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Field Engineering and Mine Warfare

PAMPHLET No. 4

MINES—INDIVIDUAL MECHANISMS

1961

(This pamphlet supersedes Field Engineering and Mine Warfare Pamphlet No. 4, Mines—Individual Mechanisms, Part I—All Arms, 1947 (WO Code No. 8208)).

Prepared under the direction of
The Chief of the Imperial General Staff.

THE WAR OFFICE.
1961

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AMENDMENTS

Amendment number	By whom amended	Date of insertion
1	B A Shaw	16-2-67
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DISTRIBUTION

(*See Catalogue of War Office Publications, Part II*)

Regular and TA.—

RAC, RA, RE (less MC and Postal), R Signals, Inf, RASC Scale D

Other Arms (incl MC and Postal) .. .. Scale B

PREFACE

1. Field Engineering and Mine Warfare pamphlets are published in two parts. Part I contains instructions for All Arms, and Part II for Royal Engineers and Infantry Assault Pioneers only.

Parts I and II of each pamphlet are published separately except in the case of Pamphlets No. 4 (this pamphlet), 7, and 9, in each of which the two parts are included under one cover.

2. The complete series of pamphlets is as follows:—

Pamphlet No. 1—Basic Field Engineering
,, ,, 2—Field Defences
,, ,, 2A—Obstacles
,, ,, 3—Demolitions
,, ,, 4—Mines—Individual Mechanisms
,, ,, 5—Laying, Recording and Marking of Minefields
,, ,, 6—Detection and Clearance of Mines
,, ,, 7—Booby Traps
,, ,, 8—Assault River Crossing
,, ,, 9—Bomb Reconnaissance and Protection against Unexploded Bombs

3. Attention is drawn to "Successful Instruction," 1951 (WO Code No. 8670) and "The Principles and Practice of Good Instruction," Part 2, 1947 (WO Code No. 8163). These pamphlets lay down the principles and methods of instruction to be followed by all officer and NCO instructors.

4. The following will be found useful for instruction in individual mechanisms:—

(*a*) *Film strips* (*see War Office Film Catalogue, Part III*)—

No.	*Title*
7113	Principles of mine igniters
7036	Russian mines and igniters—individual mechanisms and disarming procedure 1952.

(*b*) *Wall charts*—

W.O. Code No.	*Title*
9510	British mines and switches
9496	Russian and Chinese mines and igniters

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Amdt 3/ /1966

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ABBREVIATIONS

diam	diameter
°F	degrees Fahrenheit
HE	high explosive
mm	millimetre(s)
oz	ounce(s)

Amdt 3/ /1966

GLOSSARY

Activator—An American term for the detonator assembly and firing mechanism used as an anti-lift switch in the subsidiary fuze well of an anti-tank mine.

Ampoule—A small container, of glass or plastic, holding acid or a chemical fluid.

Anti-lift device—A device arranged to detonate the mine to which it is attached, or to detonate another mine or charge nearby, if the mine is disturbed. This term covers both the obsolete terms " anti-lifting device " and " anti-handling device."

Arming—Setting a mine, either by inserting an igniter and/or detonator, or by operating a setting device, and withdrawing safety devices, so that the mine is ready to operate.

Belleville washer—A particular American design of diaphragm (qv).

Booster charge—A charge of high explosive such as plastic HE, which is initiated by a detonator, and which ensures complete detonation of the main charge.

Cover plate (US " arming plug ")—A cover on top of a mine, over the main fuze well, which may incorporate a setting device. It is usually screwed into place when the igniter has been inserted.

Diaphragm—A thin plate of springy metal with a slight bulge, which inverts sharply when subjected to pressure.

Disarming—Making a mine completely safe, usually by removing the igniter or detonator.

Electrolysis—Chemical decomposition caused by passing an electric current.

Fuze—An igniter in which the actuating mechanism, detonator, and booster charge are all contained.

Igniter—A device for actuating the charge in a mine, to which a detonator or booster charge must be fitted before the assembly is placed in the fuze well of the mine.

Inert mine—The term approved by NATO nations to denote an inert replica of a standard mine, used for instructional purposes. The term " dummy mine " is no longer used.

Neutralizing—Preventing the operation of an igniter mechanism, by turning a setting device to " Safe," by inserting safety pins or clips, or by removing trip wires.

Pressure head or pressure plate—The top part of a mine casing or igniter, sufficient pressure on which will actuate the mechanism and explode the mine.

Shear pin, shear plate, and shear ring—Various methods of using a piece of weak metal, or brittle plastic, to prevent the operation of a spring-loaded striker until the shear material is broken by pressure, when the spring will force the striker down to fire the mine.

Field Engineering and Mine Warfare

PAMPHLET No. 4

MINES—INDIVIDUAL MECHANISMS

PART I—ALL ARMS

CHAPTER 1

INTRODUCTION

SECTION 1.—TRAINING REQUIREMENTS

1. During the 1939-45 War, mines were used in such large numbers that sufficient engineers were not normally available either to lay our own, or to deal with those laid by the enemy. All arms were therefore trained in the recognition and handling of the types of mine that they were likely to come across in the theatres in which they were serving.

2. In any future war, mines may again be used in great numbers. Even if nuclear weapons are employed, protective and nuisance minefields will impose delay on an advancing enemy, and will prove less of an obstacle to our own subsequent advance than would radioactive contamination.

3. It is known that the Soviet Army, for example, attach the greatest importance to training in mine warfare, and that all ranks are expected to be skilled in the use and neutralization of both standard and improvised mines.

4. All Arms must therefore be trained in laying our own standard mines, and in the detection and clearance of scattered mines or groups of mines encountered during the advance to the enemy's main positions. Appendix A gives the current training policy on the responsibilities of arms in this respect.

Safety precautions to be observed during mines training are laid down in Appendix B.

SECTION 2.—SCOPE OF THIS PAMPHLET

5. The basis of arming, neutralizing, and disarming mines is an understanding of the principles on which the initiating mechanisms work, and a knowledge of the methods commonly used to apply them to mine fuzes. This pamphlet deals with the basic working principles of igniters, gives examples of their practical application, and includes

detailed instructions for arming, neutralizing, and disarming specified mines and igniter mechanisms. Part I covers the training requirements of All Arms; Part II is applicable only to the Royal Engineers and Infantry Assault Pioneers.

6. This pamphlet should be read in conjunction with FEMW Pamphlets Nos. 5, 6, and 7.

CHAPTER 2

MINES—GENERAL FEATURES

SECTION 3.—TYPES OF MINE

7. There are two main classes of mine:—

(*a*) Anti-tank mines.

(*b*) Anti-personnel mines.

Certain types can be used for either purpose, by varying the method of arming the mine.

8. *Anti-tank mines.*—These are normally designed to break a tank track and part of the suspension, but they will also usually destroy anything on wheels which passes over them. More powerful mines, with special charges, may pierce the hull of a tank.

A fairly large load (350 to 500 pounds) is needed to actuate anti-tank mines, so that men stepping on them will rarely set them off, but they can be fitted with devices to kill or wound men trying to lift or neutralize them.

9. *Anti-personnel mines.*—These are designed to kill or wound men when they are set off. There are two main types. One relies on blast, and is meant to blow off the foot or leg of a man who steps on it, or to put a wheeled vehicle out of action. The other throws a container into the air, where it bursts and scatters fragments to wound or kill any men within effective range. A load of 30 pounds or less will actuate an anti-personnel mine.

SECTION 4.—HOW MINES WORK

10. All mines consist of three main parts:—

(*a*) The main charge, in a container which usually forms the body of the mine.

(*b*) A detonator, or igniter charge, which sets off the main charge when it explodes.

(*c*) A mechanism, or other device, to set off the detonator or igniter charge.

11. The main charge is quite safe to handle if the detonator or igniter charge is removed.

12. The detonator, or igniter charge, and the firing mechanism, or device, are contained in the igniter (*see* Section 5).

13. If treated with reasonable care, mines can be handled safely with the igniter in position, so long as the firing mechanism is prevented from operating, eg, by a safety pin.

14. It is important to be able to recognize the type of mine container, so as to know what sort of igniter is likely to be fitted to it.

SECTION 5.—TYPES OF MECHANISM

15. The aim of all firing mechanisms is to prevent the mine exploding until it is set off by interference, and to ensure immediate detonation when it is actuated by the type of interference for which it is designed.

16. The simpler types are actuated in one of the following ways:—

(*a*) By pressure.
(*b*) By releasing pressure which has previously been applied.
(*c*) By pulling a trip wire.
(*d*) By breaking a tight wire.

17. Each of these methods may be applied in different ways. For example, pressure on the top of a mine may release a striker spring, or it may press together two pieces of metal, acting as a simple electric switch, or it may crush a brittle container, and release an acid to cause a chemical reaction.

18. More complicated mechanisms may be actuated by particular sounds, by the magnetic effect of a metal tank or vehicle, by vibration, by radio, or by some similar means. No details of these are included in this pamphlet.

SECTION 6.—ARMING, NEUTRALIZING, AND DISARMING

19. To arm the mine, the igniter must be put into position, the mechanism must be properly set, and the safety device must be put out of action, eg, by removing a safety pin, or by turning a lever from "safe" to "fire."

20. To neutralize the mine, ie, to make it safe to handle, the igniter must be rendered harmless, eg, by inserting a safety pin.

21. To disarm the mine, the igniter must be removed from the main charge.

SECTION 7.—GENERAL RULES

Learn and remember these rules. They may save your life.

22. Remember that the enemy wants to kill you. He will very likely succeed in doing so unless you are always alert and always suspicious.

23. Look carefully all round a mine or booby trap *before* you start working on it.

24. Handle all mines, fuzes, igniters, and switches with care *at all times*.

25. *Never use force.* If force seems to be necessary, stop work, mark the mine, and get skilled help.

26. Never pull a slack wire, and never cut a taut one. Follow along the wire to both ends in turn, and examine the attachments, *before* you tamper with the wire in any way.

27. Always neutralize any anti-personnel mine *before* you start to lift it.

28. If you have to leave any mine or trap unlifted, and especially if you do not recognize it, *mark it* obviously and *report it*, so that experts can find it and deal with it.

29. The mnemonic " CAREFUL " may be found useful. It is made up as follows:—

Care always
Alert always
Rough never
Examine thoroughly
Follow wires
Unset mechanism
Leave novelties

CHAPTER 3

BASIC WORKING PRINCIPLES OF SPRING-OPERATED IGNITERS

SECTION 8.—GENERAL

30. Spring-operated mechanisms are those in which a strong spring drives a striker onto a percussion cap, which explodes and sets off a detonator or igniter charge. In principle they are exactly like the rifle, in which a striker fires the cartridge when the trigger is pressed.

31. In mine igniters the trigger is replaced by one of several kinds of firing device (*see* Section 5), and different types of spring-operated igniters really differ only in the way in which the firing mechanism releases the striker spring.

The main methods used are explained in this chapter.

32. In the rifle a safety catch is provided to prevent the cartridge being fired accidentally. In mine igniters there is also usually a safety device, to prevent accidents when the mine is being handled or laid.

In spring-operated mechanisms this usually takes the form of an additional pin or clip, which must be removed before the striker spring can be released by the mechanism. Safety devices are not shown in the diagrams in this chapter, but those used in particular types of mine are described in later chapters.

SECTION 9.—SHEAR PIN CONTROL

33. When the mechanism is set, the striker is pulled back against a spring, which is held in the compressed position by a shear pin through the plunger, resting against the igniter body (*see* Figure 1(*a*)).

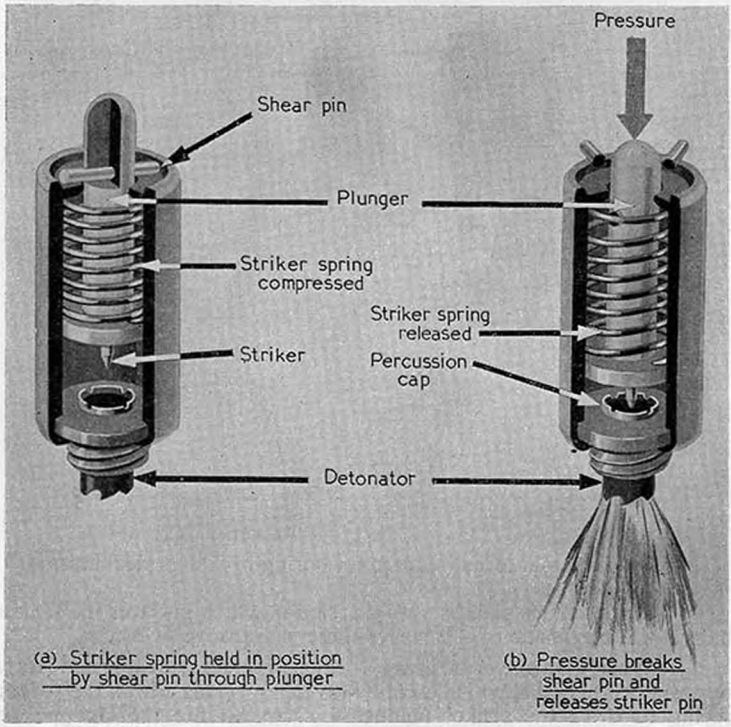

Fig 1.—Principle of shear pin control of spring-operated mechanisms

34. The shear pin is really a weak safety pin. It is strong enough to resist the pressure due to the spring, but it will not stand up to much more.

35. When sufficient pressure comes onto the plunger, the shear pin breaks, and the spring drives the striker down to fire the percussion cap and detonator (*see* Figure 1(*b*)).

SECTION 10.—BALL CONTROL

36. The striker spring is held in the compressed position by one or more retaining balls, which are pressed into a groove or recess in the striker body (*see* Figure 2(*a*)).

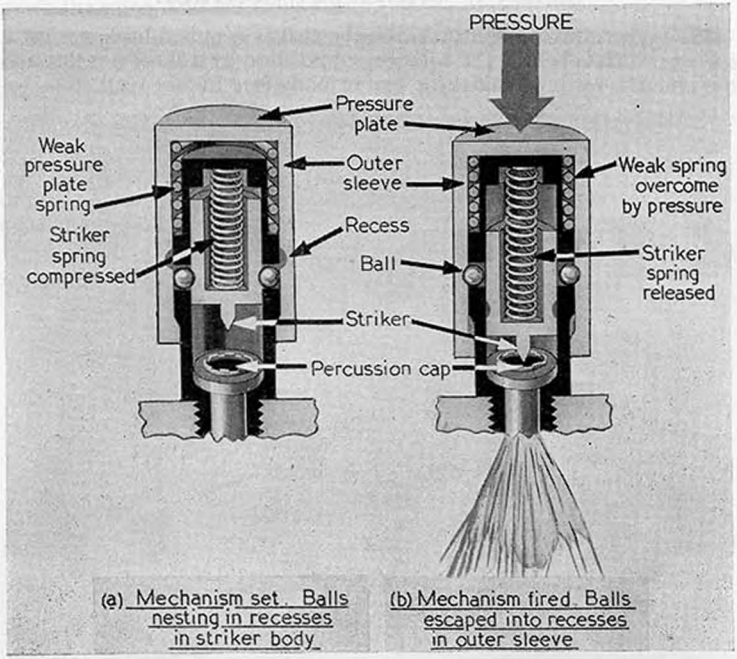

Fig 2.—Principle of ball control of spring-operated mechanisms

37. The pressure plate is an outer sleeve, which fits over the striker body. On the inside of this sleeve there is a groove or recess.

38. When the sleeve is pressed down, the recesses come directly opposite to the balls, which escape into them. This allows the striker spring to drive the striker against the cap, to fire the charge (*see* Figure 2(*b*)).

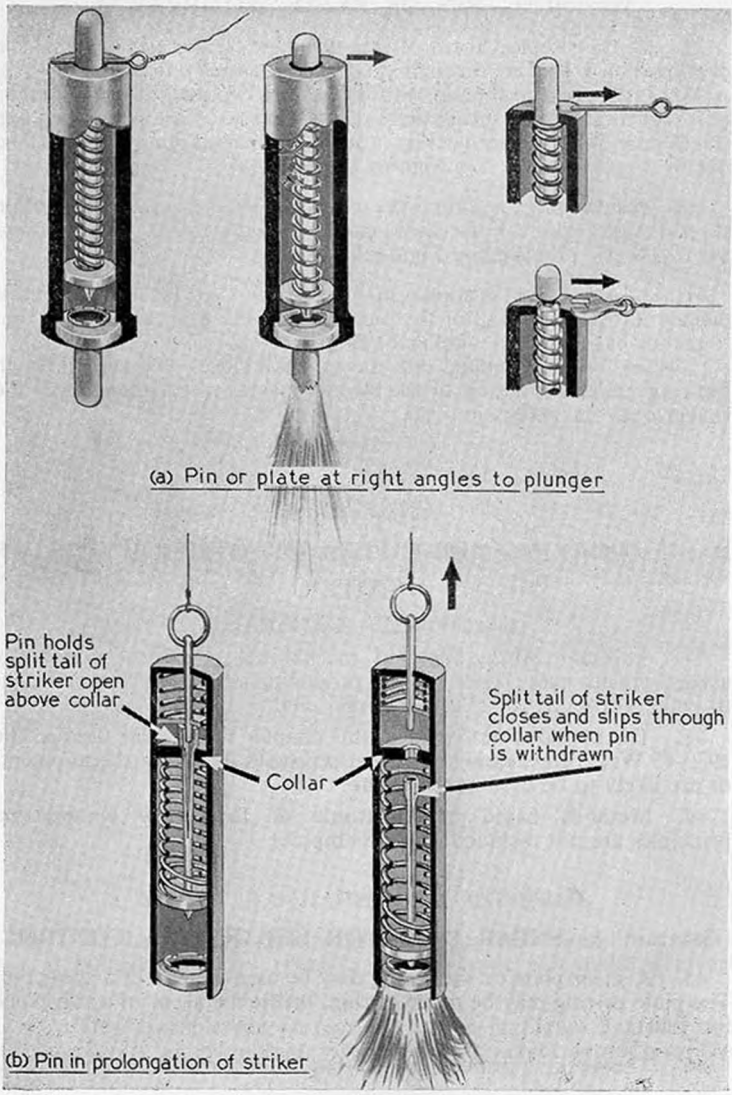

Fig 3.—Principle of control of spring-operated mechanisms by pin or plate withdrawal

SECTION 11.—PIN OR PLATE WITHDRAWAL

39. In the simplest form of this type, the striker spring is held in compression by a pin through the plunger, exactly like a safety pin. A wire is attached to the pin, and if this wire is pulled the pin is pulled out, and the released spring drives the striker onto the percussion cap (*see* Figure 3(*a*)). Alternatively, a specially shaped pin may be pushed out by direct pressure (*see* Figures 28 and 29(*a*)).

40. A small plate is sometimes used instead of a pin. This is often shaped rather like a horse-shoe, and fits snugly into a groove round the top of the plunger (*see* Figure 3(*a*)).

41. Another form is shown in Figure 3(*b*). In this case the pin is pushed into the split tail of the plunger, keeping it opened out so that it cannot pass through a collar or ring.

When the pin is pulled out, the split tail closes, and slips through the ring under the action of the striker spring, which then forces the striker onto the percussion cap.

CHAPTER 4

BASIC WORKING PRINCIPLES OF OTHER TYPES OF IGNITER

SECTION 12.—GENERAL

42. Although spring-operated mechanisms are most commonly used, there are many other ways of producing a flash which is sufficient to ignite a fuze, or to set off an igniter charge.

43. The methods described in this chapter were either used in the 1939-45 War, or are now used in certain types of standard equipment, or are likely to be used in the future.

44. Methods based on electronic or technically complicated principles are not included in this pamphlet.

SECTION 13.—SHEAR PLATE OR SHEAR RING CONTROL

45. A shear plate or shear ring may be used instead of a shear pin. The plate or ring may be made of thin, brittle metal, or of a substance like plastic.

46. The working principle is like that of the shear pin (*see* Figure 4).

47. Plastic plates or rings are often used in mines intended to defeat the mine detector.

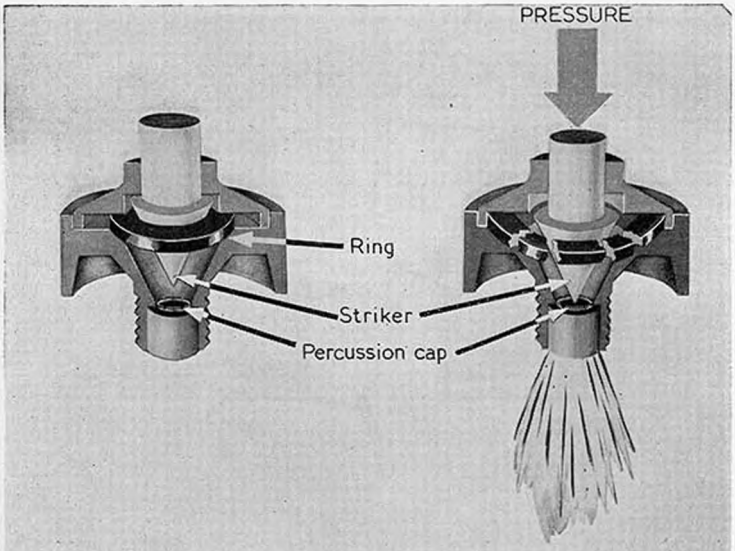

Fig 4.—Principle of shear ring control

SECTION 14.—DIAPHRAGM CONTROL

48. If a thin sheet of springy metal, such as the bottom of an empty tin, is bulged outwards, pressure on the bulge will make it invert suddenly.

49. This principle can be used, as shown in Figure 5, to force a striker onto a percussion cap when sufficient weight comes onto the striker head.

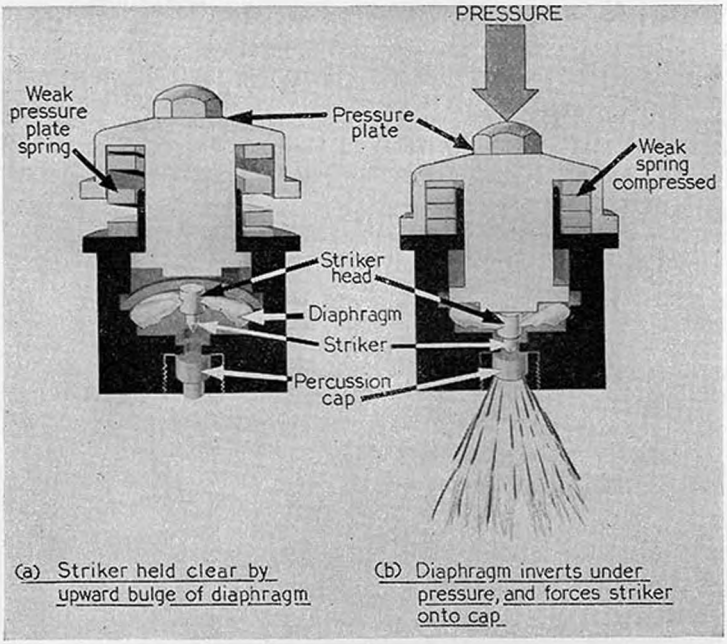

Fig 5.—Principle of diaphragm control

SECTION 15.—ELECTRIC CONTACT

50. If an electric detonator is correctly wired to a battery, through a switch, the detonator will be fired when the switch is closed.

51. Various simple devices can be used in an igniter to complete the electric circuit. An example illustrating the principle is shown in Figure 6.

SECTION 16.—CHEMICAL REACTION

52. The simplest form of chemical control is shown in Figure 7. The igniter contains a chemical powder and a capsule of acid. When the igniter casing is crushed, the acid capsule breaks, and the acid reacts with the powder to produce a flash, which fires the detonator.

53. Another form of chemical control is shown in Figure 8. In this case a glass phial of acid is placed above a small inert battery, which is connected to an electric detonator. When the phial is broken, the acid escapes into the battery cup. Current then flows from the battery to the detonator, and fires it.

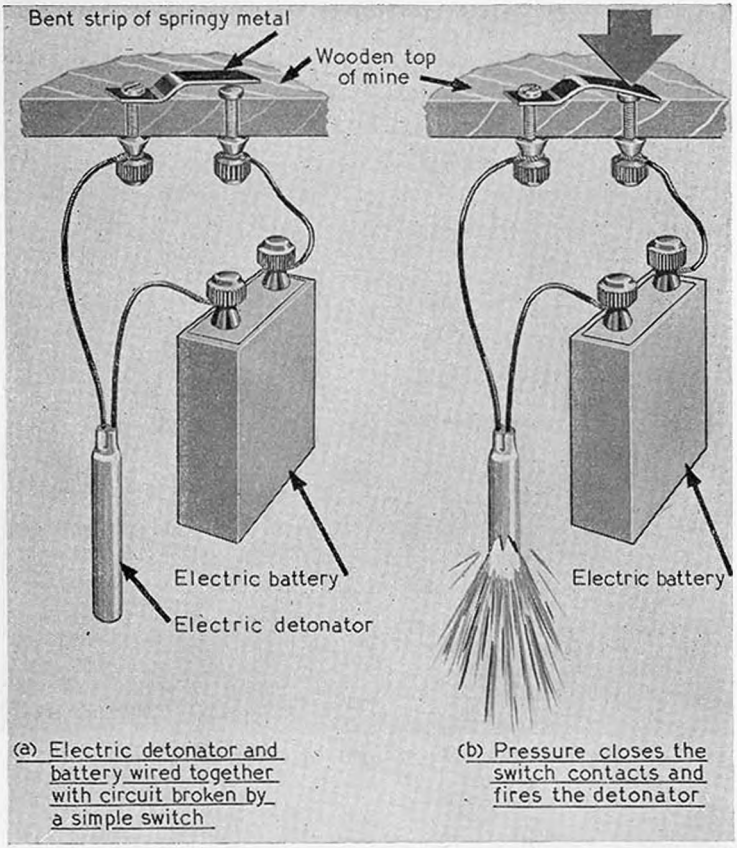

Fig 6.—Principle of control by electric contact

SECTION 17.—FRICTION IGNITERS

54. The principle of the friction igniter is similar to that of striking a match.

55. A wire coated with a chemical is drawn sharply through a friction compound. Heat is generated, and the compound ignites, causing a flash which fires the detonator (*see* Figure 9).

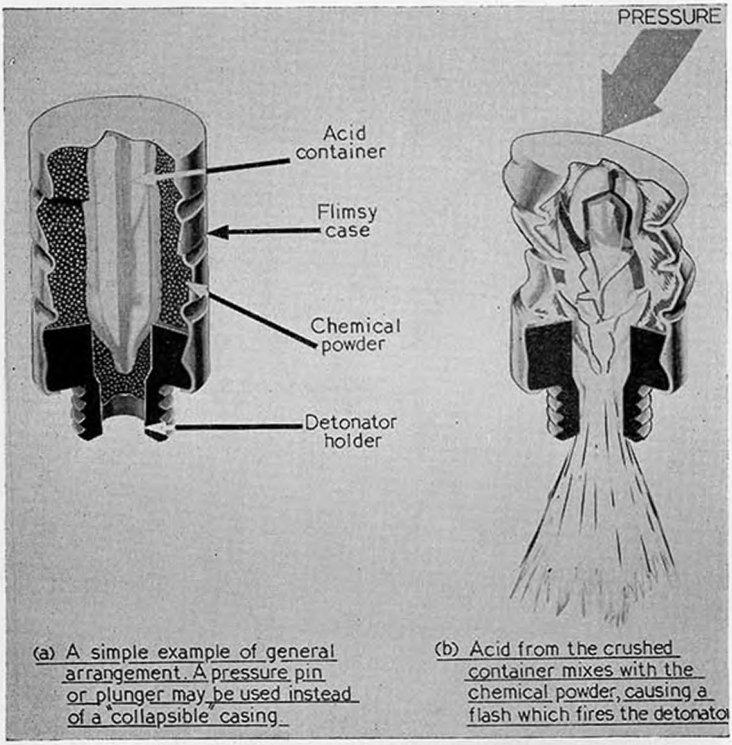

Fig 7.—Principle of control by chemical reaction

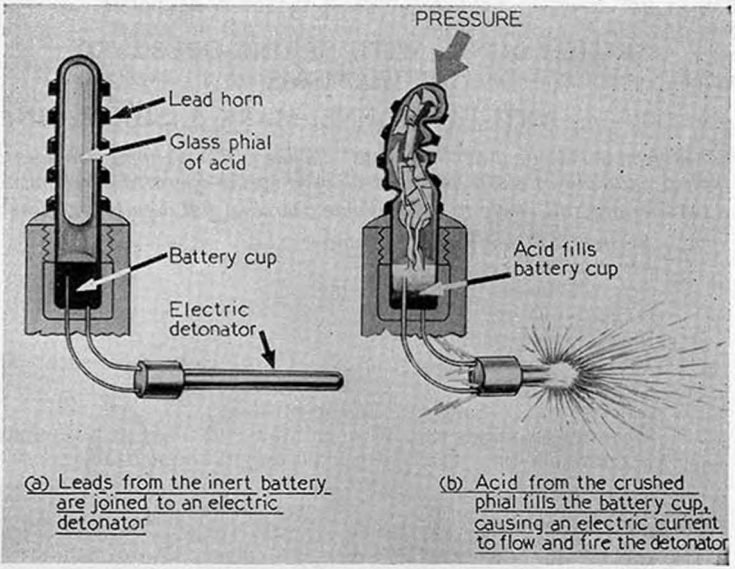

Fig 8.—Principle of control by chemical-electric reaction

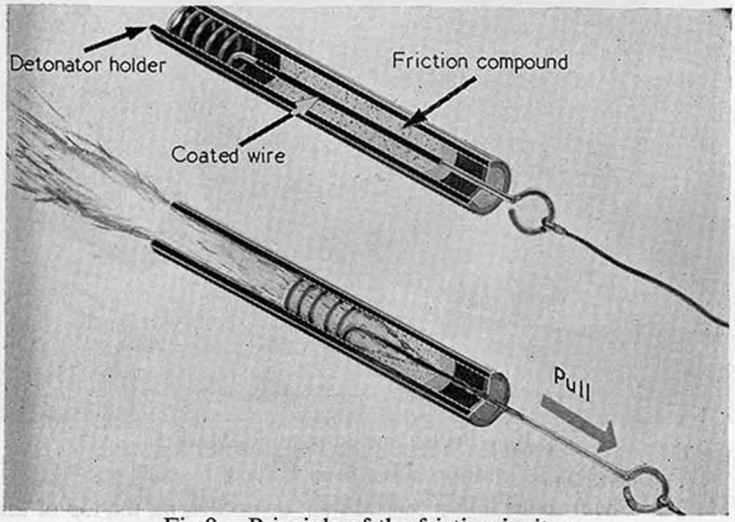

Fig 9.—Principle of the friction igniter

CHAPTER 5

BRITISH MINES WITH SPRING-OPERATED MECHANISMS

SECTION 18—ANTI-TANK MINE, MARK 5 (SHEAR PIN)

(Though now classified as "obsolete" in the UK, this mine provides a typical example of shear pin control of a spring-operated mechanism. As stocks are still likely to be available overseas, full details are given).

56. *Recognition* (*see* Figures 10 and 11).—
Material.—Metal.
Size.—8 ins diameter x 4 ins high.
Weight.—12 lb.
Weight of explosive.—8 lb.
Igniter type.—Pressure fuze, No. 3 (spring-operated; shear pin control).
Safety device.—Safety pin in top of fuze.
Packing.—5 mines to a wooden crate. 5 fuzes in a separate circular tin. Over-all packed weight about 70 lb.

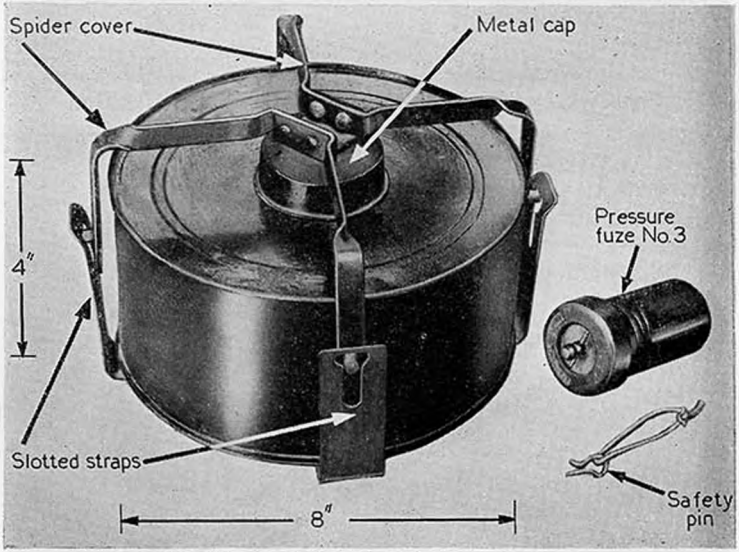

Fig 10.—British anti-tank mine, Mark 5

57. *Operation.*—
(*a*) The fuze fits into a central well, or pocket, on the top of the mine casing, and is protected from moisture by a metal cap

seated on a rubber washer. A load of from 350 to 450 pounds on the spider cover crushes the protective cap and shears the shear pin in the fuze (*see* Figure 12). This releases the spring-loaded striker, which fires the percussion cap.

(*b*) *Special note.*—The actuating load depends upon what part of the spider is depressed. A running man may set off the mine if he strikes the outer edge of the spider.

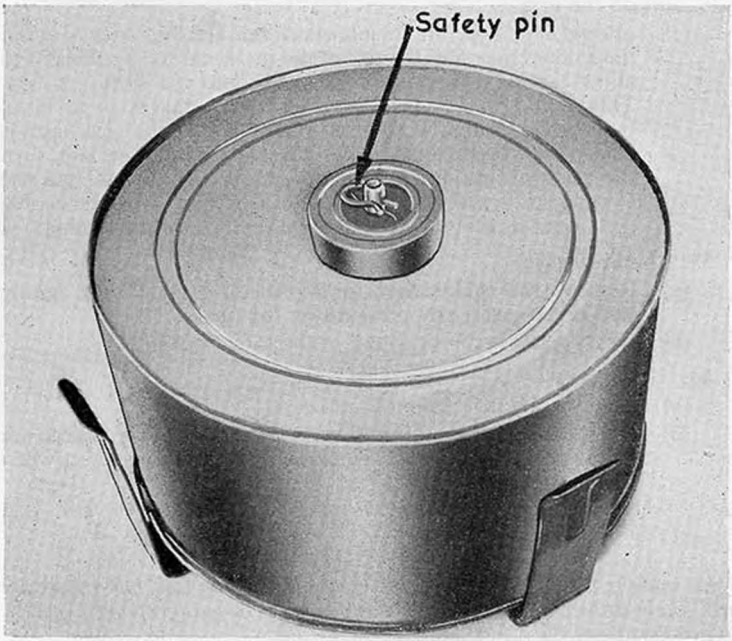

Fig 11.—Mark 5 anti-tank mine with spider cover removed, showing top of fuze and position of safety pin.

58. *Arming.*—

(*a*) Remove the spider cover and protective cap.

(*b*) Place the mine in a hole so that the spider, when replaced, will be less than one inch below ground surface.

(*c*) Remove the paper seal from the fuze well.

(*d*) Examine the fuze, to ensure that the shear wire is in position, and that it has not been either entirely or partially sheared, eg, by blast from shelling or bombing. If it has been damaged, or if it is rusty, discard the fuze.

(*e*) Withdraw the safety pin by a horizontal pull, preferably using a pair of pliers (*see* Figure 11).

(*f*) Insert the fuze in the fuze well. Do not use force; it should fit easily.

(*g*) Replace the protective metal cap, so that it rests on the rubber washer.

(*h*) Replace the spider cover, engaging the locking studs with the slotted straps in the side of the mine. Do not exert pressure on the fuze.

(*j*) *Special note.*—Before fuzing, check that the clearance between the spider cover and the top of the metal casing is sufficient to allow the locking studs to fit easily into the slotted straps. This should be done with the protective metal cap in position, but the fuze must NOT be in the mine. If the clearance is insufficient, remove the spider cover and protective cap, turn the mine upside down on a flat, hard surface, and tap the straps gently with a light hammer. If this does not enable the spider locking studs to engage easily, reject the mine.

59. *Neutralizing.*—

(*a*) Remove the spider cover and protective metal cap, taking care not to exert any pressure on the fuze.

(*b*) Insert a safety pin or a nail in the safety pin hole.

60. *Disarming.*—

(*a*) Remove the fuze from the mine.

(*b*) *Special note.*—Because the detonator and booster charge are built into the fuze, care is necessary in handling, even when the safety pin is in place.

SECTION 19.—ANTI-PERSONNEL MINE, No. 5 (BALL CONTROL)

(This mine is now classified as "obsolescent" in the UK, but stocks are still likely to be available. Attention is drawn to paragraph 66).

61. *Recognition* (*see* Figure 13).—

General appearance.—The cylindrical mine case is painted either brown or white, and has one red and one green stripe around the lower half.

Material.—Container: composition or shellacked cardboard.
Pressure plate: metal.
Fuze casing: ebonite.
Striker unit: plastic.

Size.—Container: 2 ins diameter x 3½ ins high.

Weight.—8 ounces approximately.

Weight of explosive.—Main charge: 6¾ ounces.
Booster charge: ¼ ounce.

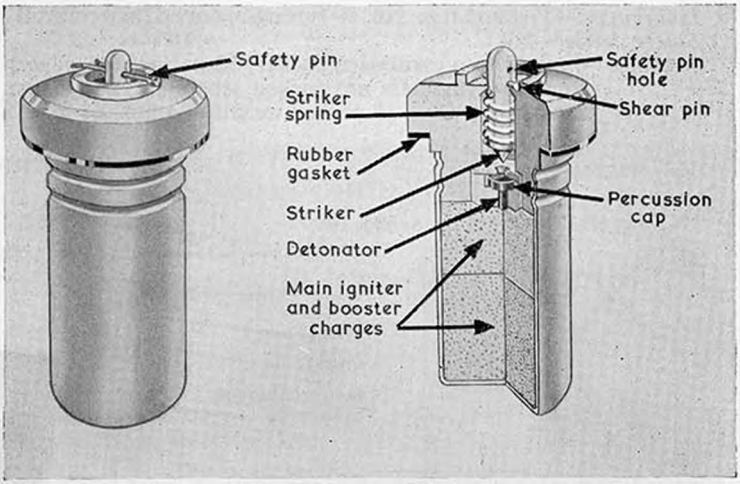

Fig 12.—British pressure fuze, No. 3

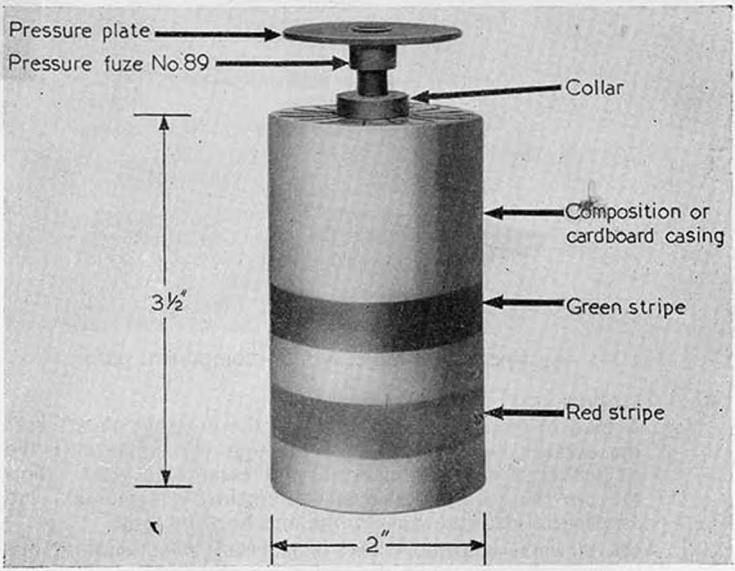

Fig 13.—British anti-personnel mine, No. 5

Igniter type.—Pressure fuze, No. 89 (spring-operated; ball control).
Safety device.—Nil.
Packing.—4 mines to a cardboard packet; 12 packets (48 mines) to a box. Igniters are packed separately, but in the same box. Over-all packed weight of a box, 68 lb.

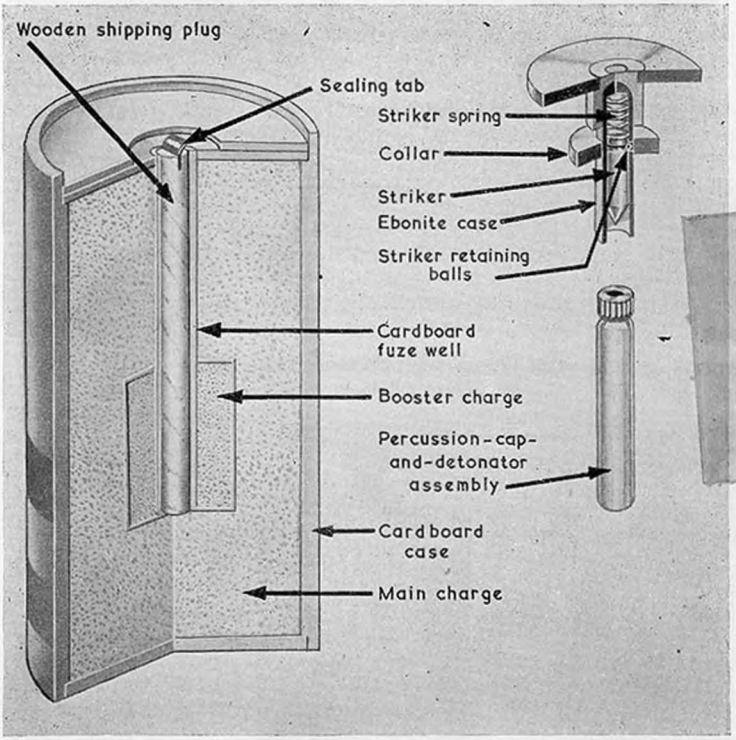

Fig 14.—Anti-personnel mine, No. 5—component parts

62. *Operation* (*see* Figure 14).—

(*a*) A load of from 6 to 12 pounds on the pressure plate forces the ebonite case of the fuze through the collar until the striker-retaining balls clear it, and escape sideways. This releases the spring-loaded striker against a percussion cap and special detonator assembly, and fires the mine.

(*b*) *Special note.*—Particular care is necessary when handling this igniter. Do not touch the collar, which has to move only a fraction of an inch to release the striker.

SECTION 19A.—MINE, ANTI-PERSONNEL, CANADIAN ELSIE (BALL CONTROL)

66A. *Recognition* (*see* Figure 14A).—

(*a*) *General appearance.*—The body is of black plastic and is pointed at one end to facilitate driving in the ground; the other end, the top, is flared out.

(*b*) *Size.*—Height 3 in. Diameter of trunk 1 1/16 in, and of flared top 2 in.

(*c*) *Parts.*—There are four separate parts: the body, the dust cap, the charge, the safety clip.

(*d*) *The body.*—This is made up of two parts; the lower part contains the firing mechanism, the upper houses the detonator assembly and receives the charge (*see* Figure 14B).

(*e*) *The charge.*—Weight 1/3 ounce. It is contained in a cylindrical plastic case 1½ in long × ¾ in diameter, and is in the form of an inverted cone.

(*f*) *The safety clip.*—This is a spring clip which fits around the top half of the charge preventing it from being pressed down and so releasing the firing mechanism.

(*g*) *The firing mechanism.*—This is of the spring-operated, ball control type; it fires a US M46 detonator.

(*h*) *Packing.*—12 mines with dust caps are carried in a plastic satchel together with 12 charges and safety clips. The charges are kept separate from the bodies. 8 satchels (96 complete mines) are carried in a transit case.

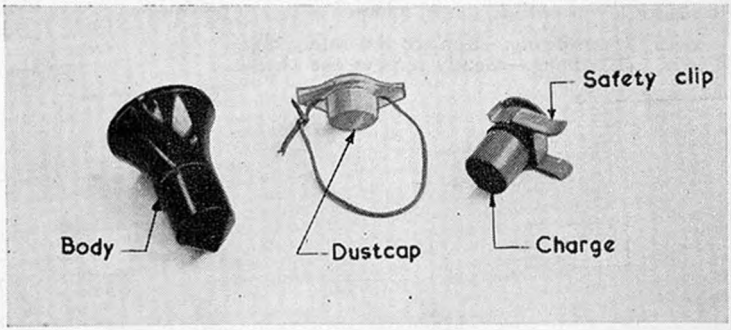

Fig 14A.—Parts of mine, anti-personnel, Canadian Elsie

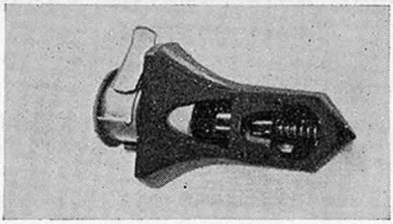

Fig 14B.—Section of mine, anti-personnel, Canadian Elsie

66B. *Arming.*—Two methods are followed:—

(*a*) *Method A.*—

(i) Remove the dust cap.

(ii) Insert the charge, with the safety clip in position, into the body.

(iii) Force the mine into the ground. Loosen the ground with a bayonet if necessary.

(iv) Remove the safety clip.

(*b*) *Method B.*—

(i) Keeping the dust cap in place, drive the body into the ground using the heel, hand, or boot.

(ii) Remove the dust cap ensuring that no loose stones or dirt fall into the charge recess.

(iii) Insert the charge.

(iv) Remove the safety clip.

66C. *Laying.*—The Canadian Elsie is laid in accordance with current drills for laying anti-personnel mines.

66D. *Neutralizing.*—Replace the safety clip.

66E. *Disarming.*—Gently remove the charge.

63. *Arming.*—

(*a*) Tear off the sealing tab from the top of the mine, and remove the wooden plug (*see* Figure 14).

(*b*) Place the mine in a hole so that the top is just below ground surface.

(*c*) Insert the special percussion-cap-and-detonator assembly into the fuze well, red top uppermost.

(*d*) Holding the upper closed end of the striker unit, and avoiding contact with the collar, insert the striker unit into the fuze well, so that the collar rests on top of the mine.

(*e*) Gently place the pressure plate on top of the striker unit, taking care not to exert any pressure.

64. *Neutralizing.*—

(*a*) Gently remove the pressure plate.

(*b*) Holding the top of the striker unit, and avoiding the collar, gently withdraw the striker unit from the mine.

65. *Disarming.*—Remove the percussion-cap-and-detonator assembly from the fuze well.

66. *Training mine.*—The training version of the anti-personnel mine, No. 5 is the British mine (M) alarm. This is identical in appearance, except that it is painted black, and has " MINE (M) ALARM " stencilled on it in white. It contains a smoke charge instead of explosive, and weighs only 2 ounces approximately. Arming and neutralizing drills are exactly similar to those for the anti-personnel mine, No. 5.

SECTION 20.—MINES WITH PLATE WITHDRAWAL CONTROL

Trip flare, Mark 2

67. *Recognition* (*see* Figure 15).—

General.—The trip flare comprises two pickets, one spring arm with spring and clamp, a 60-ft spool of trip wire, and a flare pot.

Size.—Height of picket 23 ins.

Weight.—9 ounces (flare pot only).

Igniter type.—Spring-operated with plate withdrawal control.

Safety devices.—Two safety pins, one for the flare trip plate mechanism, one for the spring links.

Packing.—12 in a metal box, complete with pickets and wire.

68. *Operation.*—The flare is set off by a trip wire, either by a pull on the wire, or by release of trip wire tension. Movement of the wire withdraws the trip plate, which allows the spring-loaded striker to ignite the flare.

69. *Arming.*—On sloping ground, pickets must be driven at right angles to the ground surface. It is most important that the arming operations should be carried out in the order given:—

(*a*) At one end of the selected trip wire position, insert the picket which is **not** to carry the flare pot, with the side prong inwards

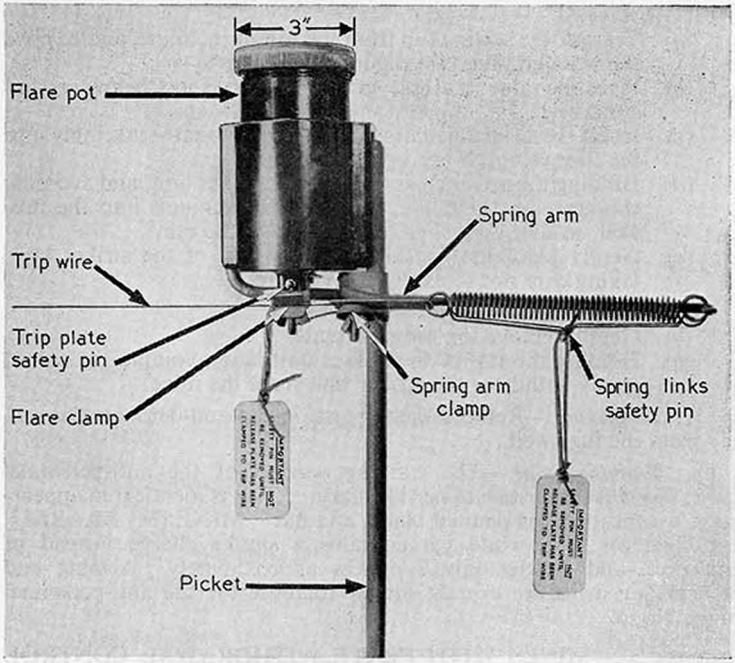

Fig 15.—British trip flare, Mark 2

(in the direction of the trip wire), and driven into the ground to the full depth of the side prong.

(*b*) Remove the split pin from the wire spool. Place the looped end of the wire over the main post of the picket, taking a turn under the side prong to prevent the loop slipping off while reeling out.

(*c*) Reel out the wire in the required direction, and insert the second picket at the desired distance (the *maximum* distance between pickets is 60 feet). Drive the picket to the full depth of the side prong, with the side prong inwards (towards the trip wire).

(*d*) Place the spring arm on the second picket, passing it over the main post and pushing it down until it is locked against rotation by the side arm.

(*e*) Pass the trip wire round the clamp on the spring arm, and draw the wire tight until the spring is extended to the limit of its link. Secure the wire by tightening the clamp.

(*f*) Remove the string on the flare safety pin from the clamp on the flare pot, and place the flare pot on the picket by sliding it between the main post and the side arm.

(*g*) Unscrew the wing nut under the flare pot, and insert the trip wire into the jaws of the flare clamp. Screw the wing nut up tight.

(*h*) Remove the safety pin from the spring links.

(*j*) Remove the safety pin from the flare pot.

70. *Neutralizing.*—Insert a safety pin or a nail in the safety pin hole of the flare pot.

71. *Disarming.*—

(*a*) After neutralizing, unscrew the wing nut under the flare pot, and release the trip wire from the clamp.

(*b*) Remove the flare pot from the picket.

Shrapnel mine, Mark 2

72. *Recognition* (*see* Figure 16).—

General appearance.—The mine is painted yellow, with two red stripes round the case.

Material.—Metal.

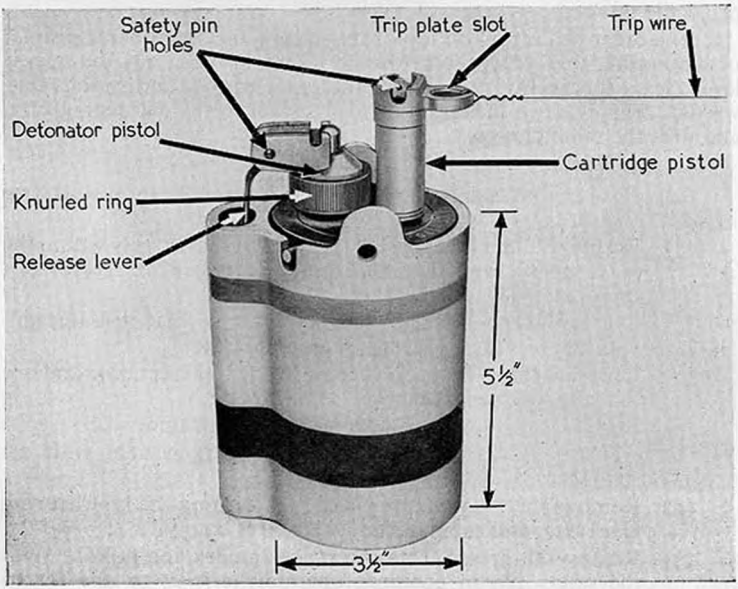

Fig 16.—British anti-personnel shrapnel mine, Mark 2

Size.—The actual mine is 3 ins diameter x 5½ to 6 ins high.
Weight.—Approximately 10 lb total.
Weight of explosive.—1 lb.
Igniter type.—Propelling fuze: spring-operated with plate withdrawal control.
Detonating fuze: spring-operated with lever release similar to No. 36 grenade.
Safety device.—Two safety pins, one for trip plate of " cartridge pistol," the other for release lever of " detonating pistol."
Packing.—4 mines to a wooden crate. Igniters are packed in the same crate, with one spanner for the cartridge pistol. Over-all packed weight 50 lb.

73. *Operation.*—The mine is set off by a pull on a trip wire. It is designed to jump about 3 feet into the air before bursting. When it bursts, fragments of the thick inner casing cause effective casualties within a radius of 10 or 15 yards, and they are dangerous up to about 50 yards.

The taller of the two projections on top of the mine is the " cartridge pistol," or propelling fuze. A pull on the trip wire withdraws a plate (*see* Figure 3(*a*)), and the spring-loaded striker fires a ballistite cartridge. The pressure created by the explosion propels the projectile upwards.

The other projection on top of the mine is the " detonator pistol," or detonating fuze. As the projectile jumps into the air, the release lever clears the well on the side of the outer casing, and springs outwards. This releases the spring-loaded striker in the detonating fuze, and fires the main charge.

74. *Arming.*—

(*a*) Ensure that safety pins are in place in both pistols (*see* Figure 17).

(*b*) Ensure that the inner casing (projectile) slides freely within the outer casing, and that the meeting surfaces are free of dirt or other obstruction.

(*c*) Dig in the outer casing, positioning it so that it is upright, with the top of the casing at ground level.

(*d*) Unscrew the " cartridge pistol " (taller projection), and see that the fuze well is empty.

(*e*) Insert a ballistite cartridge, percussion cap upwards.

(*f*) Replace the cartridge pistol, screwing it in tight with the spanner provided.

(*g*) Remove the " detonator pistol " by turning the knurled ring *clockwise*, and see that the fuze well is empty.

(*h*) Remove all grease from the striker guides and holes. With the safety pin in position, operate the lever to and fro to work the striker up and down.

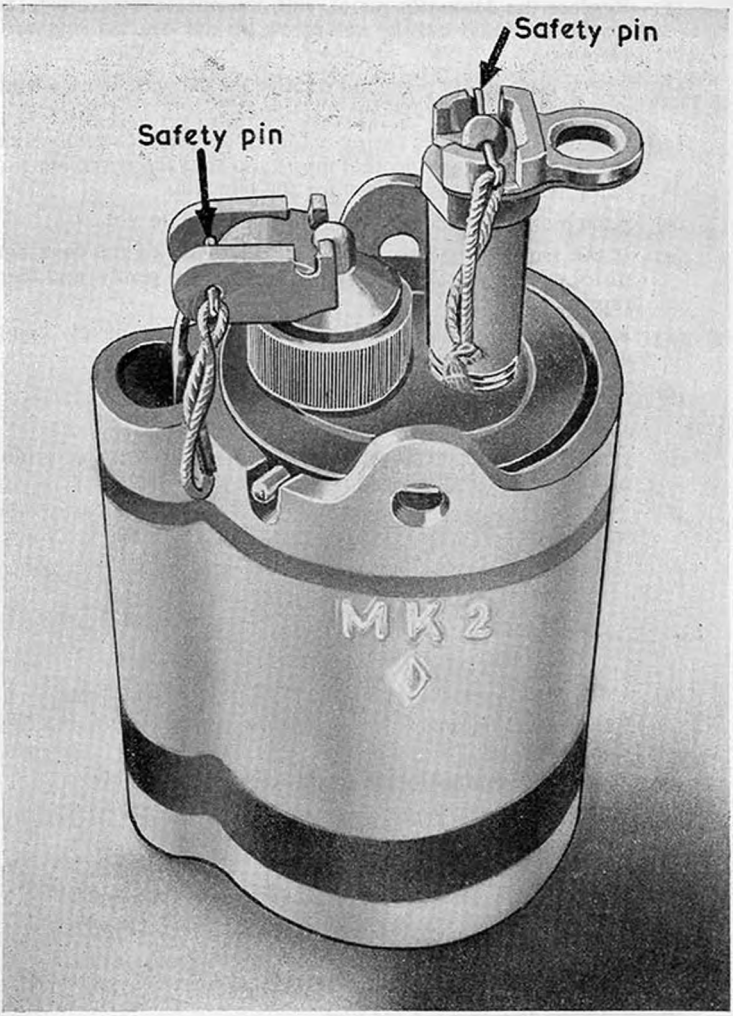

Fig 17.—Anti-personnel shrapnel mine, Mark 2—position of safety pins

(*j*) Insert the percussion-cap-and-detonator assembly, small end downwards. Shake gently to ensure that the cap head rests on the shoulder of the fuze well.

(*k*) Replace the detonator pistol, with the release lever down the slot in the outer casing, and screw up the knurled ring *anti-clockwise*.

(*l*) Check both safety pins, and remove the carrying handle from the mine.

(*m*) Check that the outer casing is free of dirt, and carefully slide the inner casing (projectile) into it, so that the trip plate slot faces the direction required for the trip wire.

(*n*) Attach an anchored trip wire to the trip plate slot.

(*o*) If the trip wire is too tight, the safety pin of the cartridge pistol will jam. Check by removing the pin gently, and then replace it.

(*p*) Remove the safety pin from the detonator pistol, being careful not to disturb the mine.

(*q*) Remove the safety pin from the cartridge pistol.

75. *Neutralizing.*—

(*a*) Hold the trip plate firmly in position, and put a safety pin, or a nail, in the safety pin hole of the cartridge pistol.

(*b*) Put a safety pin or nail in the safety pin hole of the detonator pistol.

(*c*) Trace trip wires to the other end. If no other mine or booby trap is attached, cut the trip wires.

76. *Disarming.*—

(*a*) Check that both safety pins are firmly in place.

(*b*) Unscrew the cartridge pistol, and tip out the cartridge.

(*c*) Remove the detonator pistol by unscrewing the knurled ring *clockwise*.

(*d*) Tip out the percussion-cap-and-detonator assembly.

CHAPTER 6

BRITISH MINES WITH OTHER TYPES OF IGNITER

SECTION 21.—ANTI-TANK MINE, MARK 7 (DIAPHRAGM)

77. *Recognition* (*see* Figure 18).—

Material.—Metal.

Size.—13 ins diameter x 5 ins high.

Weight.—32 lb 6 oz over-all, including dome package weighing 2 lb 7 oz.

Weight of explosive.—20 lb.

Igniter type.—Diaphragm control (*see* Figure 5).

Safety devices.—

(*a*) The igniter can be placed either way up in the mine. The ends are marked " ARMED " and " UNARMED " respectively. When the end marked " UNARMED " is uppermost, the mine is safe, unless sufficient force is applied to break the safety clip (*see* (*b*)).

(*b*) A safety clip is fitted round the centre of the igniter (*see* Figure 19).

Packing.—

(*a*) *Mines.*—Mines are packed separately, using the domed cover.

(*b*) *Igniters.*—New production: 28 to a box, in two plywood containers holding 14 each.

Old production: repacked, in a box containing 8 cylinders, holding 5 igniters each (total 40 per box).

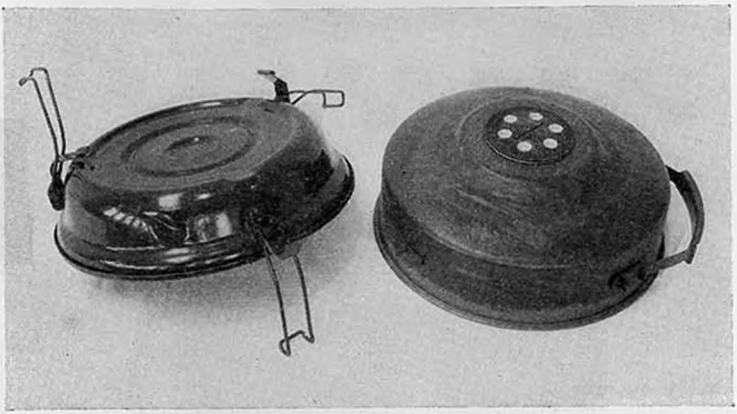

Fig 18.—British anti-tank mine, Mark 7, and dome package

78. *Operation.*—The igniter fits into a central well on the top of the mine casing. When mounted in the armed position, it is covered by a pressure plate (*see* Figure 19). Sufficient pressure on this pressure plate will cause the diaphragm in the igniter to invert, forcing the striker onto the percussion cap to fire the mine.

79. *Arming.*—

(*a*) Remove the dome package (*see* Figure 18).

(*b*) Unscrew the cap of the pressure plate.

(*c*) Remove the igniter.

(*d*) Remove the igniter safety clip (*see* Figure 19).

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78. *Operation.*—The igniter fits into a central well on the top of the mine casing. When mounted in the armed position, it is covered by the mine cap which is screwed into the pressure plate (*see* Figure 19). Sufficient pressure on the pressure plate will cause the diaphragm in the igniter to invert, forcing the striker onto the percussion cap to fire the mine.

79. *Arming.*—

(*a*) Remove the dome package (*see* Figure 18).

(*b*) Unscrew the cap of the pressure plate.

(*c*) Take an igniter from the igniter box.

(*d*) Remove the igniter safety clip (*see* Figure 19).

(*e*) Place the igniter in the armed position in the igniter well.

(*f*) Replace the cap and screw down tightly.

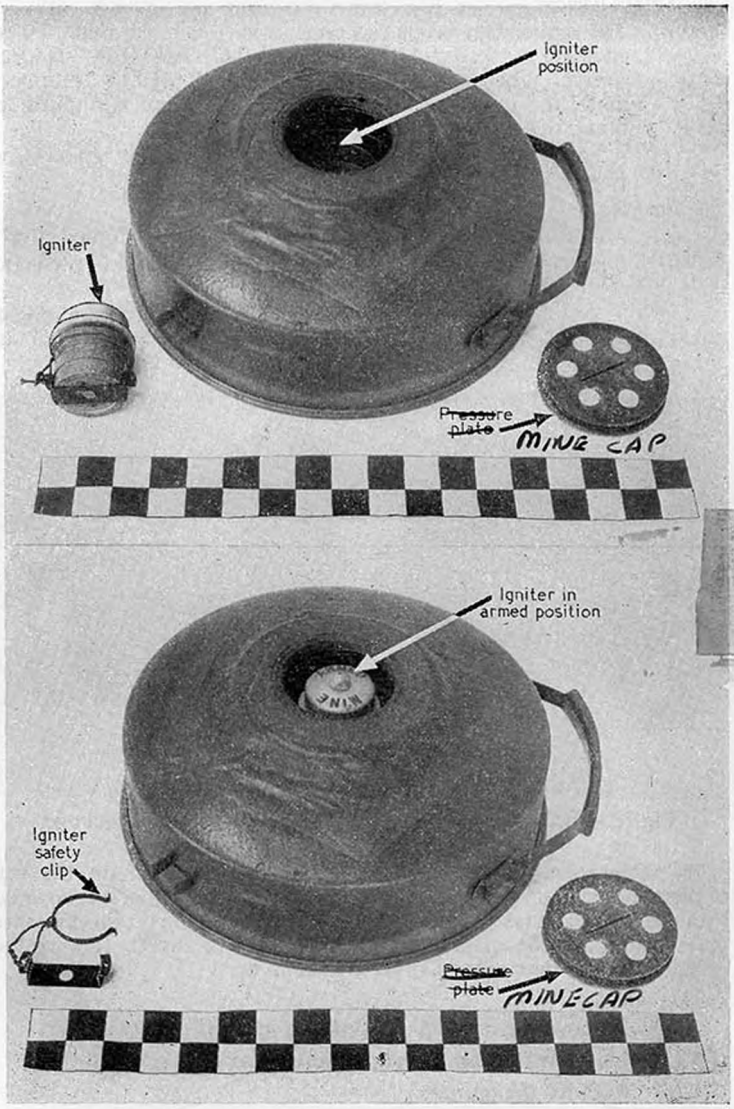

Fig 19.—Anti-tank mine, Mark 7—components

(*e*) Replace the igniter in the armed position.

(*f*) Replace the cap and screw down tightly.

(*g*) *Special note.*—A socket is provided in the baseplate of the mine, for fitting an anti-lift device, but at present no special igniter is available for this purpose.

80. *Neutralizing.*—

(*a*) Search for and disarm anti-lift devices.

(*b*) Unscrew the cap of the pressure plate.

(*c*) Remove the igniter.

(*d*) Fit the igniter safety clip to the centre of the igniter.

(*e*) Replace the igniter in the mine, in the UNARMED position.

(*f*) Replace the cap of the pressure plate.

81. *Disarming.*—

(*a*) Unscrew the cap of the pressure plate.

(*b*) Remove the igniter.

SECTION 22.—ANTI-PERSONNEL MINE, No. 6 (SHEAR RING)

82. *Recognition* (*see* Figure 20).—

Material.—Plastic. Metal is used only in the safety pin and the tip of the striker. Metal detector rings are also provided (*see* paragraph 87(*a*)).

Size.—1¾ ins diameter x 8 ins high.

Weight.—8 ounces.

Weight of explosive.—5 ounces.

Igniter type.—Snap action through fracture of a shear ring.

Safety device.—A safety pin fits through the striker stem, below the pressure prongs. When packed, the detonator of each igniter is screwed into a plastic tube. These tubes are an integral part of the box.

Packing.—20 mines are packed in a box, complete with all fittings and spare safety pins.

83. *Operation.*—

(*a*) The igniter assembly screws into the top of the mine. It has a built-in detonator. The striker is held in position by a shear ring. On the head of the igniter are three pressure prongs. If a man steps on these, the shear ring breaks, and the striker is released, and fires the mine.

(*b*) *Special note.*—Because the detonator is built-in, care is necessary when handling the igniter assembly, even when the safety pin is in place.

(*e*) Replace the igniter in the armed position.

(*f*) Replace the cap and screw down tightly.

(*g*) *Special note.*—A socket is provided in the baseplate of the mine, for fitting an anti-lift device, but at present no special igniter is available for this purpose.

80. *Neutralizing.*—

(*a*) Search for and disarm anti-lift devices.

(*b*) Unscrew the cap of the pressure plate.

(*c*) Remove the igniter.

(*d*) Fit the igniter safety clip to the centre of the igniter.

(*e*) Replace the igniter in the mine, in the UNARMED position.

(*f*) Replace the cap of the pressure plate.

81. *Disarming.*—

(*a*) Unscrew the cap of the pressure plate.

(*b*) Remove the igniter.

SECTION 21A.—ANTI-PERSONNEL MINE. No. 7 ("DINGBAT") (DIAPHRAGM)

81A. *Recognition* (*see* Figure 19A).—

Material.—Metal.

Size.—2½ ins diameter × 1⅜ ins high.

Weight.—4 ounces.

Weight of explosive.—1⅜ ounces.

Igniter type.—Diaphragm control (*see* Figure 5).

Safety devices.—

(*a*) A safety pin prevents the detonator slide from being pushed home into the armed position until it is withdrawn.

(*b*) The detonator slides are packed separately for transport.

Packing.—Five mines are carried in an "arming box" (*see* Figure 19A). Four arming boxes are packed in a solid wooden box, together with a tin containing 20 detonator slides. Four boxes containing 80 mines are packed in a transit case, with an all-up weight of 77 pounds.

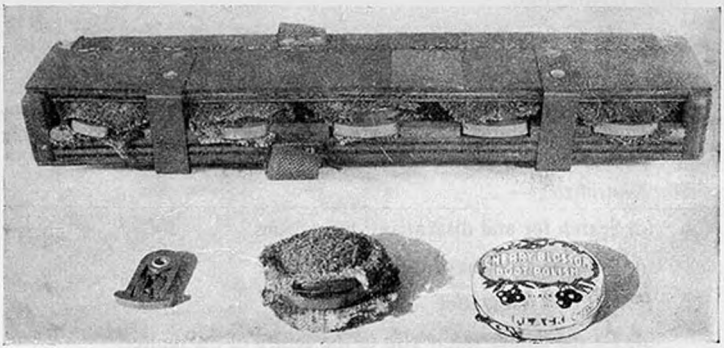

Fig 19A.—British anti-personnel mine, No. 7 ("Dingbat"), and arming box

81B. *Operation.*—A load of from 15 to 40 pounds on either face of the mine will cause the diaphragm to invert. If the detonator slide is fully home, this will fire the mine. The mine relies mainly upon blast for its effect.

81C. *Arming.*—Arming is carried out in two stages, both of which can if desired be completed without removing the mines from the arming box :—

(*a*) Insert the detonator slide in the slot in the side of the mine, and push it in as far as the safety pin allows. The mine remains safe at this stage.

(*b*) Remove the safety pin, and push the detonator slide fully home. The mine is now armed.

81D. *Neutralizing.*—Without applying any pressure on either the top or the bottom of the mine, withdraw the detonator slide until the safety pin can be inserted. When the safety pin is in, the mine is safe.

81E. *Disarming.*—Remove the detonator slide.

81F. *Special precaution.*—When inserting or withdrawing the detonator slide, the mine must never be gripped by the top and bottom ; it should be held firmly by its edges.

SECTION 22.—ANTI-PERSONNEL MINE, No. 6 (SHEAR RING)

82. *Recognition* (*see* Figure 20).—

Material.—Plastic. Metal is used only in the safety pin and the tip of the striker. Metal detector rings are also provided (*see* paragraph 87(*a*)).

Size.—1¾ ins diameter × 8 ins high.

Weight.—8 ounces.

Weight of explosive.—5 ounces.

Igniter type.—Snap action through fracture of a shear ring.

Safety device.—A safety pin fits through the striker stem, below the pressure prongs. When packed, the detonator of each igniter is screwed into a plastic tube. These tubes are an integral part of the box.

Packing.—20 mines are packed in a box, complete with all fittings and spare safety pins.

83. *Operation.*—

(*a*) The igniter assembly screws into the top of the mine. It has a built-in detonator. The striker is held in position by a shear ring. On the head of the igniter are three pressure prongs. If a man steps on these, the shear ring breaks, and the striker is released, and fires the mine.

(*b*) *Special note.*—Because the detonator is built-in, care is necessary when handling the igniter assembly, even when the safety pin is in place.

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84. *Arming.*—

(*a*) Screw the igniter assembly into the head of the mine.

(*b*) Remove the safety pin.

85. *Neutralizing.*—Replace the safety pin.

86. *Disarming.*—Unscrew the igniter assembly from the mine.

87. *Special parts* (*see* Figure 21).—

(*a*) *Detector ring.*—Because of their small diameter, and because they are non-metallic, these mines cannot be detected with any certainty either by prodding or with a standard mine detector. When laying, metal detector rings will always be used, unless definite orders are given that they are to be laid 'undetectable.'

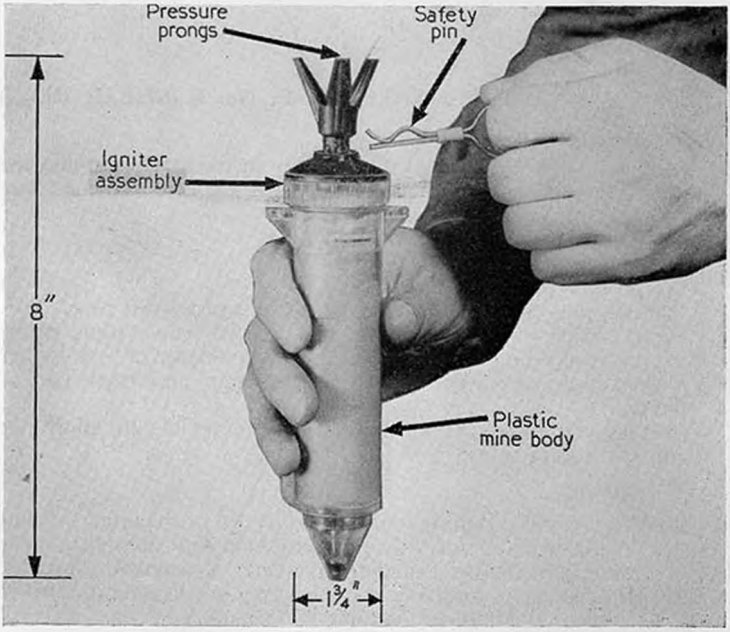


Fig 20.—British anti-personnel mine, No. 6

(*b*) *Bearing plates.*—Special plastic bearing plates are provided for use when these mines are to be laid in snow or in very soft ground. These are not normally issued, but they can be demanded if required.

Fig 21.—Anti-personnel mine, No. 6—standard and special parts

CHAPTER 7

CHEMICAL AND FRICTION IGNITERS

SECTION 23.—SIMPLE APPLICATIONS OF CHEMICAL REACTION

88. *General.*—The principle of chemical control is described in Section 16. This method is simple to apply in practice, without having to manufacture complicated or precise igniter mechanisms, and it may be used in improvised mines. As a rule, no safety device is provided. Examples of the application of this principle in standard equipment mines are given in this Section.

89. *British chemical pressure fuze, No.* 98, *Mark* 1 (*see* Figure 22).—This fuze was designed specifically for the No. 75 (Hawkins) grenade, Mark 2, which is now obsolete in the UK, but which may still be found in use elsewhere. The fuze consists of a metal block, with a detonator protruding from one end, and an ampoule of chemical inserted in the other. Above the ampoule is a pressure pin, which protrudes above the metal block. Pressure on this pin crushes the ampoule of chemical. The resulting chemical reaction produces a flame which sets off the detonator.

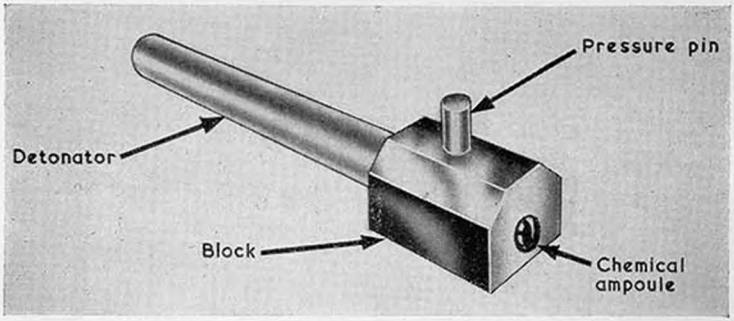


Fig 22.—British chemical pressure fuze, No. 98, Mark 1

90. *French chemical pressure fuze, Model* 1950 (*see* Figure 23).—This fuze is undetectable by ordinary electronic mine detectors, and it is used in four different types of mine. It consists of a black bakelite case containing a plunger, a phial of acid, and a pellet of chemical. The plunger, held in position by a shear pin, passes through the top end of the casing, with the bottom of the plunger touching the phial of acid.

Pressure on the plunger breaks the shear pin, and the plunger then crushes the phial. Reaction of the acid with the chemical pellet causes a flash, which sets off the detonator to fire the mine.

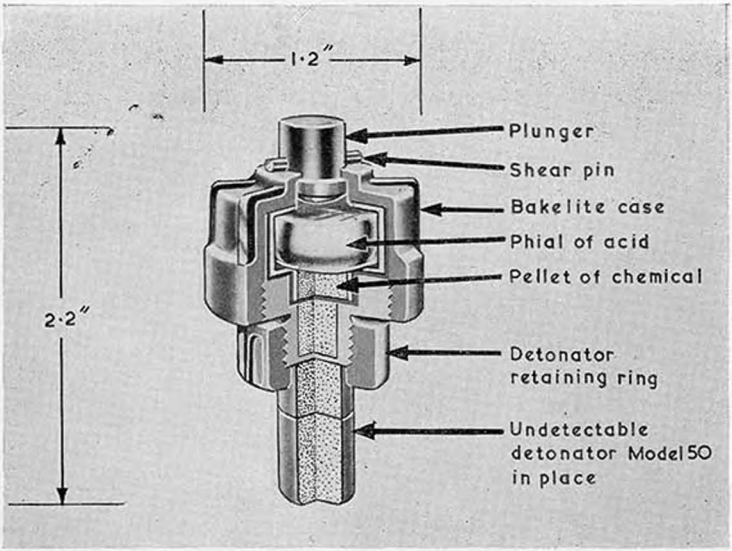


Fig 23.—French chemical pressure fuze, Model 1950

91. *Russian VZDKh and EKhZ delay fuzes.*—Both these fuzes are fired by a spring-loaded striker, which is released by a different form of chemical control, which introduces a delay period of several hours. The striker is held in position by a retaining wire, which is corroded either by the action of acid on the metal, or by electrolysis. When the wire snaps, the spring forces the striker down.

In the EKhZ fuze, the striker fires a percussion cap, but in the VZDKh fuze the charge is fired either by chemical reaction or by closing an electric circuit. The alternative forms of base for this fuze are illustrated in Figure 24.

When the chemical base is employed (*see* Figure 24(*a*)), the striker breaks the glass ampoule of acid, and the flash produced by the reaction of the acid with the chemical powder fires an ordinary detonator.

The electrical base (*see* Figure 24(*b*)) is a form of electric switch. The striker hits the metal contact rod and pushes it down against the spring until it strikes the metal screw contact in the base. This completes the electric circuit between the two electric wires, which are joined to a battery and electric detonator.

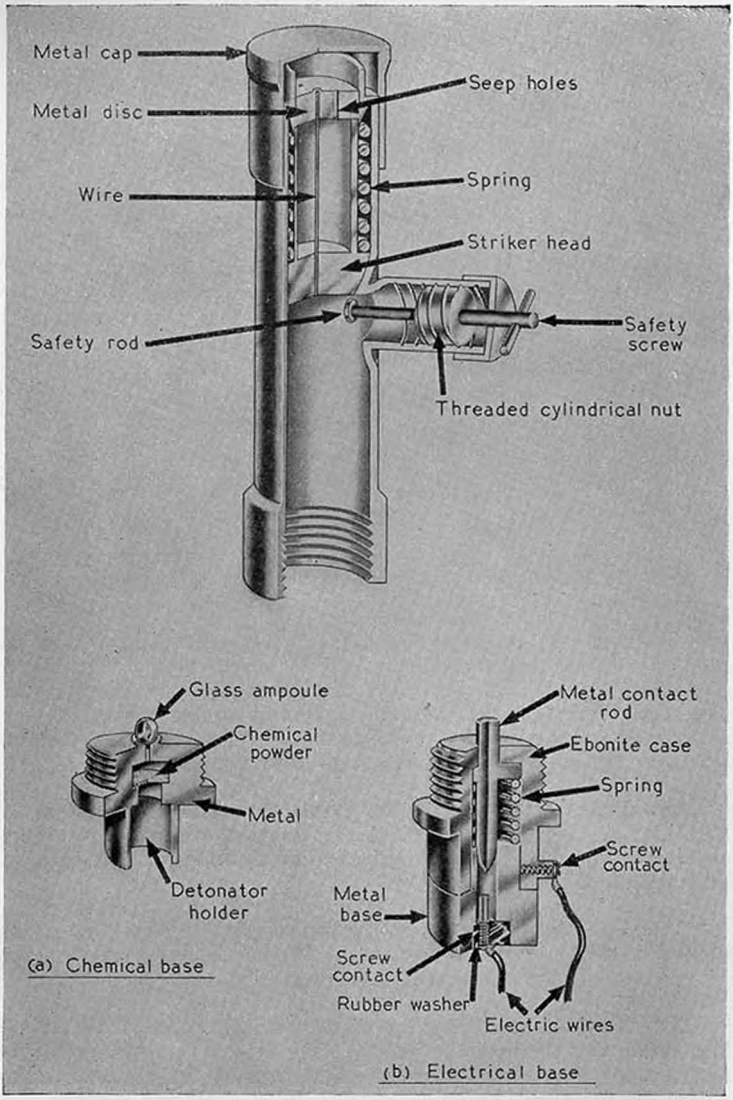


Fig 24.—Alternative forms of base for the Russian VZDKh fuze

SECTION 24.—FRICTION IGNITERS

92. Friction igniters are very simple in operation, but they must be handled with care, as no safety device is normally incorporated. They may be actuated either by pressure (*see* para 93), or by pulling a cord or ring (*see* para 94).

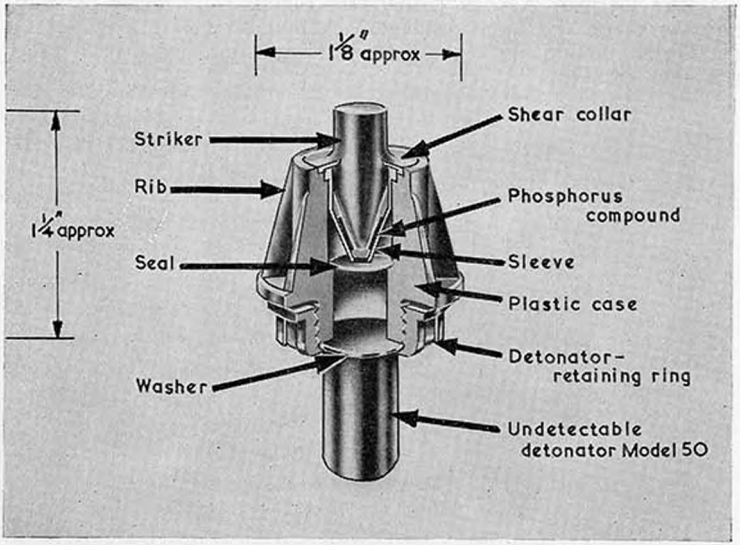


Fig 25.—French pressure-friction fuze, Model 1952

93. *Pressure-friction igniters.*—A typical example is the French pressure-friction fuze, Model 1952 (*see* Figure 25). This is a small plastic igniter designed for use with undetectable anti-tank mines.

The striker is held in place by a plastic shear collar. The top of the striker protrudes above the igniter casing; the lower portion, below the shear collar, is tapered to fit into a mating sleeve. The mating sleeve is treated with a mixture of phosphorus and glass.

Pressure on the top of the striker breaks the plastic shear collar, and pushes the tapered striker into the mating sleeve. A movement of 2 mm causes enough friction to ignite the phosphorus mixture, and produce a flash which fires the detonator.

94. *Pull-friction igniters.*—Typical examples are shown in Figures 26 and 27.

The French pull-friction fuze, Model 1951 (*see* Figure 26), is in an undetectable plastic case, and it is used chiefly in improvised mines and booby traps.

The igniter casing contains a filling of phosphorus compound, in which a pull-cord is embedded. The end of this cord passes through a seal of varnish to form a loop outside the top of the casing. A pull of from 2¼ to 7¾ lb on the cord will draw it through the compound, generating enough heat to ignite it, and cause a flash which fires the detonator.

The German ANZ29 igniter (*see* Figure 27) is made of brass, and works on the same principle. A pull on the ring ignites the friction compound inside the igniter casing, producing a flash which fires the detonator.

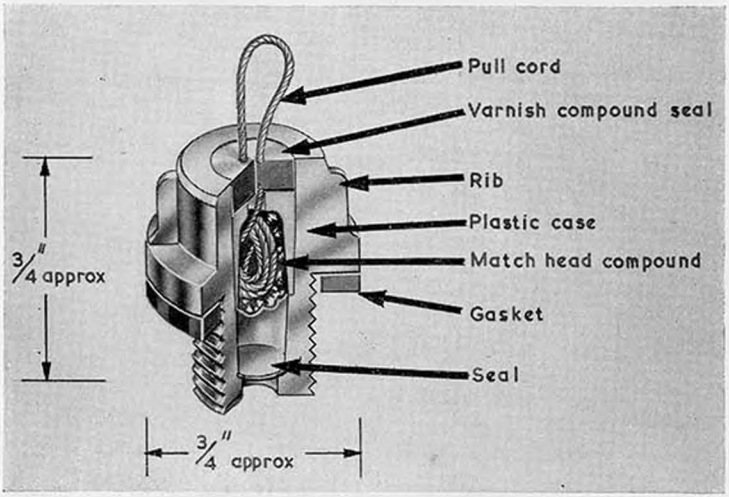


Fig 26.—French pull-friction fuze, Model 1951

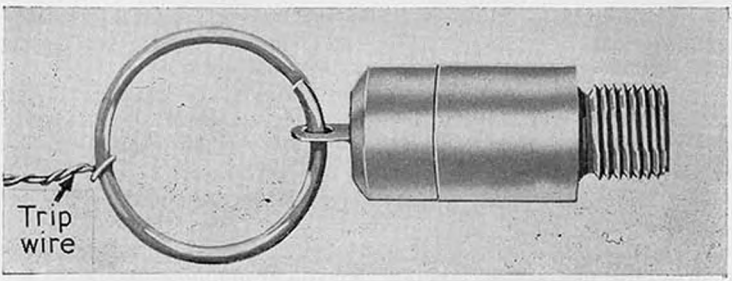


Fig 27.—German ANZ29 igniter

CHAPTER 8

RUSSIAN SPRING-OPERATED IGNITERS

SECTION 25.—METHODS OF APPLICATION TO MINES

95. In the Russian Army mine warfare is regarded as most important. All fighting troops are thoroughly trained in the use of mines, and particular emphasis is laid upon improvisation.

Although a variety of igniters is used in equipment mines, comparatively simple spring-operated mechanisms are used in most of them, and the same mechanisms are normally used in improvised mines and booby traps.

96. Few Russian mines have special attachments for anti-lift or booby trap mechanisms, but because the mines are, in general, of simple construction such devices are easily improvised.

For this reason no attempt must be made to handle any Russian mine without first searching for, and neutralizing, any such device.

97. Spring-operated mechanisms are used in:—

(*a*) Nine standard anti-tank mines.

(*b*) Nine anti-personnel and dual purpose mines.

(*c*) Improvised versions of all types.

SECTION 26.—MUV IGNITER (PIN WITHDRAWAL)

98. *Recognition* (*see* Figure 28).—

Material.—Metal. A plastic version known as the MUV—K is also made, and an ebonite case is sometimes used.

Size.—Approximately $\frac{5}{8}$ in diameter x $3\frac{5}{8}$ ins high (over-all length including detonator 5 ins). Dimensions vary slightly with the material used for the casing.

Igniter type.—Spring-operated, with pin withdrawal control.

Safety device.—No safety device is normally issued, but a metal safety sleeve can be fitted between the striker retaining pin and the hole shown in the top end of the striker (*see* Figure 28). If a safety pin or a nail is inserted in the top hole, the sleeve will prevent the striker descending onto the percussion cap if the striker retaining pin is removed.

99. *Operation.*—A pull of about 2 lb on a trip wire, or pressure on the special pin used in box mines, will withdraw the striker retaining pin. This releases the striker, which fires the percussion cap in the MD2 detonator assembly.

100. *Neutralizing.*—The igniter is armed when an MD2 detonator assembly is screwed into the base of the igniter casing. To neutralize, first cut any trip wires attached to the eye of the striker retaining pin. Then hold the striker retaining pin firmly in position, remove the igniter from the mine, and unscrew the detonator assembly.

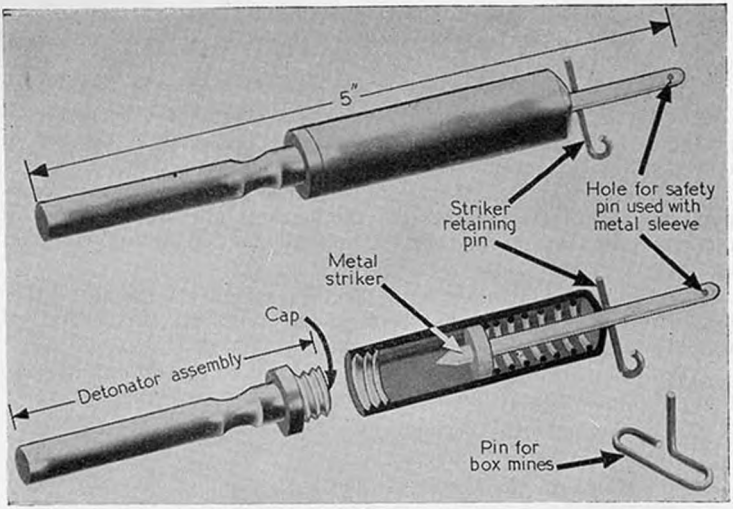


Fig 28.—Russian MUV igniter

Applications

101. The MUV igniter is the most commonly used Russian mechanical pull igniter. It is employed in eleven standard equipment mines:—

Anti-tank mines.—

(*a*) TM-38
(*b*) Anti-tank dog mine
(*c*) YAM-5 (*see* Figure 29(*a*)).

Dual purpose mine (*anti-tank and anti-personnel*).—

(*d*) Tilt-rod mine

Anti-personnel mines.—

(*e*) POMZ-2 (shrapnel)*
(*f*) PMD-6
(*g*) PMD-7
(*h*) PMD-7ts
(*j*) PMD bottle
(*k*) PMD mortar (*see* Figure 29(*b*))

Anti-lift device.—

(*l*) Wooden box anti-lift device

* The POMZ-2 anti-personnel mine is also used with a VPF pull igniter (*see* Section 27)

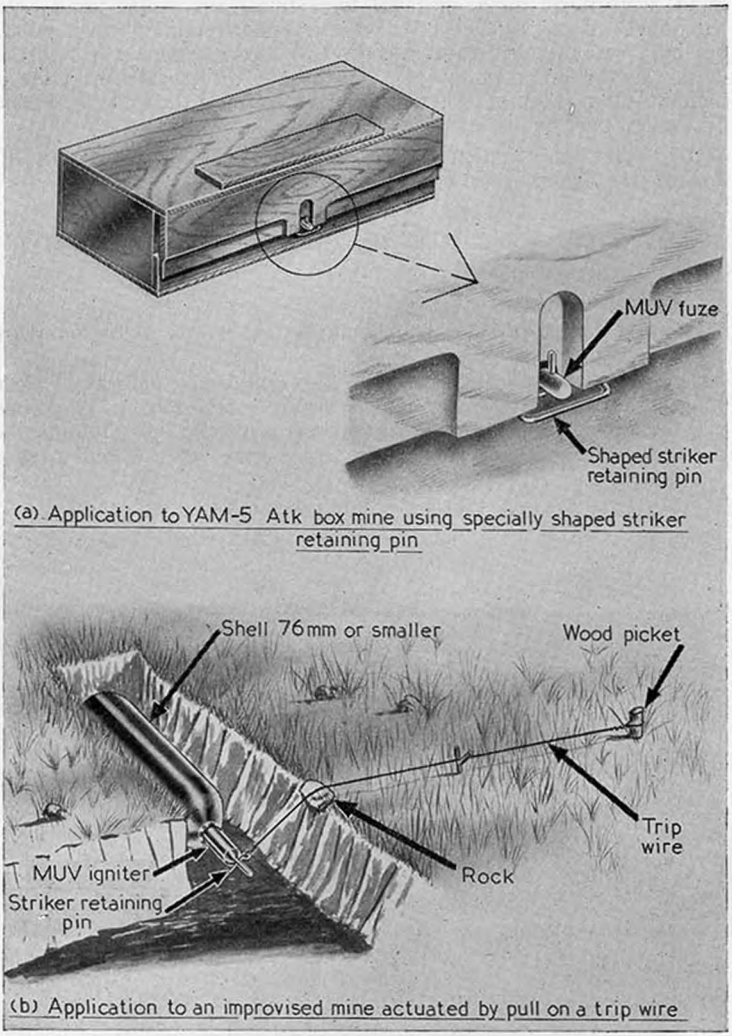


Fig 29.—Examples of the use of the MUV igniter

102. The MUV igniter is also very often used in improvised mines, particular examples being the LMG rocket anti-tank mine, the shear

tread anti-vehicle mine, and the lever tread and roller tread anti-personnel mines. In each of these, the striker retaining pin is pulled out by a wire attached to it. In the LMG rocket mine a trip wire is used. In the other examples a short tight wire inside the mine is pulled by some kind of lever action when the lid of the mine is stepped on, or run over by a vehicle wheel.

103. The MUV igniter is also very suitable for use with anti-lift devices (*see* Figures 34(*a*) and 35(*a*)).

SECTION 27.—VPF IGNITER (PLATE WITHDRAWAL)

104. *Recognition* (*see* Figure 30).—

Material.—Metal.

Size.—Approximately ½ in diameter × 5½ ins high, including detonator.

Igniter type.—Spring-operated, with control by a form of plate withdrawal. The top end of the striker is ball-shaped. A hollow retaining clamp with flexible prongs grips the ball, holding the striker in the cocked position (*see* Figure 30). A pull ring is attached to the top of the clamp.

Safety device.—A split pin is fitted through the striker rod.

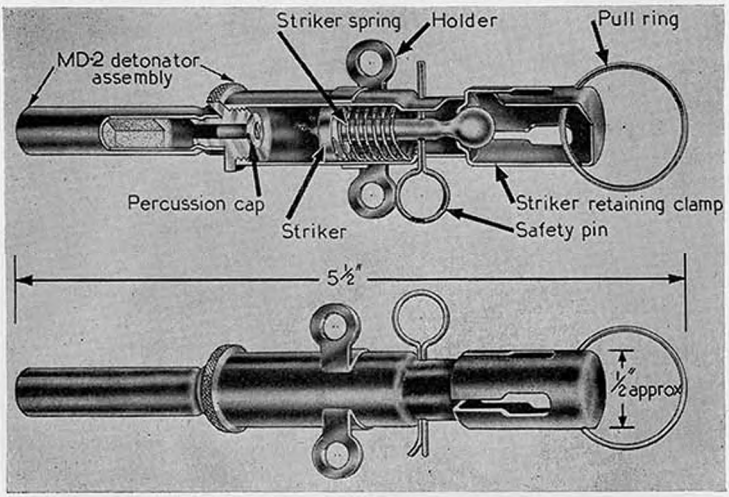


Fig 30.—Russian VPF igniter

105. *Operation.*—When the safety pin is removed, an axial pull of between 8 and 14 lb will open the flexible prongs sufficiently to release the ball end of the striker, and the spring then drives the striker onto

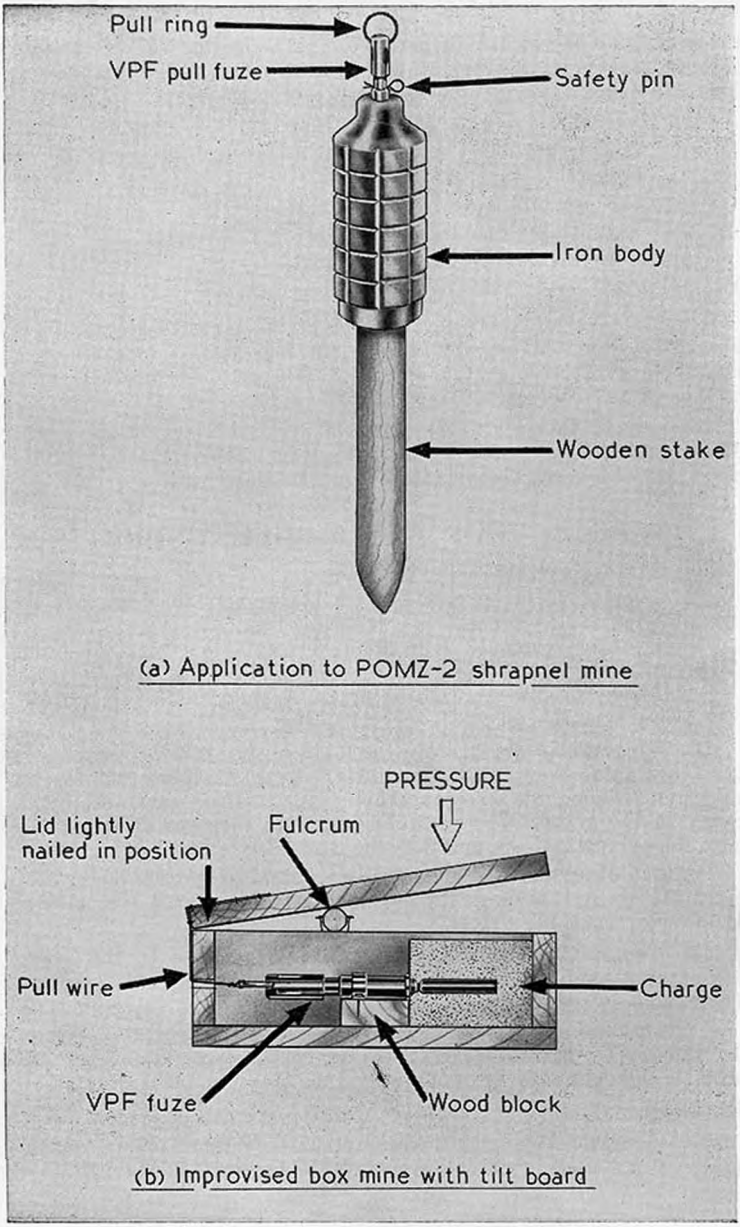


Fig 31.—Examples of the use of the VPF igniter

the percussion cap to fire the detonator. The igniter will also be fired if the retaining clamp is pushed or pulled to either side, a load of only 2 or 3 lb being needed to release the striker in this way.

106. *Neutralizing.*—

(*a*) Carefully insert a safety pin or a nail through the safety pin hole.

(*b*) Cut any pull wires.

(*c*) Remove the fuze from the mine.

(*d*) Unscrew the detonator assembly.

Applications

107. The VPF igniter may be used for all kinds of standard and improvised mines which are operated by trip wire. For example, it is sometimes used with the POMZ-2 anti-personnel shrapnel mine instead of an MUV igniter (*see* Figure 31(*a*)).

It may be found in other types of improvised mine (*see* Figure 31(*b*)), and it is also used as a booby trap mechanism, and for the operation of anti-lift devices (*see* Figures 34 and 35(*a*)).

SECTION 28.—MV-5 IGNITER (BALL CONTROL)

108. *Recognition* (*see* Figure 32).—

Material.—Normally metal, but a plastic version, known as the MV-5K, is also in use.

Size.—Approximately $\frac{1}{2}$ in diameter × $3\frac{5}{8}$ ins high, including detonator.

Igniter type.—Spring-operated pressure igniter, with ball control.

Safety device.—Nil.

109. *Operation.*—Pressure on the hood pushes it down, and at the same time compresses the striker spring. When the hood has moved a sufficient distance, the striker retaining ball escapes sideways into the cavity in the hood. The compressed spring then drives the striker onto the percussion cap, and fires the detonator.

A load of about 20 lb is normally required to operate this igniter, but if the spring is weak or the mechanism faulty, a load of as little as $4\frac{1}{2}$ lb may release the striker.

110. *Neutralizing.*—The igniter is armed as soon as the MD-2 detonator assembly is screwed into the base of the igniter casing. There is no safety device.

When handling, it is most important not to exert any pressure on the hood. To neutralize, remove the igniter from the mine, and unscrew the detonator assembly.

Applications

111. The MV-5 igniter is the most commonly used Russian pressure igniter. It is used in six equipment anti-tank mines (TM-41, TM-44,

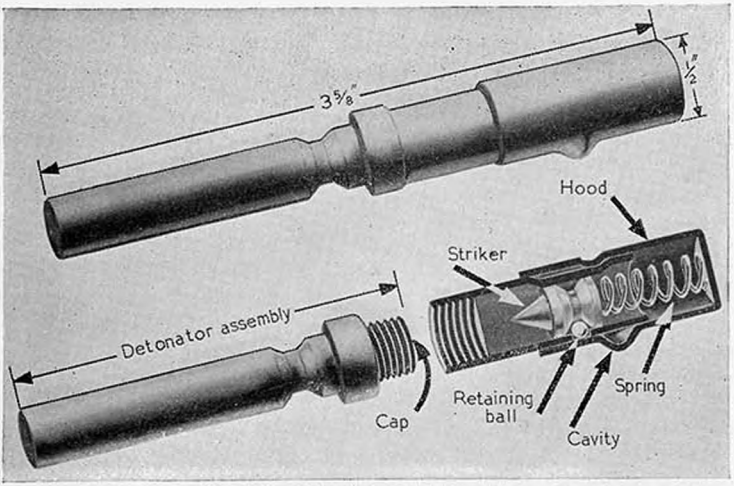


Fig 32.—Russian MV-5 igniter

TMB-1, TMB-2, TMSB, and TMD-B) and in dual purpose mines, and it may be found in any anti-personnel or improvised mine in which a pressure igniter is required.

For example, an improvised wooden box mine is readily made up by inserting an MV-5 igniter in a booster charge at the top of the mine, and fixing it in position. A gap is left in the top of the box, above the igniter, and a loose or hinged board is placed over the igniter. Pressure on this board will actuate the mechanism and fire the mine.

The use of the MV-5 igniter in a standard anti-tank mine is shown in Figure 33(*a*), and a simple improvised mine is illustrated in Figure 33(*b*).

CHAPTER 9

METHODS OF CLEARING INDIVIDUAL MINES

SECTION 29.—PULLING MINES

112. When it is not necessary for work to be done silently, and when it is not important to avoid blowing craters, the quickest and safest method of dealing with mines is to pull them clear with a long cable.

113. This method makes it unnecessary to search for and neutralize anti-lift devices before dealing with the mine itself. Mines which are fitted with such devices will be exploded when they are pulled; others can be neutralized or destroyed as required.

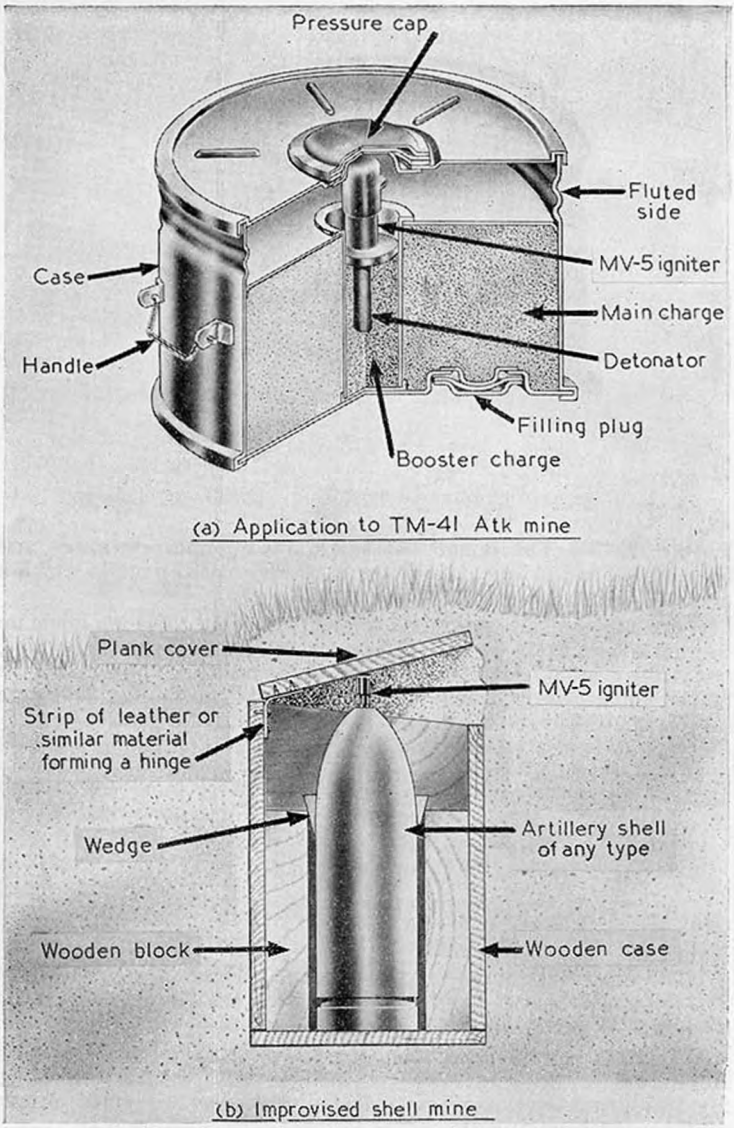


Fig 33.—Examples of the use of the MV-5 igniter

114. The normal method of clearing anti-tank mines is first to pull them, then to neutralize, lift, and place in dumps, but mines which appear to be dangerous should be blown up in situ. Dumps of recovered mines are normally destroyed by experts, but such mines can be used again, if necessary, *provided that they have not been damaged or made sensitive*, eg, shear pins weakened by blast from shell-fire or bombing.

115. Anti-personnel mines are not usually fitted with anti-lift devices. They are therefore normally neutralized and disarmed in situ. If the enemy adopts the practice of attaching such devices to anti-personnel mines, then these too should be pulled.

Procedure for pulling mines

116. The method of pulling mines with a cable is as follows:—

(*a*) Having located the mine, scrape away the earth gently until the mine is exposed, taking care not to disturb the mine nor to touch any wire attached to it.

(*b*) Use a 50-yard length of strong cordage or signal cable, and unreel it *towards* the mine before attaching it.

(*c*) Attach the cable to the mine either by a loop, or by a small hook. It must be securely fixed so that it will not slip off when pulled, as partial movement of the mine may make it highly dangerous. Pass the cable over a large stone or other object near the mine, so as to give an upward pull in order to lift the mine out of the ground.

(*d*) Withdraw to a safe position, preferably at the full 50 yards distance, lie down, and give the cable a steady pull. If the mine comes clear without exploding, remain under cover for at least 10 seconds in case a short delay fuze has been used. The " safe " position should be inspected before use. In the 1939-45 War obvious cover, eg, a slit trench, was sometimes booby trapped.

(*e*) The disposal of pulled mines is dealt with in paragraph 114.

117. *Clearance of trip wires.*—Trip wires may be cleared by grapnels. A grapnel attached to a suitable length of cordage is thrown over the area concerned, either by hand, by means of a rocket, or by firing from a mortar. The grapnel is then pulled in from behind cover, and will pull any trip wires encountered, and detonate the mines.

SECTION 30.—LIFTING MINES

118. The detailed procedure varies with the type of mine and igniter, but the basic procedure will always be as described below.

119. *Basic procedure for hand lifting.*—

(*a*) After the mine has been located, either by prodding or by mine detector, carefully remove the earth covering to expose the top of the mine.

(*b*) In the case of anti-tank mines, search for anti-lift devices, and neutralize them (*see* Chapter 10).

(*c*) Neutralize the main igniter.

(*d*) When all igniters have been neutralized, lift the mine out of the ground.

(*e*) Disarm the mine by removing all the igniter mechanisms. Remove the detonators; if the detonators are not attached to the igniters, turn the mine over and, if necessary, shake gently so that the detonators drop out.

(*f*) Remove the mine, and the igniters, to a selected dump.

120. *Clearing trip wires.*—When clearing by hand, a slack wire may be cut, but it must never be pulled. Tight wires must never be cut or pulled until the mechanisms to which they are attached have been found and neutralized.

121. *Neutralizing.*—The recognition and neutralizing of certain standard mechanisms are dealt with in earlier chapters of this pamphlet.

Some igniters cannot be neutralized. In such cases the mine should either be destroyed in situ, or be lifted carefully and carried to a safe dumping area for later destruction by experts.

If a mine or igniter of unknown type is encountered, and if the means of making it safe cannot be determined, mark the mine clearly and report immediately, so that engineers can deal with it.

CHAPTER 10

SIMPLE ANTI-LIFT DEVICES

SECTION 31.—CHARACTERISTICS OF ANTI-LIFT DEVICES

General

122. An anti-lift device fixed in or attached to a mine is in effect a booby trap.

Personnel of Category " B " are to be trained in the recognition and method of operation of standard British igniters and mechanisms, and of certain foreign equipment most likely to be used with booby traps (*see* FEMW Pamphlet No. 7, Appendix A).

This chapter does not deal with the recognition and operation of such mechanisms, except by reference to FEMW Pamphlet No. 7, but is concerned with methods of applying these mechanisms to operate anti-lift devices.

123. *Training requirements.*—Requirements for the training of Category " B " personnel in respect of anti-lift devices are set out in Table 1.

TABLE 1.—REQUIREMENTS FOR THE TRAINING OF CATEGORY "B" PERSONNEL IN RESPECT OF ANTI-LIFT DEVICES

Serial No.	Subjects in which training is required	References
(*a*)	(*b*)	(*c*)
1	Knowledge of the methods of applying anti-lift devices to anti-tank mines	Chapter 10
2	Recognition and clearance of anti-lift devices based on:—	
	(*a*) *Friction igniters*—	
	German ANZ29, and similar pull-friction igniters	Section 24
	(*b*) *Spring-operated, control by pin or plate withdrawal*—	
	British pull switch No. 4, Mark I	FEMW Pamphlet No. 7, Sec 6
	British pressure switch No. 5, Mark I	FEMW Pamphlet No. 7, Sec 7
	Russian MUV igniter	Section 26
	Russian VPF igniter	Section 27
	(*c*) *Pressure release*—	Paras 125(*e*) and 127(*c*)

124. It is unusual for anti-personnel mines to be fitted with anti-lift devices, but the possibility of booby trapping should not be ignored. In this pamphlet consideration is given only to devices likely to be used with anti-tank mines, the main igniters of which are designed to be set off by pressure.

Types of anti-lift device

125. *Examples of common anti-lift devices.*—The most common devices are:—

(*a*) Fixing a wire to the striker-retaining pin of the mine fuze, and to a stake in the ground, so that lifting the mine pulls out the pin and fires the mine.

(*b*) A pull igniter screwed into a supplementary fuze well in the side or bottom of the mine, and attached by a wire to a peg so that, if the mine is moved, the fixed wire will actuate the pull igniter and explode the mine (*see* Figure 34 (*a*)).

(*c*) A pull igniter wired to another pull igniter in another mine, or in a charge of explosive, so that a pull on the wire will actuate one or other of the igniters (*see* Figure 34(*b*)).

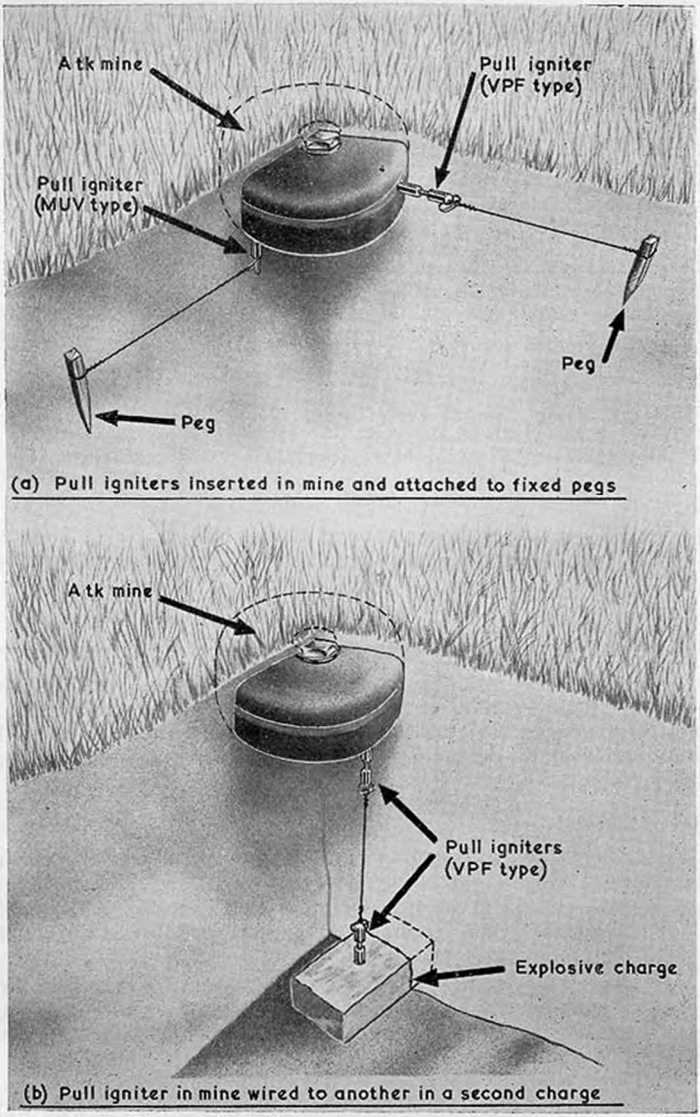
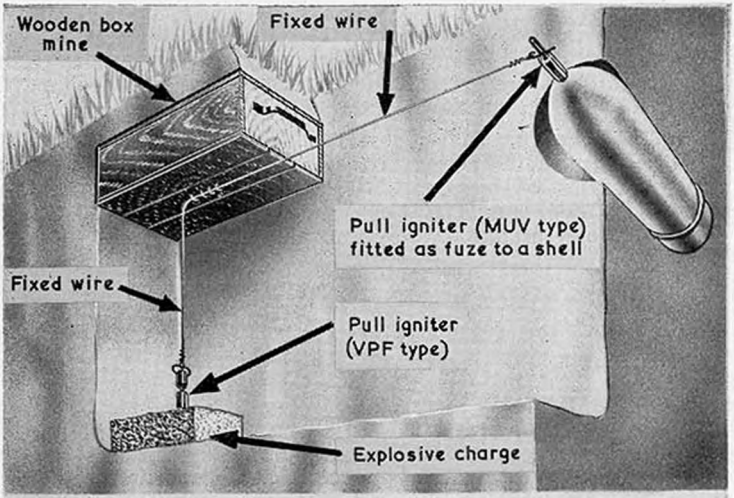
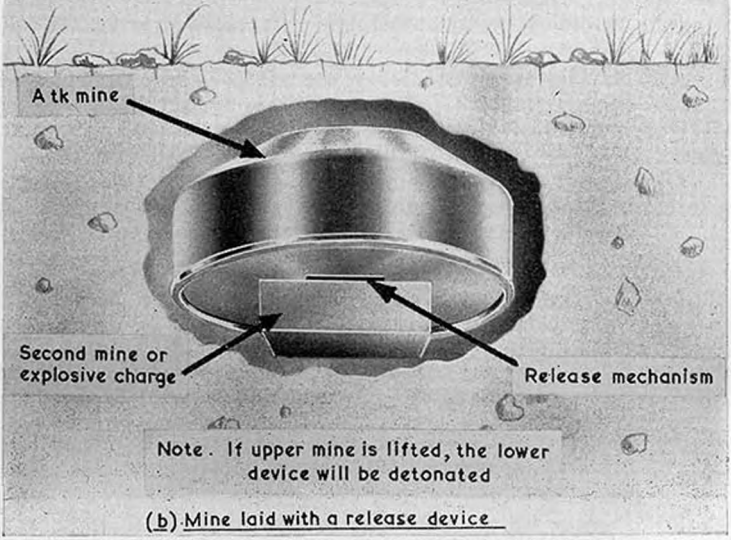


Fig 34.—Anti-lift devices using pull igniters fitted to the anti-tank mine



(a) Wires leading to pull igniters in a separate charge or improvised anti-personnel mine



(b) Mine laid with a release device

Fig 35.—Anti-lift devices using mechanisms separate from the anti-tank mine

(*d*) A wire looped round, or attached to, the mine casing and leading to an igniter in another mine, explosive charge, or anti-personnel mine, so that movement of the wire will set off an anti-lift mechanism (*see* Figure 35(*a*)).

(*e*) A release mechanism underneath a mine, and immediately on top of another charge, so that when the weight of the top mine is removed the second charge will explode (*see* Figure 35(*b*)). *Mines trapped in this way cannot be lifted*, but must be pulled from a distance, or blown up where they are.

(*f*) Booby traps attached to pickets, wire, marking signs, empty boxes, or crates.

SECTION 32.—DETECTION AND CLEARANCE OF ANTI-LIFT DEVICES

126. *Method of search.*—

(*a*) Having exposed the top of the mine (*see* para 119(*a*)) it will often be possible to identify the type of mine. Some types have standard positions for anti-lift igniters.

(*b*) Carefully scrape away the earth surrounding the mine, and search for pull or release igniters attached to the sides, and for wires which may lead to another mine (*see* Figures 34 and 35).

(*c*) Neutralize any igniters found. Trace wires to the far end, and neutralize any igniter to which they are attached.

(*d*) Having checked the sides of the mine, carefully scoop out the earth from under it, and check the bottom of the mine in the same way, taking very great care not to move the mine. Any movement may set off the anti-lift mechanism.

(*e*) If a pull device is found, neutralize it. If a release mechanism is found underneath the mine, the mine cannot be lifted, but must be pulled from a distance (*see* Section 29).

127. *Adaptation of standard igniters for anti-lift purposes.*—

(*a*) *Pull igniters.*—Any pull igniter controlled by pin or plate withdrawal can be used to actuate a charge designed to prevent lifting or moving a mine (*see* Figures 3, 34, and 35). Friction igniters can also be used, provided that they are protected from damp. The commonest methods of use are listed in paragraph 125, but pull igniters are also used with ordinary trip wires, and they may be used to booby trap obstacles, or objects such as empty containers or abandoned equipment.

(*b*) *Pressure igniters.*—Pressure igniters are not likely to be used with anti-lift devices attached to anti-tank mines, although a chemical igniter with a brittle container could be actuated by

a sharp pull on a wire. Any form of pressure mechanism which is actuated by a comparatively light load may be used to initiate an anti-personnel mine, either standard or improvised, or a booby trap. Such devices are sometimes concealed under a trip wire in order to catch a man tracing along it, or sited where a man starting to neutralize a mine might stand or kneel upon them.

(*c*) *Pressure-release mechanisms.*—These switches may be placed underneath an anti-tank mine, the weight of which is sufficient to prevent the mechanism from firing prematurely (*see* Figure 35(*b*)). If the anti-tank mine is lifted, the switch fires a secondary charge. No attempt should be made to lift any mine trapped in this way.

A simpler form of release mechanism uses a taut wire under tension to prevent a mechanism from firing, eg, by holding back a spring-loaded striker. If the taut wire is cut, or slackened by movement of the mine, the mechanism will fire. Neutralization is usually a simple matter of inserting a safety pin.

128. *Procedure for neutralizing.*—As mines laid in contact with release mechanisms cannot safely be lifted, and as pressure mechanisms are most unlikely to be used for anti-lift devices attached to anti-tank mines, the hand clearing of such devices really involves only the recognition and neutralizing of pull igniters and friction igniters.

Spring-operated pull igniters are normally provided with a safety pin. To neutralize them when set, it is only necessary to locate the safety pin hole, and to insert in it a spare pin, a nail, or a piece of strong wire. If there is no simple safety device, eg, MUV pull igniter (*see* Section 26), cut the wire attached to the striker-retaining pin, and unscrew the igniter.

Friction igniters usually have no safety device, but wires attached to them can safely be cut.

PART II—RE AND INFANTRY ASSAULT PIONEERS

CHAPTER 11

PREVENTION AND DELAY OF MINE CLEARANCE

SECTION 33.—STANDARD OF TRAINING

129. Personnel of Category "C" are required to be expert in knowledge and practical skill in respect of standard switches and igniters, and in the handling of anti-personnel devices, both standard and improvised. They must have a really sound knowledge of the subject matter of Chapter 10 of this pamphlet, and all NCOs of Category "C" should be capable of instructing Category "B" personnel to the full standard required of them.

130. The details of training requirements for Category "C" personnel are given in Table 2.

TABLE 2.—REQUIREMENTS FOR THE TRAINING OF CATEGORY "C" PERSONNEL IN RESPECT OF ANTI-LIFT DEVICES

Serial No.	Subjects in which training is required	References
(*a*)	(*b*)	(*c*)
1	As for Category "B" personnel	This pamphlet, Table 1
2	Recognition of the following standard British mechanisms, and both setting and clearing anti-lift devices based upon them:—	FEMW Pamphlet No. 7:—
	(*a*) Switch No. 4, pull, Mark I	Section 6
	(*b*) Switch No. 5, pressure, Mark I	Section 7
	(*c*) Switch No. 6, release, Mark I	Section 8
	(*d*) ~~Switch No. 9, "L" delay, Mark I~~	~~Section 9~~
	(*e*) ~~Switch (anti-lift) No. 12, Mark I~~	~~Section 10~~
3	Recognition of the following standard American igniters, and both setting and clearing anti-lift devices based upon them:—	This pamphlet:—
	(*a*) M6A1, pull-pressure	Section 39
	(*b*) M605, pull-pressure	Section 41
	(*c*) M7A1, pull-pressure	Section 42

TABLE 2–*continued*

(*a*)	(*b*)	(*c*)
4	Knowledge of methods of improvising booby traps on mines, using plastic explosive and standard switches	FEMW Pamphlet No. 5 Part II, Section 31
5	Practical experience of connecting all standard British mechanisms to charges, of setting and neutralizing mechanisms, and of the use and handling of anti-personnel mines, improvised charges, and traps	

NOTE—A high standard of skill should be acquired in handling, setting, and neutralizing switches and mechanisms. For training purposes dummy charges and inert igniters may be used.

SECTION 34.—THE USE OF STANDARD BRITISH SWITCHES

131. *Switch No.* 4, *pull*, *Mark* I.—This is a spring-operated pull mechanism, controlled by pin withdrawal. It is fully described in FEMW Pamphlet No. 7, Section 6, and its employment with anti-lift devices is summarized in paragraphs 125 and 127 of this pamphlet.

This switch is very easy to apply to improvised traps, or anti-lift devices, as it is supplied with a fuze adapter designed to take either safety fuze or instantaneous fuze and, when a No. 27 detonator is inserted in the spring mount assembly, it can also be used with detonating cord (*see* FEMW Pamphlet No. 7, Figures 3, 11, and 12).

Actuation of this switch is normally by means of a wire attached to the U-shaped clip. Examples of its use for anti-lift devices are shown in FEMW Pamphlet No. 5 Part II, Figure 19(*a*).

132. *Switch No.* 5, *pressure*, *Mark* I.—This is a spring-operated pressure mechanism, controlled by plate withdrawal. It is fully described in FEMW Pamphlet No. 7, Section 7.

The load required to operate this mechanism varies between about 21 and 60 pounds, according to the portion of the lid on which pressure is applied, so that it is well suited to employment with anti-personnel booby traps. For use in delaying or complicating the lifting of anti-tank mines, the best method is to site the switch, connected either by fuze or by detonating cord to a charge of plastic or other explosive, where it is most likely to be operated by the weight of a man engaged in locating or clearing mines. The method of employment as an anti-lift device is shown in FEMW Pamphlet No. 5 Part II, Figure 19(*b*). It can also be used to operate a separate improvised anti-personnel mine.

133. *Switch No. 6, release, Mark* I.—This is a spring-operated pressure-release mechanism, controlled by plate withdrawal. It is fully described in FEMW Pamphlet No. 7, Section 8.

A weight of at least 7 pounds should normally be placed on top of the switch to enable the safety pin to be withdrawn, in order to arm the mechanism. If the switch is not easily accessible, eg, if it is placed under an anti-tank mine, a wire or cord must be attached to the safety pin, in order to withdraw it.

If the switch is placed between two explosive charges, as in Figure 35(*b*), it is virtually impossible to neutralize it. If used as shown in FEMW Pamphlet No. 5 Part II. Figure 19(*c*), it may be possible by very careful clearance of the soil either to insert a safety pin, nail, or piece of strong wire in the safety pin hole, or to cut the fuze or detonating cord leading to the anti-lift charge.

134. *Switch (anti-lift) No. 12, Mark* I.—This is a special anti-lift pressure-release switch, provided for use under British anti-tank mines. It is not normally issued to units, and its use may only be authorized by Army Commanders.

Only Engineers may lay and record these devices.

Mines incorporating this switch should not be lifted, but should be destroyed in situ.

Operation and arming drill are described in FEMW Pamphlet No. 7, Section 10.

135. *Switch No. 9, "L" delay, Mark* I.—

(*a*) *General.*—This is a delay-action mechanism, made for standard periods of delay ranging from one hour to 28 days. Standard delay periods apply only at a temperature of 65°F. and the actual period differs considerably at higher or lower temperatures. The switch is fully described in FEMW Pamphlet No. 7, Section 9, which includes a table of correction factors for various temperatures.

(*b*) *Possible uses in minefields.*—Delay-action devices are not very likely to be used in minefields, as there can be no certainty that they will find a target when they explode. Three possible applications are:—

(i) In a withdrawal, setting charges designed to explode during the estimated period of investigation by the enemy, so as to impose delay and possibly inflict casualties.

(ii) Countering the effect of clearing trip wires by grapnel or other mechanical means, by attaching the trip wire to the starting pin of the delay mechanism, so that the charge will explode later, after a predetermined period.

(iii) Initiating deep charges, by pre-setting them to explode after normal mine clearance is expected to be completed by the enemy, so as to cause cratering, or casualties to vehicles and personnel. An alternative method for deep charges is to arrange that mechanical clearance, eg, by flails, will merely start the delay mechanism, so that the charge will explode after an appropriate period of delay.

(*c*) *Neutralization.*—Once the starting pin has been removed, the "L" delay itself cannot be neutralized, and a jolt or shock may cause premature firing. If the delay is used in conjunction with safety or instantaneous fuze, the charge can be disarmed by cutting the fuze but, if it is fixed direct to a detonator, the charge must be destroyed in situ.

SECTION 35.—IMPROVISED TRAPS AND SPECIAL MECHANISMS

General

136. The aim of a minefield is to surprise and delay the enemy, and to inflict casualties. If only standard equipment and laying methods are used, this aim will never be fully achieved, since experience will soon teach the enemy how to neutralize and clear the mines, and what to look for in order to avoid casualties. The mine is a weapon with great potentialities, but it must be used with skill and cunning, and with the intention of presenting to the enemy a constant variety of new problems.

137. Other Arms are trained to recognize and deal with specific types of mines and igniters, and to report new and unfamiliar mines and mechanisms so that Engineers may deal with them. It follows that Engineers must possess the knowledge and acumen to be able to identify the general principle on which an unknown mechanism works, and to determine whether there is a safe and practical method of neutralizing it.

138. Apart from the need to avoid casualties, it is imperative that any new type of mine or mechanism should be examined by experts, so that the best methods of identifying and neutralizing it can be determined, and so that instructions for dealing with it can be prepared. If any doubt exists about the safe method of clearing an unknown mechanism when it is first encountered, the mine must be clearly marked and reported immediately, for examination by an RE officer or other mines specialist. If it were destroyed in situ, the opportunity for investigating it in detail would be lost.

Improvised mines and traps

139. Even though new types of actuating mechanism may not be available, a great deal can be done to surprise and disconcert the enemy

by improvised methods. In general, these are likely to be based on standard igniters and switches, often using an unconventional, and frequently ingenious, method of setting off the firing device (*see* Section 25).

140. There is considerable scope for originality and ingenuity in applying anti-lift devices to anti-tank mines, particularly if the minefield is to be laid " unliftable," but familiarity with standard mechanisms, and a thorough knowledge of the mechanics of operating them, will normally solve the problem of neutralizing them. If mines are definitely " unliftable," they will usually have been laid in circumstances where there is little if any objection to clearing them by pulling, or by blowing them up in situ.

141. Wooden box mines should always be regarded with suspicion since it is easy to incorporate under the lid various types of improvised switch to actuate them if handled carelessly.

142. Examples of special improvised devices include:—

(*a*) Laying a deep mine on the forward side of a normal mine, and connected to it by detonating cord so that, if the normal mine is exploded by a roller or flails, the deep mine will explode under the tank operating the clearing device.

(*b*) Arming, or even actuating, a mine mechanism by remote control, eg, by closing an electric circuit, at a moment when a desirable target is observed.

Special mechanisms

143. It is of the utmost importance that any unknown design of mechanism should be reported immediately for expert examination (*see* para 138).

144. In any major war in which mines are used on a large scale, efforts will be made to prevent their clearance, either mechanically or by skilled personnel. Examples of special equipment are:—

(*a*) During the 1939-45 War, a special anti-defuzing fuze was sometimes fitted to German Tellermines. This caused detonation of the mine when any attempt was made to de-activate the mine fuze. Similar devices could be developed for use with covered or concealed pressure fuzes in any anti-tank mine.

(*b*) To prevent mechanical clearance by flails or rollers, or by the use of explosives, eg, by the Viper or Bangalore torpedo, a special igniter could be designed which is merely armed by the first pressure, and then remains sensitive for actuation by the passage of a tank or other vehicle.

145. Igniters could be designed for operation on principles other than those described in this pamphlet. Examples are-:—

(*a*) *Magnetic igniters.*—Naval magnetic mines were used in the 1939-45 War. A similar control could be applied to land

mines, the principle of operation being a change in magnetic field caused by the proximity of a moving tank, or even of an electronic mine detector. The mechanism might be based either on a magnetic needle, or on an induction coil.

(*b*) *Acoustic mines.*—A further adaptation of a principle used in sea warfare would be the use of a small microphone to pick up sound vibrations caused by the beat of an engine, and to convert them into electrical impulses. When amplified, these impulses could fire a detonator.

(*c*) *Vibration or tilt.*—Mines laid too deeply for detection by an ordinary mine detector could be initiated by a very sensitive device operated either by ground vibration or by a slight tilt.

(*d*) *Radio control.*—Remote control, either to arm or to initiate an igniter, could be operated by a very small radio receiver, picking up waves of a particular frequency and converting them into electrical impulses.

CHAPTER 12

AMERICAN MINES

SECTION 36.—M6A2 ANTI-TANK MINE

146. *Recognition* (*see* Figure 36).—(Obsolescent.)

Material.—Metal.

Size.—13 ins diameter x 3¼ ins high, with cover plate.

Weight.—20 lb.

Weight of explosive.—12 lb.

Igniter type.—M603 pressure fuze (diaphragm control).

Safety device.—Setting device on M4 cover plate, and safety fork (clip).

Packing.—Packed in a wooden box, containing two mines and two M603 fuzes in a metal container, with two M1 activators in separate metal containers. Over-all packed weight 60 lb.

147. *Operation.*—The fuze fits into a central well on top of the mine casing. When the cover plate is set in the armed position, a load of from 300 to 400 pounds on the pressure plate will invert the diaphragm, driving the striker onto the cap, and firing the mine.

148. *Arming and laying.*—

(*a*) Unscrew the cover plate.

(*b*) Take the fuze from its container, and inspect it to see that there is no obvious damage.

(*c*) Remove the safety fork, and insert the fuze in the mine.

(*d*) Check that the setting device on the cover plate is at " Safe," and screw the plug into the mine.

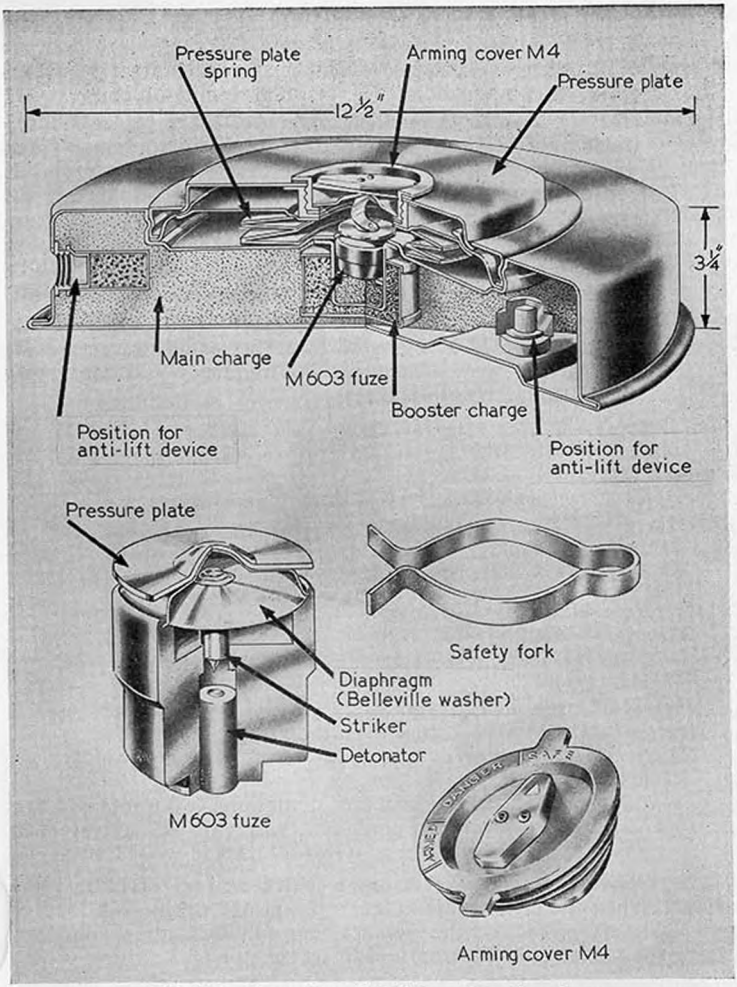


Fig 36.—American M6A2 anti-tank mine

(*e*) Lay the mine in a prepared hole, so that the top of the cover plate is at, or not more than 3 inches below, ground level, and turn the setting device to " Armed."

149. *Anti-lift devices.*—There are two built-in fuze wells for anti-lift devices, one in the side of the mine casing, the other at the bottom.

When anti-lift devices are used, they should be fitted after the main fuze has been inserted, but before the setting device is turned to " Armed."

150. *Neutralizing.*—

(*a*) Uncover the mine, and search for anti-lift devices.

(*b*) Neutralize any devices found, unscrew them, and remove.

(*c*) Turn the setting device on the cover plate from " Armed " to " Safe."

151. *Disarming.*—

(*a*) After neutralizing, unscrew the cover plate.

(*b*) Remove the fuze, and fit the safety fork (clip).

(*c*) Replace the cover plate.

SECTION 37.—MI5 ANTI-TANK MINE

152. *Recognition* (*see* Figure 37).—

Material.—Metal.

Size.—13 ins diameter x 5 ins high, with cover plate.

Weight.—30 lb.

Weight of explosive.—22 lb.

Igniter type.—M603 pressure igniter (diaphragm control).

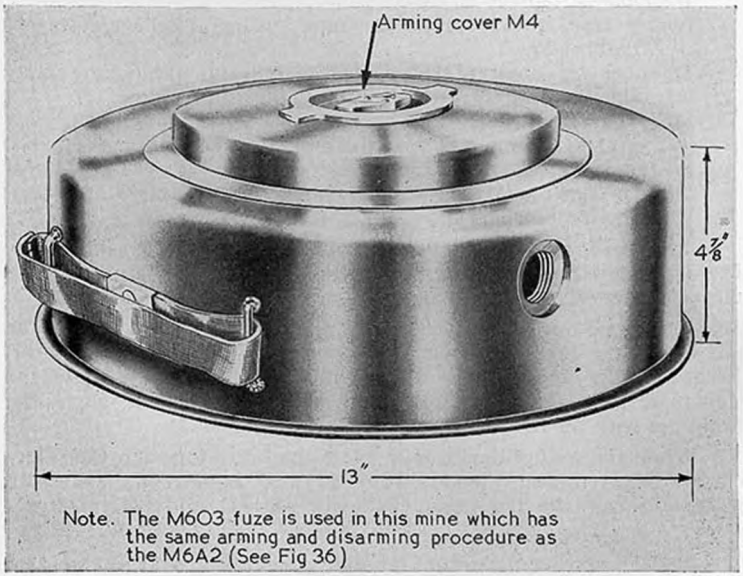


Fig 37.—American M15 anti-tank mine

(*j*) Ensure that the fuze well is free of dirt etc, and replace the pressure plate and fuze in the mine, using the wrench.

(*k*) Lay the mine in the prepared hole, with the top of the pressure plate not more than 3 inches below the ground surface, remove the safety clip, and turn the setting device to the armed position "A," using the special tool.

(*l*) Cover the mine, and camouflage.

158. *Anti-lift devices.*—There are two built-in fuze wells for anti-lift devices, one in the side of the mine casing, the other at the bottom. As supplied, these wells may be closed either by plugs and gaskets, or by strips of adhesive tape. Devices should be inserted after the detonator assembly and pressure plate have been put in place, but before the setting device is turned to the armed position.

159. *Neutralizing.*—

(*a*) Uncover the mine, and search for anti-lift devices.

(*b*) Neutralize any devices found, unscrew them, and remove.

(*c*) Turn the setting device to the safe position, and replace the locking safety clip.

160. *Disarming.*—

(*a*) After neutralizing, remove the pressure plate and fuze.

(*b*) Extract the detonator assembly.

(*c*) Replace the pressure plate and fuze.

SECTION 39.—M2A4 ANTI-PERSONNEL JUMPING MINE

161. *Recognition* (*see* Figure 39).— (Obsolescent)

Material.—Metal.

Size.—Main canister 2½ ins diameter × 6¼ ins high. Height to top of igniter prongs 9¾ ins.

Weight.—5 lb.

Weight of explosive.—0·34 lb (60-mm mortar shell).

Igniter type.—M6A1 pull-pressure igniter (plate withdrawal). Two operations on one igniter: pressure on head, pull on side release pin.

Safety devices.—Safety pin on pull release (locking pin). Safety pin on pressure head (positive pin).

Packing.—One complete mine, with a spool of four 26-ft lengths of steel wire, is packed in a carton. Six such cartons are packed in a wooden box. Over-all packed weight of a box 50 lb.

162. *Operation.*—A load of from 8 to 30 pounds on the pressure head, or a pull of from 3 to 10 pounds on the trip wire, will withdraw the plate and actuate the igniter. Operation of the igniter fires the propellant charge, which pushes the mortar bomb out, and at the same

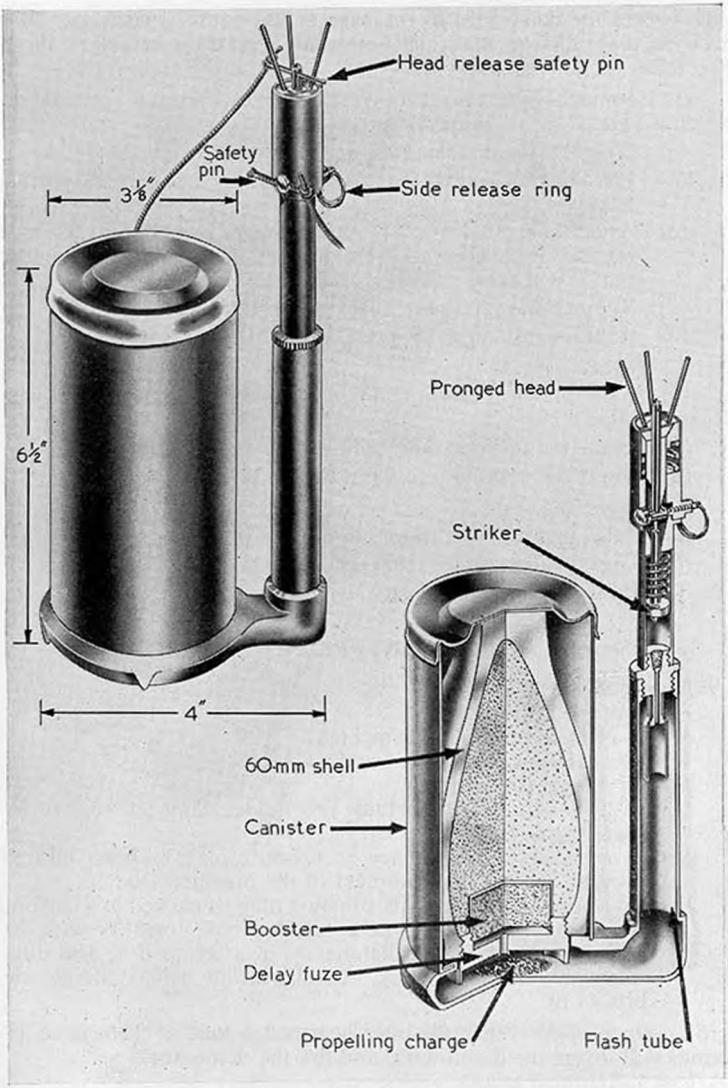


Fig 39.—American M2A4 anti-personnel jumping mine

time ignites the delay fuze in the base of the bomb. The delay fuze fires the main charge when the bomb has reached a height of about 5 to 6 feet.

163. *Arming.*—The mine is supplied complete, except for the igniter, which is carried in the same container.

(*a*) Unscrew the coupler cap, and screw in the igniter (M6A1).

(*b*) Lay the mine so that the top of the igniter is just above ground level.

(*c*) Attach a trip wire to an anchor stake, and then to the side release pin. *Caution:* Do not set the trip wire so tightly that it will exert a pull on the release pin.

(*d*) Remove the safety (locking) pin on the side release pin.

(*e*) Remove the safety (positive) pin on the pressure head.

164. *Neutralizing.*—

(*a*) Carefully clear the mine to expose the pressure head and side release pin.

(*b*) Insert the positive safety pin on the pressure head.

(*c*) Insert the locking safety pin on the side release pin.

165. *Disarming.*—

(*a*) After neutralizing, trace and cut the trip wires.

(*b*) Unscrew the igniter from the mine.

(*c*) Replace the coupler cap.

SECTION 40.—MI4 ANTI-PERSONNEL MINE

166. *Recognition* (*see* Figure 40).—

Material.—Plastic.

Size.—2¼ ins diameter x 1½ ins high.

Weight.—3¼ ounces approximately.

Weight of explosive.—1 ounce.

Igniter type.—Integral with mine (no model number), control by diaphragm (Belleville washer).

Safety devices.—Setting device on pressure plate. Safety clip to prevent downward movement of the pressure head.

Packing.—Each mine, with its shipping plug, is packed in a carton. 90 cartons are packed in a wooden box, together with 90 detonator holders with detonators in a set-up box, and nine mine and fuze wrenches. Total over-all packed weight of box 44 lb.

167. *Operation.*—When the mine is armed, a load of from 20 to 35 pounds will invert the diaphragm, and fire the detonator.

168. *Arming and laying.*—

(*a*) Ensure that the safety clip is in position.

(*b*) Remove the shipping plug from the base of the mine.

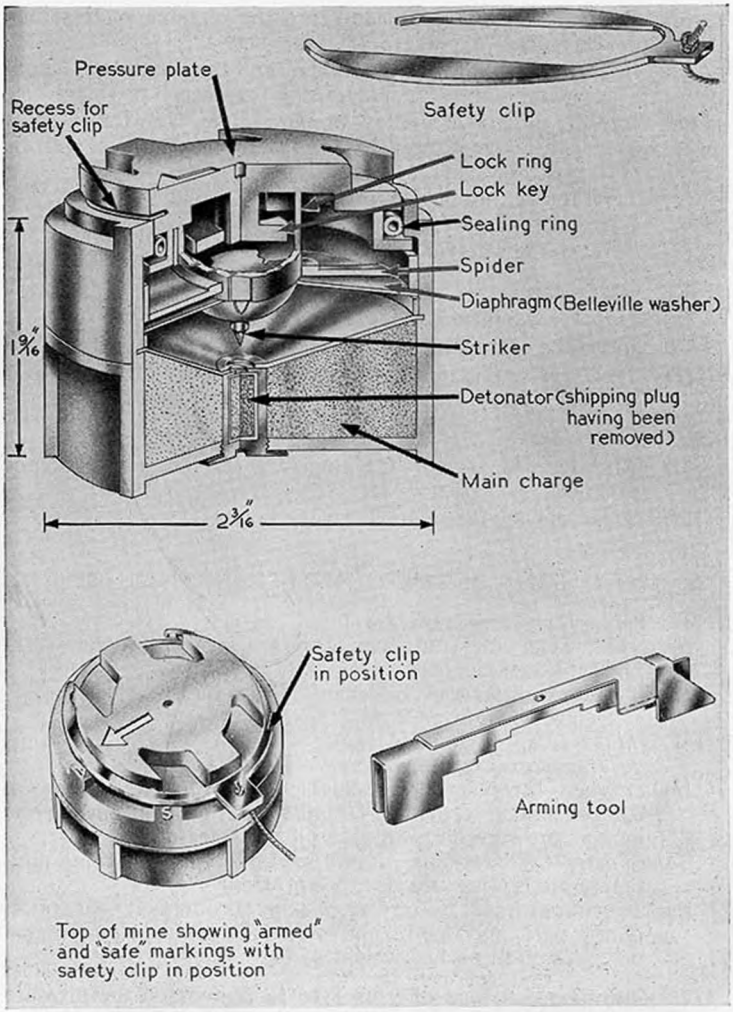


Fig 40.—American M14 anti-personnel mine

(*c*) Turn the pressure plate setting device from "S" to "A", remove the safety clip, and check that the firing pin remains in the unfired position.

(*d*) Replace the safety clip, and turn the pressure plate setting device from " A " to " S."

(*e*) Place the detonator in the holder, and then screw the detonator assembly into the mine, using the wrench provided.

(*f*) Lay the mine in a shallow prepared hole, with the pressure plate just above ground level, and anchor the mine with the cord provided.

(*g*) Turn the setting device on the pressure plate from " S " to " A," using the tool provided.

(*h*) Remove the safety clip.

169. *Neutralizing.*—

(*a*) Uncover the mine carefully.

(*b*) Insert the safety clip.

(*c*) Turn the setting device on the pressure plate from " A " to " S."

170. *Disarming.*—

(*a*) After neutralizing, lift the mine, and unscrew the detonator assembly.

(*b*) Shake out the detonator from the holder.

SECTION 41.—M16 JUMPING ANTI-PERSONNEL MINE

171. *Recognition* (*see* Figure 41).—

Material.—Steel outer and inner casing. Cast iron fragmentation body inside inner steel casing.

Size.—Main canister 4 ins diameter x 4¾ ins high. Height when fuzed 8 ins.

Weight.—8 lb approximately.

Weight of explosive bursting charge.—1 lb.

Igniter type.—M605 spring-operated igniter, with plate withdrawal control, similar to the M6A1 igniter. Two operations on one igniter: pressure on head, pull on side release pin.

Safety devices.—Safety pin on pull release pin ring (locking pin). Safety pin on pressure head (positive pin).

Packing.—Four mines, four fuzes in a metal container, four spools of trip wire, and one fuzing wrench are packed in a wooden box. Over-all packed weight 45 lb.

172. *Operation.*—A load of from 8 to 30 pounds on the pressure head, or a pull of from 3 to 10 pounds on the trip wire, will withdraw the release pin and release the firing pin. The firing pin fires the propellant charge through a short delay train. The propellant throws the cast iron shell into the air, and at the same time ignites two detonator delay charges in the shell. These explode the bursting charge in the shell at a height of from 2 to 4 feet above the ground.

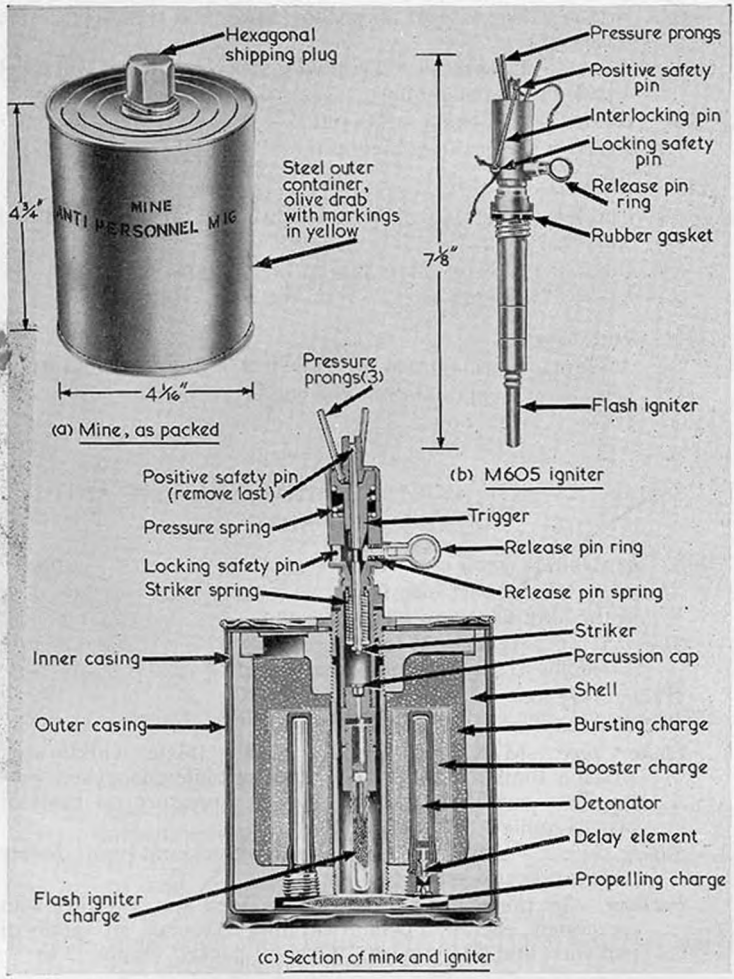


Fig 41.—American M16 jumping anti-personnel mine

173. *Arming and laying.*—

(*a*) Unscrew the shipping plug from the igniter well, using the tool provided.

(*b*) Screw in the igniter, and tighten down with the tool.

(*c*) Lay the mine, burying it up to the level of the side release pin.

(*d*) Attach a trip wire to an anchor stake, and then to the side release pin.

Caution: Do not set the trip wire so tightly that it will exert a pull on the release pin.

(*e*) Remove the locking safety pin.

(*f*) Remove the positive safety pin.

174. *Neutralizing.*—

(*a*) Carefully uncover the mine, to clear the pressure head and side release pin.

(*b*) Insert the positive safety pin on the pressure head.

(*c*) Insert the locking safety pin on the side release pin.

175. *Disarming.*—

(*a*) After neutralizing, trace the trip wires, if fitted, and cut them.

(*b*) Lift the mine and unscrew the igniter.

(*c*) Replace the shipping plug.

SECTION 42.—M3 GROUND FRAGMENTATION ANTI-PERSONNEL MINE

176. *Recognition* (*see* Figure 42).—

Material.—Heavy cast iron block, with three igniter sockets, two in the long sides and one at the end.

Size.—5½ ins x 3½ ins x 3½ ins.
Height to top of igniter when fuzed 8¾ ins.

Weight.—9½ lb.

Weight of explosive.—1 lb approximately.

Igniter type.—M7A1 pull-pressure igniter (plate withdrawal), which is similar to the M6A1, but is not interchangeable with it. Two operations on one igniter: pressure on head or prongs, pull on side release pin.

Safety devices.—Safety pin on pull release (locking pin). Safety pin on pressure head (positive pin).

Packing.—Six mines are packed in a wooden box, together with six igniters, each in a cylindrical fibre container, six spools of trip wire, and one wrench. Over-all packed weight 73 lb.

177. *Operation.*—The mine is designed to burst in situ, either at ground level or when tied to a stake or other object. It is provided with three igniter sockets, all or any of which may be used. The igniter is operated by pull, by pressure, or by a combination of both.

A load of from 10 to 20 pounds on the pressure head or prongs, or a pull of from 6 to 10 pounds in a trip wire will slide the plate and release the striker.

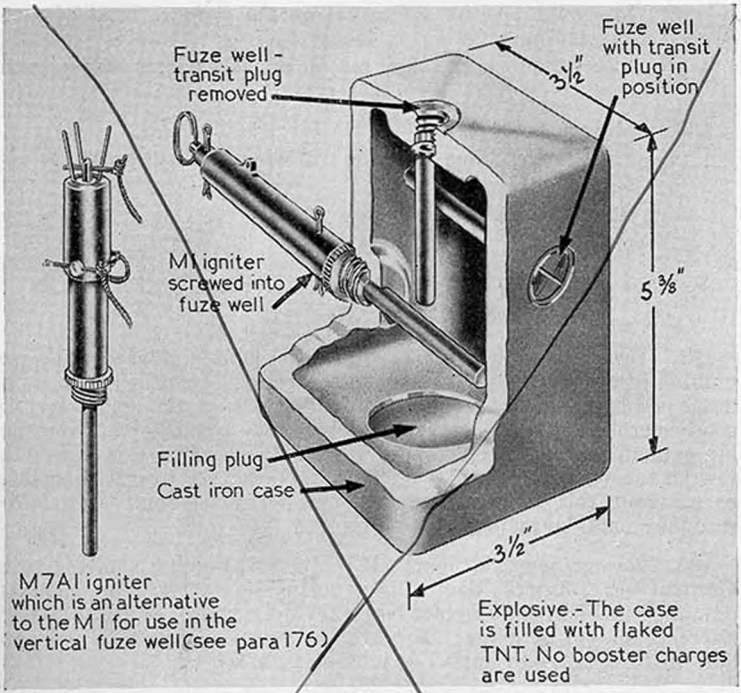


Fig 42.—American M3 ground fragmentation anti-personnel mine

178. *Arming and laying.*—

(*a*) Lay the mine in a prepared hole, or tie it to a stake or other object, according to the method of use proposed.

(*b*) Unscrew the plastic plug from each of the igniter sockets to be used, using the wrench provided.

(*c*) Screw in the igniters in the sockets concerned.

(*d*) If trip wires are to be used, first attach them to anchor stakes, and then to the pull release rings.

Caution: Do not set the trip wires so tightly that they will exert a pull on the pull release rings.

(*e*) Remove the locking pin on the pull release ring.

(*f*) Remove the positive pin on the pressure head.

179. *Neutralizing.*—

(*a*) Clear round the mine to expose all three igniter positions.

(*b*) Insert the positive safety pin on the pressure head of each igniter found.

(*c*) Insert the locking safety pin on the side release ring in each case.

180. *Disarming.*—

(*a*) After neutralizing, trace the trip wires, and cut them.

(*b*) Unscrew the igniters.

(*c*) Replace the plastic plugs.

SECTION 43.—M83 ANTI-PERSONNEL FRAGMENTATION BOMB

181. *General.*—The M83 fragmentation bomb is used with an anti-lift fuze as an anti-personnel mine dropped from aircraft. It is never laid by hand, and will not be found as part of a minefield laid to a predetermined pattern, but these bombs may be scattered, from the air, over an existing minefield or in any other area where it is desired to restrict enemy movement. It is just as important for troops to be able to recognise this dangerous type of anti-personnel bomb as it is to recognise hand-laid anti-personnel mines.

182. *Recognition* (*see* Figure 43).—The M83 bomb is similar to the German 4-lb " butterfly bomb " used during the 1939-45 War. This is described in FEMW Pamphlet No. 9 (WO Code No. 8730), to which reference should be made. The M83 is, however, only used with an anti-lift fuze, not with impact or long-delay fuzes.

183. *Method of dropping and operation.*—The M83 bomb is a small cylindrical canister containing high explosive, with a built-in fuze. These canisters are strapped together in " wafers," and a number of wafers are assembled into " clusters." The 500-lb cluster contains 90 bombs; the 100-lb cluster contains 24 bombs.

When the bomb is released from the cluster, the wings spring open and are forced by air pressure to the top of the cable extension (*see* Figure 43). They retard the fall of the bomb, and rotate. Rotation withdraws the arming stem in the fuze. When the bomb strikes the ground, a latch device is jarred free and, after a delay of about two seconds, the bomb is highly sensitive, and will be detonated by any further movement.

184. *Disposal.*—No attempt should be made to neutralize or disarm the bomb. It must be destroyed in situ by one of two methods:—

(*a*) By placing a slab of guncotton or CE/TNT, or a cartridge of plastic explosive, in line contact with each bomb, and detonating it. The greatest care must be taken not to move or disturb the bomb.

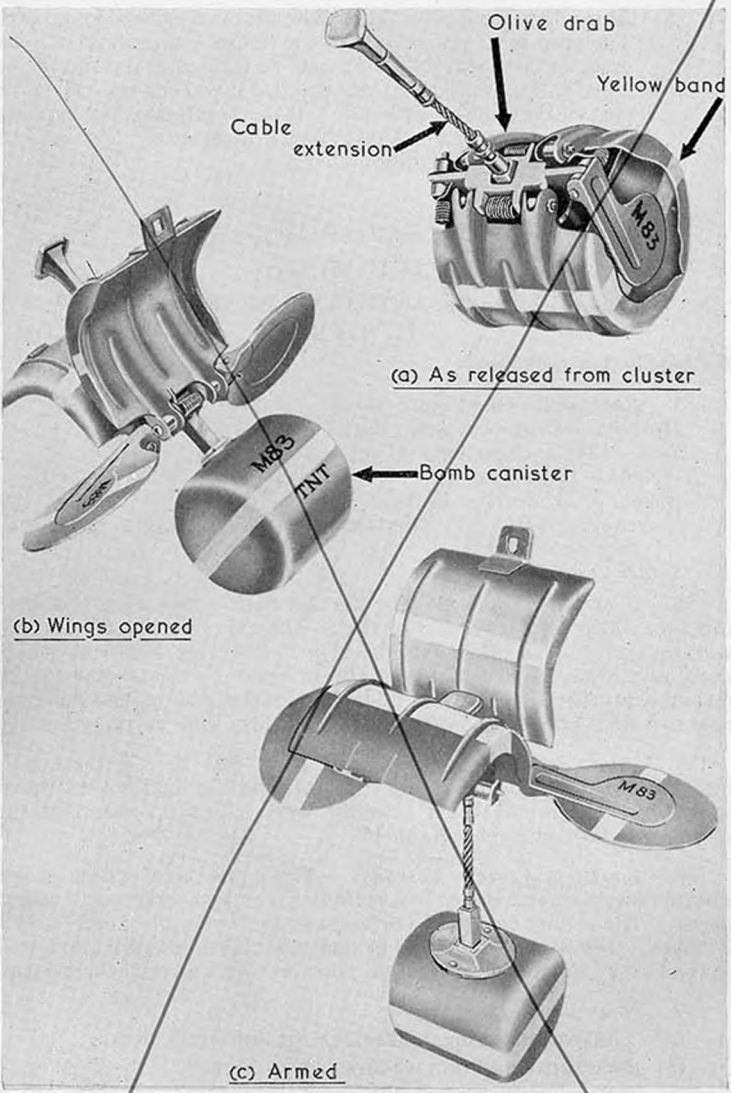


Fig 43.—American M83 anti-personnel mine (fragmentation bomb)

(*b*) By pulling the bomb, from behind cover, with a long cord. The cord must not be tied to the bomb. A grapnel may be used, or alternatively a loop may be formed at the end of the cord, and so placed that when pulled it will engage with some part of the canister or wings. If the bomb does not explode when moved, it cannot be assumed to be safe. It should be destroyed by a demolition charge.

CHAPTER 13

CZECH MINES

SECTION 44.—PT Mi-Ba ANTI-TANK MINE AND RO 7-11 IGNITER

PT Mi-Ba anti-tank mine

185. *Recognition* (*see* Figure 44).—
Material.—Drab-coloured plastic.
Size.—12¾ ins diameter x 4½ ins over-all depth.
Weight.—17 lb 6 oz.
Weight of explosive.—13 lb.
Igniter type.—RO 7-11 pressure fuze (double shear ring control) (*see* para 190).
Safety device.—Nil.

186. *General description.*—The circular plastic casing has a domed top, into which a shear rim is moulded. The top of the mine is smooth, with no excrescences other than the 5¼-inch diameter shear rim, ¾ inch deep, and it has no accessories. The well for the primer and igniter assembly is centrally placed in the bottom of the mine, where there are also two filler plugs, which also serve to hold a fibre carrying handle.

187. *Operation.*—When a load of from 300 to 550 pounds is imposed on the mine, the casing ruptures, and the load is then transferred to the igniter, which fires the mine. The operation of the igniter is described in paragraph 191.

188. *Igniter and primer assembly.*—The igniter and detonator are inserted into a threaded well in a rectangular primer wrapped in waxed paper. The primer weights 7 ounces, and its dimensions are 2¾ x 1½ x 2 inches. The whole igniter and primer assembly is inserted into a well in the base of the mine, and held in position by a watertight screw cap.

189. *Neutralizing the mine.*—
(*a*) Uncover the mine, and search for anti-lift devices.
(*b*) Neutralize and remove any devices found.
(*c*) After ensuring that the mine is properly cleared, lift it carefully. Unscrew the watertight screw cap in the centre of the base of the mine, and remove the primer and igniter

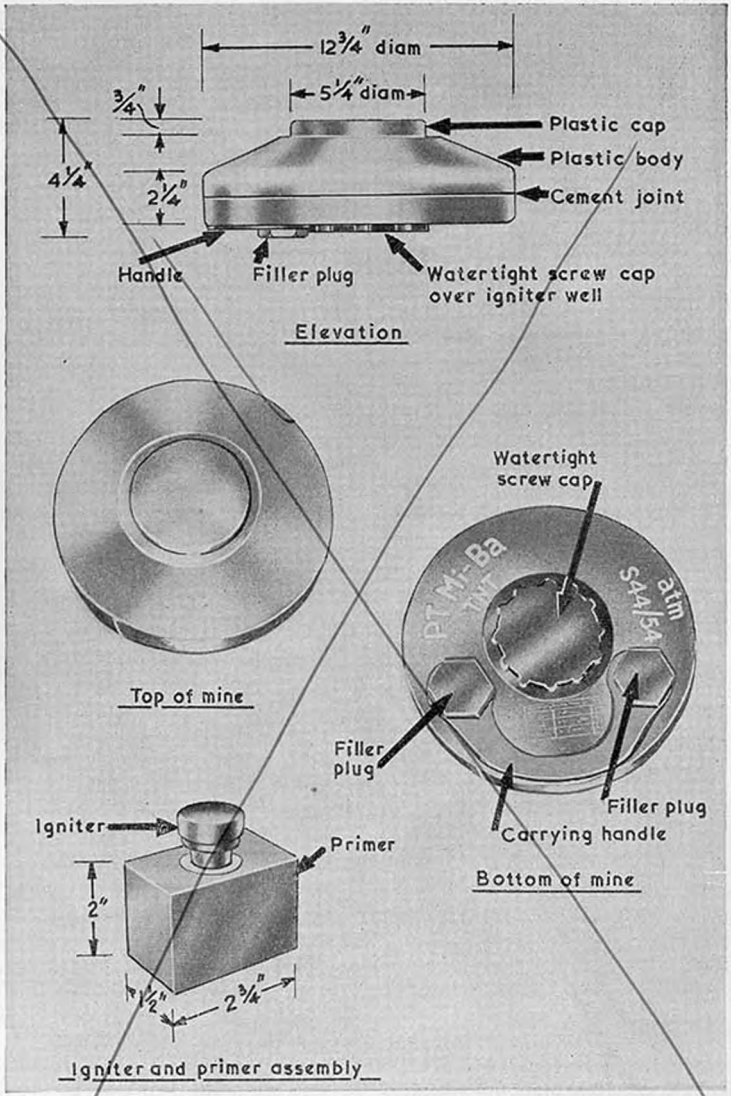


Fig 44.—Czech PT Mi-Ba anti-tank mine

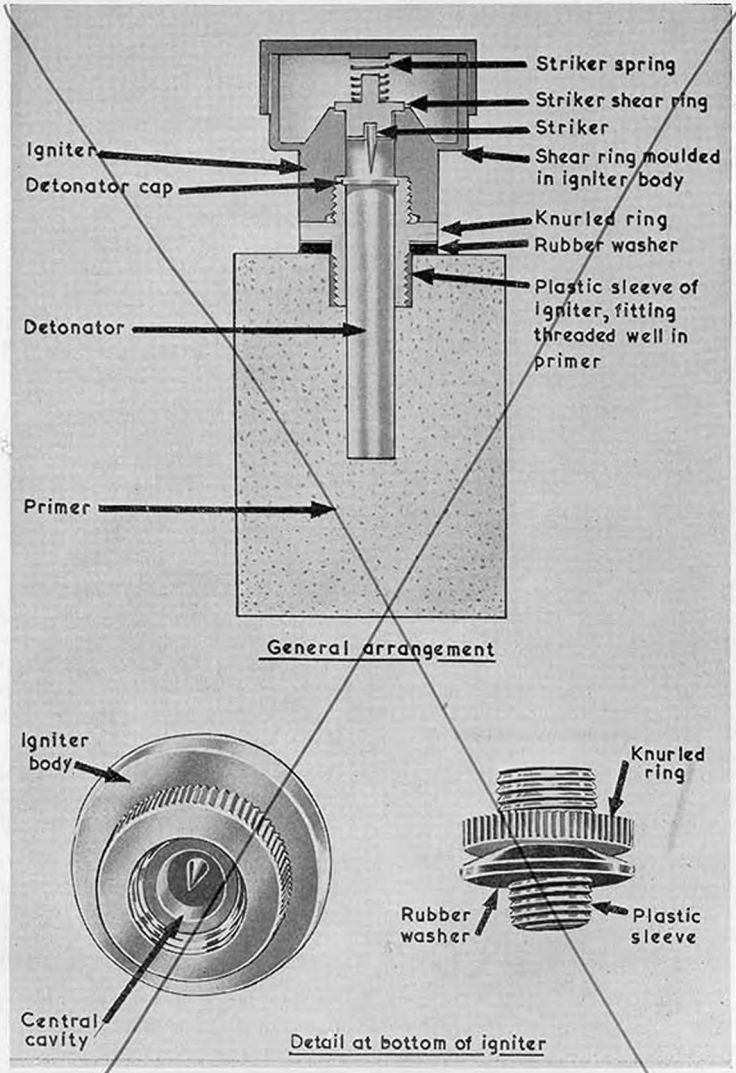


Fig 45.—Czech RO 7-11 igniter

assembly. Do not put any pressure on the domed top of the mine casing.

(*d*) Unscrew the igniter and detonator assembly from the threaded well in the top of the rectangular primer.

The RO 7-11 igniter

190. *Recognition* (*see* Figure 45).—

Material.—Plastic.

Size.—1 $\frac{3}{16}$ ins diameter x 1$\frac{5}{8}$ ins high, excluding detonator.

Igniter type.—Spring-operated, with control by two built-in shear rings.

Safety device.—Nil.

191. *Operation.*—When a load of from 300 to 550 pounds is applied to the top of the plastic cap, the shear ring forming part of the moulded body of the igniter fails. This allows the load to compress the striker spring. When the striker spring is fully compressed, the load on the striker causes the striker shear ring to fail, and the spring then drives the striker forward to fire the detonator.

192. *Neutralizing.*—The igniter is fully armed when a detonator is inserted into the sleeve, and the sleeve is screwed into the base of the igniter body. It can be neutralized only by unscrewing the sleeve and removing the detonator.

SECTION 45.—PP Mi-Sr ANTI-PERSONNEL MINE AND RO 8 IGNITER

PP Mi-Sr anti-personnel mine

193. *Recognition* (*see* Figure 46).—

Material.—Steel.

Size.—4 ins diameter x 5$\frac{1}{2}$ ins high (without igniter).

Weight.—7 lb.

Weight of main TNT charge.—11 oz approximately.

Igniter type.—RO 8 pressure fuze (ball control) (*see* paras 197 to 199).

Safety device.—Safety pin in igniter.

194. *General description.*—This mine is very like the German 1944 " S " mine. The outer casing is a steel cylindrical container, in which the body of the mine is housed, being retained by light lipping at the top of the container. When the mine is actuated, the body jumps from the container under the action of a propellant charge, and then bursts in the air.

The body comprises two concentric cylinders closed by top and bottom plates. The annular space between the cylinders is filled with chopped steel rod; the inner cylinder contains the main bursting charge of flaked TNT, and it also houses two tubes. One tube contains a delay element and the propellant charge; the other holds a striker

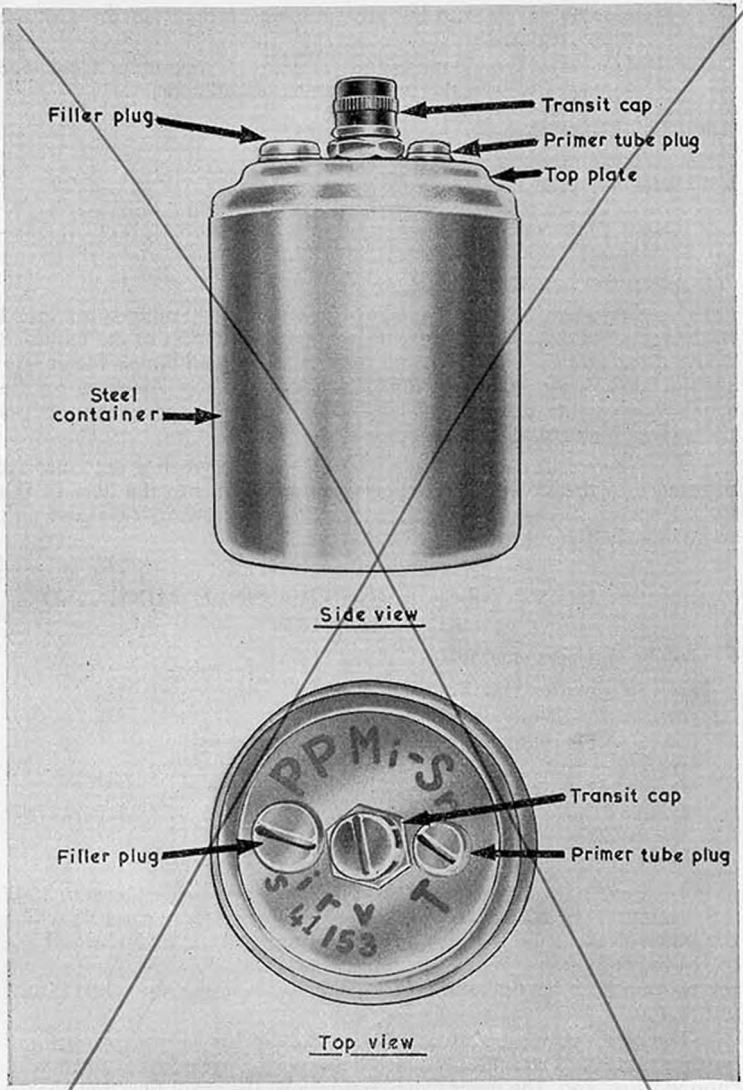


Fig. 46.—Czech PP Mi-Sr anti-personnel mine with transit cap fitted

mechanism, a detonator, and a primer. The top of the primer tube is closed by a plug, the propellant tube by a plug and transit cap, which are replaced by the igniter when the mine is armed. There is also a filler plug on top of the mine body.

195. *Operation* (*see* Figure 47(*a*)).—When the percussion cap is fired by actuation of the igniter, the delay element is ignited, and it in turn fires the propellant charge. The propellant charge ejects the body of the mine from the container. The mine body carries with it a length of wire which is securely attached to the container. When the mine body reaches a height of about two feet, the wire becomes taut, and it then actuates the striker mechanism in the primer tube. This fires the main bursting charge by means of a detonator and primer.

196. *Neutralizing the mine.*—

(*a*) First neutralize the igniter, by inserting a safety pin (*see* para 199).

(*b*) Unscrew and remove the igniter from the top of the mine body.

(*c*) Unscrew the plug at the top of the primer tube, and remove the primer.

(*d*) *Special precaution.*—The detonator in the primer tube may remain in place when the primer is removed. There is then a possibility that a fall or sharp knock could fire the detonator, and possibly explode the mine. The greatest care must be taken in handling and transporting the mine.

RO 8 igniter

197. *Recognition* (*see* Figure 47(*b*)).—

Material.—Metal
Size.—0.7 in diameter x 4 ins high (including prongs).
Igniter type.—Spring-operated, with ball control.
Safety device.—Safety pin through the plunger, just above the body of the igniter.

198. *Operation.*—When a load is applied to the prongs on top of the plunger, the plunger is depressed against the action of the control spring. The two balls which retain the striker in position then escape from the recesses in the plunger walls, and the striker is forced downwards by the striker spring, to fire the percussion cap. The actual operating pressure is not known.

199. *Neutralizing.*—

(*a*) Carefully clear the mine to expose the safety pin hole through the plunger.

(*b*) Insert a safety pin or nail in the safety pin hole.

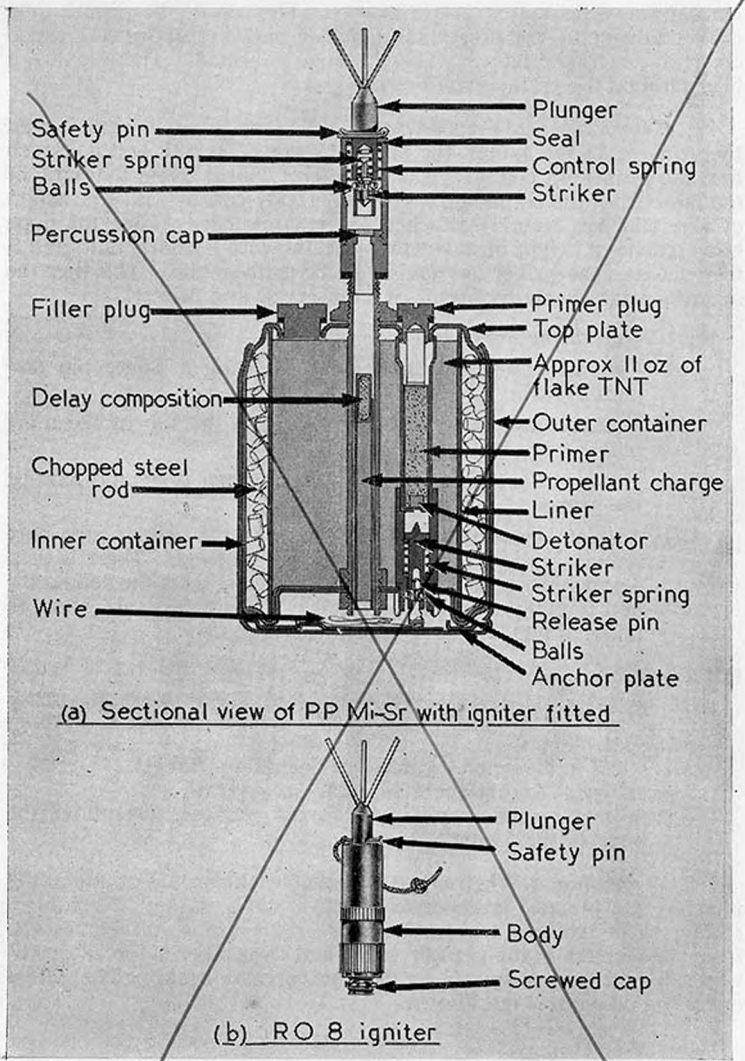


Fig 47.—Czech PP Mi-Sr anti-personnel mine and RO 8 igniter

SECTION 42.—M21 ANTI-TANK MINE

176. *Recognition* (*see* Figure 42).—

(*a*) *Material.*—Metal case painted olive drab colour with markings in yellow.

(*b*) *Size.*—9 in diameter × 4½ in high (without the fuze fitted).

(*c*) *Weight.*—17¼ lb (without fuze).

(*d*) *Weight of explosive.*—11 lb approximately.

(*e*) *Fuze.*—M607 fuze. The operation of this fuze is described in paragraphs 177 to 181.

(*f*) *Packing.*—Four mines are packed together in a wooden box. The box contains two packing supports each containing two mines, two fuzes, two boosters, two extension rods, two adapters, and one arming wrench. Each packing support is packed in a waterproof sealed plastic bag. The total weight of the packed wooden box is 82 lb.

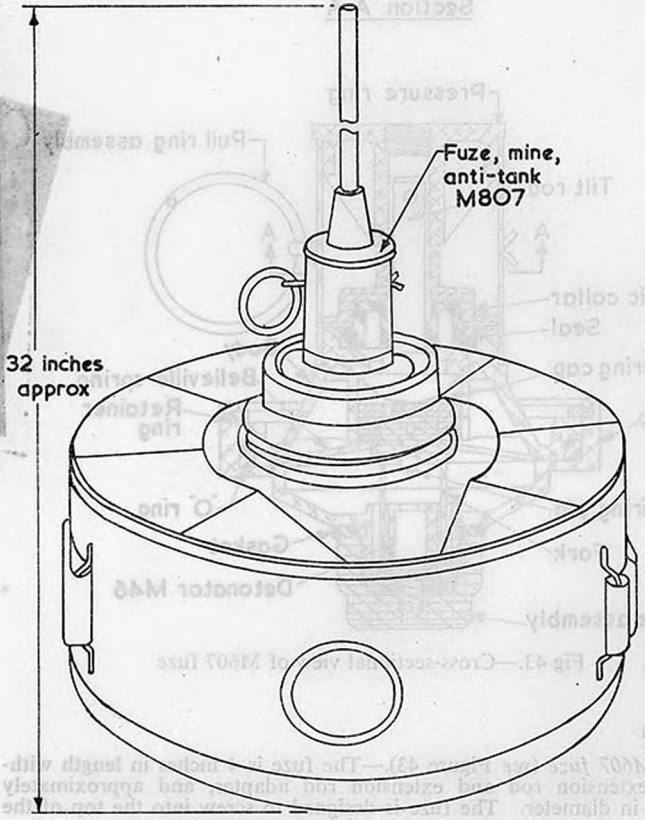
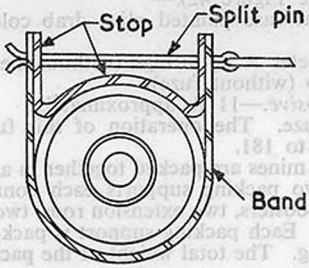


Fig 42.—General view of M21 anti-tank mine



Section A-A

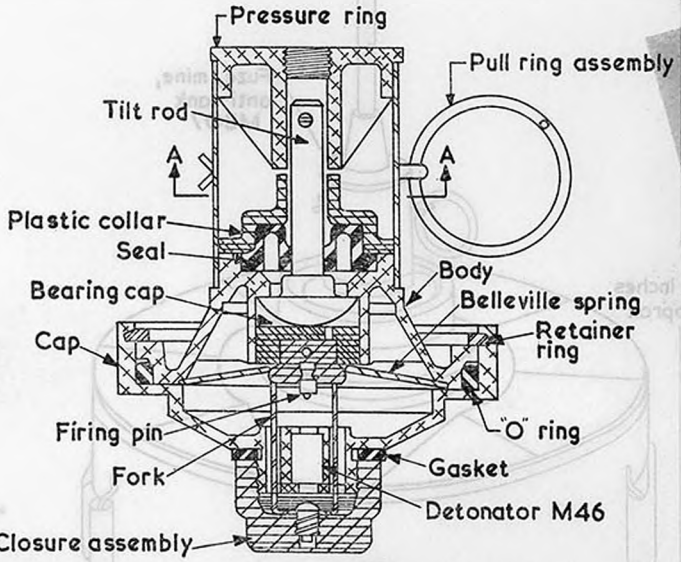


Fig 43.—Cross-sectional view of M607 fuze

Operation

177. *M607 fuze* (*see* Figure 43).—The fuze is 4 inches in length without the extension rod and extension rod adapter, and approximately 2¾ inches in diameter. The fuze is designed to screw into the top of the mine.

178. The fuze will function with or without the extension rod and its adapter. With the extension rod fitted it becomes a tilt fuze; without the extension rod it becomes an ordinary pressure igniter.

179. *Fuze used with extension rod.*—The tilting of the extension rod with a minimum force of 3·75 lb, acting through an angle of approximately 350 mils (20 degrees) or more, will shatter or break the plastic collar. Once the plastic collar is shattered or broken the tilt rod presses against the bearing cap, forcing it downwards and thus causing the Belleville spring to snap into the reverse position. The reversing action of the spring drives the firing pin of the firing pin assembly into the detonator M46 and explodes the detonator which, in turn, fires the black powder expelling charge of the mine (*see* Figure 44).

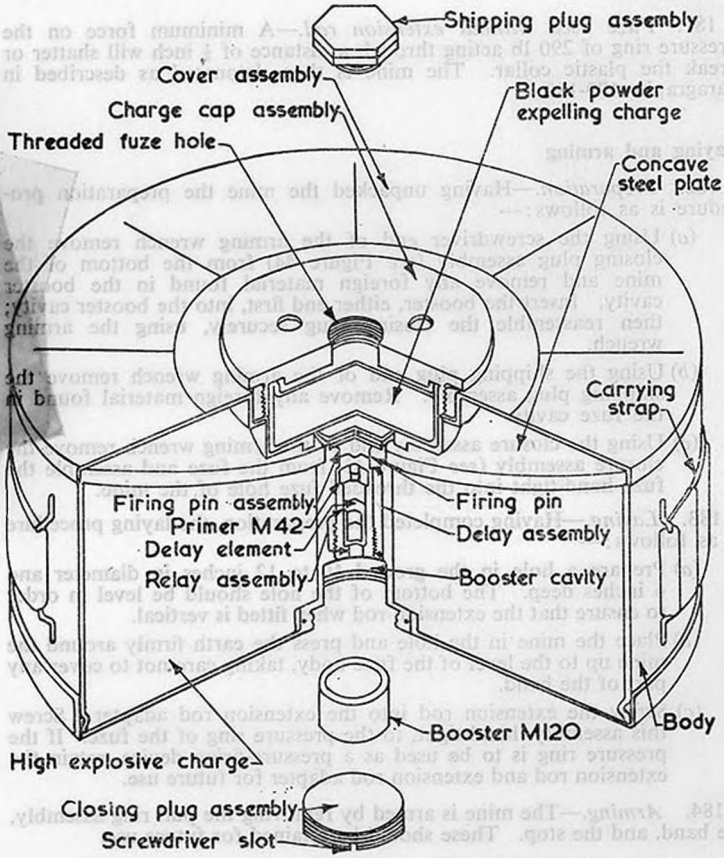


Fig 44.—Sectional view of M21 anti-tank mine

180. The blast from the black powder expelling charge blows off the fuze assembly, the cover assembly, and the earth or camouflage material which covers the mine. The pressure created by the burning of the black powder expelling charge drives the firing pin into the primer M42, causing it to ignite. The ignition of the primer, in turn, ignites the delay assembly. After a 0·15-second time delay, the relay assembly is detonated. The detonation of the relay assembly detonates the booster M120, which then detonates the high-explosive charge. The detonation of the high-explosive charge blows the body of the mine apart and causes the steel plate to be projected upward at a high velocity. The mine therefore has a similar effect against the tank to that of a shaped charge being fired at it from below.

181. *Fuze used without extension rod.*—A minimum force on the pressure ring of 290 lb acting through a distance of $\frac{1}{8}$ inch will shatter or break the plastic collar. The mine is then detonated as described in paragraphs 179-180.

Laying and arming

182. *Preparation.*—Having unpacked the mine the preparation procedure is as follows:—

(*a*) Using the screwdriver end of the arming wrench remove the closing plug assembly (*see* Figure 44) from the bottom of the mine and remove any foreign material found in the booster cavity. Insert the booster, either end first, into the booster cavity; then reassemble the closing plug securely, using the arming wrench.

(*b*) Using the shipping plug end of the arming wrench remove the shipping plug assembly. Remove any foreign material found in the fuze cavity.

(*c*) Using the closure assembly end of the arming wrench remove the closure assembly (*see* Figure 43) from the fuze and assemble the fuze hand-tight into the threaded fuze hole of the mine.

183. *Laying.*—Having completed the preparation, the laying procedure is as follows:—

(*a*) Prepare a hole in the ground 10 to 12 inches in diameter and 6 inches deep. The bottom of the hole should be level in order to ensure that the extension rod when fitted is vertical.

(*b*) Place the mine in the hole and press the earth firmly around the mine up to the level of the fuze body, taking care not to cover any part of the band.

(*c*) Screw the extension rod into the extension rod adapter. Screw this assembly, hand-tight, to the pressure ring of the fuze. If the pressure ring is to be used as a pressure-firing device, retain the extension rod and extension rod adapter for future use.

184. *Arming.*—The mine is armed by removing the pull ring assembly, the band, and the stop. These should be retained for future use.

185. The mine should not be armed until just before camouflaging.

186. After arming, great care should be taken not to tilt the extension rod or the pressure ring. The fuze may be initiated not only by a minimum horizontal force of 3·75 lb on the end of the extension rod, but also by a minimum tilt force of 45 lb on the side of the pressure ring.

Neutralizing and disarming

187. *Neutralizing.*—The procedure for neutralizing is as follows:—

(*a*) Carefully inspect the mine for booby trap devices before attempting to uncover the mine.

(*b*) Remove the camouflage material, taking care not to disturb the extension rod or the pressure ring.

(*c*) Carefully neutralize the fuze by re-assembling the band, the stop, and the pull-ring assembly to the fuze. After inserting the split pin its ends should be spread.

188. *Disarming.*—The procedure for disarming is as follows:—

(*a*) Unscrew the extension rod and extension rod adapter.

(*b*) Remove the mine from the hole.

(*c*) Unscrew the fuze from the mine. A closure assembly should be screwed on if one is available.

(*d*) If a shipping plug assembly is available this should be screwed into the top of the mine.

(*e*) Unscrew the closing plug assembly from the bottom of the mine. Remove the booster. Replace the closing plug.

SECTION 43.—M18A1 DIRECTIONAL ANTI-PERSONNEL FRAGMENTATION MINE (CLAYMORE)

189. *Recognition* (*see* Figure 45).—

(*a*) *Material.*—Moulded plastic case painted olive drab with markings in yellow.

(*b*) *Size.*—1⅜ in thick × 8½ in wide × 6¾ in high when installed (3¼ in high with legs folded). Curved and rectangular in shape.

(*c*) *Weight.*—3·5 lb.

(*d*) *Weight of explosive.*—1·5 lb (C4).

(*e*) *Fuze.*—M6 electric detonator.

(*f*) *Accessories.*—The following are issued with each mine (*see* Figure 46):—

100 ft of firing cable to which the M6 detonator is attached.
The M57 firing device.
A waterproof instruction sheet.
The M40 test set. Only one is issued for every six mines.

(*g*) *Packing.*—The M18A1 mine and all its accessories are carried in the M7 bandolier, which has two compartments and a carrying strap. The instruction sheet is attached to the bandolier.

(*h*) *Development.*—The M18A1 mine is a development of the original M18 (Claymore). Although similar in appearance, the M18 mine is much less effective.

Fig 45.—M18A1 directional anti-personnel fragmentation mine

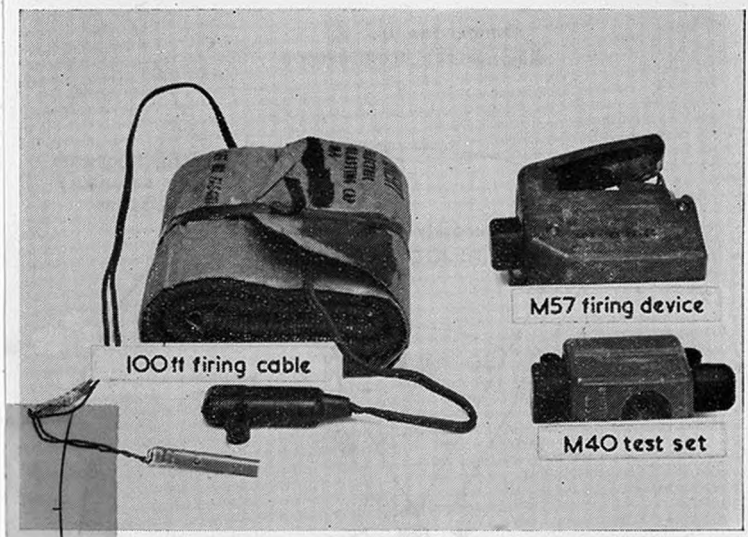


Fig 46.—Accessories for M18A1 mine

Operation

190. *Fragmentation.*—In the front portion of the case is a fragmentation face containing 700 spherical steel fragments. The back portion of the case contains a layer of C4 explosive. When fired the explosive projects the fragments in the aimed direction. This is not a shaped charge.

191. *Effects* (*see* Figure 47).—The 700 spherical steel fragments are projected in a highly effective fan-shaped beaten zone approximately 2 metres high and 50 metres wide at a range of 50 metres. These fragments are moderately effective up to a range of 100 metres and can travel up to 250 metres forward of the weapon.

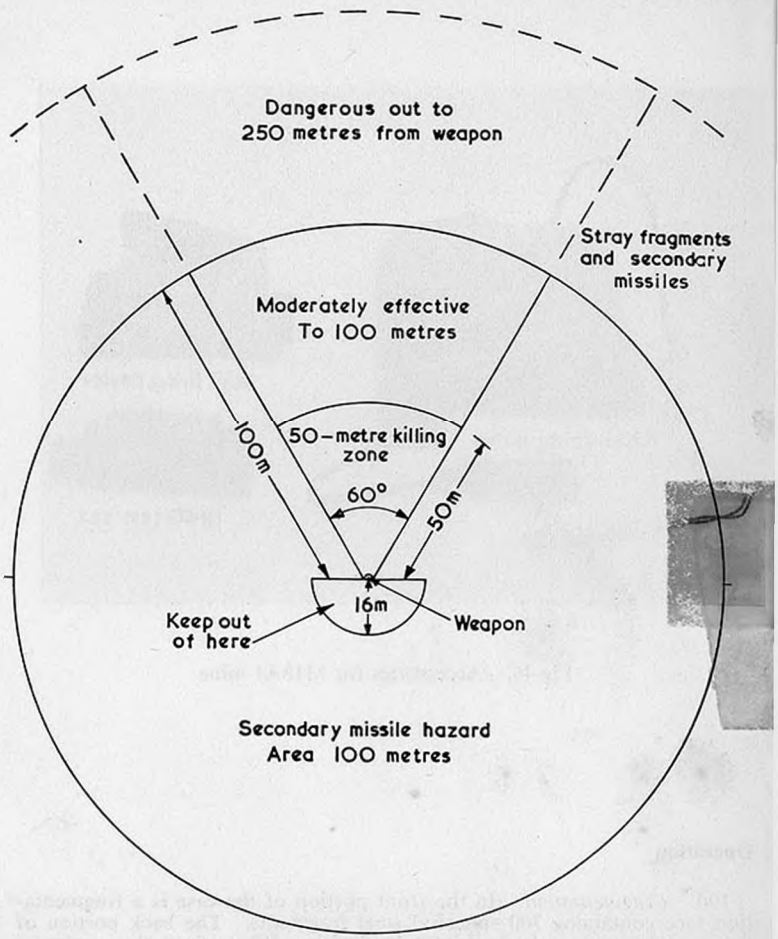


Fig 47.—Effects of M18A1 mine

Aiming, arming, and testing

192. *Aiming.*—Having decided on the position for the mine, the aiming procedure is as follows:—

(*a*) Turn the legs of the mine downwards and spread apart. Twist the spread legs to lie to the front and back. Arrows point to the enemy.

(*b*) Aim the mine by sighting through the slit sight. Shift the mine to put the groove in line with the aiming point. Aiming points are as follows:—

Distance of aiming point from mine	*Height of aiming point above ground level*
50 ft	4½ ft
100 ft	6 ft
150 ft	8 ft

(*c*) Press the legs firmly into the ground. Recheck the aim.

193. *Arming.*—The mine can be fired either directly by using the firing device or indirectly by the use of a trip wire. The arming procedure in each case is:—

(*a*) *Direct role.*—

(i) Unroll the paper from the firing cable by pulling the insulating tape tab. Save the tape for any wire repairs that may be necessary.

(ii) Lay the cable between the mine and the firing position. The cable can be unrolled from either end.

(iii) Wrap the cable round one leg of the mine. Bury the cable if possible.

(iv) Insert a detonator in either detonator well. Lock with the shipping plug/priming adapter.

(v) Recheck the aim of the mine.

(*b*) *Indirect role.*—

(i) Set up the trip wire using a standard booby trap pull switch (No. 4).

(ii) Connect the switch to a short length of detonating cord using two No. 27 detonators.

(iii) Lay a length of detonating cord between the switch and the mine.

(iv) Crimp a No. 27 detonator onto the end of the detonating cord.

(v) Insert the detonator in either detonator well. Lock with the shipping plug/priming adapter.

(vi) Recheck the aim of the mine.

(vii) Remove the safety pin from the trip wire switch.

(viii) Connect up the short and long lengths of detonating cord.

194. *Testing.*—When the mine is to be used in the direct role the following tests must be carried out:—

(*a*) *Testing the firing device M57 and test set M40.*—

(i) Remove the dust cover from the connector of the firing device and from the female connector of the test set. Plug the test set into the firing device. Leave the combination shorting plug and dust cover assembly on the other end of the test set. Swing the safety clip to the 'Fire' position and actuate the handle of the firing device with a firm quick squeeze and observe the flashing of the lamp through the window of the test set. The window of the test set should be held near the eye when checking the firing device and firing cable: this enables the operator to see the lamp flashing even in bright sunlight.

(ii) Flashing of the lamp indicates that the firing device is functioning properly. If the lamp does not flash (on and off), this may be due to corrosion on the electric connectors of the test set. The firer can overcome this by connecting and disconnecting the shorting plug dust cover on the M40 test set. If the test set indicates that several firing devices are faulty, retest with another test set since the test set itself may be defective.

(*b*) *Testing the firing circuit.*—

(i) Take cover at the firing position.

(ii) Remove the shorting plug from the firing cable.

(iii) Insert the plug of the firing cable into the test set.

(iv) Insert the plug of the test set into the firing device.

(v) Swing the safety clip to the 'Fire' position and from a covered position depress the firing handle. Light in the window of the test set indicates a good circuit. If there is no light then either the wire or the detonator may be faulty. Check the wire and repair any breaks with tape or replace the faulty detonator.

(*c*) *Use of mines in ambush.*—When a mine is laid in ambush by a patrol it should be tested before the patrol leaves its company base.

Firing and disarming

195. The procedure for firing the mine in the direct role is:—

(*a*) Insert the plug of the firing cable directly into the firing device. Ensure that the safety clip is in position.

(*b*) When ready to fire swing the safety clip to the 'Fire' position.

(*c*) Fire by depressing the handle smartly.

196. *Disarming.*—The procedure for disarming the mine is the reverse of the arming procedure described above.

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APPENDIX A

SYLLABUS OF TRAINING OF ALL ARMS IN INDIVIDUAL MECHANISMS OF MINES

(Reference para 4)

The syllabus set out in Table 3 shows the minimum training to be aimed at.

When circumstances permit, every effort should be made to raise Category " A " personnel to Category " B " standard, but no attempt should be made by other arms to carry out Category " C " training.

TABLE 3.—TRAINING REQUIREMENTS IN RESPECT OF INDIVIDUAL MECHANISMS

Category	Composition of category	Training required
(*a*)	(*b*)	(*c*)
A	All personnel of All Arms other than those in Categories " B " and " C "	(*a*) The principles of operation of the following basic types of igniter mechanism:— *Spring-operated.*— (i) Shear pin or plate control (ii) Ball control (iii) Pin or plate withdrawal *Other types.*— (iv) Plastic shear ring (v) Diaphragm (vi) Electric contact (vii) Chemical reaction (viii) Friction (*b*) The recognition, arming, neutralizing, and disarming of the following British mines:— (i) Anti-personnel mine, No. 6 (plastic shear ring) (ii) Trip flare, Mark 2 (spring-operated, plate withdrawal) ~~(iii) Shrapnel mine, Mark 2 (spring-operated, plate withdrawal)~~ (iv) Anti-tank mine, Mark 7 diaphragm) (v) Anti-personnel mine, No. 7 ("Dingbat") (diaphragm)

[Continued

TABLE 3.—*continued.*

(*a*)	(*b*)	(*c*)
B	(*a*) *RAC*—all personnel (*b*) *RA* (*fd and mob AA*)—one det per tp (*c*) *R Sigs*—line dets (*d*) *Inf*—rifle coys (*e*) *RCT*—one det per tp. (*f*) *RAMC*—one det per fd unit (*g*) *RAOC*—one det per fd unit (*h*) *REME*—one det per fd unit	As for Category "A" plus:— (*a*) The recognition, neutralizing, and disarming of:— (i) Friction igniters (ii) Russian MUV igniter (iii) Russian VPF igniter (iv) Russian MV-5 and MV-5K igniters (*b*) The recognition and clearance of anti-lift devices based on:— (i) Pin or plate withdrawal (ii) Pressure-release
C	(*a*) *RE*—all units except Tn, Svy, MC, and Postal (*b*) *Inf*—Aslt pnrs	As for Category "B" plus:— (*a*) The recognition, arming, neutralizing, and disarming of the following NATO mines:— (i) American anti-tank mine, M6A2 (ii) American anti-tank mine, M15 (iii) American anti-tank mine, M19 (iv) American anti-personnel jumping mine, M2A4 (v) American anti-personnel mine, M14 (vi) American jumping anti-personnel mine, M16 ~~(vii) American ground fragmentation anti-personnel mine, M3~~ ~~(viii) American anti-personnel fragmentation bomb, M83~~ (*b*) The recognition and clearance of anti-lift devices based on switches and mechanisms described in FEMW Pamphlet No. 7 ~~(*c*) The recognition of and methods of neutralizing:—~~ ~~(i) Czech PT Mi-Ba anti-tank mine~~ ~~(ii) Czech RO 7-11 igniter~~ ~~(iii) Czech PP Mi-Sr anti-personnel mine~~ ~~(iv) Czech RO 8 igniter~~

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(vii) American anti-tank mine, M21

(viii) American directional anti-personnel fragmentation mine, M18A1

APPENDIX B

SAFETY PRECAUTIONS FOR MINES TRAINING

(Reference para 4)

General

1. This appendix covers safety measures to be adopted when mines training is carried out.

2. All mines training, including the drawing and return of stores, will be supervised by an instructor who has qualified on a field engineering, infantry pioneer, or recognised mines course. This instructor will be responsible for checking equipment for issue, and for ensuring that any live mines to be used are unarmed.

Demonstration models and museums

3. No live mines or components will be incorporated in any mines museum, demonstration model, or equivalent layout. Only inert equipment will be used for this purpose.

Demonstration and class instruction

4. Except as stated in paragraph 5 below, inert mines and components will be used for demonstration and class instruction.

5. Live mines will be used for instruction only on the orders of the formation commander or equivalent authority. Such orders will be given only if it is considered absolutely necessary for the proper training of personnel under command, and when inert specimens cannot be provided within the necessary time. The type of mine which may be so used will be specified, and attention will be drawn to any special safety precautions to be observed. Only one live mine and its component parts will be present in any one room during indoor instruction. An officer will inspect the equipment before use to ensure personally that any explosive used is free from initiators of any kind (detonators, igniters, fuzes, etc).

6. Inert mines and components will never be used or stored with live mines.

7. All inert mines and components will be clearly marked as such.

All live equipment used for instructional purposes will be clearly marked " live."

8. Live cartridges, fuzes, or detonators will not be inserted into live mines during instruction or demonstration to classes.

9. After demonstration live exhibits will be replaced in their containers. They will not be placed loose on desk, table, or floor.

10. A list of exhibits will be kept and checked both before and after use. Every item will be accounted for before the class leaves.

11. The action specified in paragraphs 9 and 10 above will be performed deliberately. The reasons for the action will be stated in

2A. When laying or breaching drills are being taught, practice mines with audible or visible means of indicating activation may not always be available. In such cases, if it is necessary to provide some form of indication of activation of the mine itself or of an anti-handling device, then this indication will consist of a maximum of 8 inches of instantaneous fuze initiated by an adapter assembly beneath the mine.

On no account will live detonators, primers, detonating cord, or other explosive be used in mine warfare training without prior sanction of the formation commander.

order that good habits may be ingrained, from the outset, in observing safety precautions when handling explosive material.

Laying and clearance drills

12. For training in laying and clearance drills inert mines should be used. If enough of these cannot be provided, live mines may be used but they will be laid without fuzes.

All mines used must be of the same class, either all live, or all inert. Live and inert mines must never be mixed.

13. If for realistic training and psychological reasons it is considered necessary to lay dangerous mines, inert mines may be laid with live fuzes, in which case the full safety precautions laid down in the drills for handling live mines will be observed.

14. On active service, in the final stages of battle training, live mines may be laid with live fuzes, but prior sanction of the formation commander must be obtained. During such training the authorized drill, spacing of personnel, and safety precautions must be rigidly enforced.

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