Aug. 18, 1936. T. DE BOBULA 2,051,331

PROJECTING BOMB

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Fig. 1.

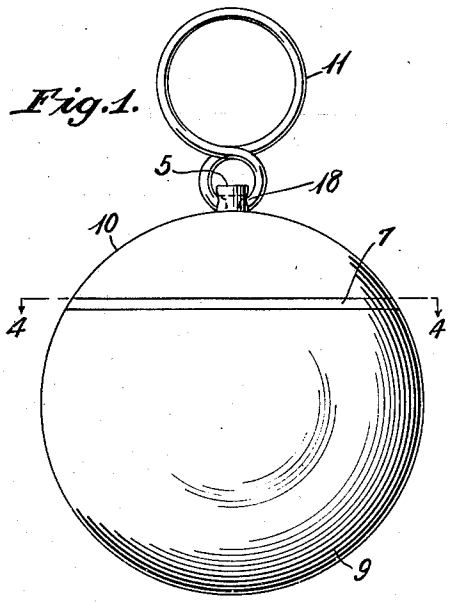


Fig. 2.

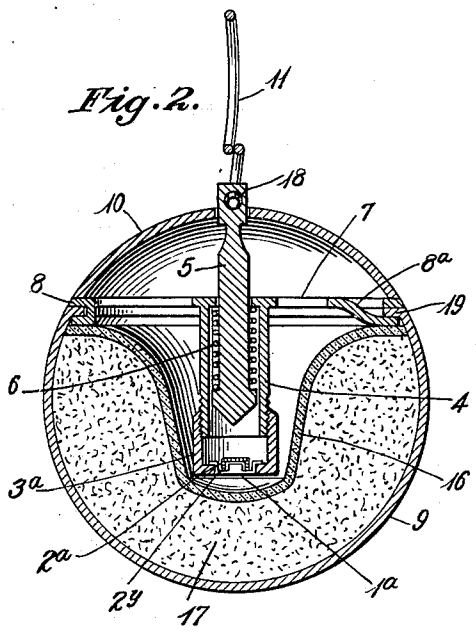


Fig. 3.

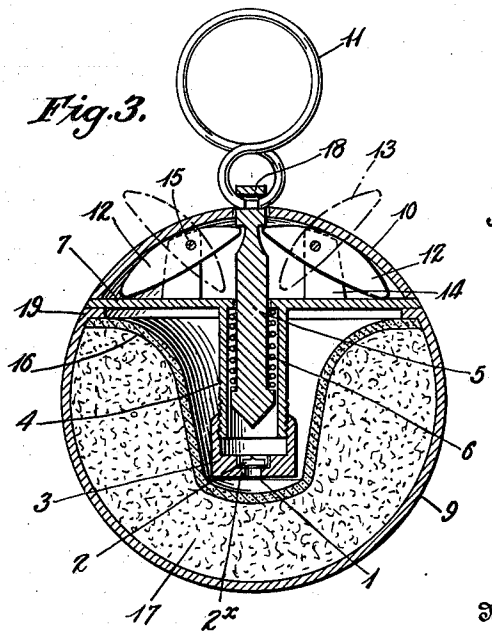
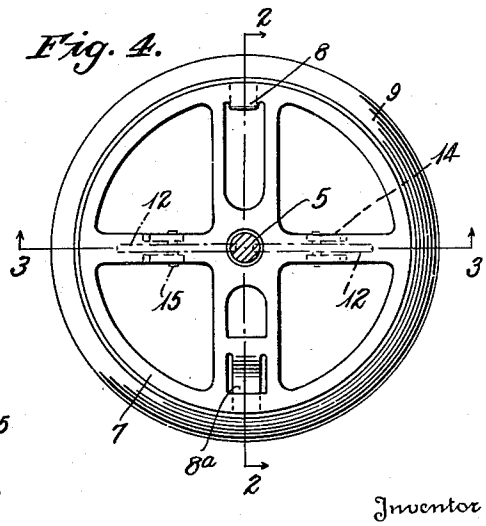


Fig. 4.



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Fig. 7.

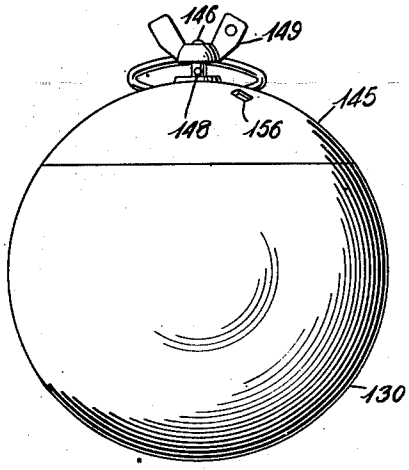


Fig. 8.

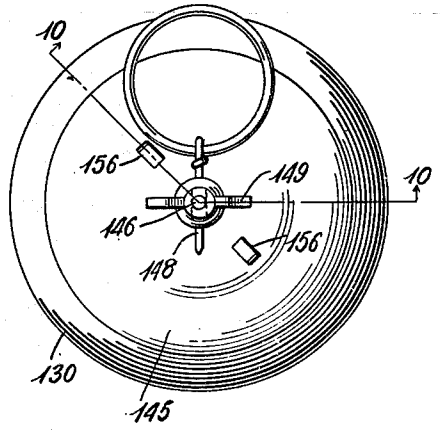


Fig. 5.

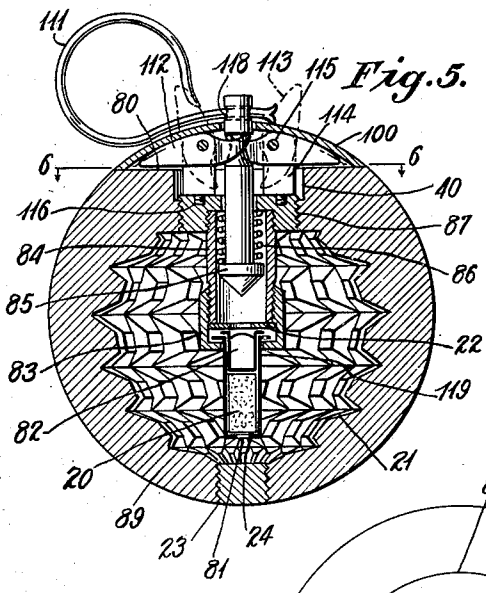


Fig. 9.

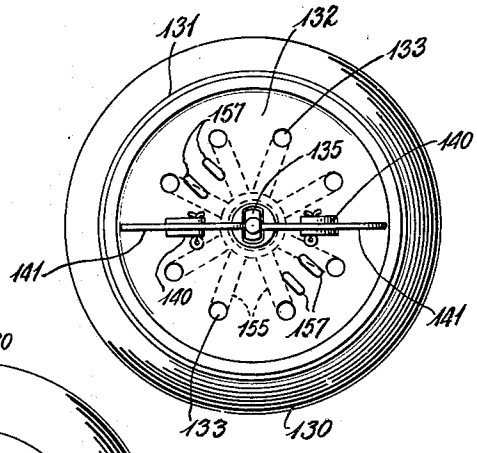
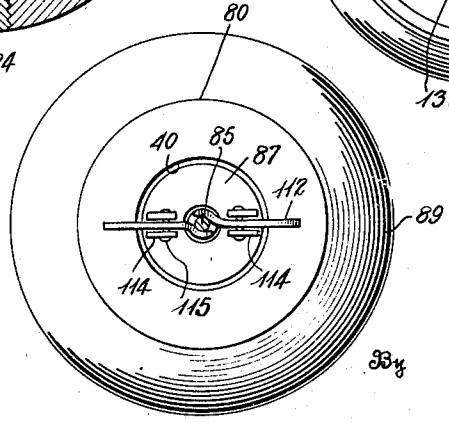


Fig. 6.



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Fig. 10.

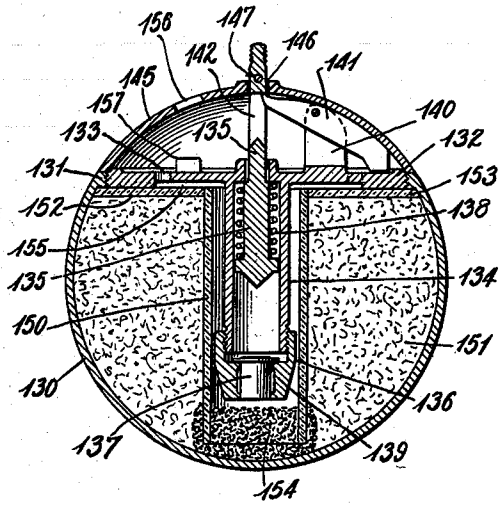


Fig. 11.

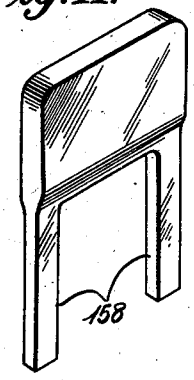


Fig. 12.

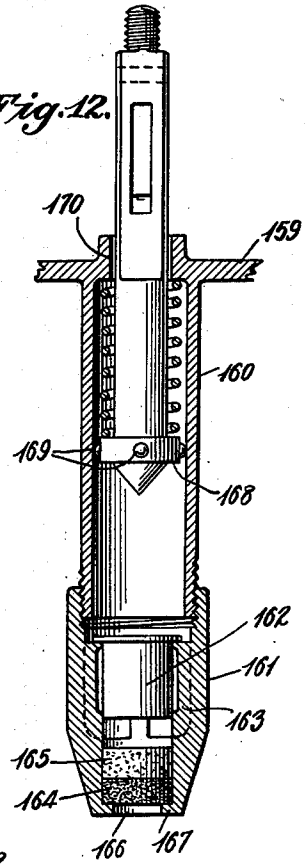


Fig. 13.

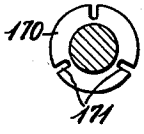


Fig. 14.

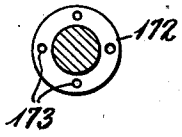


Fig. 15.

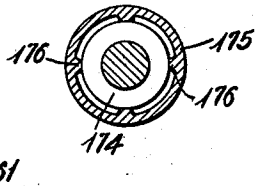


Fig. 16.

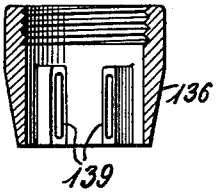


Fig. 18.

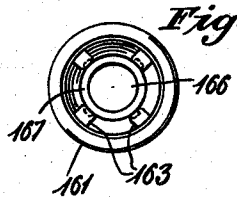
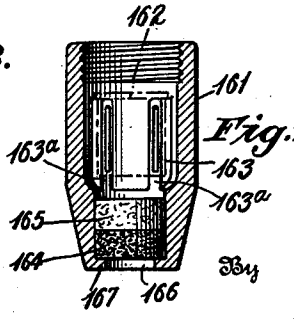


Fig. 17.



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Fig. 19.

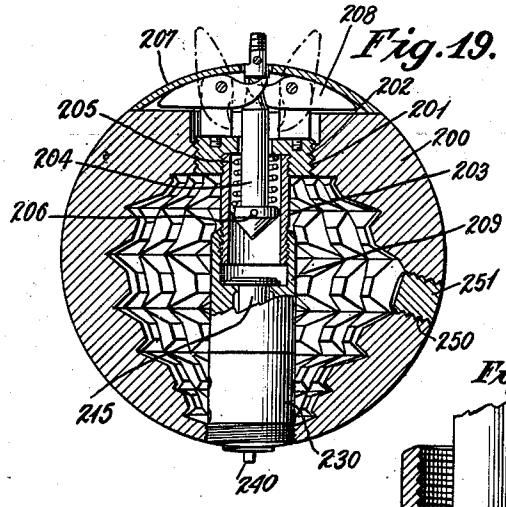


Fig. 20.

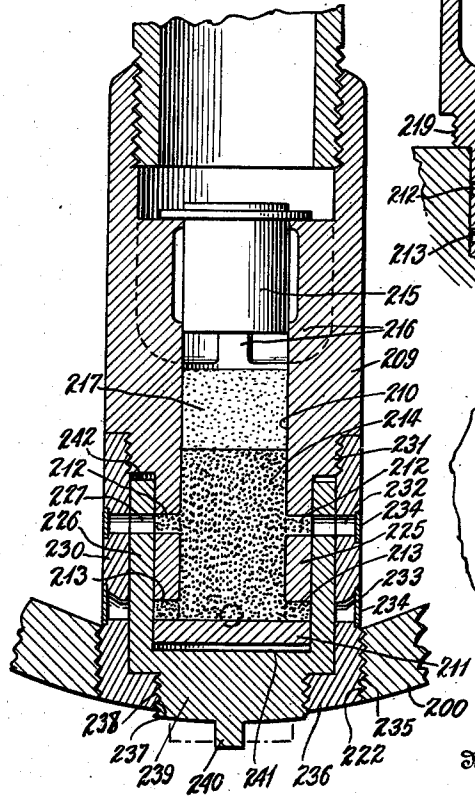


Fig. 22.

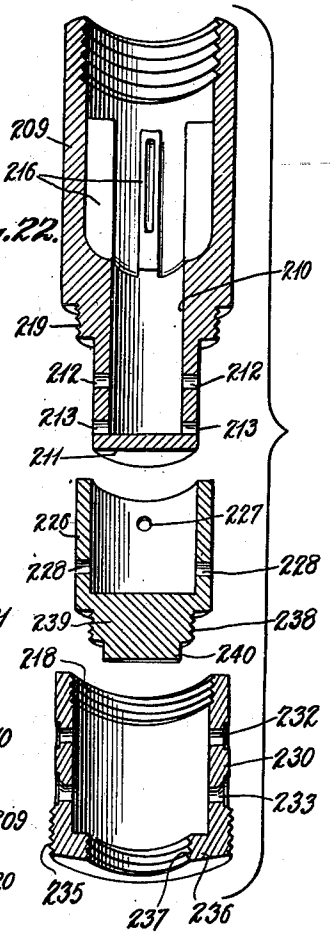


Fig. 23.

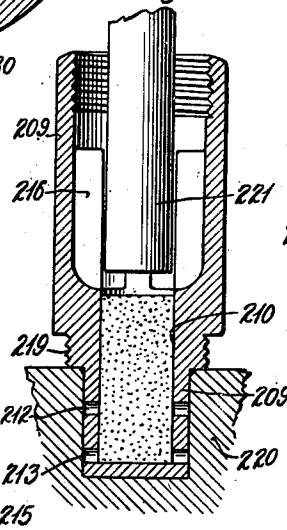
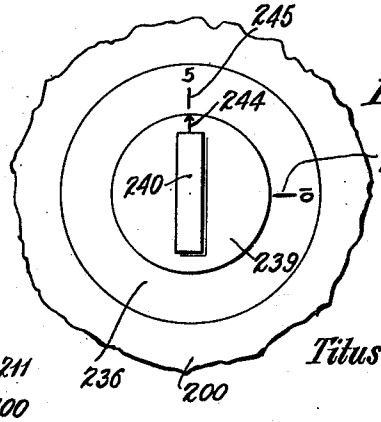


Fig. 21.



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Witness

Patented Aug. 18, 1936 2,051,331

UNITED STATES PATENT OFFICE

2,051,331

PROJECTING BOMB

Titus de Bobula, New York, N. Y., assignor to Charles Jagemann, New York, N. Y.

Application June 1, 1934, Serial No. 728,597

10 Claims. (Cl. 102—29)

This invention relates to throwing bombs, by which I mean any of the various kinds of missiles comprising a casing containing an explosive, incendiary, or gas-producing material for the purpose of fragmentation or emission of smoke, flame, or gases. The present application is a continuation-in-part of my application, Serial No. 650,149, filed January 4, 1933.

One object of my invention is to provide a bomb which can be easily and accurately thrown.

Another object is to provide a throwing bomb having a firing mechanism which operates with certainty.

Another object is to provide a throwing bomb which can be made to explode or commence to produce smoke, flame, or gases at a time separated by an accurately regulated interval from the instant the bomb is thrown.

Another object is to provide a bomb in which the period of delay in firing can be adjusted.

Another object is to simplify the construction of the bomb so that its parts can be made and assembled economically.

Another object is to provide a bomb having a double safety device to prevent premature firing.

Another object is to provide a bomb in which the active charge is completely sealed within a space formed by a container and a hardened plastic sealing layer.

Another object is to provide a bomb in which the active charge is tightly held between a casing and a plate which screws into the casing, the plate bearing a firing mechanism which projects into a cylindrical depression in the body of the charge, this depression being lined with an inflammable hardened plastic layer.

Another object is to provide a bomb having a firing mechanism provided with a compressed timing pellet composed and held in a way which insures regular burning and an exact interval of delay.

Other objects will appear from the following specification describing several embodiments of the invention with reference to the accompanying drawings, in which

Fig. 1 is an elevation of an assembled tear gas bomb in accordance with my invention,

Fig. 2 is a vertical section on the line 2—2 of Fig. 4,

Fig. 3 is a vertical section on the line 3—3 of Fig. 4,

Fig. 4 is a horizontal section looking down on the line 4—4 of Fig. 1,

Fig. 5 is a central vertical section of a fragmentation bomb made in accordance with my invention,

Fig. 6 is a horizontal section on the line 6—6 of Fig. 5,

Fig. 7 is an elevation of a modified form of tear gas bomb in accordance with my invention,

Fig. 8 is a plan view thereof,

Fig. 9 is a view of the same bomb from above, with the cover and safety devices removed,

Fig. 10 is a vertical section on the line 10—10 of Fig. 8,

Fig. 11 is a perspective view of a wrench used in assembling the bomb,

Fig. 12 is a detail sectional view of a modified form of barrel and firing pin,

Figs. 13 and 14 are transverse sections through two different forms of the firing pin,

Fig. 15 is a transverse section through a barrel and firing pin of still another form,

Fig. 16 is a detail axial section of the percussion cap cup shown in Fig. 10,

Fig. 17 is a similar view of the timing cup shown in Fig. 12,

Fig. 18 is a plan view of the timing cup shown in Fig. 17,

Fig. 19 is a vertical sectional view of a modified form of fragmentation bomb,

Fig. 20 is a detail sectional view of the timing device of the bomb shown in Fig. 19,

Fig. 21 is a bottom view of the timing device,

Fig. 22 is an exploded view in perspective section of the parts composing the timing device, and

Fig. 23 is a sectional view of the timing cup, illustrating the method of filling the same.

The bomb shown in Figs. 1 to 4 is an incendiary, or smoke, or gas-producing bomb. In this illustrative embodiment the casing 9 is of a truncated spherical shape. The firing mechanism is carried by a support in the form of a spider plate 7 placed across the mouth of the casing and attached to flange 10 in any suitable way, as by lugs 8, or 8a. A barrel 4, fixed to plate 7, extends downward into the casing and contains a firing pin 5 having a pointed head which guides it in the barrel 4 and behind which is an actuating spring 6 abutting at its upper end against the bottom of plate 7. The lower end of barrel 4 is threaded to receive an internally threaded cup 3 (Fig. 3), or 3a (Fig. 2) containing a percussion cap 2 (Fig. 3) in a central recess formed by a flange 2x in the firing hole 1, or a percussion cap 2a (Fig. 2) in a central recess formed by a bent piece of metal 2y resting in the firing hole 1a.

On the top side of plate 7 are bearings 14 carrying latch devices in the form of levers 12 piv-

oted on the bearings at 15. The inner ends of these latches engage the reduced neck of the firing pin 5 and in the full line positions shown at 12 in Fig. 3 hold the firing pin up against the influence of spring 6. The latches are held in this position by a cover 10 which, when it rests upon the plate 7, completes the spherical shape of the bomb. The top of the firing pin extends through a hole in cover 10 and is provided with an aperture 18 to receive a combined safety clamp and handle 11.

The casing 9 is partially filled with a charge 17 of a desired composition for producing the intended effect and is covered in known manner with a stable surface layer 16. As shown in Figs. 2 and 3, the filling composition is shaped with a central depression to receive the firing mechanism.

The bomb is assembled in the following manner:

The plate 7 and barrel 4 being fixed together, spring 6 is slipped into the open end of the barrel and, while the latches are held in the dotted line position 13 (Fig. 3), firing pin 5 is slipped through the inside of spring 6 and pushed against the spring as the latches are adjusted into position in the neck of the firing pin. Thereupon, by pressing down cover 10 against the ends of latches 12, the outer ends of the latches are pushed down while the inner ends draw the firing pin upward through the hole in the cover. When the aperture 18 is exposed, clamp 11 is snapped into place. The firing mechanism is now locked in cocked position. Next a percussion cap or primer 2 is fitted in the recess of the cup 3 and the cup is screwed onto the end of barrel 4. The composition 17 is packed into the casing, shaped up as shown, and covered with a coating 16. The firing mechanism is now applied to the casing by slipping lugs 8, or 8a, through slots (not shown) in flange 19 and turning the plate 7 to a full portion of the flange, in which positions the lugs 8, or 8a, may be separated from the slots in rim 19 by raised points (not shown) on the rim.

When the bomb is to be thrown, it is held in the palm of the hand while the cover 10 is held down by two fingers, then clamp 11 is removed and the bomb is thrown. At the instant it leaves the hand, the cover is thrown off as latches 12 snap to the dotted line position 13 under the influence of spring 6. The head of the firing pin 5 strikes percussion cap 2, which discharges through firing-hole 1 and ignites the charge of the bomb. The firing of the charge of the bomb is preferably timed to occur during the flight of the bomb through the air, so that there is no time for the bomb to be picked up and thrown back. The gas, smoke, or flame pours out through the openings in plate 7, thus the casing is not ruptured, nor can it get into a position in which the openings 7 would be closed, because the latches prevent it.

Fig. 5 shows a fragmentation bomb. A casing 89, which in this case also is shown in the preferred spherical shape, is preferably composed of cast metal deeply grooved on the inside, as shown at 21, to facilitate fragmentation. The spherical casing is cut off on a plane surface 80, at the center of which an aperture 40 opens into the interior of the casing. The sides of the aperture 40 are threaded to receive an externally threaded circular plate 87, which forms a support for the firing mechanism. A barrel 84 is screwed to the bottom of plate 87 and holds a firing pin 85 and an actuating spring 86. The firing pin extends through a central aperture in plate 87 into the space between a cover 100 and the plate 87. Bearings 114, which may be secured to plate 87 by screws or rivets 116, carry latches 112 pivoted at 115. These latches are arranged radially with respect to the firing pin, but their inner ends are curved around the narrowed neck of the firing pin to engage the same laterally. The firing pin extends through a hole in cover 100 and is provided with an aperture 118 to receive a locking element or clamp in the form of a looped wire 111.

A cup 83 is screwed onto the bottom of barrel 84 to hold in place a timing pipe 119 containing a timing pellet, wafer, or rod 20, preferably composed of an explosive compressed by a pressure dependent upon the time interval desired between the firing of the primer and the explosion of the charge. At the upper end of timing pipe 119 is a percussion cap or primer 82. The timing pipe and percussion cap may be flanged at their upper ends to be clamped between a fiber washer 22 at the base of the barrel 84 and a flange surrounding the aperture in cup 83. The timing pipe may also be cast or machined in one piece with cup 83. At the bottom of timing pellet 20 is a tinfoil disk 24 sealing the firing hole 81.

The assembly of this form of the bomb is substantially the same as the one first described, with such modification as is required by the different form of the primer and timing pellet. The casing may be filled with the explosive charge through an aperture at the bottom which will be sealed by a plug 23 in known manner. The packing of the explosive into the casing will take place as the last step after the firing mechanism has been fixed in place.

In operation the bomb is held in the palm of the hand, the cover is held down by two fingers, the locking wire 111 is pulled out, and the bomb is thrown. The cover flies off as the latches 112 move to dotted line position 113 under the influence of the actuating spring of the firing pin. The firing of the charge occurs at a definite interval after the percussion cap 82 is struck, this interval being determined by the length and degree of compression of the timing pellet 20.

Figs. 7 to 10 show a somewhat better form of tear gas bomb than the one represented in Figs. 1–4, though the two are the same in their principal features. A casing 130 of truncated spherical shape has at the edges of its open top a threaded flange 131. Into this flange is screwed a slab 132 perforated at 133 for the escape of gases from the charge. From the lower face of slab 132 depends a barrel 134 containing a firing pin 135. The bottom of the barrel is threaded to receive a cup 136 (Fig. 16) holding between radial ribs 139 a percussion cap 137. The pointed head of the firing pin is urged toward the percussion cap 137 by a spring 138. On the top of slab 132 are two diametrically opposed bifurcated bearings 140 pivotally supporting latches 141 which engage at their inner ends in a slot 142 in the firing pin 135. Fitting over the latches 141 and engaging their upper edges is a cover 145, which rests at its lower edge against the edge of the casing 130 and which completes the spherical shape of the bomb. At the center of the cover is a hole 146 to let through the end of firing pin 135. Just clear of the cover in the exposed end of firing pin 135 is a hole 147 to receive a locking pin 148. Beyond this hole the firing pin is threaded to receive a wing nut 149. With the locking pin 148 in place the cover 145 holds latches 141 in retracting position. If the locking pin 148 should accidentally be pulled out prematurely, as occasionally happens, the wing nut 149 stands as a second safety device

to stop the cover before it has released the latches.

The kind of packing illustrated in Figs. 2 and 3 is not entirely satisfactory in all cases, because it tends to loosen up in time, due to changing atmospheric conditions, jarring, etc.; so that it may happen that at least a part of the charge will be free to tumble around in the casing. To avoid this, I prefer to pack the casing in the following manner:

First, a tube 150 of inflammable composition such as celluloid, is plugged at one end with a ball of primer 154, such as black powder and a binder. This tube is then placed in the casing and accurately centered therein by a plug device (not shown) which fits into the tube 150 and is provided at the top with braces to engage the sides of casing 130. The braces are arranged so as to leave openings through which the filling material 151 can be poured and tamped into the space between the casing 130 and tube 150. During this operation the plug device prevents the filling composition from falling into the tube 150. The filling composition is packed up to the level 152, whereupon a plastic inflammable coating 153 is poured over the top of the charge. This coating is of such a nature as to become sealed tightly to the top of tube 150 and the wall of casing 130. When the coating 153 has hardened, the firing mechanism is mounted on the casing, the barrel slipping into tube 150, and screwed into place until plate 132 comes firmly against the coating layer 153. The casing is now packed solidly, except for a central well reserved for the firing mechanism, with a filling composition which presses tightly against the cylindrical tube 150, thus binding tube and filler firmly in place. The slab 132 pressing against the coating layer 153 forms a solid wall to hold the charge in place. The coating 153, the tube 150, and the priming ball 154 form a complete seal over the active charge, preventing access of moisture or other detrimental elements. The barrel 134 and cup 136 fit into the tube 150 with sufficient clearance to permit a rapid progress of the burning of the tube and escape of gases toward the top of the barrel. Channels 155 in the bottom of slab 132 provide paths of escape for the gases to the holes 133.

The slab 132 has to be screwed into the casing 130 after the firing pin has been retracted and the cover locked on. In order to avoid straining the firing pin and cover, as would be necessary if these were used to effect the screwing in of the slab, I provide means for engaging the slab with a wrench. The cover 145 is perforated by slots 156 which are alined above pairs of lugs 157 on the top of the slab. The proper alinement of the slots and lugs may be secured by making the upper end of the firing pin with flat sides and shaping the hole 146 in the cover accordingly. Fig. 11 shows a wrench having two arms 158 adapted to pass through slots 156 and engage between the lugs 157.

Where a considerable time interval is to elapse between the striking of the firing pin and the ignition or detonation of the active charge, I prefer to construct the firing mechanism in the manner shown in Figs. 12–17. A barrel 160 depending from the slab 159 as in the other figures is threaded at its lower end to receive a cup 161 (Fig. 17). In the bore of this cup a seat is formed for a percussion cap 162, by radial ribs 163 terminating in edges 163a equidistant from the axis of the cup. The bore at the lower end of the cup contains a compressed pellet 164 of an explosive composition, and may also contain a looser priming composition 165. The pellet 164 is compressed directly into the bore of the cup by setting the cup on a plug which fills its firing hole 166 to the level of the inner surface of flange 167, pouring in a definite quantity of the composition which is to form the pellet, and pressing this composition into the botom of the bore by means of a plunger of the same diameter as the bore. The degree of compression and amount of the composition 164 determine the length of time which will be required for the pellet 164 to burn through. To assist the ignition of the pellet 164, particularly when it is highly compressed, the looser primer 165 may be used. By this procedure and construction the pellet 164 is so tightly compressed against the inner walls of the cup that there is no possibility of flashing through around the edges of the pellet. In order to provide a way of escape for the gases resulting from the burning of the cap 162 and the primer 165 and pellet 164, the firing pin and barrel are formed in such a way as to permit the escape of the gases up through the barrel. Fig. 12 shows one way in which this can be done. At its lower end the firing pin has a collar 168 with three or more knobs 169 arranged symmetrically around its periphery. These knobs guide the head of the firing pin along the inner wall of the barrel while holding the collar spaced from the barrel. Thus the gases from the explosives burning in the bore of cup 161 escape between ribs 163 to the top of the cup and thence through the barrel past collar 168 up to the hole 170 in the slab 159 through which the firing pin extends. In this way the timing pellet is relieved of pressure which might blow it through the hole 166 or interfere with its normal burning speed.

Alternative constructions of the firing pin and barrel for providing means of escape for the gases are illustrated in Figs. 13–15. In Fig. 13 the collar 170 is provided with slots 171 opening through its edges. In Fig. 14 the collar 172 is perforated by holes 173. In Fig. 15 the collar 174 is solid, but the inner wall of the barrel 175 is provided with ribs 176 to guide the collar.

The time of delay between the throwing of the bomb and its discharge will depend upon how far the bomb is to be thrown. Therefore, it is desirable to have this period adjustable. This is particularly so in the case of bombs which may be thrown either by hand or by a projecting device, such as a rifle projector. Figs. 19–23 illustrate a bomb provided with such an adjustment.

Figure 19 shows the bomb in vertical section, and it will be seen that for the most part, it is very similar to the bomb shown in Fig. 6. A deeply grooved casing 200 is provided at the top with a threaded aperture 201 to receive a plate 202 bearing the firing mechanism. From the bottom of this plate depends a barrel 203 containing a firing pin 204 urged downward by a spring 205. The head of the firing pin is provided with knobs 206 to maintain a space through which gases can escape upward through the barrel. The cover 207 and latch devices 208 are constructed and operate in the same way as in the forms of the invention previously described.

Onto the lower end of the barrel 203 is screwed a timing cup 209 of somewhat different form from the ones previously described. As shown particularly in Figs. 20 and 22, this timing cup

has a central bore 210 closed at the bottom by an end wall 211, but provided along its sides with holes 212 and 213. The bore 210 is packed to a certain level above the holes 212 with a compressed slow-burning composition 214. This packing may be performed in the manner illustrated in Fig. 23. The timing cup 209 is set int a die 220 to cover the holes 212 and 213. Thereupon, there is filled into the bore 210 the proper amount of a composition which is to form the ignition device or timing rod 214, and a plunger 221 is forced into the bore 210, compressing the composition to a degree which will give the required burning speed; the harder the compression, the slower the burning speed. The composition 214 is thereby pressed into the bottom of the timing cup and out into the holes 212, 213 as far as permitted by the die 220.

Returning to Fig. 20, above the composition 214 is a percussion cap 215 mounted in seat formed by radial flanges 216. Between the percussion cap and the hard composition 214, there may be a more loosely packed composition 217 to facilitate the ignition by the percussion cap. The timing rod 214 after being ignited at the top burns progressively at a definite speed. The holes 212 and 213 provide alternative ports through which the flame may spurt to ignite the active charge of the bomb. The alternative opening of these ports may be controlled in any desired way. I have shown one satisfactory arrangement for this purpose in the drawing. Fitting firmly, but rotatably over the lower end 225 of the timing cup 209, is a sleeve 226 having holes 227 to register with holes 212, and holes 228 to register with holes 213. There are two of each of these holes, the pairs of holes 212 and 213 being arranged in the same plane, while the pairs of holes 227 and 228 are in planes at right angles to each other. Thus, when the sleeve 226 is turned through 90 degrees from the position shown in Fig. 20, the holes 228 will be brought into register with holes 213, and the holes 212 will be closed by the sleeve. In order to seal off the sleeve from the active charge of the bomb, to avoid the danger of ignition of the charge by friction in adjusting the sleeve, I provide a shield 230 having threads 218 to screw onto threads 219 on a shoulder 231 of the timing cup 209. The shield fits closely over the sleeve 226 and has holes 232 and 233 registering with the holes 212 and 213 of the timing cup. The holes 232 and 233 can be closed before the active charge is packed into the bomb by destructible plates 234, in order to exclude the active charge from the sleeve 226. The lower end of shield 230 is externally threaded at 235 to screw into corresponding threads in an aperture 222 at the bottom of the casing 200. The lower end of the shield also has a flange 236 provided with threads 237 to engage corresponding threads 238 on a plug 239 to which the sleeve 226 is integrally joined. The plug 239 bears a lug 240 by which to turn it.

Figure 20 shows the parts in the short-interval position in which the flame from the composition 214 is to spurt through the holes 212, 227, and 232. Since the plug 239 is connected to the shield 230 by screw threads, when the plug is turned it will also rise. Therefore, the parts are designed to provide a space 241 between the plug 239 and the bottom wall 211 of the timing cup, equal to one quarter pitch of the screw threads 237. A similar space is provided at 242 between the upper edge of sleeve 226 and the shoulder 231 of the timing cup. Also, holes 228 are the same distance below holes 213 in Fig. 20. The flange 236 and bottom wall 211, as well as shoulder 231, thus form limit stops for insuring accurate alignment of the holes of the sleeve with the holes of the timing cup and shield. The alignment of these holes may also be indicated by a pointer 244 on plug 239 and graduations 245, 246 on the shield 230. These graduations may be marked according to the periods of delay, for instance, 5 and 10 seconds.

In assembling the bomb, the timing cup 209 is mounted on barrel 203 and these parts are inserted in the casing and plate 202 screwed home. The sleeve 226 is then fitted into shield 230 and the plug 239 screwed into place. Thereupon, the shield and sleeve are fitted over the lower end 225 of the timing cup 209 and the shield is simultaneously screwed onto the threads 222 and 219. In order to avoid the necessity for accurate alignment of the barrel 203 with the opening 222 at the bottom of the casing, the screw threads 235 may be made with considerable tolerance, the threads 218, on the other hand, being preferably close fitting. The active charge can be packed into the casing through an opening 250 filled by a plug 251 after the casing is packed. The bomb will normally be stored with the sleeve 226 in the short-interval position, which is the hand-throwing position; then if the bomb is to be projected by rifle, the sleeve 226 is adjusted to the long interval.

When the timing device is set for the long interval, there is no danger of fire spurting through the upper holes 212 and along sleeve 226 to the lower holes 228, which would cause a premature explosion. The sleeve is fitted tightly on the timing cup and, furthermore, there is no high pressure tending to force the flame through this indirect path due to the venting of the combustion products from the percussion cap and timing composition up through the barrel of the firing mechanism.

The holes 233 are preferably given an upward flare at the top edge to direct the fire well up toward the active charge.

I have shown a rotary adjusting device, but the adjustment may be accomplished in any other desired way, for example, by longitudinal movement. Also, the threaded connection between plug 239 and shield 230 may be replaced by a packed joint, in which case there will be no provision for longitudinal movement of the sleeve.

I have shown a timing adjustment providing for only two different intervals, and this will ordinarily be sufficient. However, the invention is not limited with respect to the number of different time intervals for which the adjustment may be provided.

Having described my invention, I claim:

1. In a bomb, a shell, an inflammable cylinder of smaller diameter within said shell, a priming ball sealing one end of said cylinder, an active charge packed into the space between said cylinder and the inner walls of said casing, and means in said cylinder for igniting said priming ball.

2. In a bomb, a casing having an opening therein, a plate extending across said opening, said plate and casing being provided with means for joining them together, an inflammable cylinder of smaller diameter than said casing extending from said plate toward the opposite wall of said casing, a priming ball sealing the end of said cylinder remote from said plate, means in said

cylinder for igniting said priming ball, an active charge filling the space between said cylinder and said casing to within a short distance of said plate, an inflammable coating filling the space between said active charge and said plate, said coating being sealed to said cylinder and said casing, whereby said active charge is completely sealed within an enclosure formed by said casing, said inflammable coating and cylinder, and said priming ball.

3. In a bomb, a casing having a circular opening therein defined by a threaded flange, a circular plate of the size of said opening and threaded at its edges to fit the threads of said flange, an inflammable cylinder of smaller diameter than said casing extending from said plate toward the opposite wall of said casing, a priming ball at the end of said cylinder remote from said plate, means in said cylinder for igniting said priming ball, and an active charge filling the space between said cylinder and said casing and compressed by said plate.

4. A bomb as described in claim 3, wherein an inflammable coating is inserted between said active charge and plate, said inflammable coating being sealed to said casing and to said cylinder.

5. In a bomb, a casing having a circular opening therein defined by a threaded flange, an inflammable tube dividing the space within said casing into an active charge receiving space and a firing mechanism receiving space, a circular plate of the size of said opening threaded at its edges to fit the threads of said flange, and a firing mechanism depending from said plate and adapted to slide into said tube as said plate is screwed into said opening against the active charge.

6. In a bomb, a casing having a circular opening therein defined by a threaded flange, a circular plate of the size of said opening threaded at its edges to fit the threads of said flange, a firing mechanism mounted on said plate comprising a firing pin, actuating means therefor, and restraining means therefor; a cover fitting over said plate, said cover and plate substantially enclosing a space containing said restraining means, said restraining means being held in operative position by said cover, means on said plate to receive a wrench, said cover having holes therein through which to insert the wrench.

7. In a bomb, a shell having a circular screw-threaded mouth, a slab having screw-threaded edges to fit said mouth, a barrel extending downward from said slab into said shell, a spring influenced firing pin in said barrel projecting beyond the upper face of said slab, retracting means for said firing pin mounted on the upper face of said slab, a cap shaped to cover said retracting means and to hold the same in retracting position, said cover having an aperture through which said firing pin projects when retracted, locking means to engage the projecting end of said firing pin and hold the same in retracted position by abutment against said cap, wrench engaging means on said slab accessible from the upper side thereof, said cap having holes through which to insert the wrench.

8. A bomb as described in claim 7, wherein the end of said firing pin projecting through said cover and the sides of said aperture in said cover have mutually conforming non-round shapes whereby the cover can be slipped over the firing pin only in a position in which said holes in said cover are alined with said wrench engaging means.

9. In a bomb, a shell having a circular screw-threaded mouth, a slab having screw-threaded edges to fit said mouth, a barrel extending downward from said slab into said shell, a spring influenced firing pin in said barrel projecting beyond the upper face of said slab, retracting means for said firing pin mounted on the upper face of said slab, a cap shaped to cover said retracting means and to hold the same in retracting position, said cover having an aperture through which said firing pin projects when retracted, locking means to engage the projecting end of said firing pin and hold the same in retracted position by abutment against said cap, said locking means comprising a primary locking device consisting of a locking pin extending through a hole in said firing pin in direct engagement with said cover, and a secondary locking device consisting of a nut screwed onto the end of said firing pin above said locking pin.

10. In a bomb, a casing, an active charge therein, firing means comprising a tube containing a slow burning composition, means for igniting said composition at one end, said tube having apertures spaced longitudinally along the same, a sleeve fitting over said tube and having holes adapted to be selectively brought into register with the holes of said tube for admitting fire from said composition to said active charge, and a shield mounted over said sleeve to exclude the active charge therefrom during adjustment, said shield having apertures registering with the apertures of said tube, the apertures of said sleeve being covered with destructible plates.

TITUS DE BOBULA.