O. N. I. Publication No 40.

ILLUSTRATIONS AND DESCRIPTIONS OF

BOMBS, INCENDIARIES AND EXPLOSIVES USED BY THE ENEMY

CONFIDENTIAL

OFFICE OF NAVAL INTELLIGENCE

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NAVY DEPARTMENT,
OFFICE OF NAVAL INTELLIGENCE,
WASHINGTON, D. C.

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This pamphlet is disseminated for the use of commissioned officers and such reliable and trustworthy petty officers who may require knowledge of its contents. Due to the danger of possible suggestion it must be imparted with due caution.

ROGER WELLES, *Captain, U. S. N.*,
Director of Naval Intelligence.

PREFACE.

Numerous cases of incendiarism and explosion have been perpetrated by the enemy for the purpose of hindering this country and its allies in the prosecution of the war. It is important, therefore, that decisive steps be taken to check such acts, and to acquaint everyone interested with the numerous devices and methods of sabotage employed by the enemy, so that necessary precautions may be taken.

Since the possible shapes and sizes of the various types of bombs and explosives used by the enemy are unlimited, an attempt to describe them all would be impractical. This treatise will deal only with fundamental principles upon which such devices are based and give a few examples. Additional information on this and other subjects will be issued from time to time as the occasion may warrant.

The formulas of the chemical ingredients used in the construction of the bombs explained in this treatise have been omitted because of the possibility that such information would be exceedingly harmful were it to fall into the hands of indiscreet or irresponsible persons. Should anyone desire to obtain full particulars as to the construction of the bombs, the chemical ingredients and mechanical devices used, he may obtain them by writing an official letter to this Office, and such data will be transmitted as confidential and secret information.

To give a knowledge of the general appearance of the devices mentioned in this pamphlet, photographs and sketches explaining the essential parts and functions are used. In some cases a short description of the bomb is attached; in others, the photographs are self-explanatory. Only the simplest chemical and mechanical detonator devices are included herein for the reason that they will more easily explain the principles involved in their construction. However, should it be considered necessary to secure a detailed analysis of any bomb, explosive or incendiary, of complicated construction in use by the enemy, it would be advisable to send such device to the Office of Naval Intelligence, Washington, for examination, or to consult a local expert.

The importance of adequate precautions against bombs and infernal machines is emphasized by the following information, which has been received from reliable sources: "German naval authorities frequently oblige ships plying between Germany, Sweden, and Holland to wait four days before entering the Kiel Canal, lest their cargoes contain time bombs which might explode while the ship was in the canal." This country and its allies are doing everything possible to safeguard property against these devices of destruction.

INCENDIARY BULBS.

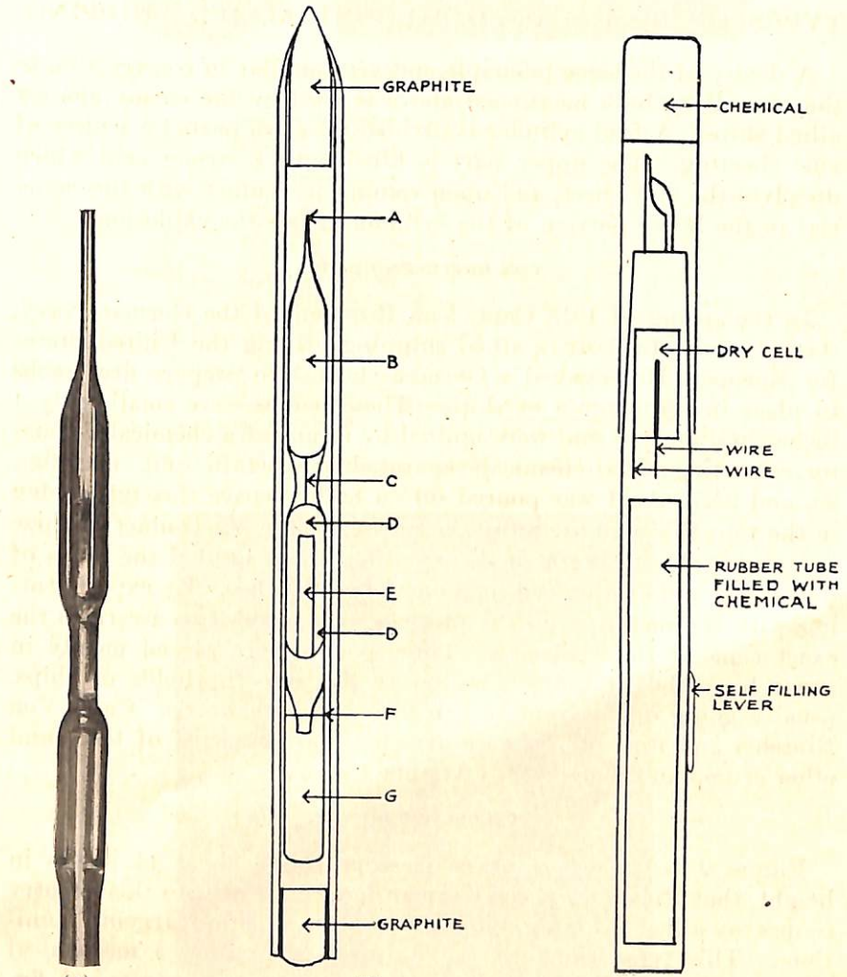
Bombs may be classified roughly into two main groups as chemical and mechanical detonating bombs, according to the kind of detonator used. In its simplest form the chemical detonator is made by suspending a bottle containing a corrosive chemical neck downward over some other chemical. When the stopper has been eaten away by the action of the chemical and the two liquids come in contact with each other, an explosion will result. This device has long been known, its advantage being that no scientific knowledge or apparatus is required.

Incendiary bulbs have been used extensively by German agents for practicing sabotage both in allied and neutral countries. They are merely a variation of the simple chemical detonator outlined above and are so small (varying in size from 2 to 3 inches) that they may be carried in the vest pocket or in baggage and avoid detection. They will set fire to any inflammable material near by but are not practicable for explosions of any magnitude. The manufacture of these bulbs is a simple matter, easily done by anyone with a fair knowledge of glass blowing, and a manufacturer of glassware can turn them out in large quantities. The English authorities have found many of these tubes, shown in Figure 1, sealed in lead pencils, fountain pens, and similar objects. Among German sabotage stores sent to the German legation in Christiania were found such incendiary fountain pens and incendiary pencils of celluloid. The pencils have been found in tins containing magnesia and labeled "Asparagus." They have also been found concealed in cans of talcum powder with enough powder on the top of them to indicate to anyone handling the cans that they served only the purpose for which they were made. The tubes were wrapped in paper to separate them from the powder and a little piece of cardboard was fitted in the cans on top of the tubes and packing, the powder occupying the chamber between the cardboard and the perforated tops of the cans. In the examination and search of suspects special attention is called to the extreme importance of discovering any such tools on their persons or in their baggage, as the variety of their uses for destruction is unlimited.

The incendiary pencil (fig. 1*b*) is to all outward appearances an ordinary blue lead pencil of the larger type, approximately 8 or 9

inches in length. Both ends are plugged with blue graphite and the writing end is neatly sharpened. The glass apparatus AG, which is blown in one piece, is concealed within the pencil. The apparatus is put in action by sharpening the point of the pencil with a knife until the point A is exposed. This point is then broken and the pencil placed in an upright position with the point uppermost. When the point A is broken the force of gravity and the pressure of the air causes the chemical compound in the bulb B to run slowly through the capillary tube C into the empty space D, till the space has been filled to such a height that it overflows into the tube E, which is closed by means of a cork of metal separator F. When the separator has been eroded by the chemicals the chemical compound comes into contact with the chemicals in the tube G and an explosion results. The explosion usually takes place 35 minutes after the end is opened, thus giving the person placing the pencil plenty of time to get away from the danger zone and to avoid detection. The time elapsing from the breaking of the point to the firing of the charge is controlled by the length and bore of the capillary and by the volume of the empty space D and the height of the tube E. The incendiary bulb operates upon exactly the same principles whether contained in a pencil, cigar, fountain pen, or uncovered.

In place of the glass-bulb device in fountain pens, the following mechanism (see fig. 1*c*) may be substituted: A galvanic cell is concealed in the long front part of the pen with the positive and negative wires, well insulated, projecting into the empty space below. By raising the self-filler lever and turning the pen upside down the rubber tube is broken and the liquid comes into contact with the wires. When these pole wires are thus connected gas is formed by electrolysis and the pen point is forced off. Thereupon the liquid flows into the penholder, eats away the metal separator, and comes in contact with the chemical charge in the cap of the pen. The explosion is caused by the contact of these two liquids.



(*a*) Incendiary bulb.

(*b*) Incendiary pencil.

(*c*) Incendiary pen.

FIGURE 1.

74707—18——2

TYPES OF BOMBS USED AGAINST ALLIED SHIPPING.

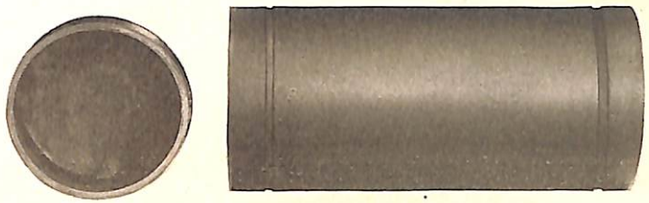
A device of the same principle and very similar in construction to the incendiary bulb mentioned above is used by the enemy against allied ships. A lead cylinder is divided into two parts by a piece of zinc sheeting. The upper part is filled with a strong acid which dissolves the zinc sheet, and upon coming in contact with the material in the lower portion of the cylinder causes the explosion.

VON RINTELEN BOMB.

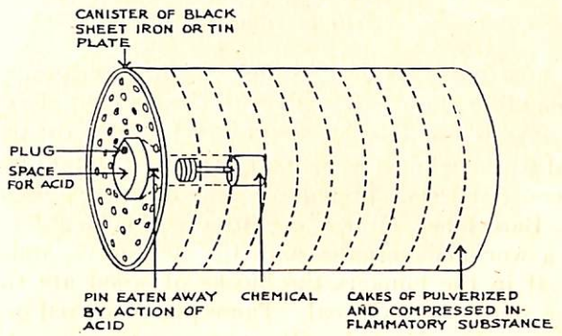
In the spring of 1915 Capt. Von Rintelen, of the German Navy, started a plot to destroy allied shipping leaving the United States for Europe. He engaged a German chemist to prepare fire bombs to place in the cargoes of ships. These bombs were small, only 4 inches in diameter, and were ignited by means of a chemical detonator, consisting of two chemicals separated by a metallic pin. (See figs. 2*a*, and 2*b*.) Acid was poured into a hollow space through a plug in the top; this acid ate away the pin separator, the contact of these two chemicals causing a small explosion which ignited the cakes of pulverized and compressed inflammatory substance. By experimenting with the metallic pin the plotters were enabled to ascertain the exact time of the explosion. These bombs were placed mostly in sugar bags aboard lighters and were put into the holds of ships, usually going off in from two to five days afterwards. Capt. Von Rintelen and nine others were arrested and convicted of these and other crimes and sentenced to Atlanta Prison.

TELESCOPE BOMB.

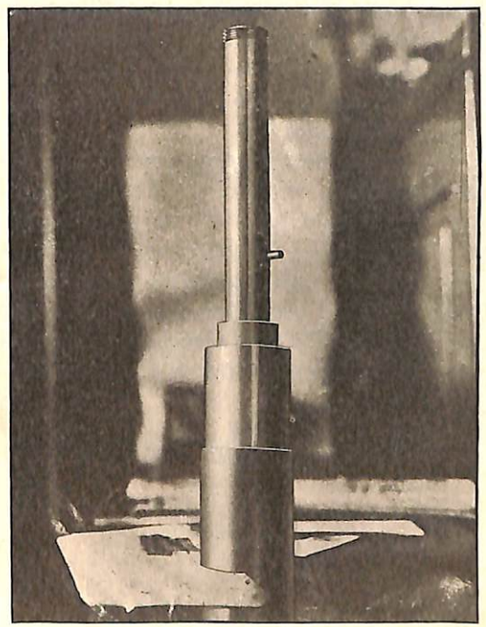
Figure 2 (*c*) shows a brass telescope bomb, about 14 inches in height, that Robert Fay, the German lieutenant, sent to this country to destroy allied shipping, intended to place on ships carrying munitions. This type bomb can be equipped with either a mechanical detonator or a chemical-mechanical detonator, as illustrated in figures 9 (*a*) and 9 (*b*).



(a) Photograph of von Rintelen bomb.



(b) Diagram of von Rintelen bomb.



(c) Telescope bomb.

FIGURE 2.

THE COAL BOMB.

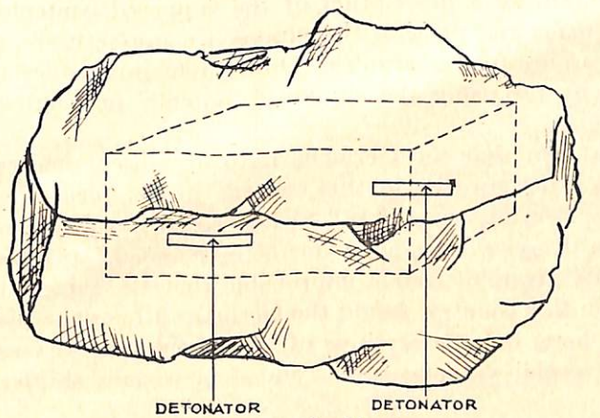
German spies have planned to destroy allied shipping by mixing bombs, resembling chunks of coal, with the coal supply of the ships.

An explosive is put into blocks of wood which are painted black and covered with coal dust so as to appear to be chunks of coal. (See fig. 3.) Deposits of such prepared blocks have been found at Christiania and Barcelona. When a ship needs coal a German agent dressed as a workman mingles with the stevedores, and when these load the coal in the bunkers the blocks of wood are thrown in as though they were pieces of coal. These pieces of coal or coal bricks may be prepared to explode either by a detonating device or by means of heat.

The coal bomb, as shown in figure 3, is an explosive bomb made of papier-mâché and has in the middle a cardboard box (diameter, $2\frac{9}{16}$ inches; height, 4 inches) filled with about 400 grams of a powerful explosive. On the middle of each end, with the opening outside, is an ordinary explosion cap.

Bombs and infernal machines of almost every construction may be disguised as coal, briquettes, oil tanks, jam jars, small margarine barrels, meat cans, or in fact as any small package. Incendiary apparatus concealed as pastilles in the shape of vichy tablets or inflammable matches similar to real matches have been found mixed with real ones in the original box, there usually being one explosive in each box. Incendiary bulbs can also be concealed in cigars; in fact in any article which presents suitable facilities for concealment.

(a) Coal bomb.



(b) Diagram of coal bomb.

FIGURE 3.

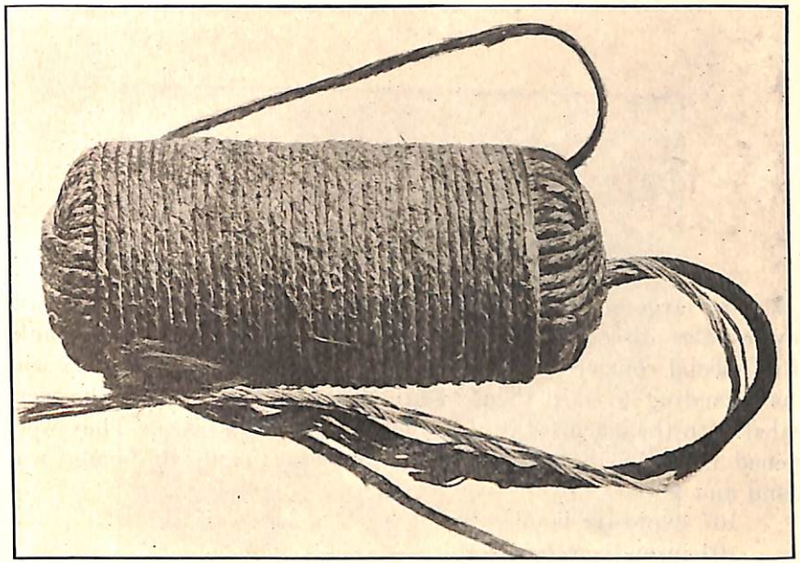
DISGUISED BOMBS, "DOMESTIC-UTILITY" TYPE.

Attention is called to the illustrations in figure 4 which show how incendiary bombs and infernal machines may be made to appear like harmless articles of daily domestic use.

Figure 4 (*a*) is a bomb skillfully dressed in the guise of a coil of cord. Its construction is very simple, consisting of an explosive powder contained in a cardboard box to which is attached a fuse. The time of the explosion depends upon the ingredients of the explosive material and the length and nature of the fuse.

Figure 4 (*b*) shows what are apparently tins of cooked corned beef canned in Buenos Aires, Argentina. In reality they are powerful bombs designed by the enemy to bring about destruction in the establishments of the allied and neutral countries engaged in war work. These bombs are pyramidal in shape, 9 centimeters high, the larger end measuring $9\frac{1}{2}$ centimeters long by 7 centimeters wide; the small end, 8 centimeters long by $5\frac{1}{2}$ centimeters wide. The four sides and the top are made of thin white metal, while the bottom is composed of a thin sheet of cardboard covered with a light-colored varnish. The whole is inclosed in a cover which gives it an innocent, harmless appearance. Figure 4 (*b*) shows two sides of the "can of corned beef," containing a description of the supposed contents, together with the name and place of the supposed manufacturers, and carrying even a pure food guarantee. On the remaining sides are printed instructions for using the supposed contents, in English, French, and Spanish.

It is known that the Germans have also been sending infernal machines from Sweden to this country in the form of preserved-meat tins bearing the mark "SVEA KOWT (Viande Suedoise), Broderna Kossler Stockholm, made in Sweden," printed in large characters. It is of course improbable that the same labels would be used in this country should the Germans attempt to use a similar machine here, but the captains of allied and neutral vessels should exercise special vigilance over canned provisions shipped on their vessels.



(a) Bomb in guise of coil of cord.

(b) Bomb in guise of can of beef.

FIGURE 4.

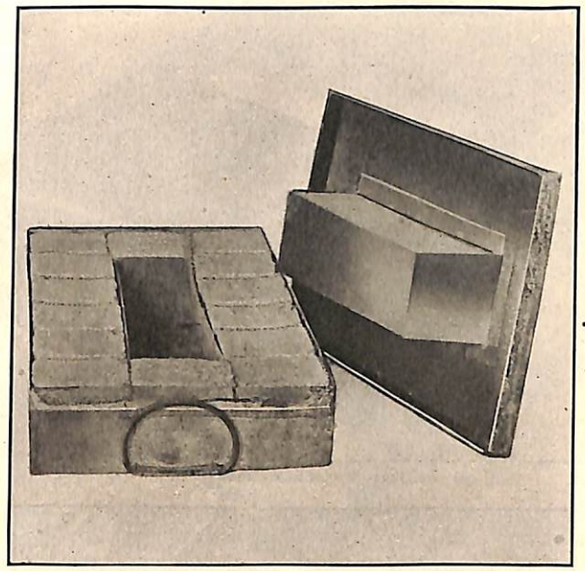
BOMBS SEIZED IN CHRISTIANIA.

A very large quantity of bombs, infernal machines, and explosive devices were discovered by the Norwegian authorities in the trunks of an official courier of the German Government in Christiania who was intending to ship them to allied countries. The trunks were sealed with the official seal of the German foreign office. They were opened nevertheless and the following assortments of bombs was found and seized:

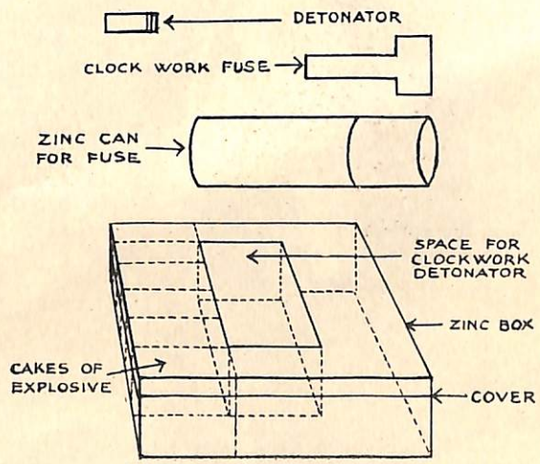
107 explosive bombs.
104 incendiary bombs.
135 time fuses (of which 90 were fitted with clock fuses).
269 detonators.
9 bombs in the form of lumps of coal.
407 tubes of acid.
31 cigarettes (containing carborundum).
33 small parcels of cut tobacco (containing carborundum).
32 crayons (Faber trade-mark) containing carborundum.
5 large fountain pens (with galvanic-cell mechanism).

The bombs shown in figures 5, 6, 7, and 8 were taken from the baggage mentioned above and were examined by technical experts.

Figure 5 shows a large rectangular explosive bomb consisting of a zinc case, 2 by $6\frac{1}{4}$ by $9\frac{7}{8}$ inches, with a space $1\frac{5}{16}$ by 2 by $6\frac{1}{2}$ inches in the middle for a cylindrical holder (diameter, $1\frac{3}{16}$ inches; height, $6\frac{3}{8}$ inches) for the ignition mechanism with detonator. The explosive material in all weighs $5\frac{1}{2}$ pounds. This bomb is incased in a coarse-linen carrying case, intended to be carried under the coat or overcoat. (See fig. 6.)

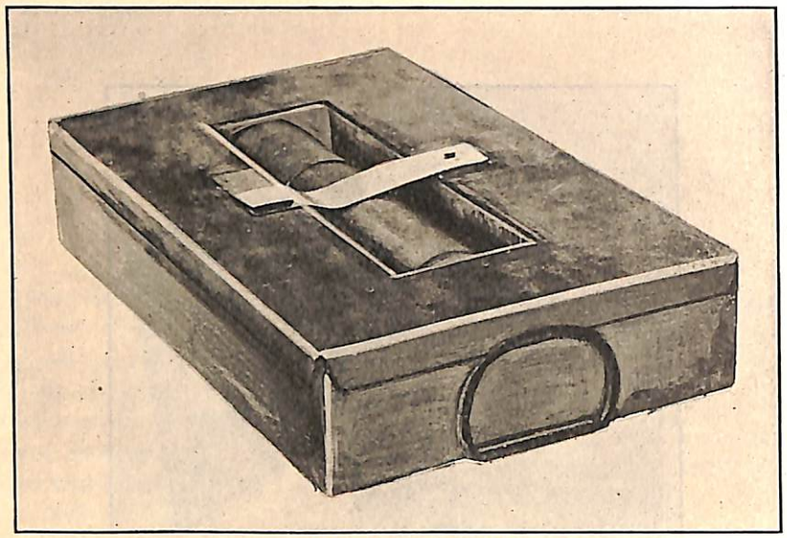


(a) Photograph of bomb seized in Christiania.



(b) Diagram of bomb pictured above.

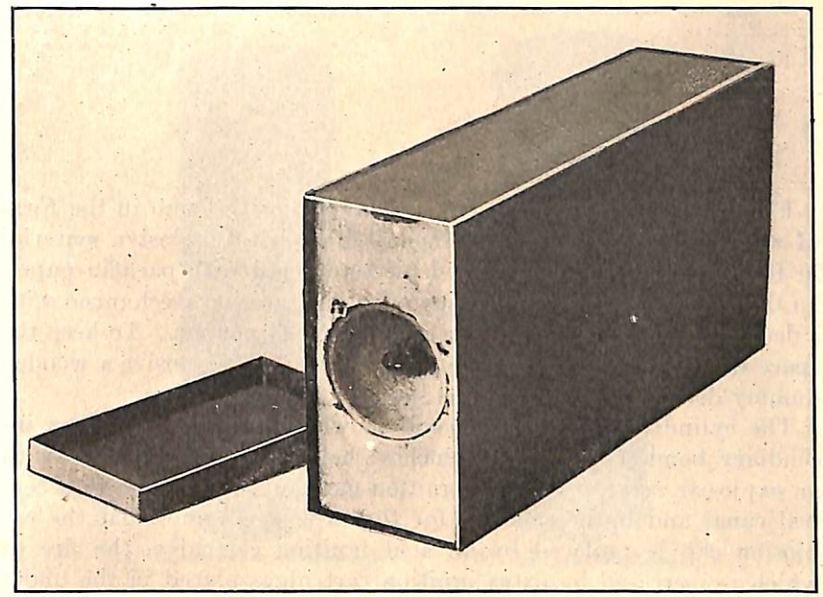
FIGURE 5.



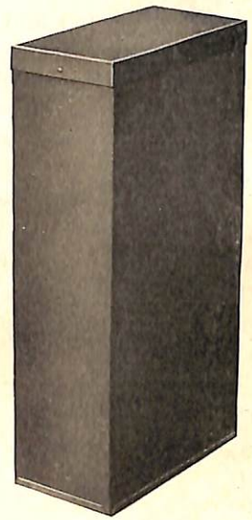
(a) Another view of bomb shown in figure 5.

(b) Bomb shown in figure 5 carried under coat.

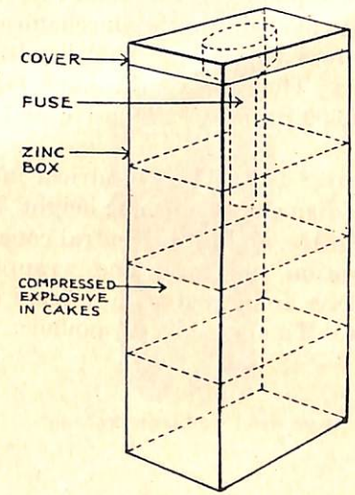
FIGURE 6.



(b) Rectangular explosive bomb.

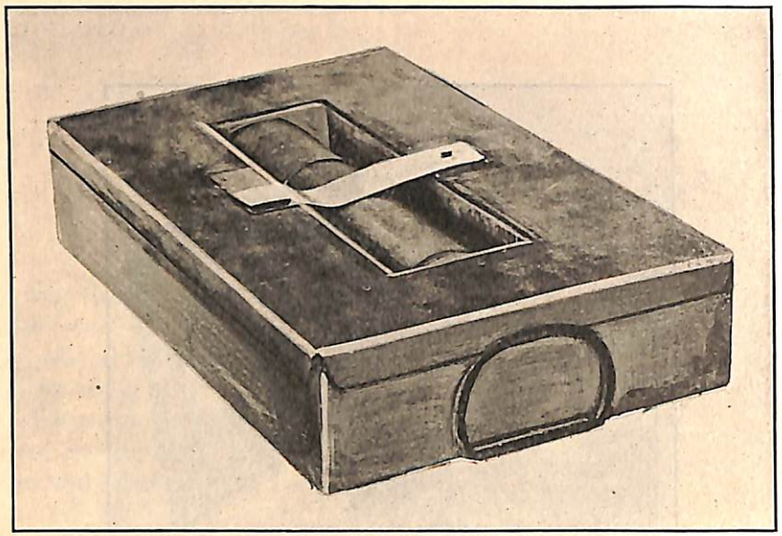


(b) Side view of bomb.



(c) Diagram of bomb.

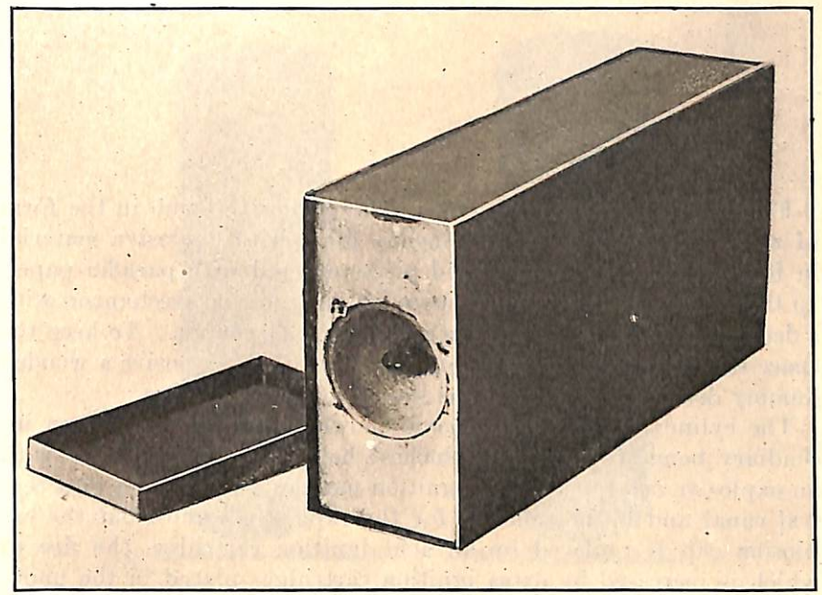
FIGURE 7.



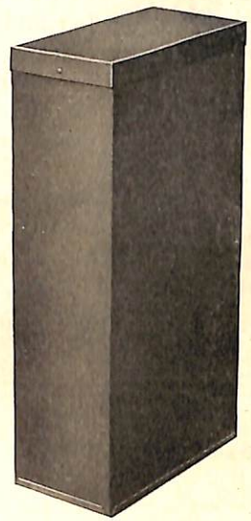
(a) Another view of bomb shown in figure 5.

(b) Bomb shown in figure 5 carried under coat.

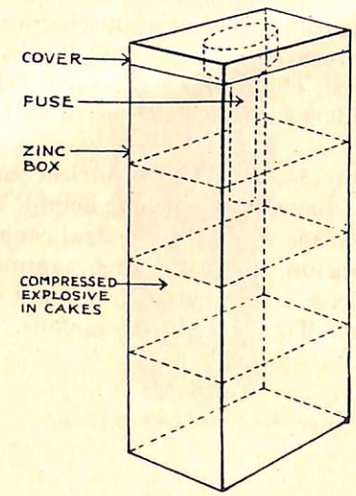
FIGURE 6.



(b) Rectangular explosive bomb.



(b) Side view of bomb.



(c) Diagram of bomb.

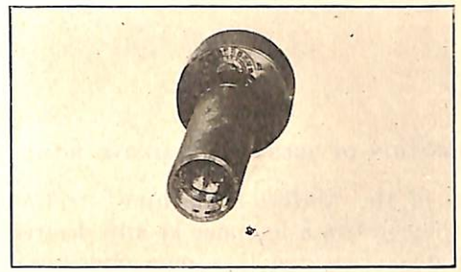
FIGURE 7.

TYPES OF DETONATORS.

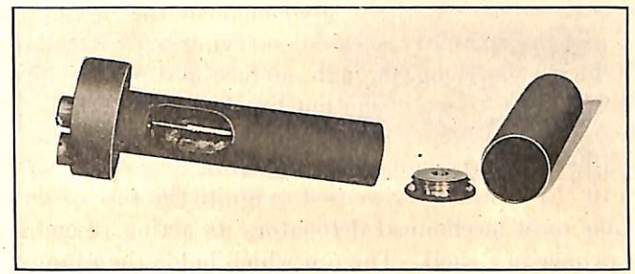
Figure 9 (*a*) shows a mechanical detonator used in time bombs. In the head of this detonator there is a clock which can be set so that the percussion will occur after a determined length of time. These detonators may be timed from one-half to 30 hours, others from 1 to 14 days, and still others from 10 to 30 days.

Figure 9 (*b*) illustrates a chemical-mechanical detonator of the same dimensions and shape as the mechanical detonator described above. At one end it has a hollow cylinder in which is placed a spring ejector with igniting point and feather. The spring is held in an upright position by a steel wire passing through the head and is held fast by a screw outside of the head. The latter has also a filling hole closed by a screw. When the detonator is to be used, an acid solution, contained in an acid bulb, is poured through the filling hole, which is then screwed shut. The acid bulb contains acid in various degrees of dilution, so that the period of time before the solution eats through the steel wires can be regulated.

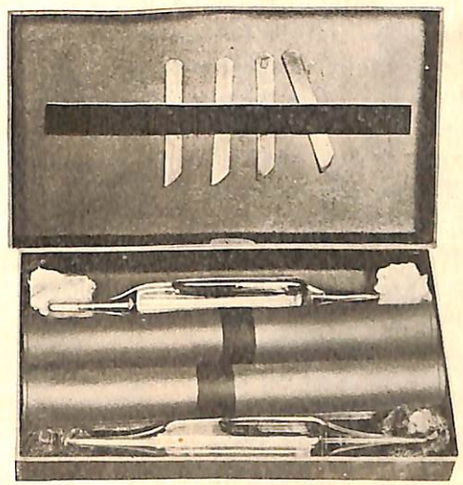
A small cardboard case containing acid bulbs and small saw blades for cutting the bulbs when the contents are to be poured into the detonator (see fig. 9 (*c*)) is furnished with every mechanical-chemical detonator of this description. When the acid has eaten through the steel wires, the feather, now released, strikes the spring ejector with igniting point and sets off the detonator or the cartridge. The cartridge is based upon the same principle as the incendiary bulb. The percussion caused by the igniting point breaks the cartridge, usually made of glass, and allows the two explosive chemicals to come into contact with each other.



(a) Mechanical detonator.



(b) Mechanical-chemical detonator.



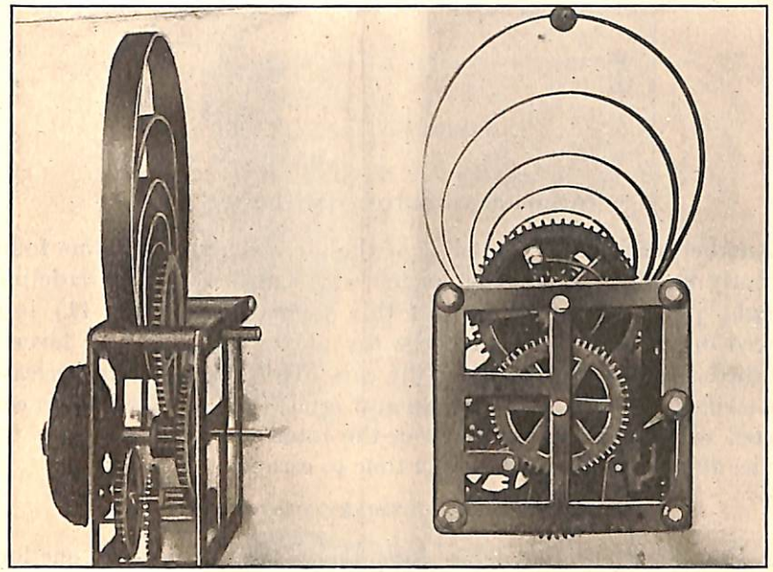
(c) Acid bulbs with steel saws.

FIGURE 9.

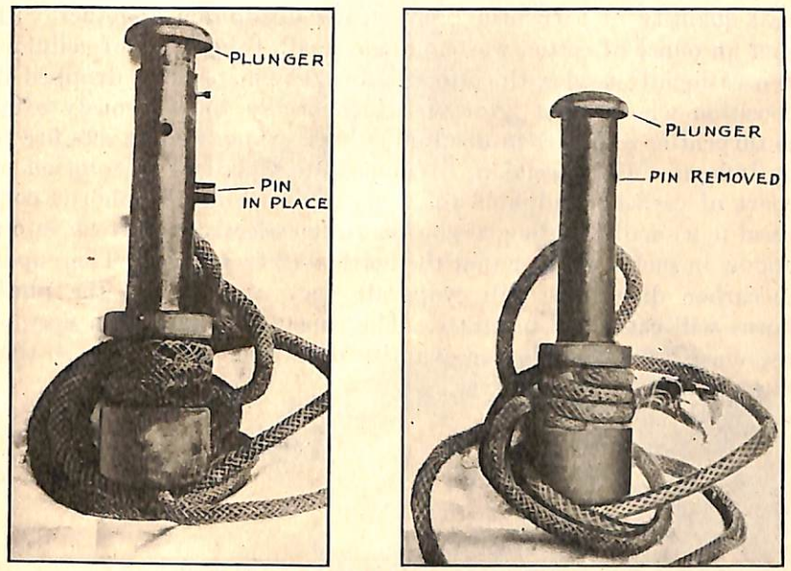
IGNITION DEVICES OF EXPLOSIVE BOMBS.

A crude form of the "infernal machine" is the use of a clock (see fig. 10*a*), which raises a hammer at any desired moment. The hammer is so arranged that it strikes some explosive substance, which in turn sets fire to some matches. An ordinary clock will suffice, especially one which lights itself. This is furnished with a spring, to the end of which a wax match is fixed. The spring is stretched and held by a catch. At the desired moment the mechanism moves the catch and the spring is released, carrying with it the match, the head of which rubs along a rough surface and catches fire. Sometimes a little knife is set in motion by clockwork. This knife cuts a stretched-out cord, which sets free a spring that strikes a lucifer capsule. Figure 10 (*a*) shows the clockwork of an infernal machine.

Figure 10 (*b*) shows a device used to ignite the fuse of an explosive bomb. Like most mechanical detonators its action resembles the action of a primer in a shell. The pin which holds the plunger in place acts as a safety lock. After this pin is removed the plunger is struck a sharp blow with the palm of the hand, which explodes the mercury cap at the opposite end and ignites the fuse. This igniting device is readily held in the palm of the hand, being about 6 to 8 inches in length. Both the device and the fuse are waterproof, the fuse consisting of a powder covered by a rubber coating and the whole encased in a canvas covering. Such a detonator, connected with a glass bomb filled with reddish liquid, was used by the U-boats in their recent raid off the Jersey coast to sink small coastwise vessels, thereby conserving torpedoes. The bomb, measuring not more than two inches in diameter, was suspended from the ship's rail so that it lay against her sides. A survivor of one of the ships sunk states that the noise of the explosion was deafening, the ship being blown up like a rocket and falling on her side.



(a) Clockwork detonator of infernal machine.



(b) Mechanical detonator used by German submarines.

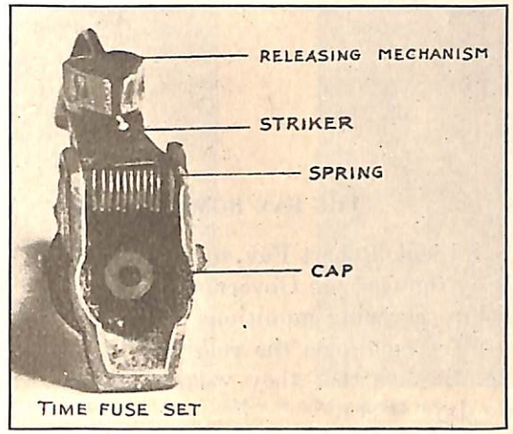
FIGURE 10.

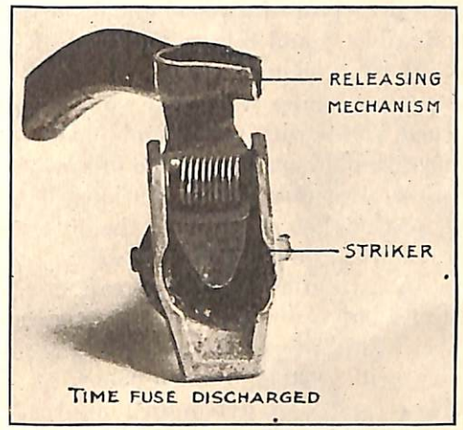
MECHANICAL DETONATING DEVICE.

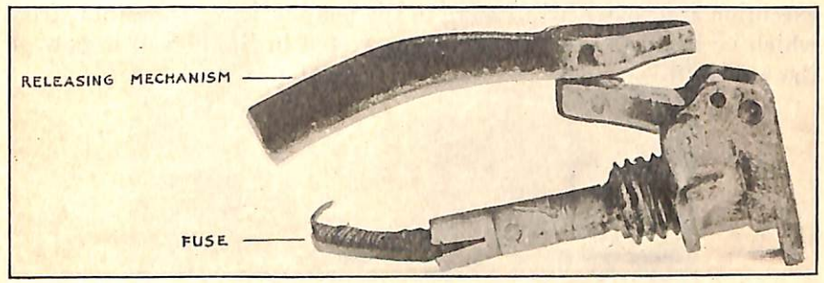
Another mechanical detonator of the same general type was found recently under a freight car loaded with powder in a Philadelphia freight yard. The time fuse of this detonator (see fig. 11) is so placed on the rail that when the car moves the releasing lever is brushed aside by the wheel of the car. This lever in turn releases the striker, which strikes the cap and ignites the fuse, which is connected with an explosive bomb in the interior of the car. By this device the plotter is given ample time to escape.

COMMON INCENDIARY DEVICE.

A simple but effective device for incendiary purposes and one long known, consists of a small, round, clear-glass bottle about 1 inch in diameter and 3 inches long, containing a stick of phosphorus about $1\frac{1}{2}$ inches in length and of the thickness of a knitting needle; also a small quantity of turpentine and carbon disulphide, together with about an ounce of cotton waste. Some small, thin strips of celluloid are occasionally used with cotton waste. The material is dropped in a position where upon ignition, which occurs spontaneously after the turpentine and carbon disulphide have evaporated, it sets fire to any inflammable material in its immediate vicinity. A solution of 1 part of carbon disulphide to 12 parts of white phosphorus contained in a small, fragile glass bottle can be effectively thrown into a window in such a manner that the bottle will be broken. Thereupon the carbon disulphide will evaporate very rapidly and the phosphorus will catch fire instantly. The time of conflagration may be postponed by using a larger quantity of carbon disulphide, so that the evaporation will be slower.







Time fuse found under freight car loaded with powder at Philadelphia, Pa.

FIGURE 11.

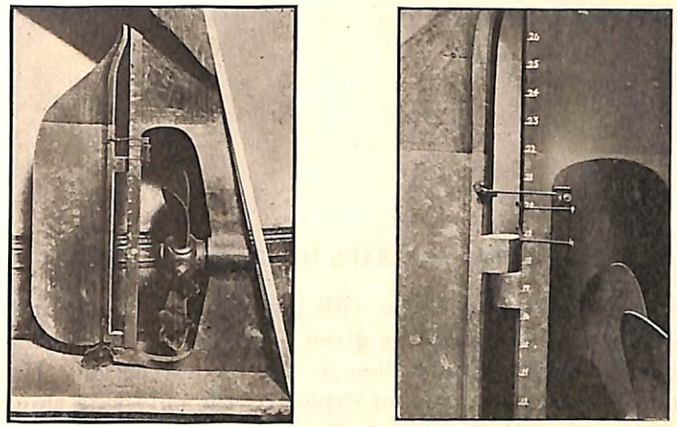
THE FAY BOMB.

In April, 1915, Lieut. Robert Fay, of the German Army, was sent to this country by the German Government for the purpose of placing bombs on ships carrying munitions of war to the allies. Fay's scheme was to place bombs on the rudder posts of ships riding at anchor (see fig. 12*a*) so that they would explode when the ships were about two days at sea.

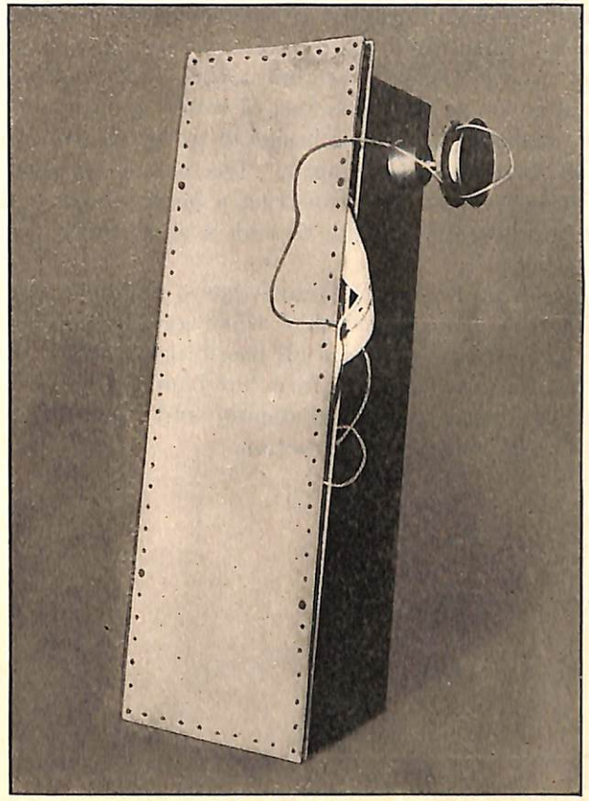
The bomb he made for that purpose consisted of a box, containing about 40 pounds of an immensely powerful explosive, which was to be fastened to the rudder post of a vessel and so geared to the rudder itself that its oscillations would release the catch of a spring within the bomb in the following manner:

Attached to the ship's rudder was a rod which was connected with a number of notched wheels within the bomb. At every swing of the rudder the rod turned up, by one notch, the first of the wheels within the bomb; after a certain number of revolutions that wheel gave one revolution to the next, and so on through the entire series. The last wheel was connected with the threaded cap around the upper end of a square bolt, and its revolutions made this cap slowly unscrew until the bolt dropped clear of it and released the strong pressure of the steel spring above. This pressure drove the bolt downward with great force upon two rifle cartridges fixed below it. These cartridges exploded, set off two sticks of dynamite placed near by, and this explosion in turn exploded the immensely powerful chemical.

Fay was arrested before he could put his destructive plans into execution and sentenced to serve in the penitentiary at Atlanta, from which he later escaped. He was re-arrested in Spain and is now on the way to this country to serve out his sentence.



(a) Fay bomb attached to rudder post of ship.



(b) Fay bomb.

FIGURE 12.

SUGGESTIONS FOR SAFE HANDLING OF BOMBS.

In conclusion, a little advice with regard to the safe handling of bombs and explosives might be given. Of course, too much precaution can not be taken against these devices of destruction. Upon discovering a bomb, incendiary, or explosive, the only safe thing to do is not to tamper with it, and an expert should immediately be called to take care of it.

Immersing a bomb in water, which is usually done at first impulse, with the expectation of rendering the device ineffective, is highly impracticable. With the modern development of bomb construction, the bomb or infernal machine is almost without exception incased in a waterproof cover, so that the effect of water upon it is nil.

The size or shape of the bomb should never be considered as an indicator of its potential strength. The use of modern explosive chemicals make it possible to construct a bomb of small dimensions with a charge powerful enough to sink a ship, destroy a plant, or blow up a depot.

The old proverb of "A little knowledge is a dangerous thing" can not be more aptly exemplified than when applied to the subject of bombs and explosives. To avoid all possible dangers, consult an expert. He knows the types and forms of bombs, their chemical and mechanical properties and ingredients, and the best safeguards against their tendencies of destruction.

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