(Model.)

H. GRUSON & A. HELLHOFF.

EXPLOSIVE SHELL.

No. 287,924. Patented Nov. 6, 1883.

Fig. 1.

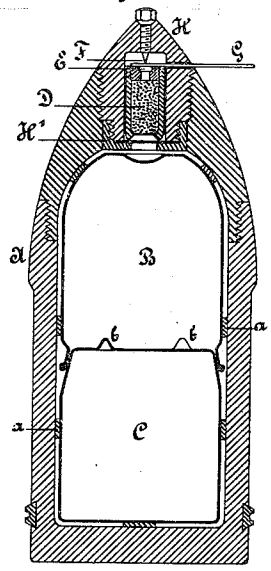


Fig. 2.

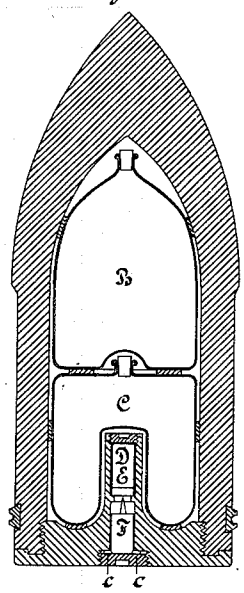


Fig. 3.

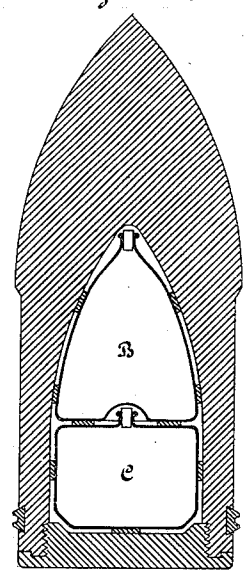


Fig. 4.

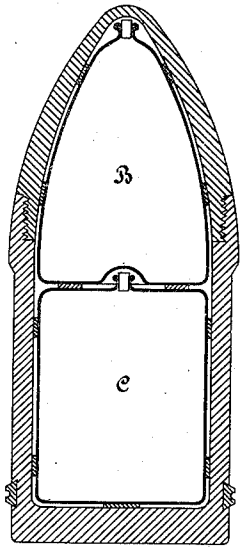


Fig. 5.

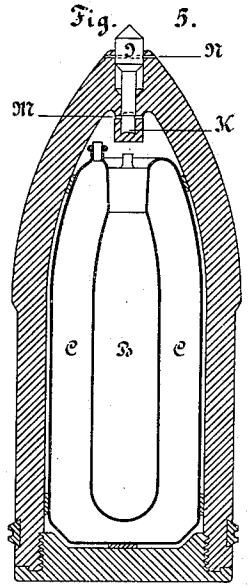
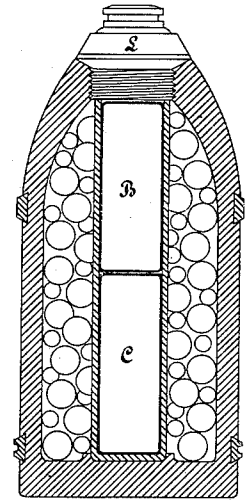


Fig. 6.



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UNITED STATES PATENT OFFICE.

HERMANN GRUSON, OF BUCKAU, PRUSSIA, AND ALBERT HELLHOFF, OF MENTZ, GRAND DUCHY OF HESSE, GERMANY.

EXPLOSIVE SHELL.

SPECIFICATION forming part of Letters Patent No. 287,924, dated November 6, 1883.

Application filed November 8, 1879. Renewed October 14, 1881. (Model.) Patented in Germany July 2, 1879, No. 12,901; in England March 27, 1880, No. 1,285; in Sweden April 1, 1880; in France October 23, 1879, No. 133,320; in Belgium April 16, 1880, No. 51,167; in Italy April 17, 1880, XXIII, 365; in Spain May 17, 1880, No. 645; in Austria-Hungary May 29, 1880, No. 1,490 and No. 38,365; in Portugal June 26, 1880, No. 603; in Norway August 20, 1880, and in Canada January 19, 1882, No. 14,017.

To all whom it may concern:

Be it known that we, HERMANN GRUSON, of Buckau, Kingdom of Prussia, manufacturer, and ALBERT HELLHOFF, of Mentz, Grand Duchy of Hesse, artillery officer, have invented certain new and useful Improvements in the Construction of Shells for use of Explosive Matter, whereof the following is a specification.

Our invention relates to a new kind of shell or projectile, which is not charged with any completely-prepared explosive matter, but which contains the non-explosive component parts or ingredients thereof inclosed in separate vessels, these vessels being sufficiently fragile as to break and to allow their contents to become mixed and to form the explosive substance when the projectile is discharged from the gun, and while it is on its flight. As ingredients suitable for this purpose may be named, on one hand, nitric acid, and, on the other hand, the nitro derivatives of naphthaline, phenole, toluole, benzole, and xylole; but certain other substances may also be used, the composition of the charge not constituting a part of this invention.

On the annexed sheet of drawings different arrangements of projectiles designed according to this invention are represented.

In Figure 1, A is the body of the projectile or shell, the top of which is screwed into the main part for allowing the vessels B and C, which are made of glass, porcelain, or other fragile material, to be put into their place. In case the above-named ingredients are used for charging the shell, one of these vessels may contain the nitric acid, the other vessel one or more of the nitro derivatives mentioned, and the latter substance or substances may be mixed with a certain quantity of the said acid, if prefered. The vessel C is supposed to have been provided with two apertures at *b b*, one for admission of the liquid, the other for the escape of air from the vessel while being filled, and these apertures have been sealed by melting their necks by a blow-pipe. The top of C is ground into the neck of B, which latter vessel having been filled, the joint between B and C may be made completely tight by water-glass or any other suitable cement. The strength of the vessels B and C is such that they will not be broken by concussions which may occur while they are transported or handled. Moreover, rings *a* of any soft material—such as india-rubber or felt—are interposed between them and the walls of the shell, or the entire space between the vessels and the shell is filled with a similar material. When the shell is fired off from the gun, the impact thereby caused has the effect of shattering the vessels B and C. Their contents will thereupon mix with each other, the mixing process being promoted by the rotation of the shell during its flight, and by the fragments of the vessels acting as stirrers, so that when the shell reaches its mark the explosive compound will have been formed. The same is thereupon caused to explode in the following manner:

D is a tube having a very thin bottom, and filled with gunpowder. This tube can slide in the hollow screw-plug H; but it is kept in its place by the pin G until the shell leaves the gun.

E is a priming-capsule containing fulminate of mercury. When the shell is fired off, the centrifugal force resulting from its rotation causes the pin G to fly out of its place, thus leaving the tube D at liberty to rush forward when the shell strikes its mark. In consequence, the firing-pin F penetrates the priming-capsule E, the gunpower in D ignites, shatters the bottom of D, as also the thin plate H′, and causes the main charge of the shell to explode. This detonating-fuse also forms part of the invention.

Fig. 2 shows a shell in which the apparatus for firing the charge is at the bottom. The bottom of the firing-pin F, which is by preference made of antimony, is held in its place by two lateral projections, *c c*, which break when the shell strikes its mark. The pin thereupon rushes forward and pierces the detonating-fuse D E, consisting again of fulminate of mercury and gunpowder, or of the former only. The vessel C is made of a shape to give room

for the firing device, and B is adapted to the conical form of the cavity of the projectile.

The shells, Figs. 3 and 4, are similar to the former in so far as the vessels B and C are concerned; but they are intended to be used with charges which will explode from the mere impact of the shell against a non-elastic mark, and for this reason they are not provided with any priming or firing device.

In the shell, Fig. 5, the explosion is caused in a novel manner by the piston I, which is held in its place by a wire passed through it and through the point of the shell. After the shell has been fired off, and the vessels B and C broken, a part of the charge will flow through the lateral perforations of the cup K into the interior of the same. The piston I, on striking the mark, shears off the retaining wire, plunges into the cup K, and causes the substance contained within the same to explode. The cup is thereby broken and the whole charge ignited.

Fig. 6 shows a shrapnel-shell with time-fuse. The vessels B and C, which are contained in a metallic tube, are supposed to be closed by sealing their orifices.

Instead of inclosing the constitutent substances of the explosive charge in two separate vessels, they may be kept apart from each other by means of a fragile partition-wall within the shell, which breaks when the gun is fired off. Moreover, instead of but two vessels, B and C, or of but one partition-wall, three or more such vessels or two or more partition-walls may be applied.

The combination, with a projectile of the character herein shown and described, of a detonating-fuse is not claimed herein, as that subject-matter is contained in another application.

We claim as our invention—

1. An explosive projectile consisting of a hollow shell within which is provided a plurality of compartments separated from each other by a fragile partition, the said compartments containing constituent parts necessary to form, when brought together, an explosive compound, substantially as and for the purpose described.

2. An explosive projectile consisting of a shell in which is inclosed a plurality of vessels of glass or other fragile material, each containing a constituent part necessary to form an explosive compound when all are brought together by the rupture of the vessels, substantially as described.

3. An explosive projectile consisting of a hollow shell within which is provided a plurality of compartments separated by a fragile partition, said compartments containing constituent parts necessary to form, when brought together, an explosive compound, with which shell is combined a plunger, I, substantially as described.

4. An explosive projectile consisting of a hollow shell, in which is contained a plurality of vessels adapted to separately contain constituent parts necessary to form, when brought together, an explosive compound, one of which vessels is constructed to form the means for closing the mouth of another vessel, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HERMANN GRUSON.
ALBERT HELLHOFF.

Witnesses:
BERTHOLD ROI,
EDWARD P. MAC LEAN.