Aug. 1, 1944. E. L. SAMANN 2,354,882

INCENDIARY BOMB

Filed Dec. 29, 1941 3 Sheets-Sheet 1

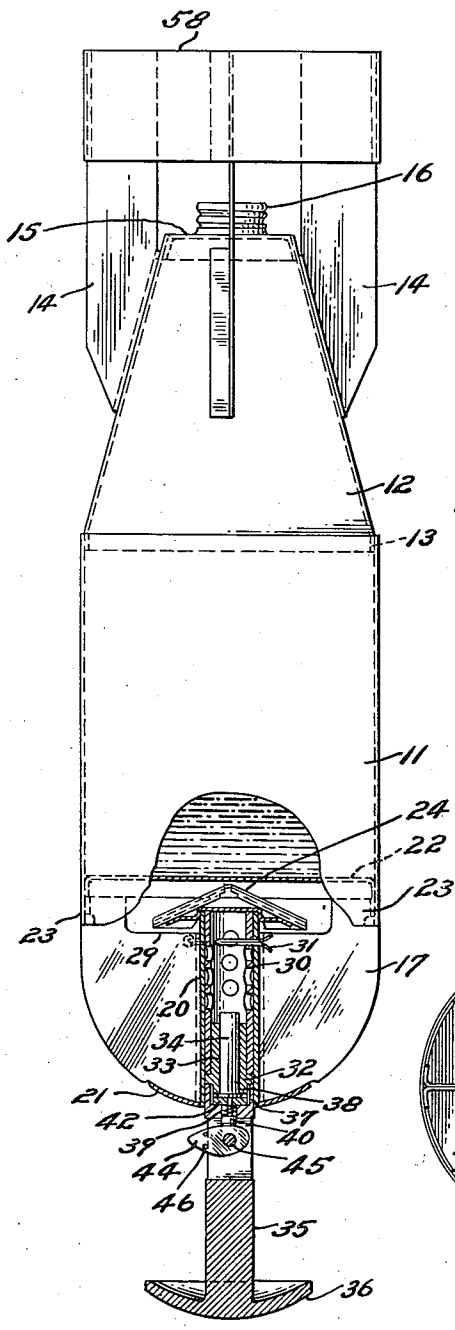


Fig. 1.

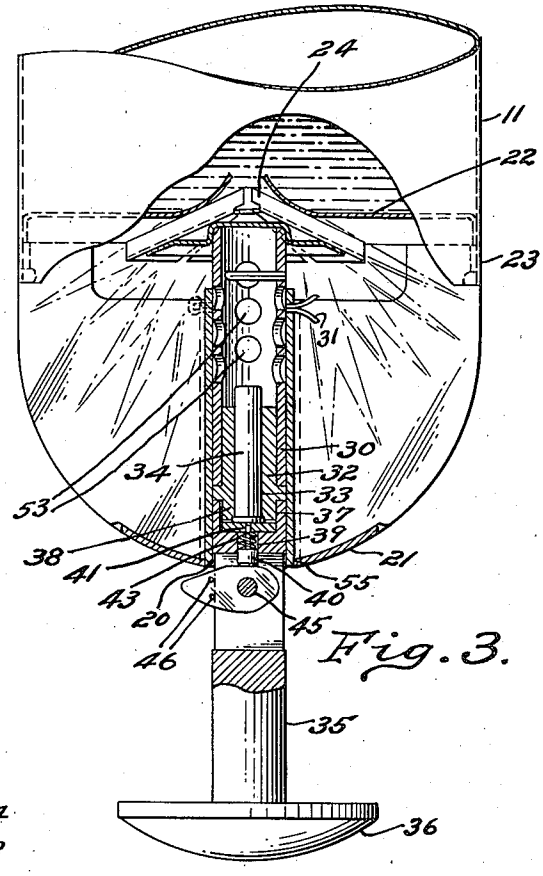


Fig. 3.

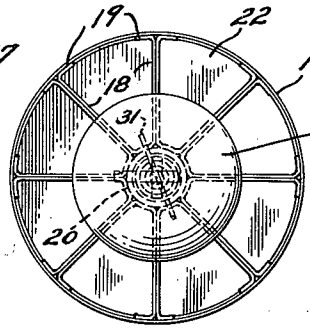


Fig. 2.

INVENTOR.
Eric L. Samann
BY
Joseph Darley
ATTORNEY

Aug. 1, 1944. E. L. SAMANN 2,354,882

INCENDIARY BOMB

Filed Dec. 29, 1941 3 Sheets-Sheet 2

Fig. 5.

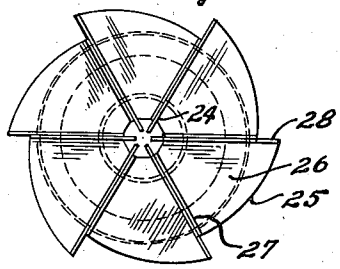
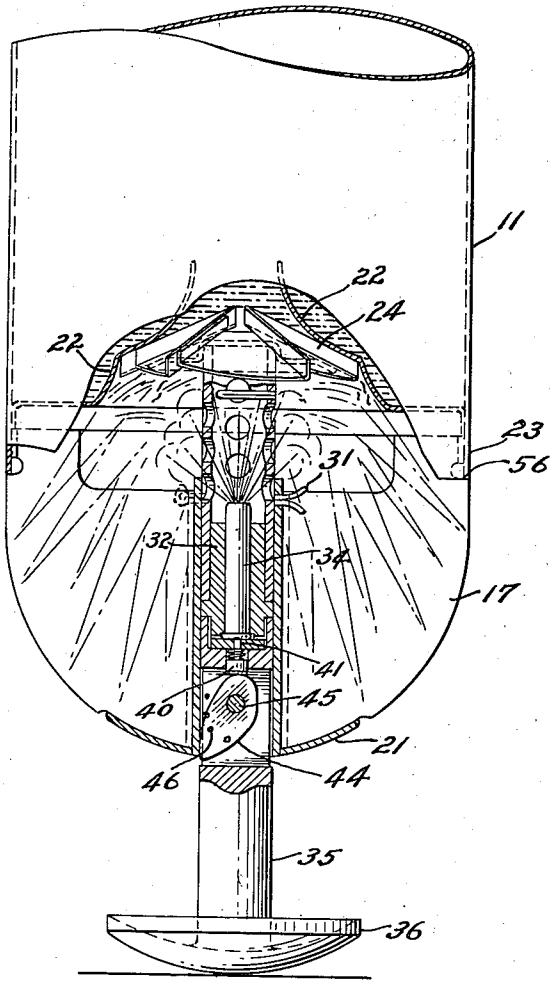


Fig. 4.



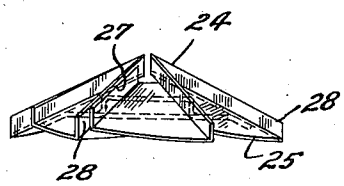


Fig. 6.

INVENTOR.
Eric L. Samann
BY
Joseph Darley
ATTORNEY

Aug. 1, 1944. E. L. SAMANN 2,354,882

INCENDIARY BOMB

Filed Dec. 29, 1941 3 Sheets-Sheet 3

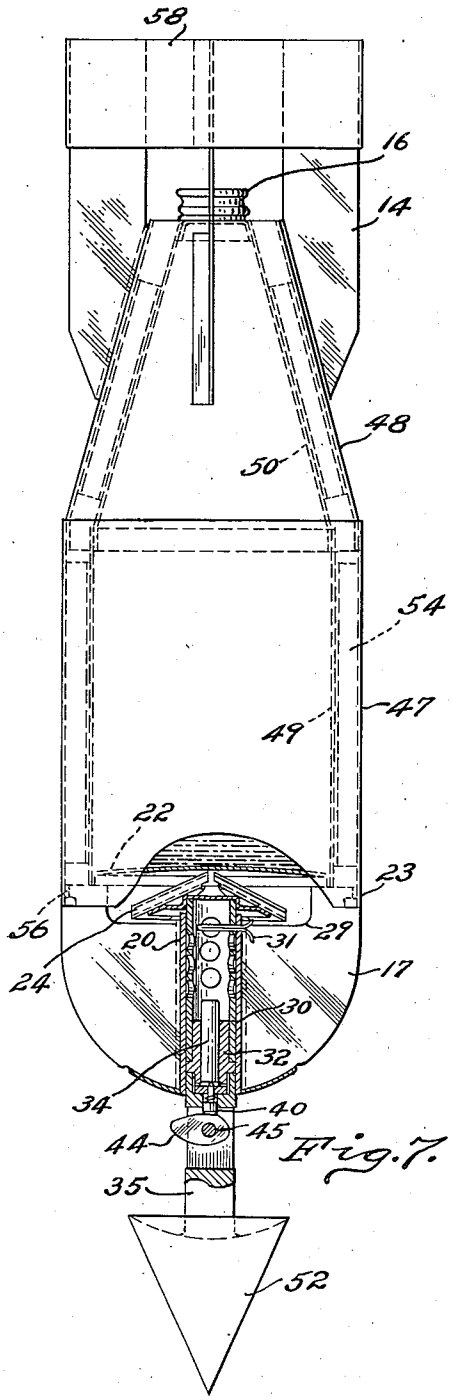


Fig. 7.

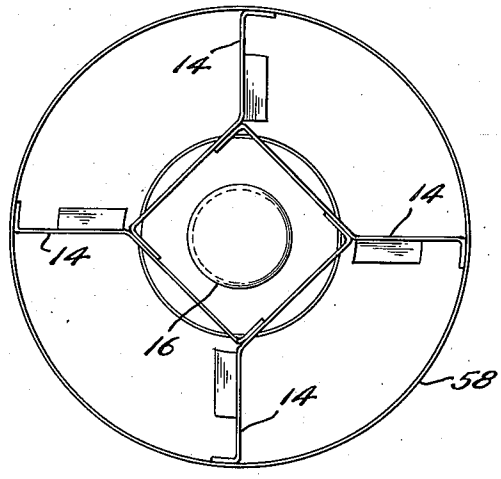


Fig. 9.

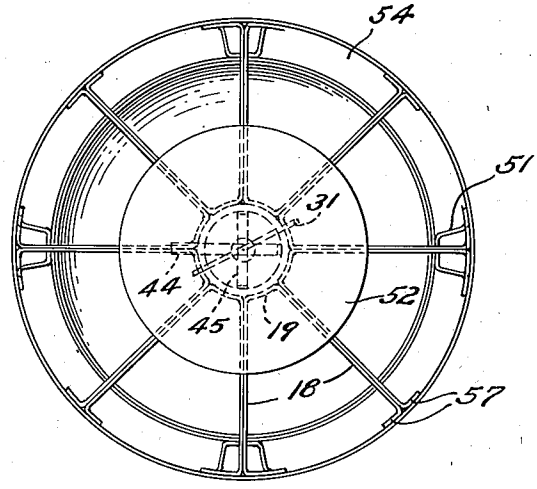


Fig. 8.

INVENTOR.
Eric L. Samann
BY
Joseph Farley
ATTORNEY

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UNITED STATES PATENT OFFICE

2,354,882

INCENDIARY BOMB

Eric L. Samann, Detroit, Mich.

Application December 29, 1941, Serial No. 424,704

13 Claims. (Cl. 102—6)

This invention relates to improvements in the design of liquid incendiary bombs and places special emphasis on a firing mechanism to be used for igniting the liquid upon impact of the bomb with its target.

The general object of this invention is to design a type of liquid incendiary bomb which is simple of construction, which may be ignited by a simple and positive type of firing mechanism and which may be constructed as a penetrating or non-penetrating type of bomb by slight changes in design only. Included in this general object is the design of the above mentioned firing mechanism. The following are the more important of the specific objects of the invention:

(a) To provide a bomb having a liquid container separate and removed from the firing mechanism associated therewith.

(b) To provide a firing mechanism comprising means for piercing the liquid container of the bomb in combination with means for igniting the liquid which will thereupon be released.

(c) To construct the firing mechanism in a manner such that the means for igniting the liquid will not be actuated until after the liquid container has been pierced.

(d) To construct the firing mechanism so that the actuating parts thereof may readily be removed in order that the bombs may be stored and handled with no danger of their being ignited.

(e) To provide safety or retaining members in association with the actuating members of the firing mechanism so that there will be no danger of the bomb being ignited in ordinary handling.

In the drawings accompanying this specification, the constructional details of both a penetrating and a non-penetrating type of bomb are disclosed, together with fragmentary views showing the mode of operation of the firing mechanism associated therewith. These drawings comprise:

Fig. 1, which is an elevation showing a non-penetrating type of bomb with the firing mechanism attached thereto, this view showing in section the various parts of the firing mechanism in the position they occupy prior to actuation;

Fig. 2, an end view showing the nose of the bomb illustrated in Fig. 1;

Fig. 3, showing the nose portion of the bomb of Fig. 1 in elevation, with sectional details of the firing mechanism to illustrate the parts thereof in the position they occupy immediately after actuation but prior to firing;

Fig. 4, a view similar to Fig. 3 but showing the position of the parts of the firing mechanism at the instant of firing;

Fig. 5, a plan view of the cutter employed as part of the firing mechanism;

Fig. 6, an elevation of the cutter;

Fig. 7, a view similar to Fig. 1 but showing constructional details of the penetrating type of bomb;

Fig. 8, an end view of the bomb of Fig. 7, showing the nose thereof; and

Fig. 9, an end view showing the external structure of the tail of either form of bomb.

The incendiary bombs of this invention are designed to be used with any of the inflammable hydrocarbons, gasoline being preferred. In the construction of the non-penetrating type shown in Fig. 1, a cylindrical tank 11, together with a conical tank 12, are united along a seam 13 to form the liquid containing portion of the bomb, the tank 12 also serving as a tail piece to which an assembly composed of suitable fins 14 and a tail ring 58 is attached. The tail end of the tank 12 is sealed by an end wall 15 to which a filler cap 16 is secured, while the opposite or lower end of the liqud container is closed by a bulkhead 22 attached to the tank 11 at a position inwardly from the lower end thereof so as to leave an overhanging area 23 which is used as a surface to which the nose section of the bomb is secured.

This nose section of the bomb is composed of a series of segments 17, each of which has portions 18 which extend radially of the longitudinal axis of the nose section, and which are joined by a central web 19. As shown by Fig. 2, eight of these segments 17 are employed in the bomb illustrated to form a circular nose section and, when assembled in this manner, the webs 19 of this series of segments form a roughly circular aperture 20 extending up through the center of the nose section, and the outside portion of the nose section is open to the air except along the areas formed by adjacent radial portions 18 and except for a circular area at the tip of the nose which is reinforced by a circular member 21 provided with a hole 55 corresponding to the diameter of the aforementioned aperture. In order that the nose section may be fitted within and secured to the overhanging area 23 left at the lower end of the tank 11, a small shoulder 56,

together with an inwardly bent lug 57, is formed at the upper and outer part of the radial portions 18 of each of the segments 17, the lugs 57 being connected to the shell of the tank 11 when the bomb is assembled.

Since the foregoing construction results in a unitary liquid container having no opening through which liquid may flow other than that provided by the filler cap 16, means for piercing the container must be provided so that the liquid may escape and be ignited. This means in the present invention forms part of the major assembly referred to herein as the firing mechanism, and therefore it may be said that the firing mechanism consists of a combination of piercing means and firing means, together with a common member which actuates both. The piercing means consists of a cutter 24, shown in Figs. 5 and 6 to be made up of a number of individual segmental cutters 25, each of which is formed with a central portion 26 bound on either side by radially extending upturned flanges 27 and 28, the flange 27 being shorter in length than flange 28. To form the assembled cutter, the cutting segments are secured together along these upturned flanges with the short flange 27 of one segment being attached to the long flange 28 of the adjacent segment. Thus, the upturned flanges comprise the cutting portions, and the outer periphery of the cutter is of a fluted shape. When a bomb is assembled a cutting member is mounted within a recess provided by cutaway portions 29 which are formed on the inner and upper part of each segment 17 of the nose section, and when the cutter is so positioned, it lies immediately below the lower end 22 of the liquid container. It is held in this position by being attached to the upper end of a sleeve 30 which is slideably mounted within the aforementioned aperture 20 of the nose section, but which is held against accidental movement by a cotter key 31 extending through holes provided in the side walls of both the aperture and the sleeve 30. An adapter member or shell chamber 32 is secured to the lower end of the sleeve 30, this shell chamber being provided with an inner bore 33 of such dimensions as to hold some form of explosive shell, such as a standard size shotgun shell 34, used here with a charge of powder only, preferably the non-smokeless type.

In the non-penetrating bomb of Figs 1 through 4, the firing means incorporated in the firing mechanism consists of a shaft or stem 35, one end of which is shaped in the form of a mushroom point 36. The opposite end of this shaft is recessed and internally threaded at 37 so that it may be secured to a correspondingly threaded portion 38 formed on the lower end of the shell chamber 32. Immediately below the recessed and threaded portion 37, the shaft is counterbored at 39 to accommodate a firing pin having a cylindrical portion 40 from which projects a pin 41. This firing pin is retained within the counterbored portion 39 by a spring retaining plug 42 which is threaded so as to be inserted within the recessed portion 37 of the shaft 35. A spring 43 bears against the surface of the spring retaining plug 42 and the cylindrical portion 40 of the firing pin thereby normally urging the firing pin downwardly and away from the shell chamber 32.

Means to actuate the firing pin is provided in the form of a cam 44 which is positioned within a slotted portion formed in the shaft 35 immediately below the counterbored portion 39 thereof and is pivotally mounted upon a pin 45. Small holes 46 are bored in the face of the cam 44 at points thereon which are immediately adjacent the circumference of the shaft 35 when the cam is in a neutral or cocked position so that by plugging these holes with suitable pieces of wire it becomes impossible for the cam 44 to rotate and actuate the firing pin while the bomb is being handled.

Constructional details of the penetrating type of bomb are shown in Figs. 7 and 8. From a cursory examination of these figures, it can be seen that the operating principle of this form of bomb is identical to that of the non-penetrating type described, although it is obvious that changes have been made in some of the constructional details in order that this bomb may more capably perform the function for which it is designed. In view of the general similarity between the two forms of bombs, the following description of the construction of the penetrating type will be specific to only those features which are not found in the previously described non-penetrating type. Similar parts of both types are designated by the same reference character.

The penetrating type is distinguishable in that it is formed with an outer shell consisting of a cylindrical portion 47, to the upper end of which a conical portion 48 is secured. A separate liquid container is positioned within this outer portion and is composed of a cylindrical tank 49 connected at its upper end to a conical tank 50. The complete liquid container consisting of these two tanks is held within the outer portion of the bomb by a number of U-shaped spacers 51. The double shell resulting from this construction has the structural effect of giving added resistance against a collapse of the liquid container upon impact which would prematurely disperse the liquid and also cause such distortion of the bomb as a whole as would prevent it from penetrating the target to the extent desired and possible when a rigid form of construction is used.

Details of the construction of the tail fins, tail ring and filler cap of this bomb are similar to corresponding parts of the non-penetrating type, and the same is also true of the nose section, although it may be found desirable to employ a heavier gauge of metal in the fabrication of the segmental stampings which comprise this part, or to substitute a cast or forged nose section for added weight and resistance against impact loads.

Regarding the firing mechanism used with the penetrating bomb, the only change is the substitution, for obvious reasons, of a penetrating type of point 52 for the mushroom point 36 with which the non-penetrating bomb is equipped.

Both the foregoing description and the drawings show that the specific forms of the invention disclosed herein have been designed in such a way that all component parts entering into the construction of a bomb may be fabricated by stamping processes with the exception of certain parts of the firing mechanism. It is intended that connections between parts will be made by welding and therefore an employment of the principles of design disclosed will result in achieving the well-known advantages in speed and economy which arise from the combined use of stamping and welding processes in mass production.

The construction of either type of bomb is broken down into a suitable number of sub-assemblies, such as the following: (1) tail fins and

ring; (2) liquid container or body; (3) nose section; (4) piercing means; and (5) firing means. In the final assembly, all these subassembles are united with the exception of the firing means, the piercing means being placed within the aperture of the nose section and secured in place by the cotter key **31** before the nose section is attached to the body of the bomb. By leaving the firing means to be assembled later, preferably just before the bomb is used, the handling of the bomb is facilitated since it occupies less space, and the possibility of damage in handling becomes remote as there are no protruding parts. When it is desired to use a bomb, the liquid container is filled with gasoline, a shell is inserted in the shell chamber **32** and the firing means is secured to the piercing means by screwing the former on to the threaded portion **38** of the shell chamber. Naturally, a bomb does not become an inherently dangerous instrumentality until this time, which fact further facilitates previous handling.

The inflammable liquid contained in either the penetrating or non-penetrating type of bomb is ignited upon contact with the target by the following action of the firing mechanism: When the nose point strikes the target, the force of the blow will cause a shearing of the cotter key **31** and the entire firing mechanism will thereupon travel inwardly of the bomb allowing the cutter **24** to contact and pierce the bottom wall **22** of the liquid container, and the inflammable liquid, which will behave as though under pressure, will instantly begin to flow from the container down the upper surface of the cutter to drop in a roughly conical spray through the open nose portion of the bomb. This condition is depicted in Fig. 3. Fig. 4 shows a condition that will obtain an instant later. Here, the firing mechanism has travelled a further distance inwardly and during this travel the upper face of the firing cam **44** has come in contact with the reinforcing plate **21** on the nose of the bomb with the result that the safety wires which extend through the holes **46** in the cam have been sheared. The cam has then been forced to rotate about the pivot pin **45**, thereby driving the firing pin against the percussion cap of the shell **34**, firing it. Flame from the explosion of the shell escapes into the gasoline saturated atmosphere within the nose of the bomb through a series of holes **53** which are provided in the sleeve **30** for this purpose and the gasoline is instantly ignited.

After firing has taken place, the firing mechanism will continue to travel inwardly until the point is resting against the nose portion of the bomb. This further travel of the firing mechanism gives a piston-like action to the cutter and aids in forcing further gasoline from the liquid container.

As a consequence of the lighter construction of the non-penetrating type of bomb, contact of the same with the target will, and is intended to, result in a structural failure of the bomb itself, which will cause the ignited inflammable liquid to be dispersed over a large area. The penetrating type, however, is designed so that the bomb structure will withstand the heavy shock of impact, since otherwise the desired penetrating action will not be achieved. Due to this penetrating action, a somewhat different form of ignition of the inflammable liquid may occur with this type. It can readily be seen from the construction of the parts that the firing action of the firing mechanism employed will be identical to the foregoing description of this firing action relative to the non-penetrating type. In other words, initial contact of the bomb with the target will cause the liquid container to be pierced and the explosive shell to be fired, thereby igniting the liquid then released from the liquid container. Since the penerating bomb may travel a considerable distance after this initial contact, depending, of course, on the resistance offered by the type of construction of the target, the flame initially produced by the action of the firing mechanism will not occur at the point where the major portion of the inflammable liquid will be released, and therefore some of this initial flame must be carried along with the bomb until the downward motion thereof has ceased. Two factors contribute to insure the presence of flame during this downward motion: (1) The fact that a supply of inflammable liquid is escaping from its container at all times after initial contact with the target, and (2) the fact that a portion of this ignited liquid will be forced, as a result of the downward motion of the bomb, up into the air space **54** between the liquid container and the outer shell from whence it will fall back to the nose of the bomb when downward motion has ceased.

It is intended that both types of bombs will be constructed so that their overall dimensions correspond to those of existing forms of bombs. This will permit their use in present bomb racks where they can be aimed at a target with the aid of a bombsight, thus securing greater precision and accuracy than can be obtained with the present small sizes of thermite and similar incendiaries.

Any modifications within the definitions of the following claims will, of course, be considered as part of the scope of this invention.

I claim:

1. A bomb having a container adapted to be filled with an ignitable substance, means to ignite said substance upon contact of the bomb with a target comprising a member movable relative to said container, said member having means adapted to pierce said container, a primary charge, percussion means to detonate said primary charge, comprising a firing pin, actuating means therefor carried by said movable member and means fixed to said container for engaging said actuating means and operating the same only after said piercing means has punctured said container.

2. A bomb having a container adapted to be filled with an ignitable substance, a nose section mounted adjacent said container, the major portion of said nose section being open to the air, a member carried by said nose section and movable relative thereto, said member having piercing means normally positioned adjacent said container, whereby said container will be pierced upon movement of said member allowing said substance to escape into said open nose section, a primary charge carried by said nose section percussion means to detonate said charge carried by said member, and means for actuating said percussion means also carried by said member and operative only after an initial predetermined movement of said member of sufficient extent to cause said piercing means to puncture said container.

3. A liquid incendiary bomb having a body forming a container for an inflammable liquid, a nose section secured to said body, the major

portion of said nose section being open to the air, a member mounted in said nose section and movable relative thereto, said member having piercing means normally positioned adjacent to said container, a primary charge, means to detonate said charge carried by said member, said detonating means comprising a firing pin mounted adjacent said charge and a trigger adapted to actuate said firing pin, and cooperating means carried by said nose section and member for actuating said piercing means and said trigger upon the movement of said member.

4. A liquid incendiary bomb having a body forming a container for an inflammable liquid, a nose section secured to said body, the major portion of said nose section being open to the air, a member mounted in said nose section and movable relative thereto, said member projecting externally of said nose section, said member having piercing means normally positioned adjacent to said container, a primary charge, means to detonate said charge carried by said member, said detonating means comprising a firing pin mounted adjacent said charge and a trigger adapted to actuate said firing pin, said trigger being associated with said projecting portion of said member whereby said piercing means and said trigger will function upon the movement of said member.

5. A liquid incendiary bomb having an outer shell, a liquid container positioned within said outer shell, a plurality of reinforcing members positioned longitudinally of said outer shell and connected to the inner surface thereof, said reinforcing members defining the position of said liquid container, a nose section secured to said outer shell, the major portion of said nose section being open to the air, a member carried by said nose section and movable relative thereto, said member having piercing means normally positioned adjacent said container, whereby said container will be pierced upon movement of said member allowing said liquid to escape into said open nose section, a primary charge carried by said nose section and means to detonate said charge.

6. A firing mechanism adapted to be used with bombs of the type wherein an ignitible liquid substance is carried within a container, said firing mechanism comprising a sleeve adapted to be mounted adjacent said container, a member mounted within said sleeve and movable relative thereto, piercing means carried by one end of said member, the other end of said member projecting from said sleeve, a primary charge and means to detonate said primary charge both carried by said member, said detonating means comprising a firing pin and means to actuate said firing pin, said actuating means being located on the said projecting portion of said member.

7. A nose section and firing mechanism adapted for use with devices of the class described, said nose section having a sleeve extending along its longitudinal axis, piercing means carried by said sleeve, said firing mechanism being mounted in said sleeve and projecting therefrom, said firing mechanism comprising a primary charge and means to detonate said primary charge, said piercing means and said firing mechanism being movable as a unit relative to said sleeve, and said firing mechanism including a trigger solely actuated by the relative movement between said unit and sleeve.

8. A nose section and firing mechanism adapted for use with devices of the class described, said nose section having a sleeve extending along its longitudinal axis, ribs extending radially of said sleeve, a tubular member slidably mounted within said sleeve and projecting from the inner end thereof, piercing means mounted on said projecting end of said tubular member, said tubular member being adapted to carry a primary charge, means to detonate said primary charge, and a nose point adapted to be secured to said tubular member.

9. A nose section and firing mechanism adapted for use with devices of the class described, said nose section having a sleeve extending along its longitudinal axis, ribs extending radially of said sleeve, a tubular member slidably mounted within said sleeve and projecting from the inner end thereof, piercing means mounted on said projecting end of said tubular member, said tubular member being adapted to carry a primary charge, means to detonate said primary charge, a nose point adapted to be secured to said tubular member, said detonating means comprising a firing pin, a firing cam contacting said firing pin, said firing cam being pivotally mounted in said nose point and projecting therefrom.

10. A nose section and firing mechanism for use with devices of the class described, said nose section comprising a plurality of segmental stampings each having portions extending radially of the longitudinal axis of said nose section, the inner ends of the said radial portions of each such stamping being connected by a web whereby a sleeve is formed along the longitudinal axis of said nose section, a tubular member mounted in said sleeve and wholly contained within said nose section, a piston-like cutter carried by the inner end of said tubular member, said tubular member being adapted to carry a primary charge, a nose point detachably secured to said tubular member, and means carried by said nose point to detonate said primary charge.

11. A bomb comprising a main body portion and a nose section, a liquid container mounted within said main body portion, piercing means carried by said nose section adjacent to said liquid container, a readily shearable locking device for normally holding the piercing means spaced from said container, a firing mechanism adapted to be detachably secured to said piercing means to move therewith as a unit, said firing mechanism comprising percussion detonating means and an actuating mechanism therefor, a readily shearable means for normally preventing operation of said actuating mechanism, and means carried by said nose section for successively shearing said first named and then said second named readily shearable devices upon impact of said bomb to first effect a puncturing of said container and then the discharge of said detonating percussion means.

12. A bomb comprising a main body portion and a nose section, a liquid container carried within said main body portion, said nose section being open to the air and having a sleeve mounted immediately below said liquid container, piercing means mounted for longitudinal sliding movement in said sleeve, a first readily shearable locking device for normally holding said piercing means against movement relative to said sleeve, a firing mechanism adapted to be detachably secured to said piercing means to move therewith as a unit, comprising a detonating charge, percussion means therefor, an actu-

ating device for said percussion means and a second readily shearable means for normally locking said actuating device against movement and an impact member carried by said firing mechanism for causing said first readily shearable device to be severed and to effect longitudinal movement of said piercing means to puncture said container upon impact of said bomb and means carried by said nose section to engage said actuating device after said container has been punctured to shear said second readily shearable means and to cause said actuating device to explode said detonating charge.

13. In a device of the character described a container adapted to contain a main charge of ignitible or explosive material and a firing mechanism adapted to be detachably secured normally in fixed relation with respect to said container, said firing mechanism comprising a sleeve, an explosive cartridge shell mounted within said sleeve, a firing pin and actuating means therefor, means for normally locking said actuating means against movement and means for releasing said locking means and effect operation of said actuating means and firing pin upon forcible impact of said device with a target.

ERIC L. SAMANN.