No. 633,458. Patented Sept. 19, 1899.

G. JARED.

HIGH EXPLOSIVE SHELL.

(Application filed Oct. 12, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

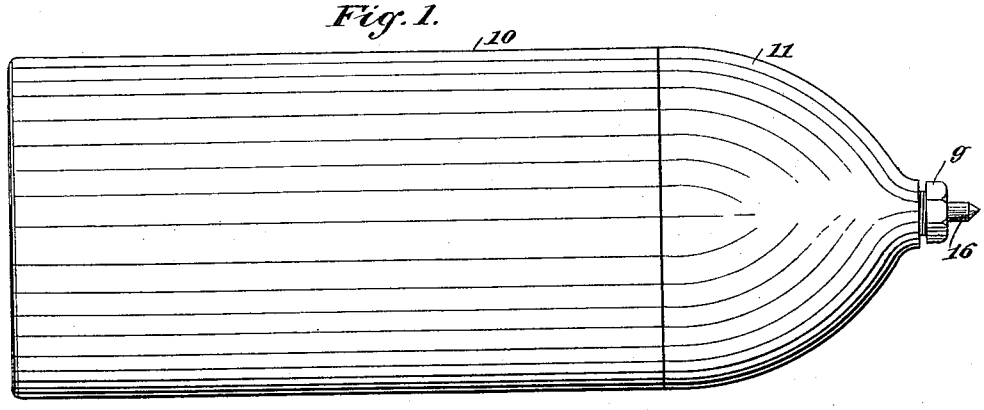


Fig. 2.

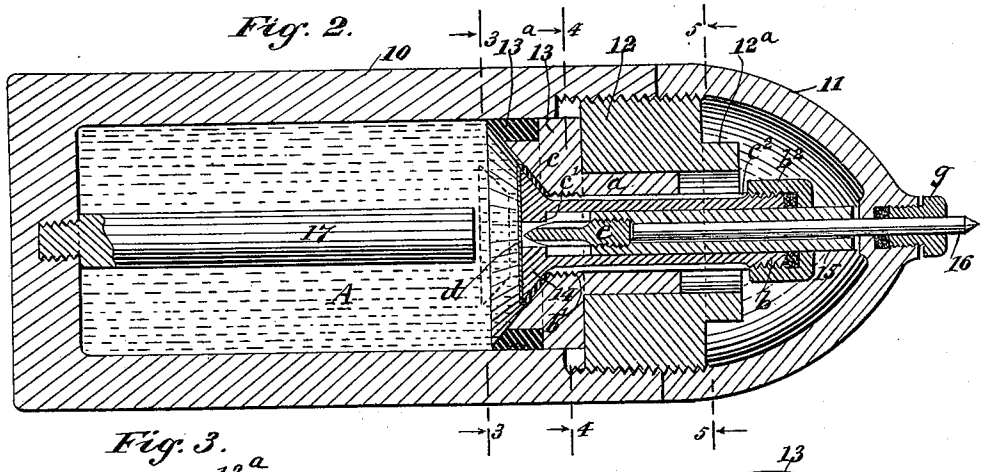


Fig. 3.

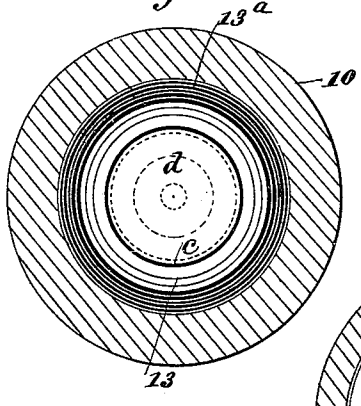


Fig. 4.

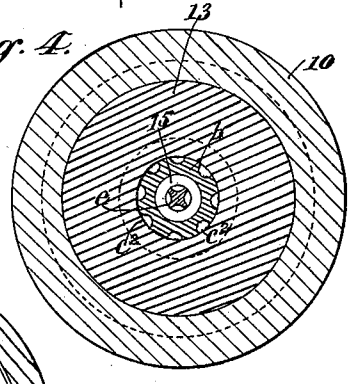
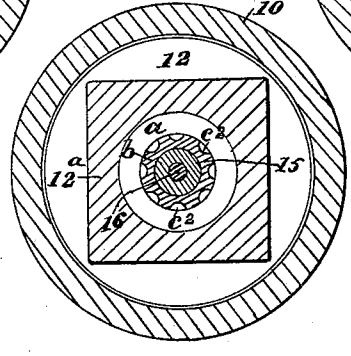


Fig. 5.



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Fig. 6.

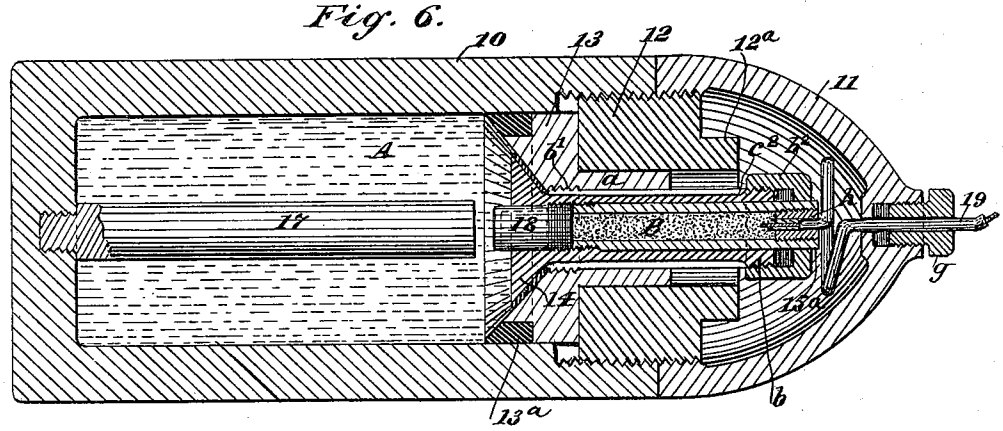


Fig. 7.

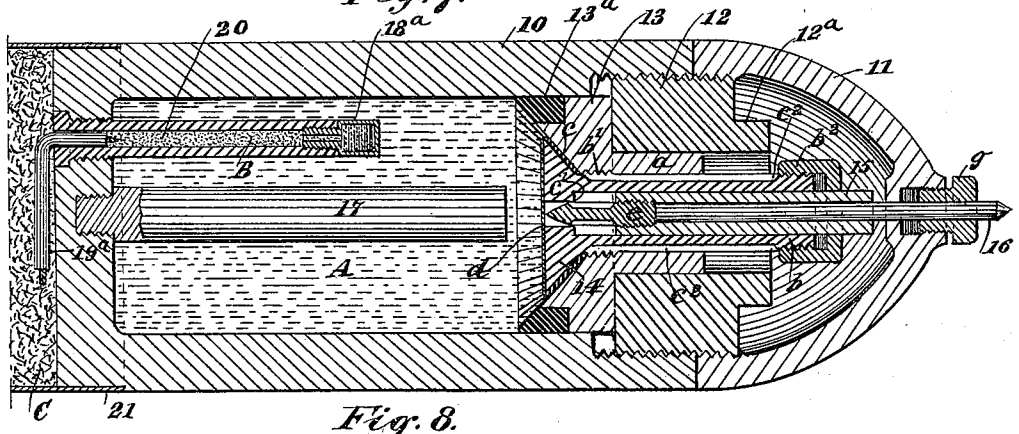
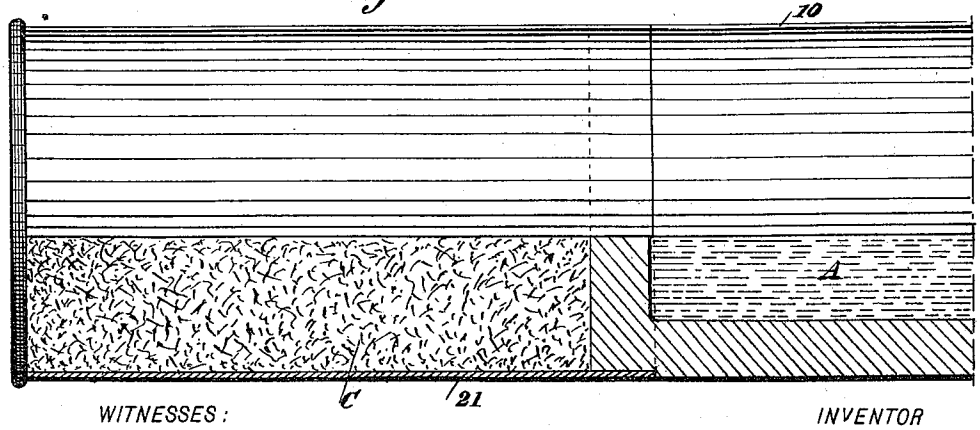


Fig. 8.



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UNITED STATES PATENT OFFICE.

GILBERT JARED, OF PRAIRIE CITY, ILLINOIS, ASSIGNOR OF ONE-HALF TO WARREN RAWALT, OF SAME PLACE.

HIGH-EXPLOSIVE SHELL.

SPECIFICATION forming part of Letters Patent No. 633,458, dated September 19, 1899.

Application filed October 12, 1898. Serial No. 693,314. (No model.)

To all whom it may concern:

Be it known that I, GILBERT JARED, of Prairie City, in the county of McDonough and State of Illinois, have invented certain new and useful Improvements in High-Explosive Shells, of which the following is a full, clear, and exact description.

My invention relates to projectiles containing a high-explosive charge, such as dynamite or nitroglycerin.

A primary object of my invention is to provide a projectile of the class indicated having such novel details of construction as will adapt the charged shell for safe handling and transportation and that may only be exploded after it has been fired from a gun toward an object either by impact on the latter or by means of a fuse.

A further object of my invention is to afford safe and novel means for the employment of a time-fuse in conjunction with the improved projectile and at either end thereof, which will permit the missile to be detonated either by impact or by use of the time-fuse, as may be desired.

The invention consists in the novel construction and combination of parts, as hereinafter described, and defined in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a side view of the improved projectile or shell. Fig. 2 is a sectional side view through the longitudinal axis of the shell, showing novel interior parts adapted to detonate the projectile by impact of its forward end upon an object. Fig. 3 is a transverse sectional view of details shown in Fig. 2, taken substantially on the line 3 3 in said figure. Fig. 4 is a transverse sectional view substantially on the line 4 4 in Fig. 2. Fig. 5 is a transverse sectional view essentially on the line 5 5 in Fig. 2. Fig. 6 is a sectional side view through the axis, showing the device arranged for the employment of a time-fuse at the forward end of the shell. Fig. 7 is a longitudinal sectional view of the projectile arranged for explosion of its charge either by impact at the front end or by a time-fuse located at the rear end of the shell, and Fig. 8 is a partly-sectional side view of the rear portion of the improved projectile and of a cartridge-case fixed thereon containing powder for its projection.

The hollow cylindrical body 10 of the projectile may be formed of any suitable metal and may have such relative dimensions as will adapt it for use as a shell to be discharged by gunpowder from ordnance of any desired caliber. A cupped coniform head 11 of proper size is provided for the body 10, and at the opposing ends of said parts they are internally threaded a suitable distance to permit an engagement therein of the externally-threaded piece 12, which is preferably termed the "coupling-plug," it being of such proportionate length as will permit the threaded periphery of the same to screw neatly into the body 10 and head 11, as shown in Figs. 2, 6, and 7. On the end of the coupling-plug 12 that projects into the head 11 a polygonal formation 12^a is produced, to which a wrench may be applied to screw the plug into or out of the body 10.

In an axial perforation in the coupling-plug 12 the reduced cylindrical end *a* of the compression-block 13 is fitted liquid-tight, said portion *a* being preferably made shorter than is the coupling-plug 12, thus leaving a portion of the bore in said plug unoccupied at the outer end. The compression-block 13 is of such diameter in its larger rear portion as to permit it to slidably fit within the true cylindric chamber in the body 10 at the forward end thereof, and at the rear end of said plug a cupped recess is formed therein.

On the periphery of the compression-block 13 a rabbet is formed at the rear end of the same for the reception of a suitable packing-ring 13^a, which forms a liquid-tight joint within the chamber of the body 10 by contact with its true bore. A central orifice, circular in cross-section, is formed longitudinally through the compression-block 13, and within this orifice, extending from the cupped end of the block, a short threaded formation is peripherally produced. A sealing-valve 14 is provided having a cylindrical hollow stem *b*, that is adapted to slide endwise in the cylindrical orifice of the block 13, this coniform valve being fitted to seat within the coniform recess at the rear end of said compression-block. Preferably a pliable joint-

facing *c* is secured upon the valve 14, whereby an air-tight joint is afforded between the valve and block when the valve is drawn into contact with the coniform seat of said block, as indicated in Figs. 2, 6, and 7. The stem of the sealing-valve 14 may with advantage be projected somewhat beyond the front end of the coupling-plug 12, and on said forward end of the stem a packing-nut b^2 is screwed, so as to hold any suitable packing material between it and the end of the stem.

On the peripheral surface of the valve-stem *b*, near the valve, a screw-thread *b'* is formed, which may be screwed into the thread within the compression-block 13 by rotation of the valve-stem at its forward end, and thus draw the joint-facing *c* upon the coniform valve-seat. The stem *b* of the valve 14 is axially perforated in two diameters when constructed as shown in Figs. 2 and 7, the smaller diameter being at the rear end within the valve-head 14, which provides an offset or level shoulder *c'* where the bore of the stem is reduced. A suitable number of grooves c^2 are formed in the peripheral surface of the stem *b* and extend longitudinally from points near each end of said stem, the function of which will hereinafter be explained. Upon the rear end of the valve 14 a thin cover-plate *d* is secured by any preferred means, so as to hermetically seal the forward end of the perforation in the stem and the valve-head thereon. In the bore of largest diameter that extends from the shoulder *c'* forwardly through the stem *b* a plunger-tube 15 is located and is adapted to slide longitudinally, which slidable movement is controlled by the packing-joint in the nut b^2, through which the tube passes and projects somewhat in front of the nut. The rear end of the plunger-tube 15 is internally threaded to receive the threaded end of the piercing-head *e*, that is pointed at the rear end and is longitudinally grooved in its body, the said head being adapted to traverse the reduced bore of the stem *b* if it is forcibly driven rearward so as to penetrate the cover-plate *d*. A pusher-rod 16 is fitted to slide in the plunger-tube 15 and seat at the rear end thereof upon the front end of the piercing-head *e*, the front end of said rod being extended through the packing-nut *g* at the front of the coniform head 11 and beyond it at a proper degree to serve as a contact-point for the shell, the packing of said nut serving to prevent accidental displacement of the rod. Within the body 10 a post 17 is held to project forwardly in alinement with the pusher-rod 16 and is so proportioned in length as to space its front end from the valve-head 14 a suitable distance.

I have found by practical experience that liquid or viscid nitroglycerin may be rendered safe from explosion by shocks received in handling and transportation if such material is held solidly compressed in an air-tight chamber or vessel from which air has been expelled, which discovery I have carried into effect by means of the present improvements in high-explosive projectiles.

In preparing the empty shell for reception of nitroglycerin the coniform head 11 is removed from the coupling-plug 12 and the latter is withdrawn from the body 10. Nitroglycerin A, of safe temperature, is now filled into the body 10 to such a height as will afford space above it to receive the compression-block 13. The coupling-plug 12 is now carefully screwed into the body 10, and air that occupied the space entered by the plug escapes through a crevice that is formed between the valve-head 14 and coniform seat in the block 13, the valve-head having been previously unseated by rotation of the stem *b*, so as to slightly unscrew the thread *b'*, which will permit the air to pass into the grooves c^2 and pass thence from the compression-block 13. After the atmospheric air has been completely expelled from the body 10 by compression, as explained, and which will be indicated by the exuding of the nytroglycerin in the outer portions of the grooves c^2, the valve 14 should be closely seated upon the block 13 and the plug 12 be given a slight inward movement by turning it, which will forcibly compress the mass of nitroglycerin, and the joint-facing *c* of the valve 14 will prevent access of air to said explosive material.

In the shell constructed as hereinbefore described, and which is adapted for detonation by impact of the front end upon an object toward which the shell has been projected by gunpowder in a piece of ordnance, the impact of the pusher-rod 16 upon an object which has been aimed at will cause said rod to forcibly slide rearward, which will push the piercing-head *e* through the cover-plate *d*. The perforation of the cover-plate will permit an escape of a small amount of the nitroglycerin through the grooves of the piercing-head *e* into the annular space between the shoulder *c'* and rear end of the plunger-tube 15. The violent impact of the end of the tube 15 upon the nitroglycerin that is caught between said tube end and the shoulder *c'* will produce a primary explosion, which will drive the plunger-tube forward and the valve 14, with its stem *b*, rearward, which in turn will forcibly impinge upon the front end of the post 17, and by impact upon the nitroglycerin that lies between the valve-head 14 and said post the explosion of the mass of nitroglycerin in the body 10 of the shell is produced.

One of the objects of my invention is to utilize the essential features of the same in the production of a high-explosive shell that may be exploded by a time-fuse located either at the forward or rear end of the shell, such adaptations being clearly represented in Figs. 6 and 7 of the drawings, which will now be described.

In Fig. 6 the pusher-rod 16 has been re-

moved and a percussion-cap 18 takes the place of the piercing-head *e*, said cap being screwed into the rear end of the hollow stem *b* of the valve-head 14. The plunger-tube 15ª in this case is filled in advance of the cap 18 with quick-fire gunpowder B, held in place by a longitudinally-perforated plug *h*, that receives one end of a time-fuse 19 of any preferred kind, which fuse may be coiled in the coniform head 11 forwardly of the plunger-tube and be extended at the front end through the packing-nut *g*, which holds the fuse gripped by the compression of the packing therein. It will be evident that the time-fuse 19 may be shortened to suit the interval of time which is to elapse before explosion of the shell, and as the bared outer end of the fuse will be ignited, as usual, by the flash of gunpowder used to project the shell from a gun it will be seen that at a proper instant the priming-powder B will detonate and in turn explode the cap 18, that will cause an explosion of the nitroglycerin A. In Fig. 7, which exemplifies the means for detonating the improved high-explosive projectile either by impact of its front end on an object or by a time-fuse located at the rear end thereof, it will be seen that the interior construction, which provides for explosion by impact, is identically the same as that shown in Fig. 2, already described.

To convert the shell into one that may be detonated either by the percussion of its front end on an object or by a time-fuse 19ª, the latter is held in a tube 20, that is screwed into a tapped perforation in the rear end wall of the body 10, said tube having a filling of priming-powder B, and a percussion-cap 18ª, mounted upon its free inner end, which locates said cap in the mass of nitroglycerin A. The gunpowder C, used to project the improved high-explosive shell from a gun, may be held in a separate cartridge or be fixed on the rear end of the body 10 by providing a sheet-metal case 21 to contain the powder charge as is now provided for the indicated purpose and joining said casing upon the body of the projectile, as is indicated in Fig. 8.

It is obvious that in the provision of a time-fuse which is located in the rear end of the body 10 said fuse should be cut of a proper length to burn during a definite interval of time, which is determined by the distance the projectile is to traverse toward an object, and the length of the fuse should be previously graduated for such a purpose when the gunpowder charge that projects the shell is held in a fixed casing 21 upon the body of the projectile.

It should be explained that comparatively slow-burning powder is to be used as a propelling agent for the projectile, that such as is now provided for use in large guns being available, and the gas evolved by the combustion of such powder will start the shell without danger of exploding the nitroglycerin charge of said shell if the air has been entirely removed and the nitroglycerin is held under compression by the means hereinbefore specified.

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

1. A high-explosive shell, comprising a hollow body, a compression-block movable therein and provided with a vent or air-passage, and a valve for closing said passage.

2. The combination with a hollow body and a coniform cupped head therefor, of a threaded coupling-plug engaging the body and head, and a compression-block actuated by said plug and mounted to slide tightly in the body for compressing a high-explosive filling within the body, substantially as described.

3. The combination with a hollow body, a coniform head therefor, and a threaded coupling-plug engaging the body and head, of a perforated compression-block held to project at the rear of the coupling-plug, and a valve longitudinally adjustable toward or from the rear face of the compression-block, substantially as described.

4. The combination with a hollow body, a coniform head therefor, and a perforated and threaded coupling-plug engaging the body and head at opposing ends, of a perforated compression-block having its rear end cupped to form a valve-seat, a coniform valve having a hollow stem which is slidable through the compression-block, and a plunger-tube slidable in the valve-stem and adapted to detonate high-explosive filling in the body when said tube is forcibly driven rearward, substantially as described.

5. The combination with a hollow body, a cupped coniform head therefor, an axially-perforated coupling-plug engaging the body and head to join them, and a hollow compression-block having a portion of its body held in the perforation of the plug, the other portion of said block slidably fitting the bore of the hollow body, a joint-ring on said rear portion of the compression-block, and a valve held on a stem that is longitudinally adjustable in the hollow block, so as to hold the valve against the rear end of said block or remove it therefrom, substantially as described.

6. The combination with a hollow body, a cupped coniform head therefor, a threaded coupling-plug adapted to join the body and head, and axially perforated to receive the reduced body of a compression-block, and a perforated compression-block the rear portion of which is fitted to slide in the true bore of the body, and having a joint-ring on its periphery which also contacts with said bore, the rear end of the block being concaved to form a coniform valve-seat, of a coniform valve having an elongated hollow stem bored in two diameters to produce a shoulder near the valve-head, a slidable plunger-tube in the hollow valve-stem, a piercing-head on the

rear end of the plunger-tube, adapted to penetrate a thin cover-plate that seals the perforation in the valve-head, a pusher-rod in the plunger-tube, having contact with the piercing-head and projecting from the front end of the coniform head of the projectile, and a post extending forwardly in the body, substantially as described.

7. A high-explosive shell, comprising a hollow body, a compression-block movable therein and provided with a cavity on its inner face and with a vent or air-passage connecting with said cavity, and a valve for closing said passage.

8. A high-explosive shell, comprising a hollow body, a compression-block movable therein and provided on its inner face with an air-tight packing, and with a vent or air-passage, and a valve for closing said passage.

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Witnesses:
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JOHN H. MYERS.