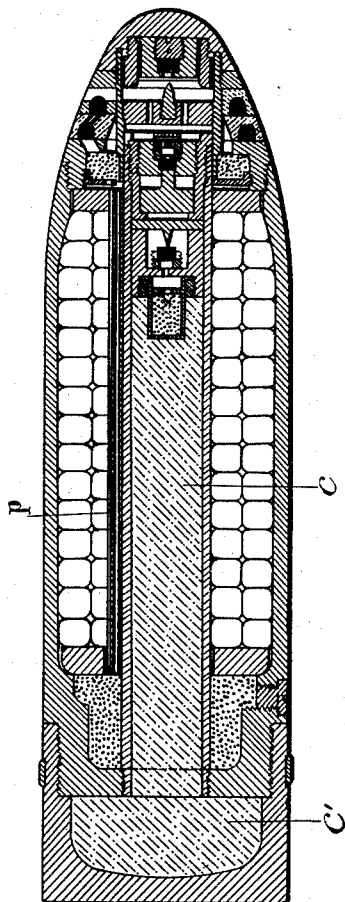
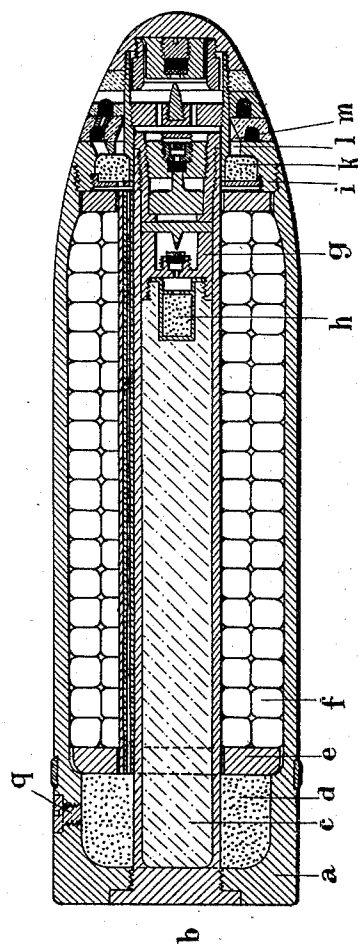


FIG. 1.



Witnesses.  
M. Kelling  
V.C. Randerberger.

Inventor,  
Carl Puff,  
by B. Singer,  
Att'y.

67

C. PUFF.  
BURSTING SHRAPNEL WITH GRENADE CHARGE.  
APPLICATION FILED MAY 26, 1909.

1,006,875.

Patented Oct. 24, 1911.

2 SHEETS—SHEET 2.

Fig. 4.

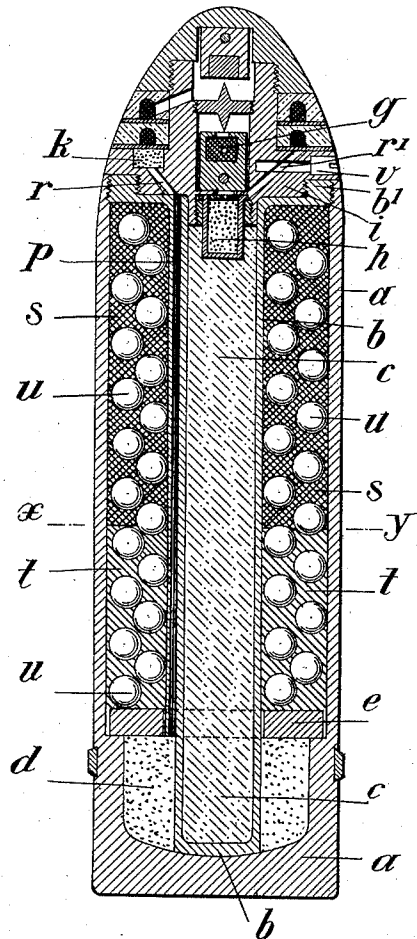
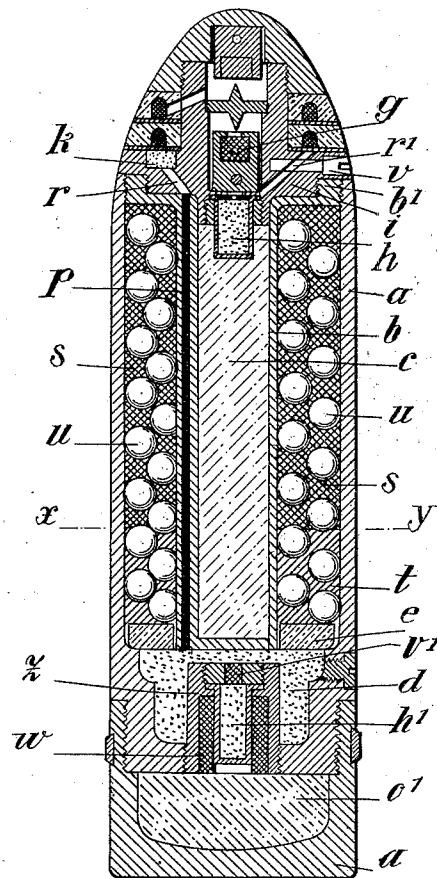


Fig. 5



Witnesses:  
M. Keefling  
D. E. Burdine.

Inventor:  
Carl Puff.  
by B. Singer Attorney.

## UNITED STATES PATENT OFFICE.

CARL PUFF, OF SPANDAU, GERMANY.

BURSTING SHRAPNEL WITH GRENADE CHARGE.

1,006,875.

Specification of Letters Patent.

Patented Oct. 24, 1911.

Application filed May 26, 1909. Serial No. 498,339.

*To all whom it may concern:*

Be it known that I, CARL PUFF, a subject of the German Emperor, and resident of Spandau, Germany, have invented certain new and useful Improvements in Bursting Shrapnels with Grenade Charges Inclosed in a Central Chamber, of which the following is a specification.

Projectiles are already known containing separate shrapnel and grenade charges in which the grenade charge is arranged in a base or head chamber of the projectile and is connected in such a manner with the fuse that in shrapnel shooting it is detonated by percussion alone or during its flight after the explosion of the shrapnel bursting charge.

According to the present invention it is intended to provide such a separate fuse in such unitary projectiles in which the grenade charge is housed by itself in a central chamber. This arrangement allows of a new effect being realized, this being that the grenade charge housed in the central chamber and connected with an igniting device exerts a favorable side effect, which is especially effective for attacking shield batteries even when that part of the projectile which contains the grenade charge detonates in shrapnel shooting by percussion alone or during the flight of the projectile. This favorable side effect of the grenade charge housed in a central chamber cannot be found in the well known projectiles comprising a separate grenade charge in the heading or in the base of the shell. In the well known similar projectiles having a grenade charge in a central chamber, the bursting carcass charge is thrown out of the shell in shrapnel shooting by the bursting shrapnel charge, without detonating and thus is entirely lost without any practical result, or it is inflamed at the same time as the bursting shrapnel charge and in this case disperses the filling balls laterally and thus prevents the desired action of the shrapnel shot.

In the accompanying drawing: Figure 1 shows a longitudinal central section of a general embodiment of the invention; Fig. 2 shows a similar section of a somewhat modified form; Fig. 3 is a cross section of same. Figs. 4 and 5 are longitudinal sections of embodiments hereinafter referred to.

In the form of embodiment shown in Fig. 1, a rigid bursting tube *b* containing the ex-

plosive grenade charge *c* is screwed from behind into the base *a* of an ordinary shrapnel shell. This bursting tube *b* can have any suitable thickness; it can also be inserted into the shell from the front and be secured therein in any suitable manner. Arranged between the bursting tube *b* and the shell case is an annular space which contains the bursting shrapnel charge *d* in its rear part and is closed at its front part by the case shot bottom *e* situated behind the filling balls *f*. The shrapnel bursting charge *d* can be formed of explosive substances which when ignited in the ordinary manner only explode and therefore have only a propulsive action, while when they are ignited from the explosive grenade charge *c* when the latter is ignited by percussion, also detonate and have thus a much stronger action. The front end of the bursting tube *b* is closed by the percussion fuse *g* provided with a detonator *h* and constructed in the well known manner. The time fuse forms the point of the projectile and is connected by the fuse body *i* with the shrapnel case, that is, it lies immediately adjacent the front portion of the shrapnel case. The time fuse is not connected with the bursting tube *b* however, as the percussion fuse lies between the latter and the time fuse. The time-fuse could also be rigidly connected directly or indirectly with the bursting tube *b*. This connection may for instance be obtained by screwing or pressing the fuse body *i* into the head of the bursting tube *b* as shown in Figs. 4 and 5. When the charge *d* is exploded and the shrapnel is discharged, the time fuse is thrown forward together with the filling balls while the percussion fuse remains on the bursting tube *b* its casing being screwed onto the tube *b* and when the projectile strikes against an object, causes the detonation of the grenade charge *c*. In a similar manner, the bursting tube *b* could be connected with the expelling disk *e* or be made in one piece with the latter. Owing to these arrangements the bursting tube *b* and the parts rigidly connected with it are thrown out from the projectile case *a* when in a shrapnel shot the shrapnel explosive charge *d* explodes, so that the grenade charge *c* explodes in the bursting tube *b* later than the shrapnel charge *d*, either in the air or by percussion. When the projectile is shot entirely as a percussion projectile, that is to

say as a grenade, the action of the time fuse is prevented in the well known manner. The grenade charge  $c$  is in this case ignited by the percussion fuse and thus determines the explosion of the shrapnel bursting charge. It is needless to say that a connection can be made between the detonator of the grenade charge and the time fuse whereby the grenade charge is also ignited during a shrapnel shot, for instance by a grain of powder in the channels  $r$  and  $r'$ , Fig. 4, leading from the time fuse to the detonator  $h$  or to the grenade charge  $c$ . These channels can be closed from the outside by rotating the valve cock  $v$ . The fuse body  $i$  contains a charge of powder  $k$  which is detonated by the explosion of the shrapnel charge and which is adapted to destroy the entire time fuse in a shrapnel shot. Channels  $l$  lead from the fuse body  $i$  behind recesses of the fuse member  $m$  and have for their object to cause the latter to burst. The destruction of the time fuse has for its object to increase the number of shell fragments and also to prevent adjusted time fuses falling in the hands of the enemy during the shooting and thus allowing the latter to determine the distance of the shooting artillery from the reading of the adjustment of the fuses.

Fig. 2 shows a form of embodiment of the invention in which, with a view of increasing the bursting effect, a part of the explosive grenade charge  $c'$  is housed in a bottom chamber of the projectile. This grenade charge  $c'$  is connected with the grenade charge  $c$  contained in the middle chamber and is either ignited by the latter or receives a special fuse with a detonator. In the forms of embodiment shown and described the fire is transmitted from the time fuse to the shrapnel bursting charge through a small narrow tube  $p$  arranged outside the blasting tube and filled with quickly burning powder or with a priming. This small tube  $p$  can be made integral with the tube  $b$  as shown by Fig. 3 or be inserted therein as a special part.

The shrapnel bursting charge  $d$ , Fig. 1, is introduced into the shell through an opening which is closed by the screw plug  $g$ . This opening may be provided in the mantle or in the bottom of the chamber.

The filling balls  $f$  may have any suitable form and nature. Those in the forms of embodiment shown are arranged around the central chamber, and they may obviously be arranged also in the central chamber, for instance in such a manner that the grenade charge is positioned between the outer projectile case and the filling balls. In a similar manner still another blasting charge  $s$  might be arranged between the wall of the projectile  $a$  and the filling balls, that is to say, in the interstices between the filling

balls  $u$  in the front part of the projectile about to the line  $x-y$  or along the entire length of the ball filling. This blasting charge  $s$  is obviously projected when the shot is a shrapnel shot and is caused to detonate by the central grenade charge when the entire projectile works as a percussion shot. If the explosive only reaches the line  $x-y$ , the interstices between the filling balls behind are filled up with any of the substances heretofore employed. In all the different forms of this projectile, I may make use of the well known smoke developers, that is to say, substances which are ignited by the explosion of the blasting charges and burn with a strong smoke which may be seen from a great distance. In Fig. 5 the letter  $w$  shows, by way of example, the arrangement of the smoke developer.

In Fig. 5 the auxiliary grenade charge  $o'$ , has been arranged so as to be separated by the sleeve  $Z$  from the central grenade charge  $c$  and remains in the bottom chamber when the central grenade charge and the filling projectiles have been expelled in a shrapnel shot by the shrapnel blasting charge  $d$ . The deflagration of the auxiliary grenade charge  $o'$ , is performed by the detonator  $h'$ , which is ignited by the powder  $v'$ , which has been ignited in turn by the shrapnel blasting charge  $d$ . As up to this transmission of the fire a certain space of time passes, by using a slowly burning powder  $v'$ , the filling projectiles will have already been expelled before the auxiliary grenade charge  $o'$  detonates. It is needless to say that in a percussion shot the auxiliary grenade charge  $o'$ , is directly ignited by the central grenade charge  $c$ , which when detonating destroys all the intermediate walls.

I claim—

1. In a shrapnel of the kind described, the combination of the shell, the shrapnel charge, the shrapnel balls, a time fuse adapted to ignite the said shrapnel charge at the desired moment, a bursting tube secured in the base of said shell and extending centrally in said shell, a grenade charge housed in the said bursting tube, means permanently connected with said bursting tube and adapted to cause the said grenade charge to explode at the desired moment, and a tube connecting said time fuse and said shrapnel charge, substantially as described.

2. In a shrapnel of the kind described, the combination of the shell, the shrapnel charge, the shrapnel balls, a time fuse adapted to ignite the said shrapnel charge at the desired moment, a violently acting explosive material housed in the said time fuse adapted when exploded to destroy the said time fuse, a longitudinal bursting tube arranged centrally of said shell and adapted to be thrown thereout by the explosion of the said shrapnel charge, a grenade charge

in the said bursting tube, and a percussion fuse connected with said bursting tube, substantially as described.

3. In a shrapnel of the kind described,  
5 the combination of the shell, a bursting tube centrally arranged in said shell, a grenade charge housed within said bursting tube, shrapnel balls arranged to surround said  
10 bursting tube, a bottom chamber provided in said shell and surrounding the rear part of said bursting tube, a shrapnel charge housed within said bottom chamber, a time fuse arranged in front of said shrapnel balls adapted to ignite the said shrapnel charge at the  
15 desired moment, a passage-way arranged alongside said bursting tube connecting said time fuse and said shrapnel charge, means permanently connected with said bursting tube and adapted to cause the said grenade  
20 charge to explode at the desired moment, and a supplemental grenade charge introduced into the spaces between the said shrapnel balls, substantially as described.

4. In a shrapnel of the kind described,  
25 the combination of the shell, a bursting tube centrally arranged in said shell, a grenade

charge housed within said bursting tube, shrapnel balls arranged to surround said bursting tube, a bottom chamber provided in said shell and surrounding the rear part  
30 of said bursting tube, a shrapnel charge housed within said bottom chamber, a time fuse arranged in front of said shrapnel balls adapted to ignite the said shrapnel charge at the desired moment, a violently acting  
35 explosive material housed in the said time fuse and adapted when exploded to destroy the said time fuse, a passage-way arranged alongside said bursting tube connecting said time fuse and said shrapnel charge, means  
40 permanently connected with said bursting tube and adapted to cause the said grenade charge to explode at the desired moment, and a supplemental grenade charge introduced into the spaces between the said shrap-  
45 nel balls, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two witnesses.

CARL PUFF.

Witnesses:

WOLDEMAR HAUPT,  
HENRY HASPER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."