

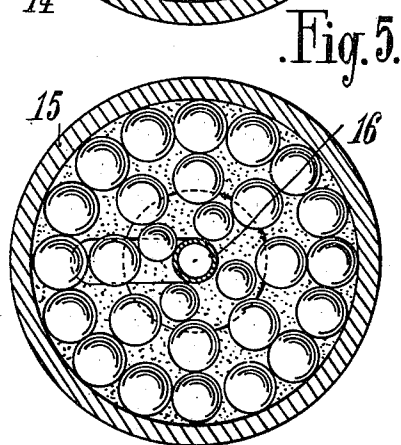
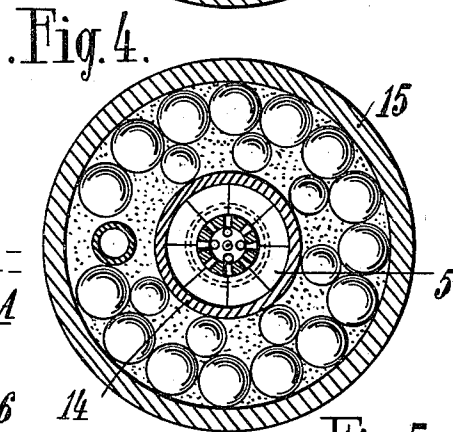
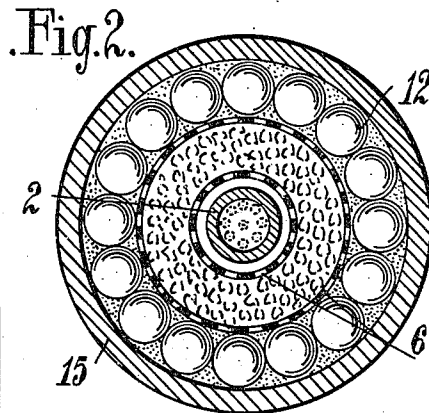
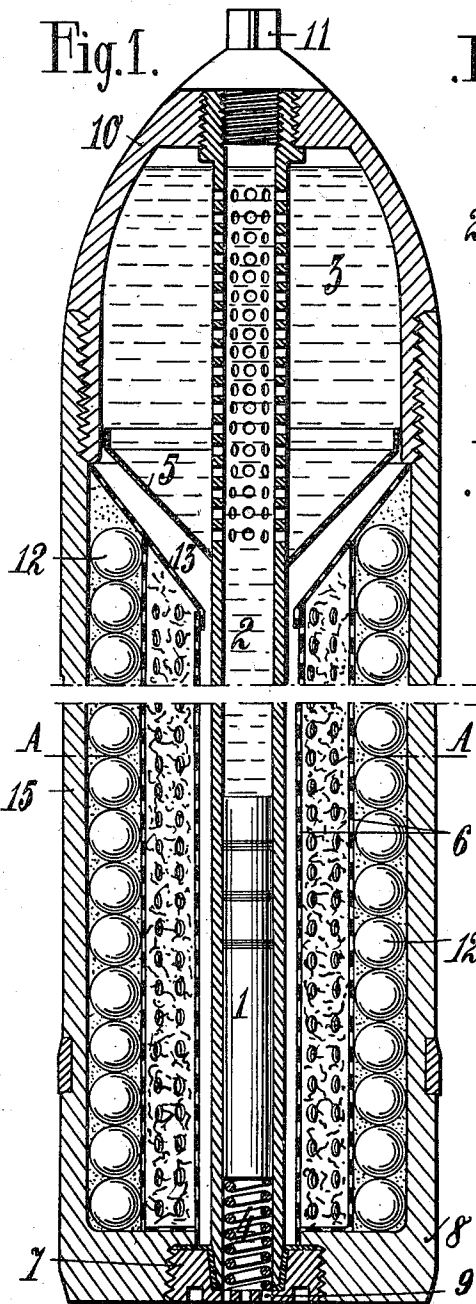
A. BUREAU.
PROJECTILE.

APPLICATION FILED JUNE 26, 1911.

Patented Nov. 26, 1912.

4 SHEETS—SHEET 1.

1,045,671.



Witnesses:
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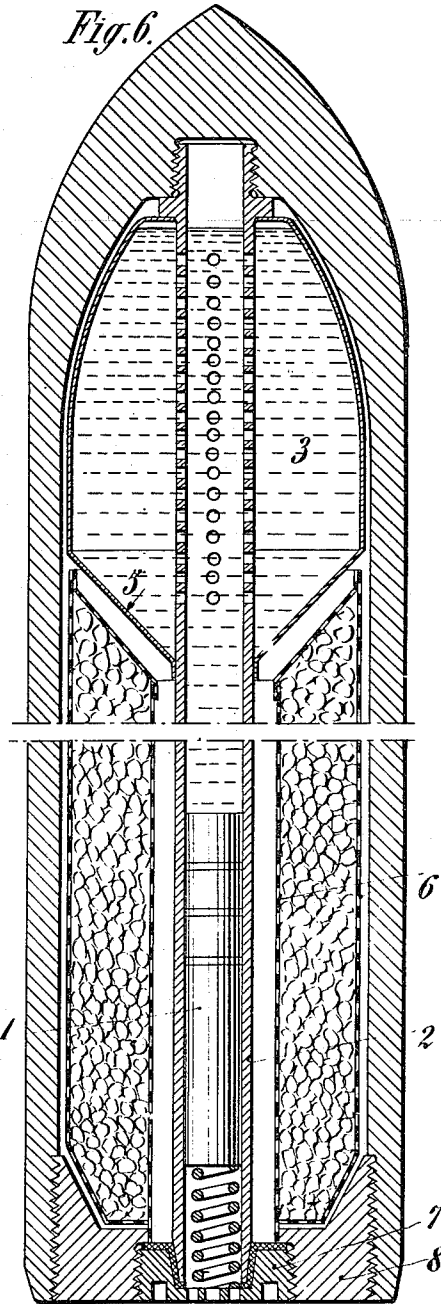
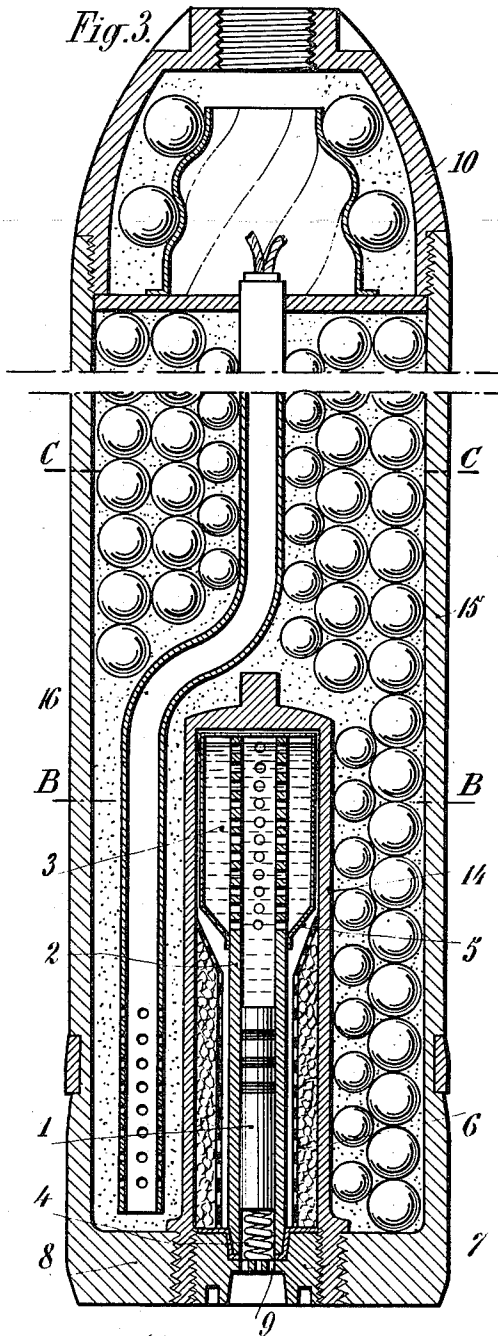
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4 SHEETS—SHEET 2.

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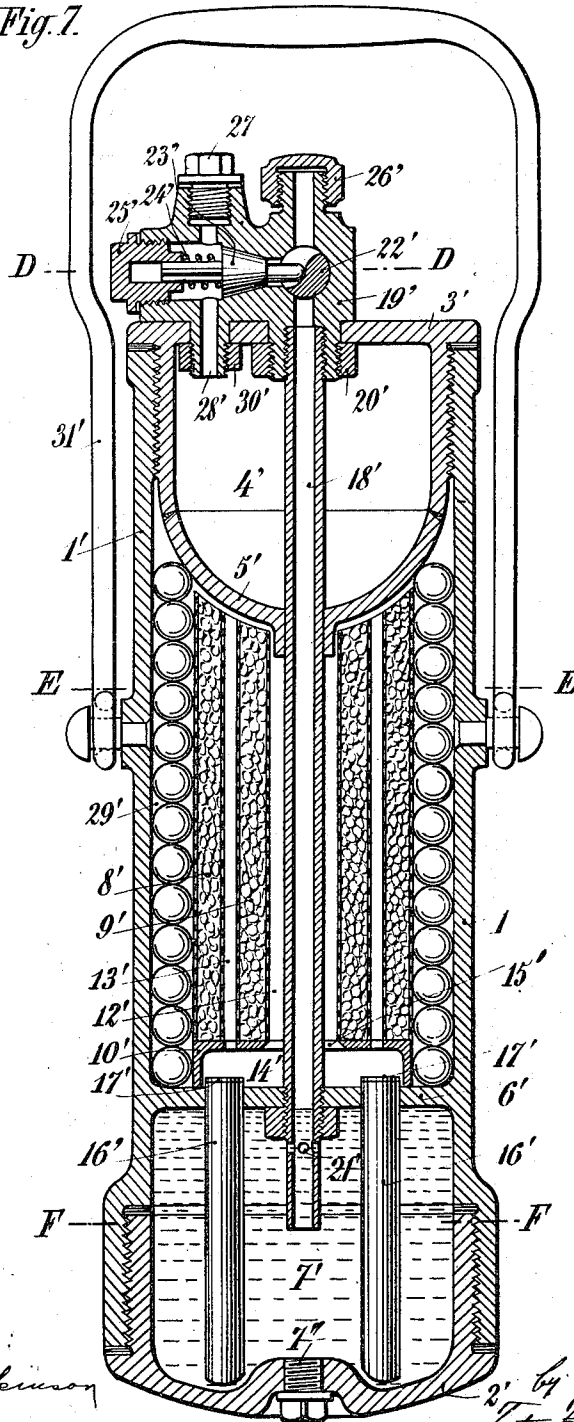
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4 SHEETS—SHEET 3.

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Fig. 7.



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4 SHEETS—SHEET 4.

1,045,671

Fig. 9.

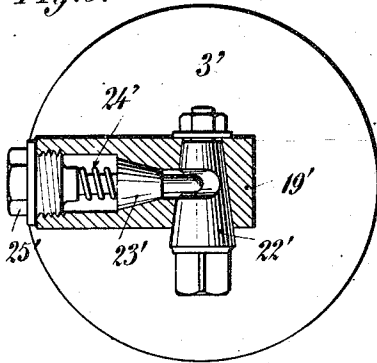


Fig. 8.

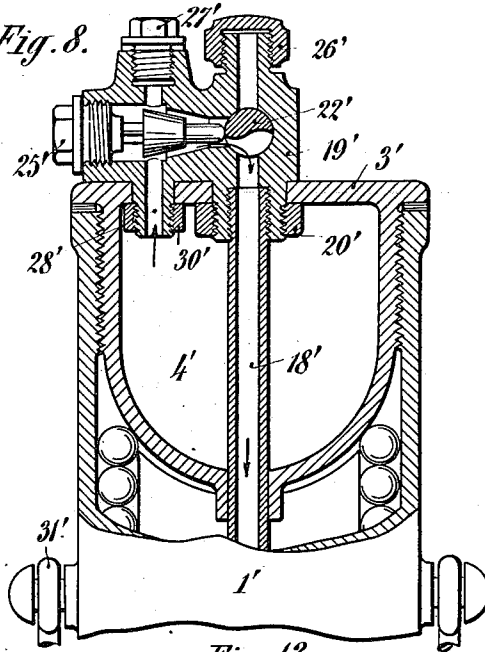


Fig. 10.

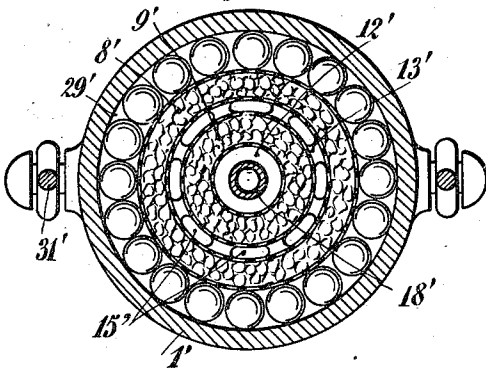


Fig. 11.

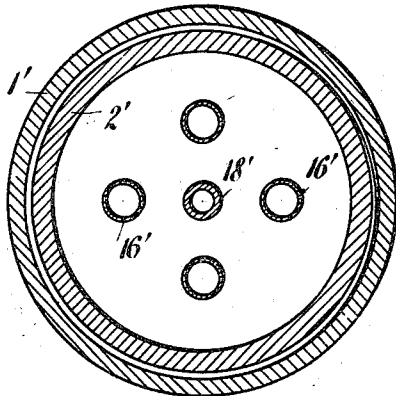


Fig. 13.

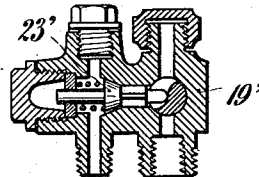
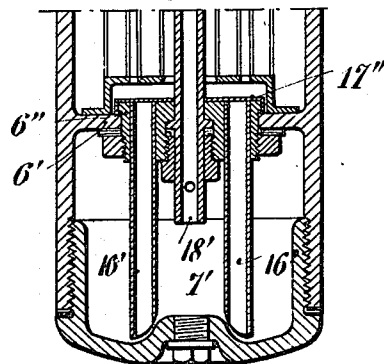


Fig. 12.



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UNITED STATES PATENT OFFICE.

AUGUSTE BUREAU, OF LA FEUILLADE, NEAR NÎMES, FRANCE.

PROJECTILE.

1,045,671.

Specification of Letters Patent.

Patented Nov. 26, 1912.

Application filed June 26, 1911. Serial No. 635,273.

To all whom it may concern:

Be it known that I, AUGUSTE BUREAU, a citizen of the French Republic, residing at La Feuillade, pres Nîmes, France, have invented certain new and useful Improvements in Projectiles, of which the following is a specification.

Starting from the principle that the most powerful explosives generally used in the charges for shells are also the most dangerous, and present considerable danger in their transport and manipulation, the object of this invention is to replace the said charges by acetylene generated in the projectile itself at the moment of its projection, the dissociation of which acetylene, at the pressures to which it will be submitted, produces blasting effects and pressures five times as great as those that would be produced by an equal charge of chlorated powder and almost equal to those of picrate of potash (Berthelot & Vieille). This charge does not present the least previous danger, as it consists of granulated carbid of calcium which can be kept for an indefinite period in a closed vessel and is arranged in a special device owing to which the decomposing liquid element will act only after the projectile has been fired or thrown, and under the action of the pressure of the firing gases.

Several constructions according to this invention are illustrated by way of example in the accompanying drawing in which—

Figure 1 is a section through the longitudinal axis of a projectile constructed according to this invention, Fig. 2 is a cross-section on the line A—A of Fig. 1. Fig. 3 is a longitudinal section showing a shell of the Robin type, in which the device according to this invention is embodied in the form of a deflagrator. Figs. 4 and 5 are cross-sections respectively on the lines B—B and C—C of Fig. 3. Fig. 6 shows, also in longitudinal section, a penetrating shell, the inner charge of which is constituted exclusively according to this invention. The following figures represent a modified construction of the projectile, designed chiefly for being utilized during the travel of an aeroplane or similar aerial apparatus. Fig. 7 is a section through the longitudinal axis of the said projectile, the insulating device of the constituent elements of the acetylene gas being in its closed position. Fig. 8 is a partial longitudinal section of the upper portion of the projectile, the device in question being shown in the

open position. Figs. 9–11 are cross-sections respectively on the lines D—D, E—E and F—F of Fig. 7. Fig. 12 is a partial vertical section showing a modified construction of the device for closing the intercommunication tubes of the water and carbid receptacles. Fig. 13 is a vertical section showing a modified construction of the valve arranged at the upper portion of the shell shown in Figs. 7 and 8.

In all its applications and constructions, the essential device forming the subject of the invention consists in the projectile being provided inside with a water receptacle and a calcium carbid receptacle remaining insulated from each other up to the moment of firing, and brought into communication either automatically by the firing itself (Figs. 1–6) or by means of any suitable mechanical device (Figs. 7–12).

In the constructions shown in Figs. 1, 3 and 6, the device consists of a piston 1 provided with packing segments or grooves, and adapted to move in a tube 2 which terminates at one end in a perforated recess arranged in the breech of the projectile to which the device has been adapted. The other end of the tube 2 is perforated throughout a portion of its length and passes through a receptacle 3 intended to contain a quantity of water which thus penetrates into the said tube up to one of the faces of the piston 1. The latter rests with its opposite face on a spring 4 arranged in the tube 2. The wall of the receptacle through which the tube 2 passes, is conical and constituted by a series of segment-shaped elements 5 (Fig. 4) put on and welded along their radial edges, so as to form between them lines of breakage suitably distributed around the tube 2 and capable of yielding only under a given pressure.

Between the receptacle 3 and its end situated in the breech of the projectile, the tube 2 is surrounded by a perforated annular basket 6 containing a quantity of calcium carbid, and terminating in a funnel perforated at its end corresponding to the receptacle 3. The empty space is left between the inner cylindrical wall of the said basket 6, and the corresponding outer wall of the tube 2, as well as between the conical end of the said basket and that of the receptacle 3.

In the construction shown in Fig. 1, the recess for the tube 2 is constituted by a screw cap 7 screwed into the breech 8 of a

shell of the Robin system. The said nut or cap 7 is provided with perforations 9 which establish communication between the rear face of the piston 1 and the outside of the breech of the shell. In the same construction shown in Fig. 1, the tube 2 is screwed into the ogival end 10 of the projectile, which terminates in a nut 11 provided with a polygonal head facilitating its insertion. This ogival portion constitutes the outer wall of the receptacle 3. Between the outer cylindrical wall of the basket 6 and the corresponding inner wall of the projectile is arranged shrapnel constituted by steel balls 12.

The method of assembling the parts is as follows: Into the casing of the projectile is placed the outer cylindrical portion of the basket 6 which leaves around it an annular space for receiving the balls 12. Then the inner cylindrical portion of the said basket is placed in position concentrically, an annular space being left between the said inner and the outer portions, into which is placed granulated carbid of calcium. The funnel 13 of perforated sheet metal, which constitutes the lid or cover of the basket is then placed in position. The ogival portion 10 of the projectile carrying the tube 2, is then screwed on the body 15 of the said projectile. The projectile is turned over, and into the tube 2 of the same is introduced water which fills the tank 3 and the tube 2 up to a level leaving an empty space equal to the length of the piston 1 and of the spring 4. The said piston 1 and the spring 4 are put in, and the screw cap 7 screwed on. The projectile is then ready for firing, and is provided inside with a charge consisting of separate elements each of which is harmless by itself, this being a characteristic feature of the invention. When the projectile is to be used, it is introduced into the chamber of the gun with the firing cartridge in the usual manner.

At the moment of the firing of the cartridge, there is produced in the chamber a very heavy pressure which is also exerted on the piston 1 and causes it to force back the water contained in the tube 2. This water passing in an excessive quantity into the receptacle 3, brings about the bursting and widening of the cone 5. All the water contained by the said receptacle is then forced into the central portion of the basket and comes into contact with the calcium carbid which is spontaneously decomposed, acetylene gas being produced which, being in a closed space, is very quickly compressed and reaching a very great pressure in a few seconds becomes heated to such an extent that the said acetylene is dissociated and fired. Berthelot & Vieille have proved that the explosive effects of acetylene under pressure, are five times as powerful as those of

chlorated powder and almost as powerful as those of picrate of potash and even of fulminate of mercury.

In the modified construction shown in Figs. 3-5, the same device in smaller size is applied as a firing device for insuring in an absolute manner the explosion of the shell. In the said construction, the whole of the device comprising the piston 1, the tube 2, the receptacle 3 and the carbid basket 6, is inclosed in a casing 14 screwed in the interior of the shell, into the breech 8. The screw cap 7 is screwed into the said casing 14, and secures the tube 2 between it and the bottom of the casing.

The fuse tube 16 which leads from a nose fuse is curved so as to clear the casing 14. This fuse tube is used if it is desired to employ an independent fuse but of course an independent fuse is not essential.

The working is similar to that of the construction shown in Fig. 1, and its action is the result of the increase of temperature of the casing of the cartridge and of its explosion.

In the application of the device according to this invention to a penetration shell, as shown in Fig. 6, the shrapnel is done away with and replaced by a larger charge of calcium carbid which correspondingly increases the power of the projectile and consequently its destructive effects.

In all of the above constructions, any effects that water might produce owing to a shock during transport, are paralyzed by the spring 4 which acts as a dash-pot and enables the water to expand without interfering with the tight joint of the water reservoir.

In the construction shown in Figs. 7-11, the projectile comprises a shell constituted by a cylindrical body 1' preferably of tempered steel, at the ends of which are screwed in, on the one hand, a breech 2', and on the other hand a cover 3'. The said cover is hollow and constitutes a tank 4' in which a compressed fluid (air, carbonic acid or the like) is stored and which is closed by a spherical cap 5' secured to the flange of the cover 3' by autogenous welding or in any other suitable manner. At a certain distance from its lower end, the body 1' is provided with a partition 6' forming between it and the breech 2' another tank 7' into which water is introduced, this introduction being effected through a plug 7'' with which the breech 2' is provided at the center. The tank 7' is tinned or enameled inside so that it can not become oxidized and so that the water can be kept for an indefinite time.

The portion between the partition 6' and the spherical cap 5', forms a chamber into which are placed baskets 8' 9' containing granulated calcium carbid and which are

arranged concentrically on one and the same bottom 10'. In the center and between these baskets spaces 12' and 13' are left communicating with a chamber 14' formed below the bottom 10', by means of openings 15' provided to that effect in the said bottom. At the moment of firing, the chamber 14' itself communicates with the water tank 7' by means of tubes 16', the bottom end of which is open and reaches close to the bottom of the said tank, whilst the upper end of the said tubes is covered by a thin washer 17' kept in place by a slight tin soldering or other means so adapted that the said washer 17' may be broken by a given pressure coming from the tank.

Through the center of the tank 4' and of the intermediate chamber passes longitudinally a tube 18' having its upper end screwed into the casing of a cock 19' mounted on the cover 3' and held tightly on the latter by means of a nut 20'.

The lower end of the tube 18' passes with a tight joint through the partition 6', and is provided below the said partition with a series of holes 21', and ends about half-way through the tank 7'.

In the construction shown in Fig. 12, the washers 17' of the above construction are replaced by a single disk 17'' of an easily deformable material such as sheet tin, and slightly soldered with its circumference to the flange of the union 6'' in which the tubes 17' are mounted, and with its central orifice to the tube 18'.

The plug 22' of the cock mounted in the casing 19', acts as a cam for opening at the same time a valve 23' and allowing compressed air to escape through the pipe or tube 18', as shown in Fig. 8. The said valve 23' is exposed to the action of a spring 24' having the tendency to keep it closed, concurrently with the pressure of the air contained in the tank 4'. A plug 25' closes the opening made in the casing 19' so as to enable the seat of the valve 23' to be bored, and forms a guide for the latter. Another plug 26' closes the opening of the pipe or tube 18', and a third plug 27' closes the extension of the conduit 28' through which compressed air passes from the tank 4' to the valve 23', and is used for discharging compressed air if it is desired to discharge the shell.

The valve 23' can be constituted as shown in Fig. 13, that is to say, provided with a spider guided in the corresponding conduit of the casing 19', insuring perfect concentricity of the said valve and its seat.

Between the wall of the shell and the circumference of the carbid baskets, is arranged an annular space 29' within which is placed a number of balls of tempered steel.

A handle 31' is pivoted to the body 1', a little above the center of its height, in order that the greatest weight should be at the

bottom. When the handle is released, it falls under the projectile which then keeps its vertical position.

The assembling of the parts of the shell is effected as follows. The casing 19' is first secured to the cover 3' by means of nuts 20' and 30' which close hermetically the openings through which the branches of the said casing pass. The tube 18' is screwed into the casing 19', and an air tight joint is formed by means of tin soldering or in any suitable manner. The spherical cap is placed around the tube 18' and secured with its edge to the cover 3' and with its hub to the tube 18', by autogenous welding. The plug 26' is unscrewed, and is replaced by the union for the discharge pipe of an air compressing pump, the tank 4' being charged with such compressed air to a pressure of 10-12 atmospheres. This charging is effected before the tank is mounted on the shell. The washer 10' is then introduced into the body 1 as well as the baskets 8' 9' previously charged with calcium carbid, and the balls are then placed into the annular space 29'. The cover 3' is screwed on the body 1 by introducing the tube 18' through the central hole of the partition 6', the said tube being of a length sufficient to engage with the said hole before the screwing of the cover 3' on the body 1' begins. The vessel intended to receive the water having been previously tinned, as well as the tubes 16', the latter are screwed into the partition 6' and afterwards fixed by tin soldering, and the breech 2' is screwed on the body 1'. The shell is finally turned over, the plug 7'' is unscrewed, and the tank 7' filled with water. The plug 7'' is replaced, whereupon the shell is ready for throwing or firing.

The operation is as follows: As long as the plug 26' of the cock remains closed (position Fig. 7) water cannot get into the central compartment of the shell, so that the calcium carbid remains intact, and the bursting of the shell cannot take place, even if the latter is dropped, or accidentally allowed to fall. This shell offers therefore every guarantee from the point of view of safety, which cannot be said for shells with a charge of powder as used at present. At the moment of dropping the shell during the flight from an aerial machine (aeroplane or other aviation apparatus), the cock 22' is opened, which at the same time produces the opening of the valve 23'. The compressed air at once gets through the tube 18' into the water tank 7', and by exercising its pressure on the water, forces it through the tubes 16', the washers 17' of which, yielding to the thrust exercised on them, will break. In escaping through the tubes 16', water is distributed in the small chamber 14' and passes through the openings 15' into the in-

terior of the two baskets 8' and 9', in which it completely and instantly covers the carbid under a comparatively considerable pressure which merely facilitates the decomposition of the said carbid and the generation of acetylene gas. The compressed air having driven out the whole of the water from the tank 7', an equilibrium of pressure will be established in the two tanks 4' and 7', which pressure remains fairly high and increases with that of the acetylene gas which, during the first seconds, reaches that of the liquefaction. With that increase of pressure takes place a considerable increase of temperature to the extent of several thousands of heat units, which brings about the dissociation of the elements and the explosion of the shell at a pressure five times as great as those that would be produced by equal charges of chlorated powder.

This shell specially designed for aeroplanes and aviation apparatus, has the following advantages:

1. Complete and absolute safety in case of a bad landing of the aeroplane or aviation apparatus, the shell remaining perfectly neutral and its firing device remaining inoperative.

2. Terrific explosion after fall with projection of shrapnel and splinters at very high speeds and pressures, if the shell before being thrown has been set to explode.

What I claim as my invention and desire to secure by Letters Patent is:—

1. A projectile provided with a chamber adapted to hold water, a chamber adapted to hold carbid of calcium, and means operated by the discharge of the projectile from

a gun to bring the water and carbid of calcium into contact for the purpose set forth.

2. A projectile provided with a chamber adapted to hold water, a chamber adapted to hold carbid of calcium, and a hydraulic piston in communication with the water chamber and with the rear outer face of the projectile for the purpose set forth.

3. A projectile provided with a chamber adapted to hold water, a chamber adapted to hold carbid of calcium, a hydraulic piston in communication with the water chamber and with the rear outer face of the projectile, and a fuse tube with a nose fuse for the purpose set forth.

4. A projectile provided with a chamber adapted to hold water, a chamber adapted to hold carbid of calcium, a chamber adapted to hold compressed fluid, means to connect when desired the water chamber and compressed fluid chamber so as to bring the water into contact with the carbid of calcium for the purpose set forth.

5. A projectile provided with a chamber adapted to hold water, a chamber adapted to hold carbid of calcium, a chamber adapted to hold compressed fluid, a conduit connecting the water chamber and the compressed fluid chamber, and a valve in said conduit for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

AUGUSTE BUREAU.

Witnesses:

H. C. COXE,
GEORGES BONNEUIL.