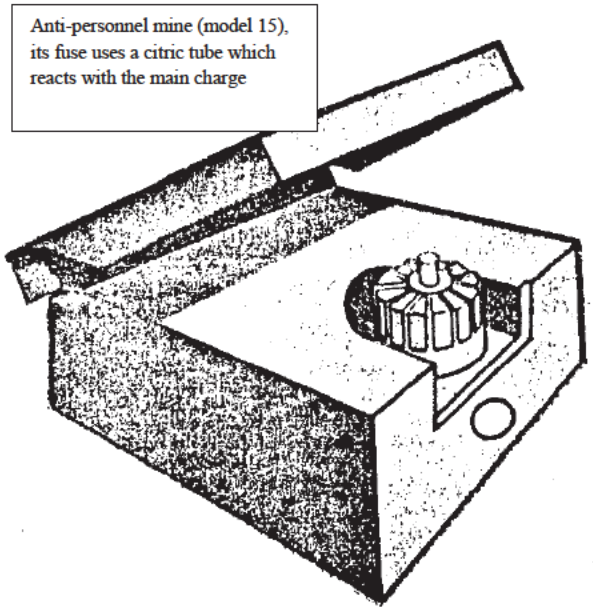
AFGP-2002-000032-0127

Dutch Anti-personnel (model 15) mine

Specifications:

Weight:	.79 kg
Weight of charge:	.176 kg
Height:	67 mm
Length:	113 mm
Width:	100 mm

Background:
Production status is not exactly known. It is available in the Dutch army. The Dutch (model 15) mine is similar to a small box with a separate cover. The cover is actually the pressure plate which will activate the detonator. When pressure is applied on this plate, the action fuse is pressed toward the inner tube which contains acid. When this tube is broken and the acid is exposed and mixed with chemical black powder, a reaction develops and activates the main charge. The (model 15) works via flexible plastic with no metal parts. Also, it does not have a safety mechanism. Therefore it is not supported by any fuses until it is in place. The small size of this mine makes it ideal for booby traps.

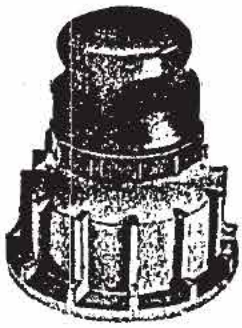


AFGP-2002-000032-0128

Israeli Anti-personnel (number 10, number 4) mines

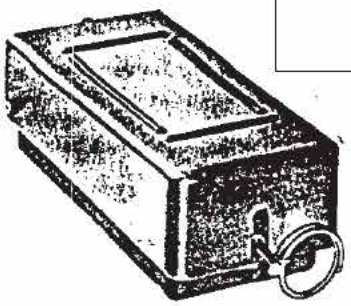
Specifications:	number 4	number 10
Weight:	350 g	120 g
Weight of charge:	180 g	5 g
Height:	52 mm	75mm
Length/diameter:	152 mm	70 mm

Background:
The number 4 mine is still in production but the number 10 mine production has ceased. The number (4) mine is used by the Zionist enemy forces and it is available for export as well, while the number (10) mine is used by the Ugandan army and by the Zionist forces.
The Zionist enemy uses the rectangular number (4) anti-personnel mine with a standard box, basic plastic brown. The mine is deployed manually. The last stage to engage it is to lift the safety pin from either side. The mine will explode after that when it receives pressure equaling more than 8 kg on the upper cover which acts as a pressure plate. It is a small mine which can be disguised easily. Its intent is to injure personnel, not to kill them. This mine is shipped in wooden boxes, each one containing 30 mines in addition to the detonation devices which are needed to engage the mine before it is deployed. The Zionist enemy has produced another small anti-personnel mine, which is the number (10). It is a small cylindrical plastic mine.



Anti-personnel mine (number 10) which is used by the Zionist enemy Its body is made of plastic

Rectangular Zionist anti-personnel mine (number 4) Its body is made of plastic.



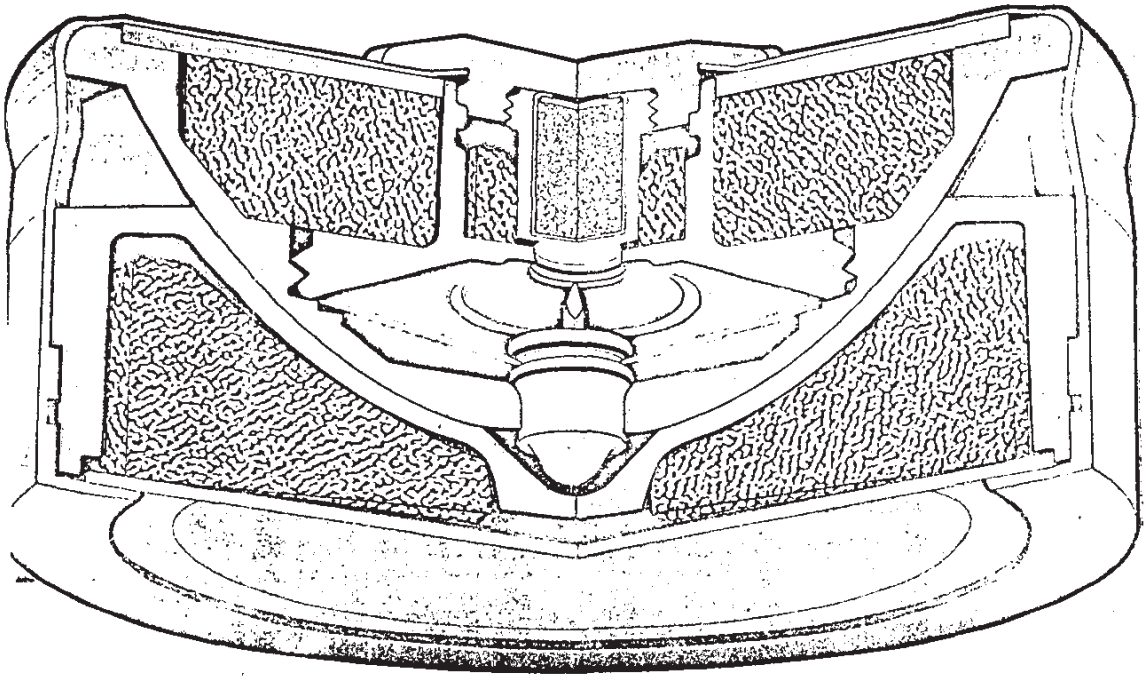
AFGP-2002-000032-0129

Swedish anti-personnel mine (LI-11)

Specifications:

Weight:	.2 kg
Weight of charge:	.5 kg
Height:	35 mm
Diameter:	80 mm

Background:
It is not in production any more. It is found in the Swedish army.
The Swedish anti-personnel (LI-11) mine is an unusual small design. It has several unusual characteristics, one of which is that it is made of two rubber parts joined by a rubber casing. The mine works with small pressure, but this operation is done in an unusual way. When the mine is placed in its location, the upper part is separated from the bottom one by a central axis inserted inside a cavity of the lower half. The upper part also has a fuse, and when pressure is applied on it from either side, the axis is pushed inside the cavity which will cause the upper part of the axis to enter the fuse causing the mine to explode. This explosion is resulted from a slight pressure on either part.
When transporting this type of mine, the detonator is disarmed and a safety ring is put in its place.
The unusually designed Swedish anti-personnel mine (LI-11) whose main components and outer cover are made of rubber.



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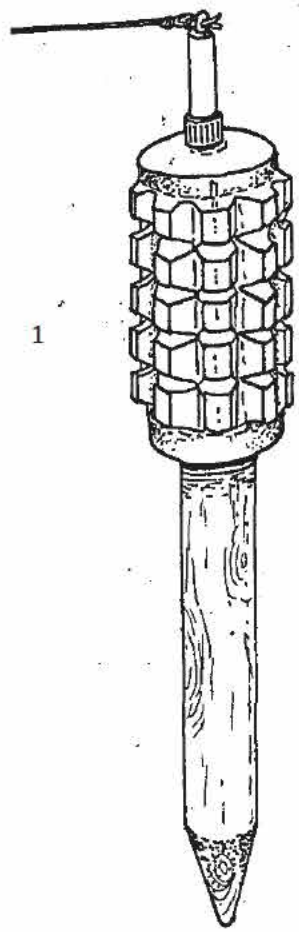
* * Secondary: Stake mines.

Russian stake mine (Bomz-2)



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Specifications:

Weight:	2 kg	1.7 kg
Weight of charge:	75 g	75 g
Height:	135 mm	111 mm
Diameter:	64 mm	64 mm

Background:
It is likely that production continues on a small scale. Some types are manufactured in China, Czechoslovakia, and North Korea. It is used in several countries of the Warsaw pact, Vietnam and Yugoslavia.
Stake mine (Bomz-2) is an anti-personnel weapon that goes back to the early days of the Second World War. In spite of being old, it is still widely used.
The mine itself is very simple. It consists of an explosive warhead surrounded on the outside by a ribbed collar of iron. There is a retractable fuse in the top of the mine which is connected by a booby trap net. The mine is placed on a wooden stake. The usual arrangement is to scatter several of these mines in a network of booby traps which are connected to each other in order to cover a certain area and in ambush locations. It is not required that more than one mine is connected to one trip wire. The original (Bomz-2) mine can be distinguished by its six fragmentation shelves. The new model (Bomz-2M), has only five shelves. A different helical fuse is fixed in the body of the mine, making it light weight.
Also, there are fragmentation patterns for these mines. It will explode in big pieces of shrapnel indiscriminately, while the other parts turn to harmless dust. Therefore, it is difficult to pinpoint the danger range of this mine, but most probably its range is about 25 meters.
Both mines (Bomz 2, Bomz 2M) are widely used and copied. The Chinese and North Korean are developing them in different types. Also, the Czech produce the mine (BP-MI-CK) which is similar to (Bomz 2M).

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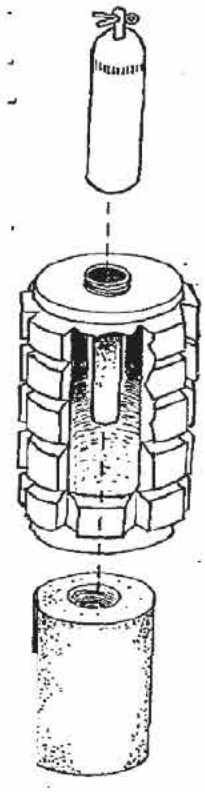
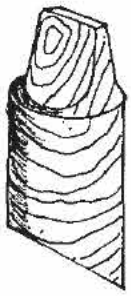
This mine has great effectiveness, as it affects a large concentration of enemy personnel. It is usually deployed in mountainous regions, and between grass and trees. It is hard to detect, but the vigilant seeker in the grass can detect it easily. It is easy to deploy due to its small parts.

* Mine parts:

1. Cylindrical concave body made of steel, with a big opening to insert the charge and the wooden stake to hold it. There is a small hole at the top to insert the detonator.
2. A mold, which is a cylindrical shape with a hole to insert the detonator.
3. Fuse, contains the firing pin within a pressured spring inside a metal tube. The pin head protrudes from the top side so a safety pin can be installed thru the small hole from the other side.
4. The detonator and the capsule. One can notice gears around the capsule, and this is for securing the detonator and the capsule with a fuse in the metal mine body.
5. The wooden stake is inserted from the top of the metal body to secure the charge and to lift the mine a certain distance from the ground. The pointed end is to lodge the stake halfway inside the soil and to secure the mine.
6. The tripwire is a non-polished fine wire, so it will be hard to notice. This wire is coupled with the safety fuse and the fixed pin of the needle, so it will not move freely from the pressure force of the spring. The other part is linked to a wooden stake or a tree branch at a certain distance, but is not to be stretched too much.





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Mine function:

After arming the mine, by placing the mold (charge) inside the metal body and securing the mine via a wooden stake, then placing the detonator in the fuse through the metal body's hole inside the charge. Pull the tripwire and tie it with the safety pin of the fuse, then to the wooden stake or a tree branch, after that pull the wire along the road of enemy troops, for example. When the enemy crosses it and trips the wire, the safety pin will be pulled from the fuse, and the pin will hit the capsule which will blast the detonator and the charge will explode. Metal shrapnel will fly. These small metal pieces will kill or injure the enemy.

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French stake mine (Mark 61-mark 63)

Specifications:	Mark 61	Mark 63
Weight:	125 g	1 kg
Weight of charge:	57 g	30 g
Height:	270 mm	270 mm
Body diameter:	35 mm	35 mm
Danger zone:	10 m	10 m

Background:
Under production. Both are found in the French army and several other countries.
The French mines are more advanced in comparison to other stake mines. Each one has a long stake and equipped with anti-disarming measures. Each mine has a warhead manufactured at a high cost. Both mines function similarly, but the type (63) contains an anti-handling device which is not found in mine (61).
The warheads consist of a tightly secured plastic explosive head. It also contains about 225 pieces of steel shrapnel. This shrapnel will be scattered in a 360 degree fan shape when it explodes. When deploying this mine, it is secured in the ground by digging a hole to secure the special stake. Once it is secured in place, the anti-disarming segments will prevent it from moving in place even in soft ground or sand. The mine will be buried in the ground up to its warhead, which will explode by either the pressure fuse or the trip wire or the retracting fuse. In most cases the mine is deadly within a 10 meter radius, and since it is placed in a low position, it is dangerous even for targets lying down.
The older models of this mine use steel stakes, but the newer ones have plastic stakes instead of steel, which makes its detection by metal detector almost impossible. This mine can be equipped for training purposes with a metal ring which allows for detection by metal detection devices. Also there is training mine which will disperse a cloud of smoke when it explodes.

Stake anti-personnel mine (Mark 61). Notice the metal sheets at the end of the stake to guard against the removal of the mine after it is planted in the ground

Mark 63

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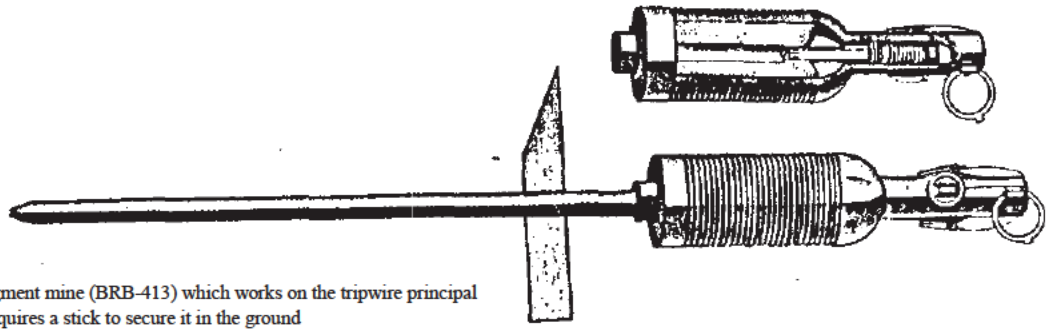
Belgian stake mine (PRB-413)

Specifications:

Weight:	640 g
Weight of charge:	95 g
Body diameter:	46 mm
Danger circle:	14 m
Height of install location:	230 mm

Background:
Under production. It can be found in several countries.
This mine is also known as the (mine with a stick) because it consists of a warhead sitting on a stick lodged in the ground; only the warhead is visible above the ground surface.
The (PRB 413) mine's warhead is mounted on a solid stake or a stick that goes in the ground at a height ideal for the mine. The mine will stay at that height due to a solid sheet of steel that surrounds the spike. The warhead is armed by a tripwire linked to a launching device mounted on top of the warhead. Each mine comes with two fine wire reels, each with a length of 15 meters, and they are used for making the tripwire. The ignition device has four arms that can be tied to tripwires if necessary, forming a web of tripwires of 360 degrees. When one of the tripwires is removed or severed, the ignition system starts functioning so the actuation arm is operational by a spring causing the warhead to explode.



Fragment mine (BRB-413) which works on the tripwire principal
It requires a stick to secure it in the ground

AFGP-2002-000032-0135

Thirdly: Jumping mines:

German jumping mine (DM 31)

Specifications:

Height without plunger:	135 mm
Body diameter:	100 mm

Background:
Under production. It is used by the West German army and Denmark.
The (DM-31) mine is considered another type of jumping mine. The Germans have gained much experience from the two anti-personnel mines (SM 35) and (SMI-44). These two mines inflicted many causalities on troops between 1940 and 1945. Many countries took this design as a starting point to enhance their efforts in mine production. Currently, West Germany is producing a new version. Its effect is similar to the original, and as far as destruction is concerned, it is more destructive than other mines because the anti-personnel charge is bigger, and the steel shrapnel is unlimited. This (DM-31) mine functions as a system of tripwire and a retractable plunger, in addition to employing a remote electric fuse. When this mine is engaged, a small charge inside the casing is buried in the ground, and it will launch the mine upward about one meter high, which will allow the wire surrounding the buried canister to pull the pin from inside the fuse of the mine body. After that, a plunger pulled by a spring will be released and strike the blasting cover and the mine will explode. The shrapnel will fly along a 360 degree radius for 10 meters. Some of the shrapnel is deadly even beyond that range.

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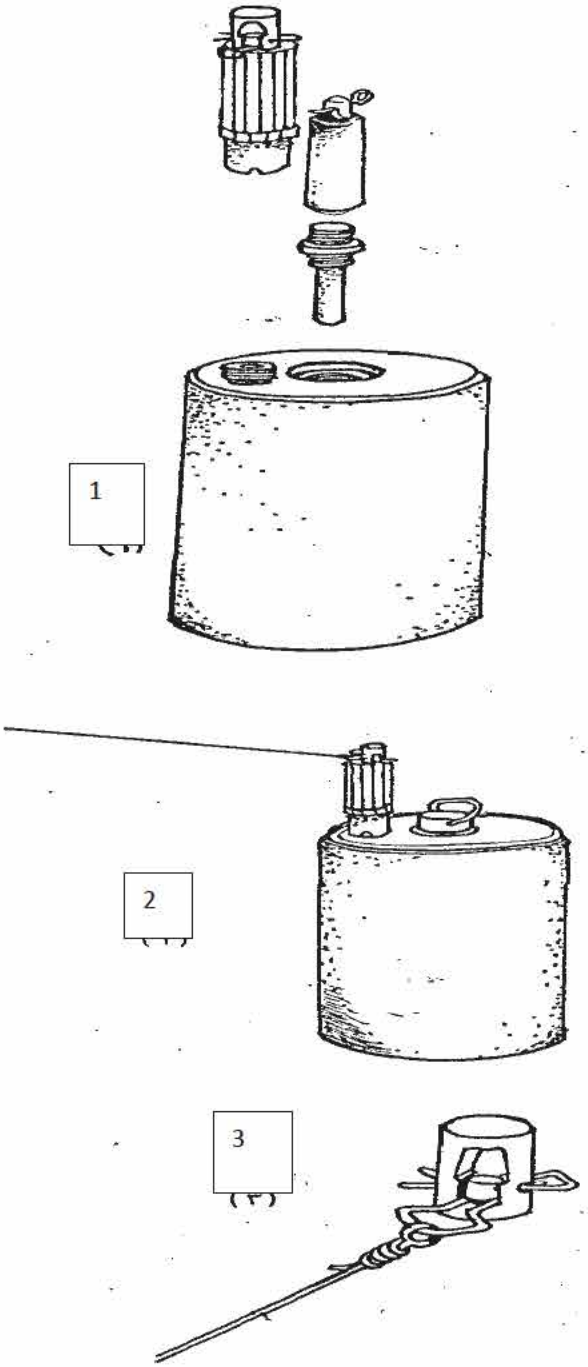

German jumping mine

It is a very effective anti-personnel mine. It works via tripwire. It has an opening for the detonator to slide in from the top, and a capsule on the side of the detonator. The fuse is assembled on it. There is a thrusting material inside of it, a capsule, a quick detonator and explosive material (TNT).
This mine can be transformed to a standard anti-personnel mine by installing a detonator and capsule, then a fuse to be pulled, as illustrated in the figure. This mine can be detonated in two ways, either by a jumper or the normal way by installing a pull fuse, as in figure (1).
Note: The detonator used in the jumping mine mode is different than the one used in the regular mine mode.

Mine function:

Install the detonator in its place as in figure (2), and then install the fuse on the capsule, after that tie the safety fuse from the top with the tripwire in one end and the other end to the side of the road. When a passing enemy pulls the tripwire, a pin will strike the capsule which will ignite the quick fuse and it will ignite the accelerant material, which will ignite the mine and launch it upward to one meter high above the ground, at the same time the fuse will burn quickly and detonate the capsule which will explode 1 meter above the ground, the mine will explode and a large quantity of shrapnel will be scattered inflicting injuries or death on the enemy.

Method of deploying mine:

Mine is deployed by placing it in the ground then disguising it well, nothing should show above the ground except the fuse. Place it in a grassy area so it will not be discovered.

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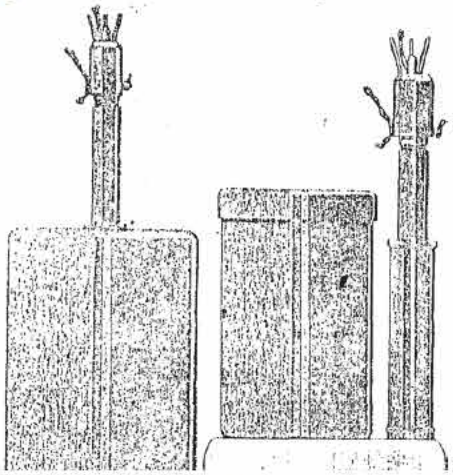
Note:
The top safety contains two safety devices when engaged. Leave alone the lower one which is tied to the trip wire, as in figure (3).

The American jumping mine

Specifications:	M 2116	M412	M26	M3	M14
Weight:	2.83 kg	2.95 kg	1 kg	4.68 kg	.99 kg
Weight of charge:	.59 kg	.154 kg	.17 kg	.408 kg	.028 kg
Height:	199 mm	244 mm	145 mm	220 mm	40 mm
Diameter:	103 mm	104 mm	79 mm	89 mm	56 mm

Background:
Most of the mentioned mines are under production in the US, or licensed to be manufactured in other places. All of these mines are used widely throughout the US armed forces and other countries.
The US uses different kinds of anti-personnel mines. It exports many of them to all over the world. Some countries are producing some of them, such as Taiwan, under US licensing along with other kinds of jumping mines and anti-personnel mines. One of these mines is the (M16) mine, where different types have been produced like the (M2116). This type can be activated via a network of tripwires or by pressure. The main mine (M16), is carried via airplane and uses the shrapnel from its cast iron body.



Right figure illustrates the jumping mine (M412) which uses the fuse (M16). Notice that in the photo the safety system is separate from the main mine. The left mine is (M2) which uses fuse (M17). This mine is the fragment type, and it can be rigged by trip wires.

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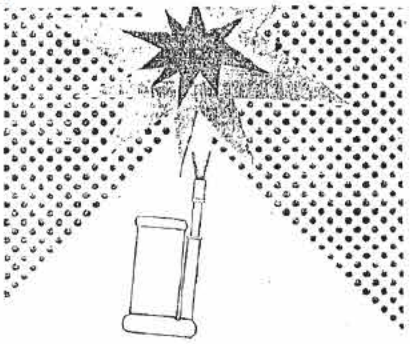
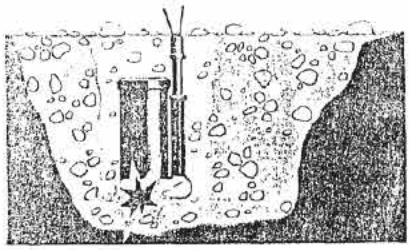
The jumping mine (M412) has a plunger system separate from the main mine casing. Both parts are joined together by a base tablet. When the mine is ignited by the trip wire or pressure, the main mine will be launched upward 2-3 meters in the air before it explodes. The body of the mine is actually the body of a 60 mm caliber mortar shell. The effect against personnel depends on the fragmentation of the body which is made of cast iron.

Mine (M26) is also a jumping mine. It has a casing which is buried in the ground; it is made in a helical aluminum cone shape. When the tripwire network is activated (four wires, with 6 meters each spread all throughout the mines), or when the plunger system receives direct pressure, the mine body pushes a steel ball 2 meters up in the air where the explosion takes place, and steel fragments will cover a vast area.

The (M3) anti-personnel mine is a fragmentation mine. It is usually placed on the ground about one half meter high from the surface to get a full effect. But, it can be buried in the ground if necessary. It has a body made out of cast iron, and can be rigged with a booby trap from a distance or by pressure.

The (M4) mine's body is made of plastic. It has a key dial on the upper part which allows the mine system to be safe. This mine works on pressure force, and can be set at zero for booby traps.





This illustration shows the jumping mine underground without the additional accessory. The photo shows the way the mine blasts upward, and then explodes about 1-1.5 meters from the surface.

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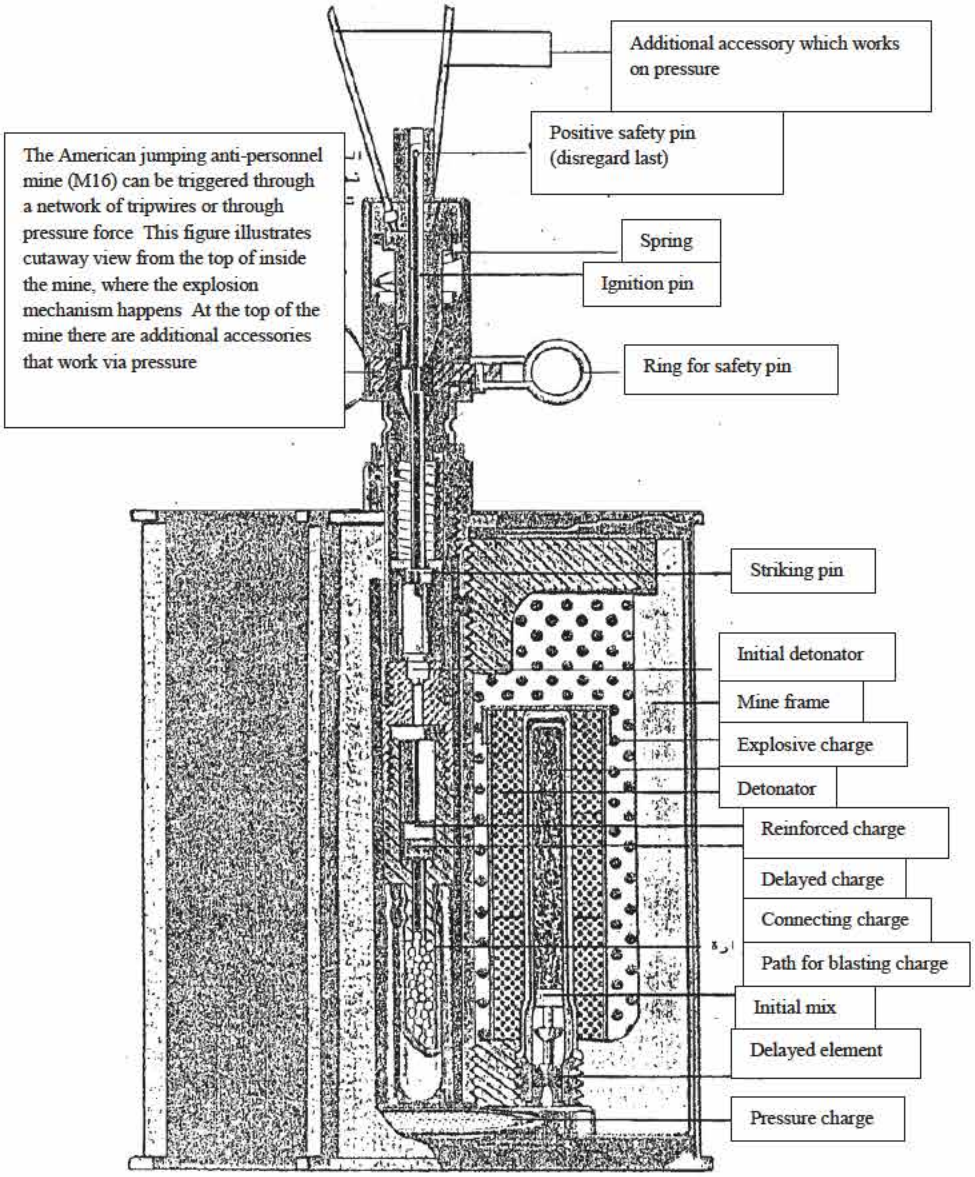

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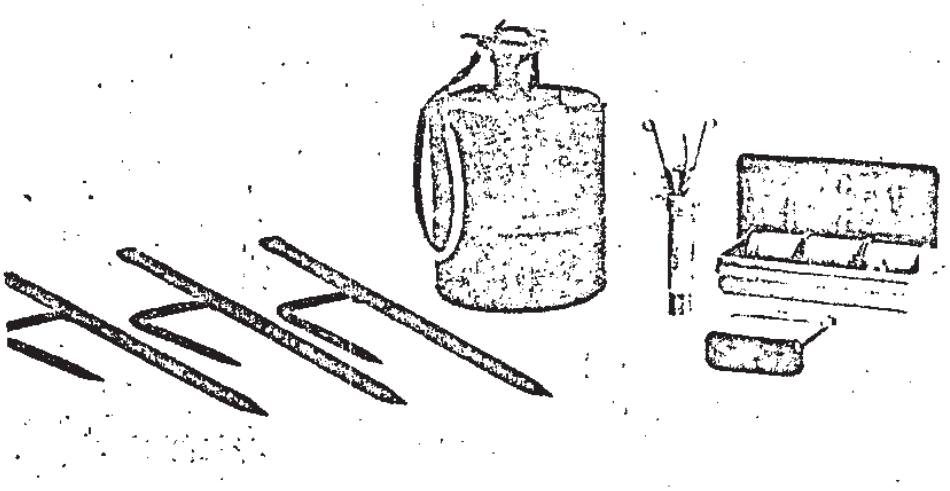
Israeli jumping mine type (12/1)

Specifications:

Weight:	3.5 kg
Height:	160 mm
Diameter:	102 mm
Danger radius:	40 m

Background:
Under production. It is found in the Zionist enemy service and the Ugandan and Argentine armies.
It is also known by the name (number 14). It is a jumping anti-personnel mine, and it has a standard design, with special detailed attention paid to the enclosure. This mine usually does not get buried in the ground; instead it is assembled on steel stakes. One stake is for each mine. This mine works via tripwire. To ensure there is enough tripwire for the mine, an additional small plastic box contains three wire reels; each reel has 10 meters of wire.
There are several types of fuses, the standard one is the one that works with gravity, pressure or pushing.



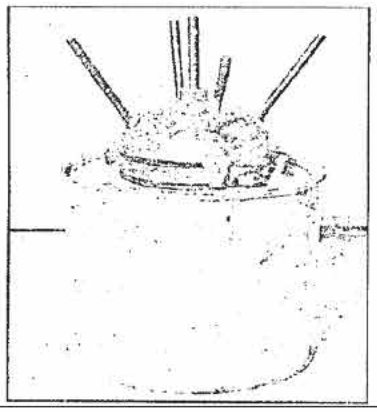
Zionist anti-personnel mine, type (12/1), observe the components used in the picture.

AFGP-2002-000032-0141

Italian bounding mine (type Valmara 69)

Specifications:

Weight:	3.2 kg
Diameter:	130 mm
Height:	with fuse (2.5 mm)
Main charge:	complex "B"
Weight of main charge:	420 g
Auxiliary charge:	RDX
Weight of RDX:	13 g
Pressure force:(pressure)	10.8 kg
(Pull)	6.5 kg
Working temperature range:	from 31.5 to 55 degrees C.
Who uses it:	Italy
Manufactured:	Valsilia Company – Italy



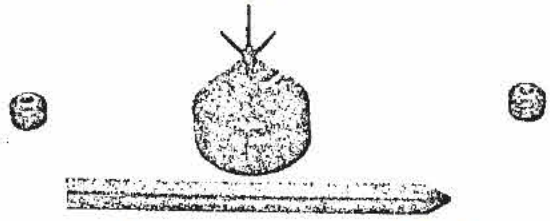
Jumping anti-personnel mine type Valmara 69

This mine has a plastic casing with an ignition fuse which can be pulled from the top. To achieve maximum effect, expose the main charge, which contains about 1000 metal fragments which are thrown 45 cm in the air via a device before it explodes. The effective lethal radius is at least 28 meters.

Italian jumping mine (Var 100 SB)

Specifications:

Type of the main charge:	High explosive.	Weight:	1.77 kg
Weight of main charge:	100 g	diameter:	120 mm
Radius of effect:	25 meters	height:	138 mm
Working force: (pressure)	12-13 kg	(pull)	6 kg
Working temperature range:	41 to +70 degree C.		
Countries that uses it:	Italy.	Manufacture:	Technovar Company – Italy



It is a cylindrical mine with a head in the shape of a button. Made out of solid steel and enclosed in a fragmentation cover with three spikes. It is a water proof mine but will not float in the water. It can be buried in the ground so nothing is visible except its button and the three spikes, or it can be rigged on a metal spike 800 mm above the ground.

AFGP-2002-000032-0142

Italian jumping mine (type B-40)

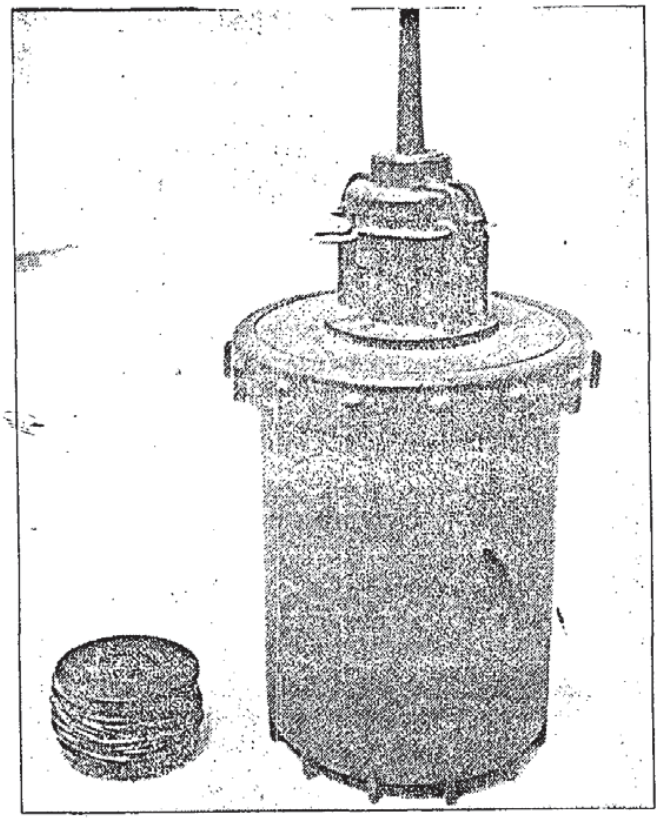
Specifications:

Weight: 1.5 kg diameter: 90 mm height with fuse: 200 mm

Type of main charge: high explosive height of casing: 120 mm

This mine is comprised of a plastic cylindrical case. There is another case inside which holds the high explosive charge and the shrapnel. It can be buried in the ground until its ignition fuse is visible from the top. Its function is as follows: when the holding wire is pulled the casing shoots in the air, and when it reaches a pre-calculated height it will explode and the fragments will fly in an arch shape. Experiments by the company proved that this mine is deadly in a 15 meters radius for at least 55 % of the personnel. This mine is a waterproof but it will not float. It can be kept without maintenance for about ten years.

* It comes packed in a box of 8 mines. The country which uses this mine is Italy, and it is manufactured by the Italian Mysar Company.



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AFGP-2002-000032-0143

Britain:

Anti-personnel mine system

The system of these mines consists of 72 tubes which are discarded after use. They are inserted inside a projectile casing which can be mounted on any armored vehicle, medium or heavy. Each tube contains 18 anti-personnel mines which can be blasted by a cartridge. The blasting can be controlled manually and each readied mine inside the tube can be launched independently. The system which holds 1296 mines can be reloaded in six minutes.

The mine:
The mine is a cylindrical shape with a height of 32 mm and a diameter of 62 mm, and includes safety system, as well a main loading system. The mine works via pressure and is designed to inflict nonlethal casualties against personnel.

Specifications:

Loading:	1926 mine **[TC: Sic]**
Weight:	(the projectile is fully enclosed) 630 kg
Targeting system:	it can be controlled for 180 degrees
Angle of height:	it can be controlled (+5 degrees to 35 degrees)
Time of loading:	(with two men) less than 6 minutes.
Range:	100 meters
Average of shot:	one tube contains 18 mines, every second (maximum).
Height:	(on top of armored vehicle) 1.3 meters.
Width:	2.2 meters
Length:	1.5 meters
Countries that use it:	Britain and some European countries.
Manufactured:	Royal Weapons Factory, Britain.

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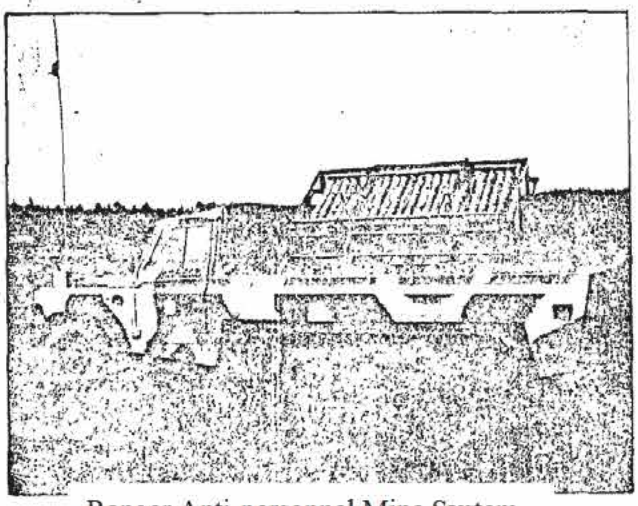
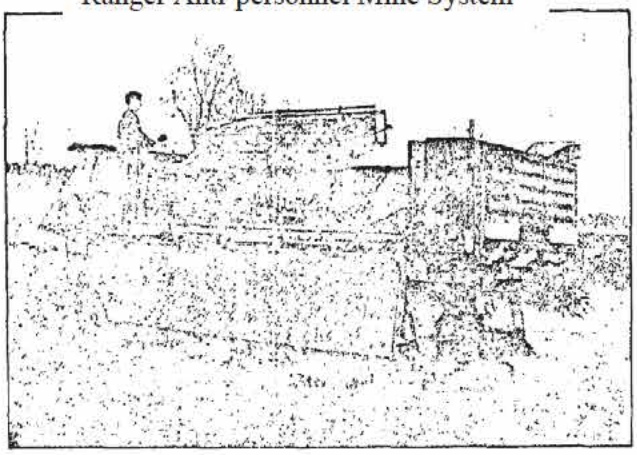


Ranger Anti-personnel Mine System



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AFGP-2002-000032-0145

Britain:

Tubing mine system

This system was revised to replace anti-tank mine number 7. This system consists of two main parts: the mine and the deployment method. The tube mine is made of plastic material with some metal parts. The firing plug is shipped with the mine so it saves time and effort when deploying the mine.

The mine is capable of destroying the track of a tank and destroying the metal sheet of the armored frame. This mine was designed to be used in conjunction with the mine deploying device, but it can be done manually. Usually the mine sits on top of a moving platform which can hold up to 72 mines. Also, it can be picked up by fork lift.

The mine deploying device itself in its design does not have any complex hydraulic or mechanical parts. The crewmen place the tubing mines in the feeding drop where it will be charged while moving toward the ground.

The main advantages of the tubing mine system can be summarized by the following: average speed of mine deployment, simplicity in deployment which frees much man power, lower amount of mines covering a vast area, and simple storage.

Specifications:

Tubing mine:

Weight:	11 kg
Length:	1.2 meters
Width:	1.8 mm
Height:	81 mm
Weight of explosive:	8.4 kg

Tubing mine carrier

Weight:	855 kg
Length:	4.19 meters
Width with cage:	with
wheels:	1.6 meters
Height:	1.27 meters

Countries that use this mine:
Britain, Denmark, Egypt, Iraq.

Manufactured: Royal weapon manufacturing – Britain

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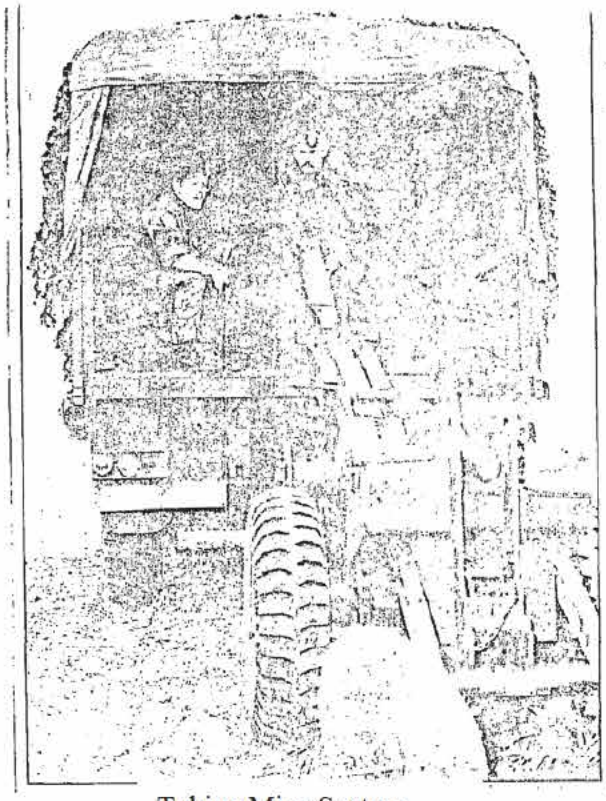
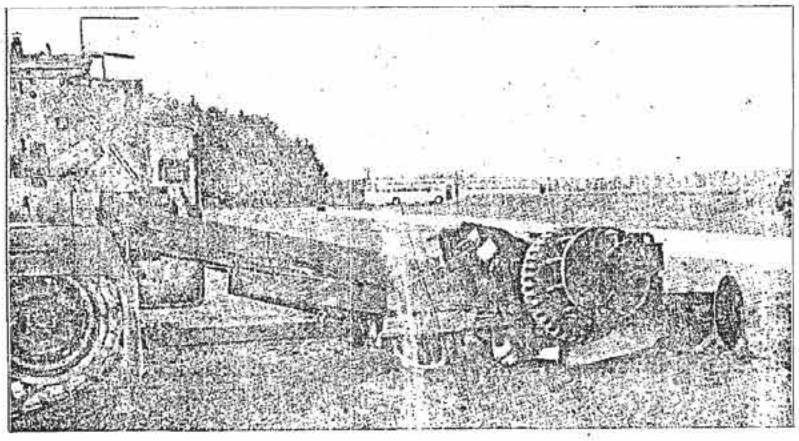


Tubing Mine System



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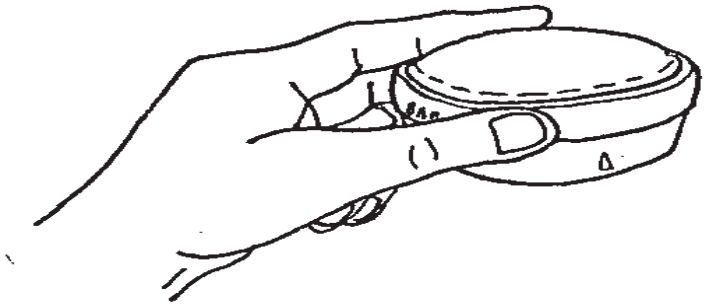
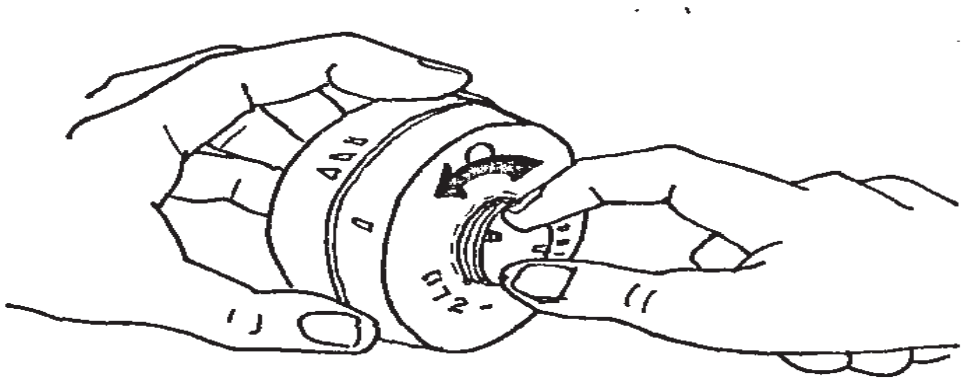
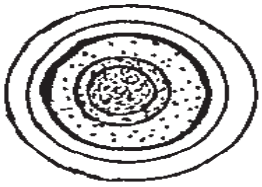
Chinese mine type (7C)

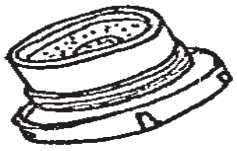
The Chinese mine consists of a detonator on the bottom of the mine (as in figure 2), which will ignite the main material surrounding it (see below). The material is orange in color and it can be torn up by unwrapping it from the bottom as it is illustrated.

Removing this material will disable the mine completely, therefore, it must be removed immediately if this mine is found.









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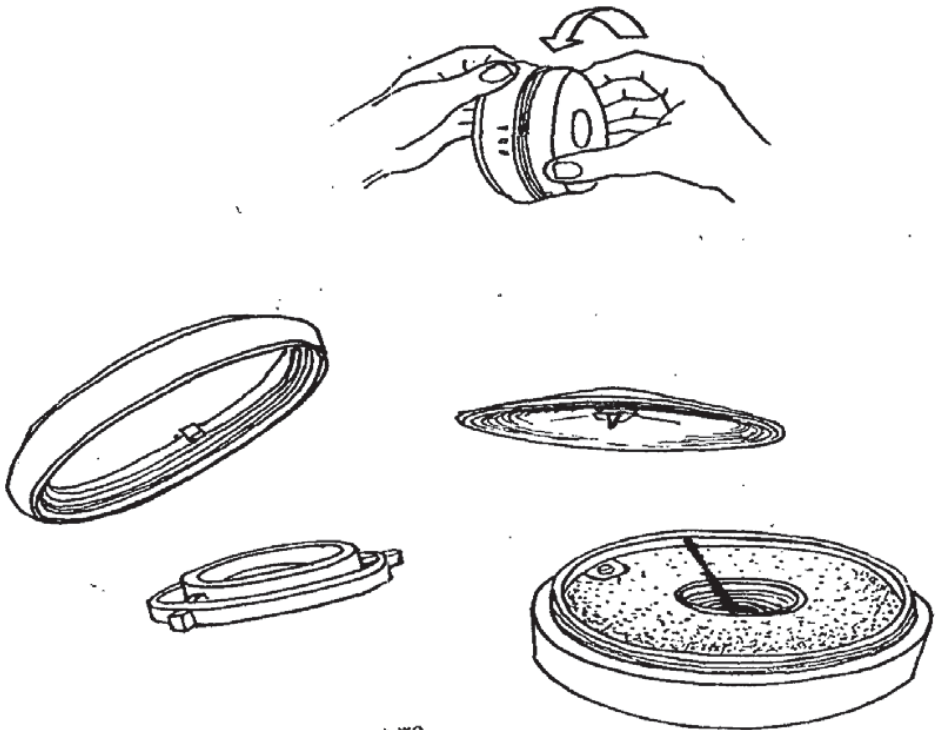
The outer casing cover of the mine (figure 3b) is disassembled by turning as in figure (3), then the inner casing cover is used to focus pressure on the pin, figure (3d). This cover's operation depends on a certain safety device. The safety consists of a pin installed from an outer point of the mine; it withstands a weight force between (70 to 75 kg) of pressure.
The inner casing cover is secured in place as in figure (3d) along with the outer casing, figure (3b), by pressing on the mine. The inner cover does not press on the pin unless the safety pin has been removed, so that the inner cover goes down.
The pin is mounted on a compressible piece, figure (3a). The safety is removed, pressure is applied to the mine, the inner casing pushes the part holding the pin, and thus the pin is pressed strongly toward the capsule. Without the pin the mine will not explode.
The capsule is found in the center of the middle inside the mine, in the center of the main explosive material, on top of the accelerant material, figure (3c). When the capsule explodes, the accelerant (the detonator) usually explodes, causing the main material to explode.
Note: when the capsule explodes without the accelerant material, figure (2a, b), it does not lead to explosion of the main material; it may, however, lead to its fragmentation.
The Chinese mine is distinguished by its small size and green color for camouflage in grass. The explosion wave without steel fragments is depended upon to sever or mutilate the foot.



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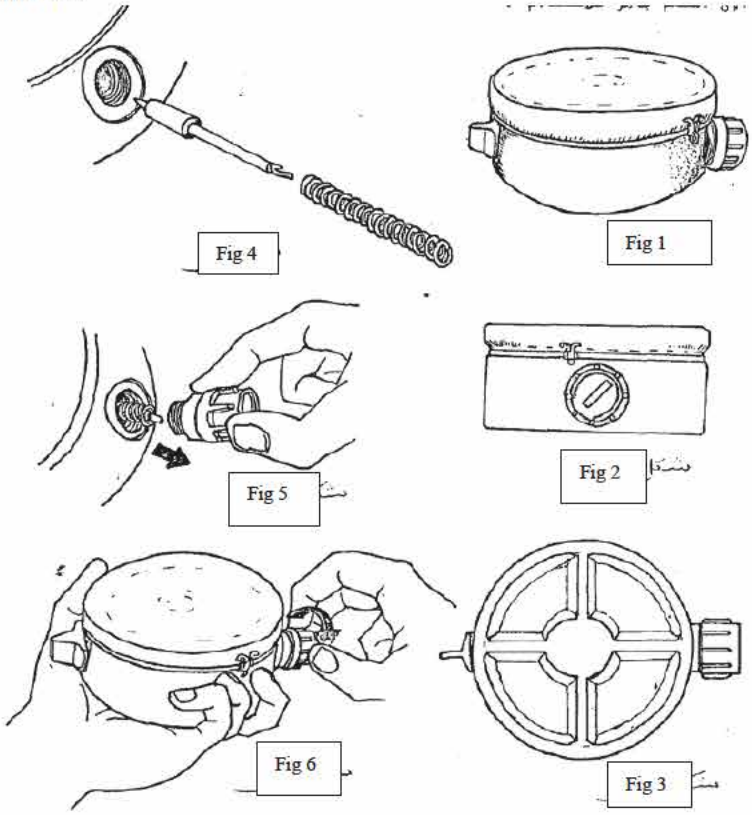
Russian mine

Medium in size, cylindrical in shape, and having a subdued earthy color as of a green or desert-like (red soil) shade, it depends on the principle of pressure for its operation. It consists of several parts: the mine body of hard plastic, an outer cover of rubber on the top, and a side indentation with two openings, one large and the other small, with one of the two being for the pin and spring, and the other for the capsule, figure (1). A side view of the mine is in figure (2). A view of the mine's base is in figure (3).
The pin and spring together are installed through a side passage (figure 4, the larger opening). The pin is placed within the spring, which is inserted into the passage, figure (5). After insertion of the pin with the spring, the passage is closed and locked. Figure (6). The mine is now ready for use.



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Italian Mine (TS-50)

This is an anti-personnel mine of a circular shape. Its body is made of plastic, with prominent ribs. To ensure safety, the pressure plate on the mine stays covered with a spider-like plate that is removed before the mines are dropped onto their sites by means of its mine-planting system, (Technovar). This mine may also be disbursed manually; further, it may be dropped from a moving vehicle in emergency conditions. Because the body is constructed of plastic, it is waterproof.

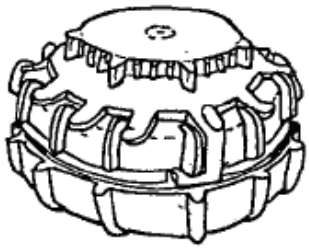

Figure 3

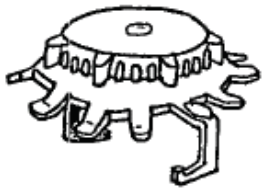

Figure 2

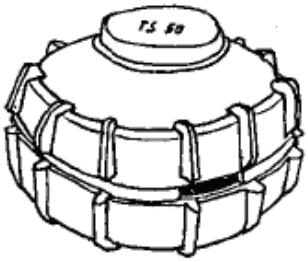

Figure 1

Sketch (1): The mine's external shape
Sketch (2): The safety cap
Sketch (3): The mine without the safety cap, with cover removed when prepared for planting.

To prepare the mine, we install the actual capsule in its specified place at the bottom of the mine (Sketch 4).
When pressure is applied to the mine, the needle ignites the capsule and the mine explodes. The mine's prominent ribs make it more stable in the ground, especially in sandy and muddy terrain.

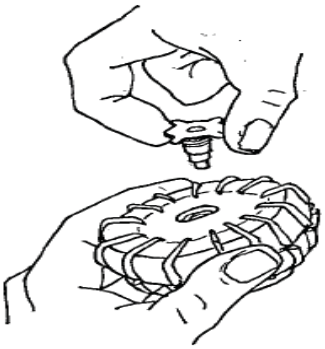

Figure 4

The TS-50 anti-personnel mine: the image on the right illustrates the ribs and the other illustrates the spider-like plate.

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Fourth: Directional Mines

Russian mine with straight shrapnel.
Specifications:
Diameter of the Casing: 14.5 cm
Depth of the Casing: 2.5 cm
Thickness of the Casing: 5 cm
Diameter of the Plastic Cover: 14.7 cm
Width of the Upper perimeter: 2 cm
Diameter of the circle where the detonator is installed: 3.2 cm
Depth of the circle where the detonator is installed: 1.7 cm
Thickness of the Base: 1cm
Thickness of the Plastic Cover: 1.1 cm
Height of the Plastic Cover: 7 cm
Height of detonator circle from the outside: 1.5 cm
The length of the increment of the rear side 0.5

Frontal View

** Components:
The directional mine consists of:
*The explosive material: metal casing, plastic cover, detonator fuse, detonator.
*The weight of the explosive material: 1060 grams.
The weight of the metal casing: 890 grams.

Back View

The wave is reflected when the core of the mine is in midair and this change puts the fragmentation in a straight direction.
*The effect of the shrapnel: Lethal at a distance of 200 meter.
*The possibility of penetration: The released shrapnel at the time of the mine explosion could penetrate an armor of a 2cm in thickness at a 20 meters distance.

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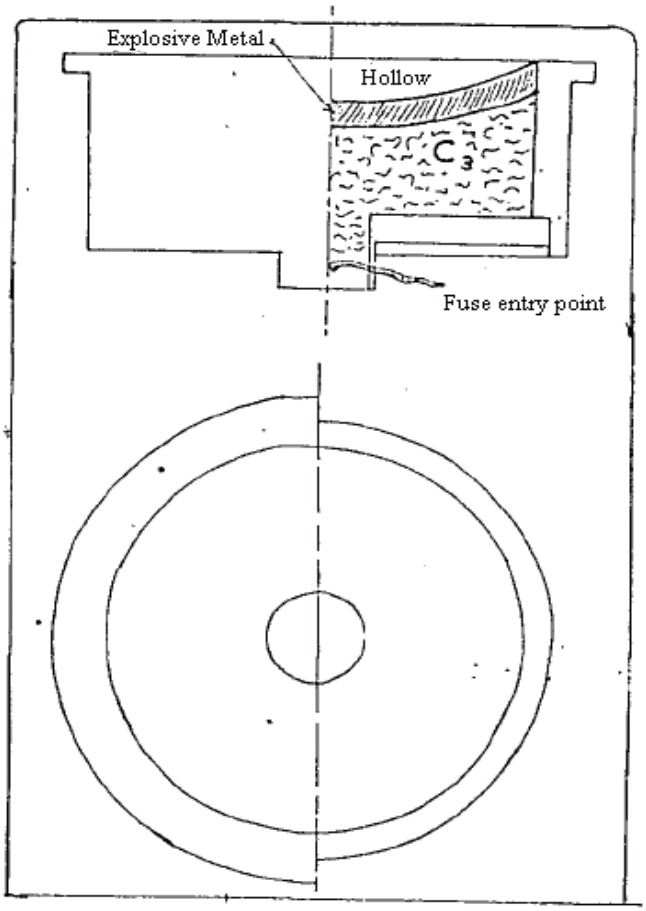

The directional mine: the sketch is a two half sector size (2:1).
*The size of the arc of the metallic shrapnel.
*The thickness of the metal is 5 mm.
*The depth of the bottom from the center is 2cm from the inside.
*It is a circle with a radius of 21 cm.
* The outside arc has a 2.5 cm depth.
*Circle with a 25cm radius.
*As for the rest of the mine sizes, they are taken from the drawing according to the ratio (2:1).
*The size of the explosion material: 1050 grams (C3)
*The size of the metal shrapnel: 890 grams.
*The total weight of the mine: 2350 grams.

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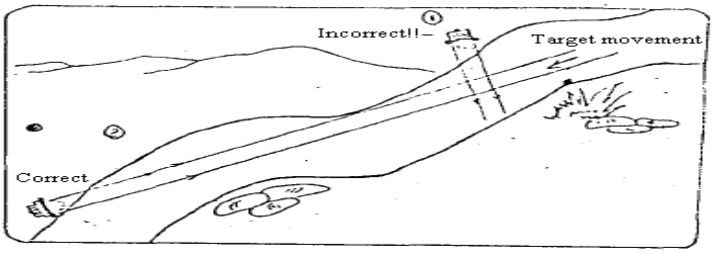
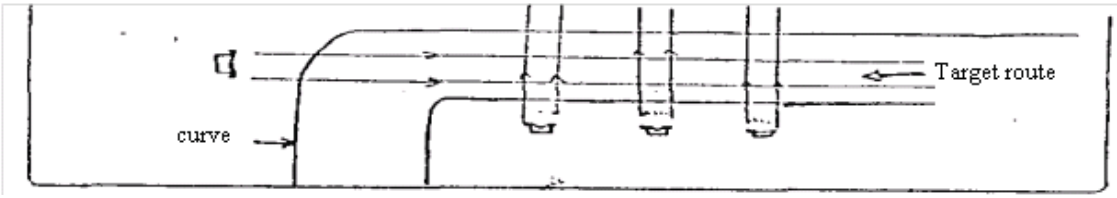


Comment on the drawing:

1- This positioning of the directional mine is not good because it covers only a very small portion of the road and that is due to its location widthwise where it will not hit the target.
2- Position (2) is the proper position for the directional mine because its strong shrapnel covers a long range up to (200 meters) in covering the biggest possible area of the road and consequently hitting more targets. It is important to properly position it on curvy roads where the position will avoid the curvature of the road as it appears in the diagram above.

It is possible for one mine to do the job of several mines if proper effort is put into choosing the right place for the mine, and it is better and less costly - the following figure shows how.



The mine shrapnel travels in a straight direction vertically on the surface of the mine, therefore, it is necessary to make the level of the target parallel to the level of the mine.

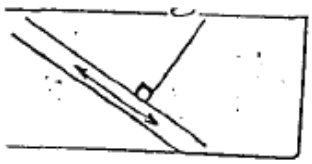
-So if the height of the target is 105, make the height of the mine also 105 meters.

-We must closely check the direction in order to ensure hitting the target.

*Important Notes:

-It is necessary to use a water level when aiming the mine to ensure that the mine is directed in a completely horizontal way with the road in order for the shrapnel to travel above the road with the required Height to hit the target without hitting the ground or causing friction

-The direction of the mine will be vertical at sea level when we deal with targets that travel vertically.



Perpendicular also

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Claymore Directional Mine (Type M-18-A-1)

Data:

Weight:	1.58 kg.
Weight of Mine:	0.682 kg.
Height:	83mm
Length:	216 mm
Width:	35 mm

History:

It is still in production. It is available and it is used by the U.S. Armed Forces and the British Army and many other countries.

This mine is generally known as a claymore and it has earned the reputation as a very dangerous weapon. It is similar in many ways to a fixed shotgun that shoots a large quantity of circular shaped shrapnel in a large area. It resembles a small book in size and shape and it is fixed on support legs that can be folded.

The visible part of the mine is directed toward the target area and the mine is equipped with simple leveling equipment above its body and it is connected with a wire or a network of tripwires which set off the mine if the tripwire is triggered by an enemy. Here the range of damage will appear which the (M-18-A-1) causes because the part that is visible and directed from the mine is a block of solid small metal shrapnel with a plastic explosive material attached to it. Therefore, the explosive material pushes the shrapnel forward (there are almost 700 pieces of shrapnel) in a fan-shaped pattern with a range of approximately 50 meters. It is almost impossible to avoid this lethal fan across an arc of 60 degrees and one meter height above ground level.

The mine also can be exploded remotely when necessary. For that reason, the mine can be used in a number of mobile defense situations or to set-up ambushes. The effective use of the (M-18-A-1) requires only a little training. Therefore, it was adopted and imitated widely. The (M-18-A-1) mine is distributed usually as a personal weapon that is placed in the soldier backpack. The backpack includes not only the mine but it also contains a small warning system unit, explosive equipment, a launching cover and the necessary wires.

Directing the Mine:

-The visible part of the mine is directed toward the area target.
- The arc is large and the effective area and the distance is large.
- If we want to increase the size of the arc we move the mine backward.
- If the target requires accuracy in targeting, we move the mine forward.

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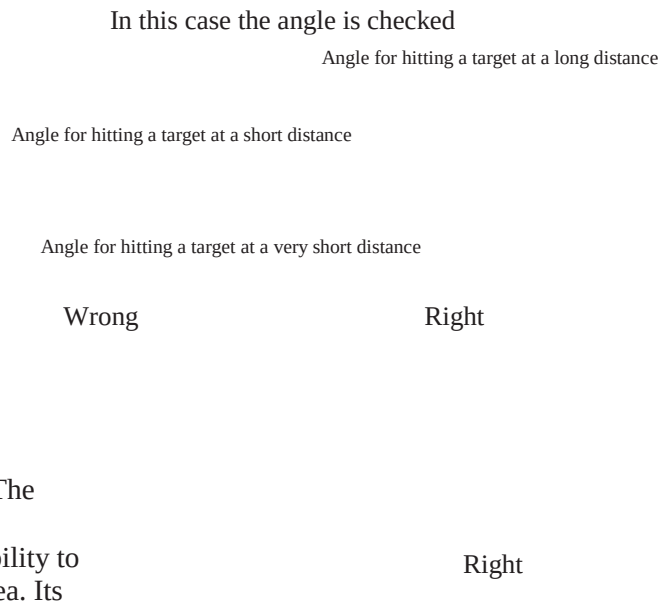
The narrowing or widening of the road controls the distance of the enemy from the mine and, therefore, controls the angle of the mine. The following examples clarify this. Notice in the first sketch that the mine is in its appropriate correct position because its area of impact is large and it is deadly for those found in this area during the detonation because the mine is placed in the middle of the road -- it needs to be measured by quality and not quantity.
** We notice in the second drawing that the mine is not in its normal position because it is placed along the side of the road and it has a short range. Its arc is big, plus it is very difficult to camouflage.

- This is subjective guidance- on being inflicted within the affected area-- if there are pedestrians or a friendly soldier, the shrapnel will not hit them if they are at the beginning of the road and outside the impacted area.
- It has a range of 20 to 25 meters; it is placed 5 meters from the road to most benefit from its effective range from the arc of shrapnel.
- Operational Testing: Its impact was at a distance of 7 meters: The shrapnel arc is 7 meter. From the characteristics of this mine is its capability to cover a good area from the ambush area. Its lethal range is between (20 to 25 meters) a quantity of it can also be used in sweeping a field for gathering members of the enemy.



In summary, it is an addition to the directional mines that are considered indispensable for the jihadist groups. They are both characterized by their simple manufacturing and low-cost as well as their effectiveness. The experiment has increased our confidence in these two mines.

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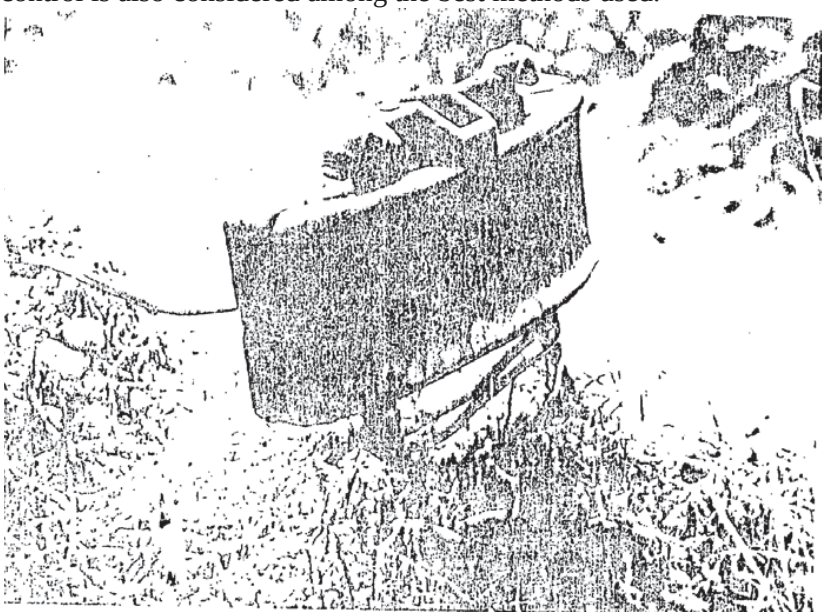
As for methods of detonation, we can use the slow or fast fuse, detonators or electrical weapons or by using the (television) timers / programmers as well as the detonator fuse. The remote control is also considered among the best methods used.



Anti-personnel mine (M18A1) known as the claymore. This mine works via trip wire. The sketch illustrates the front of the mine that faces the enemy.

Directional Swedish Mine (FFV-13)

Data:

Weight:	20 kg.
Height of Body:	250 mm.
Width:	420 mm.

History:

Ongoing production: It was first used by the Swedish Army Service and made available for export.

The anti-personnel Swedish mine model (FFV-13) is a type of claymore, however it is intended for anti-personnel use of a much longer range than the range of other similar weapons. It is used for anti-personnel purposes more than it is used in narrow area. It was also designated to be used in field airports and in critical defensive positions against landing operations of airborne troops by helicopters.

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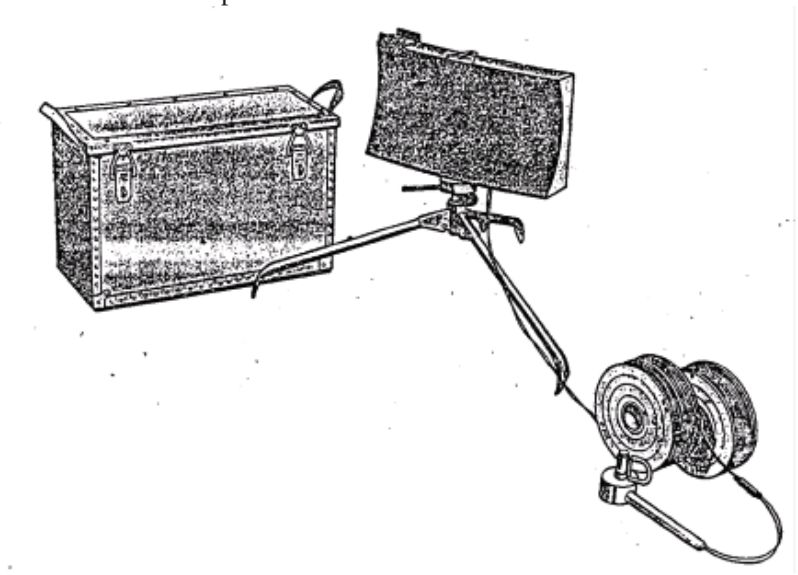
This mine could potentially launch steel shrapnel spread in the form of a fan in an area of 4 meters in height and 100 meters in width with a 150 meters in range while the maximum range of the American mine claymore reaches (18 A 1) to 50 meters only.
The mine consists of a pre-split plate in an upright position, and an explosive device is placed behind it in a fiberglass casing. When the explosive material detonates, and usually this is done by using an electric current, shooting shrapnel blasts to the outside to form a fan that covers a wide area. The plate is broken down to 1200 pieces of shrapnel. The mine can also be used from a launching point that travels at a certain distance, and at least 3 mines can be used from one launching point and is triggered by a pressure pedal in the target area. Usually the (F FV-13) Mine is installed on a tripod, however, when it is mined between facilities and buildings it needs to be mounted on a more fixed device.
The (FFV-13) Mine came as a result of long experiments which were conducted since the seventies. Its actual production started in 1980.



(FFV-13) Swedish Mine for area defense is shown at the left side of the sketch. The rest of the sketch shows the launching unit and the trip wires that are connected to the mine. This mine is based on a curved plate of explosive material topped by a layer of prefabricated shrapnel. The curved plate has been calculated carefully where the shrapnel moves forward in the form of an expanding fan. The mine can be exploded and activated in many ways, or connected to various types of sensor devices that set off the mine once the enemy personnel approaches.

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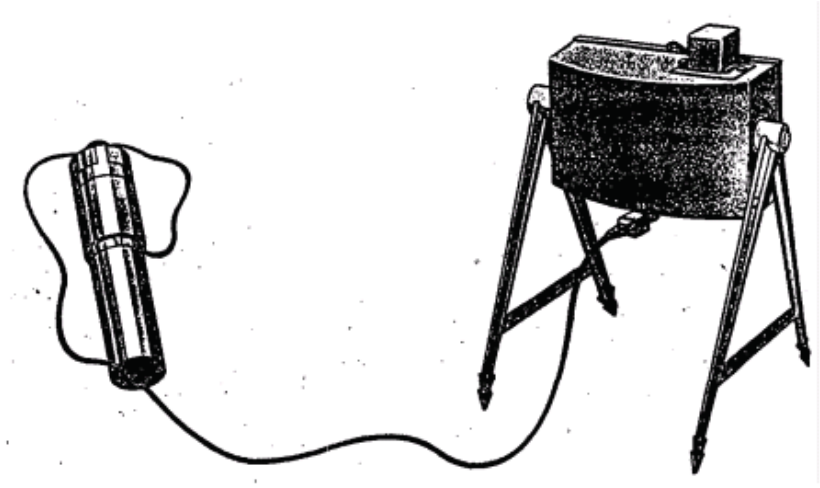
French Anti-personnel Mine Claymore Type (MAPED-F1) Model. The sketch illustrates the use of tripwire connected to an electrical source to detonate the mine from a remote location and when preparing ambushes.



French Directional Mine (MAPED-F1)

Data:

Weight:	1kg.
Height:	230 mm.
Length:	180 mm.
Width:	60mm.

History:

The (MAPED-F1) mine belongs to the Claymore class of mines. This extremely lethal mine, when detonated, has an impact similar to a shotgun where a large number of steel balls is launched over a specific arc. It is usually in the form of a fan in a horizontal direction. The overall design of claymore has it stabilized directly above the ground by fixed legs on both sides. There is a small bent surface between these legs in the direction of the potential enemy. Inside this bent surface there is a layer of

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plastic explosives and inside there is a block of steel shrapnel. The (MAPED-F1) mine utilizes steel shrapnel. Therefore, when the mine explodes, the shrapnel flies in a cloud taking the form of a fan. It is impossible for anyone who falls inside this fan to avoid being wounded, whereas the cloud of the shrapnel does not explode forward only but also upward. It will strike any average typed person standing several meters away, from his head to his feet. The (MAPED-F1) utilizes 500 pieces of steel shrapnel and spreads in a 60 degree arc up to a range of 40 meters. The mine does not only present a danger to the area located in front of it but, also on the area from the rear side where the bomb of plastics in this mine produces a blast that flies toward the rear side.

There are many ways to detonate the (MAPED-F1), the most common of which in the case of defense is via tripwire that is pulled so tightly that the least pressure that falls on it will result in cutting it, therefore the mine will explode electrically. Electrical sources are also used to detonate the mine from a remote location and when preparing ambushes.

When necessary, we can use a pressure plate that detonates the mine after the enemy passes over it and often the two last methods are used when preparing ambushes.

The (MAPED-F1) mine is a small weapon, and despite its terrible effect it is easily concealed between the grass and long plants and other concealment. We can prepare the (MAPED-F1) mine by camouflaging the body of the mine with colors.

If the color does not fit with the desired purpose, the concerned unit can quickly coat it with a color that achieves the desired purpose. There is a formula that is intended for training purposes which uses the same method as the regular mine, but when it explodes, it produces a cloud of smoke only and it makes a loud explosion.

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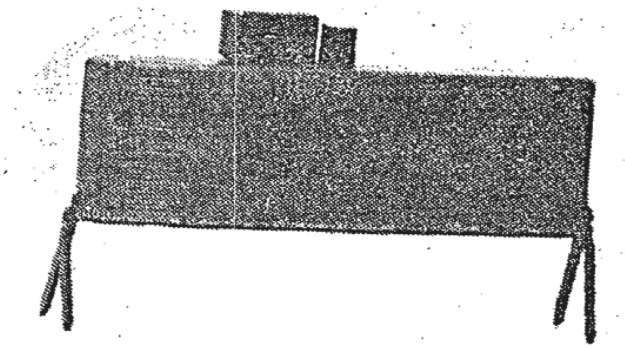
Anti-personnel Directional Fragmentation Mine (AC/20)

Data:

Weight of Mine:	1.9 kg	Width of Mine:	260 mm
Length of Mine:	110 mm	Number of Shrapnel:	840
Weight of one shrapnel:	0.5 g	Weight of Explosive Charge:	0.9 kg
Type of Boat:	Boat B	Angle of Shrapnel Spread:	60 degree

Penetration Ability: Up to 30 meters distance penetrating a steel piece of 3mm in thickness and up to a distance of 50 meters, penetrating wood up to 25 mm in thickness.

This mine is used to protect military bases and military barracks in combat areas against potential infiltration by enemy personnel. It is also used to protect airports and power stations from acts of sabotage because it provides an intense and immediate fire cover against such acts. In addition, this mine is highly effective on unarmored vehicles such as trucks and jeeps.
The body of the mine is made of reinforced plastics and it is equipped with 2 igniting fuses. One is at the top of the body and is used as an electronic detonator, and the other is at the bottom of the body and is used to detonate the other mines close to it. It is currently used by Austrian, Greek, and Turkish troops and is manufactured by the Austrian SMI Company.



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Anti-tank Mines

The purpose of the Anti-tank Mine:
The purpose of these mines was to destroy tanks and vehicles, but experiments and certain cases show that the weight of the foot may explode it with these two points taken into consideration:

1- The danger of the movement through these mines by our troops.
2- The lack of dependability of its effectiveness on the enemy.

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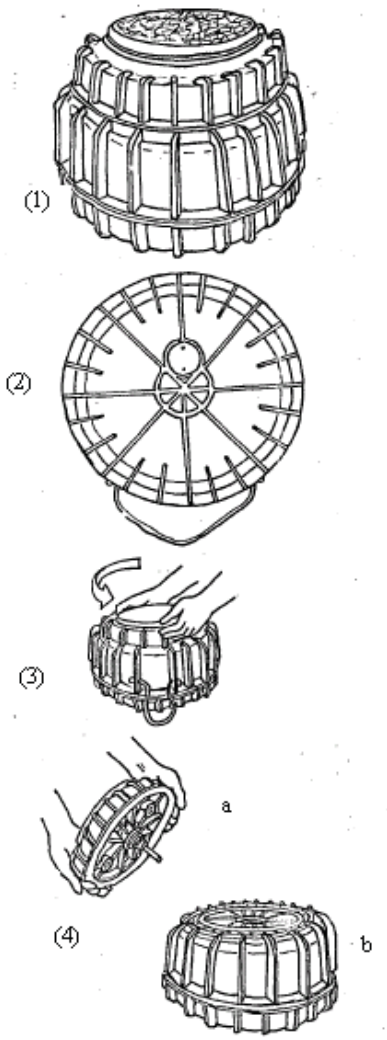
Tank Mine (TC 3.6)

This is a light brown circular land mine that contains external fins to stabilize it in case it is planted in clay or sand. It is an anti-tank mine, very effective and contains 3.6 explosives and it works via pressure, where the pin will hit the capsule. There is a net device that is attached to the bottom of the mine (Sketch 2).



It consists of many parts to include the cover where the detonator is installed, then the body of the mine which contains the explosive material TNT. Two blocks of RDX are in its center as an activator for the TNT.

This mine is considered waterproof and it can be planted in water but only for short distances and in places of traffic for enemy vehicles. Some need explosives weighing almost 300kg which means that when individuals pass over them, they do not explode unless the individual jumps, in which case it could detonate.

The outer cover is removed by unscrewing it (Sketch 3).
The outer cover: It is the cover that the equipment passes over and it consists of a metal plate which needs approximately 300 kg pressure in order to break, as well as an air chamber so when the equipment passes over the mine and with the sufficient weight it will break the metal plate and the pressured air will push the needle toward the fixed capsule with the detonator in the cover from the inside Sketch (14). Therefore, the capsule explodes making the detonator explode, as well as the block of RDX and TNT.

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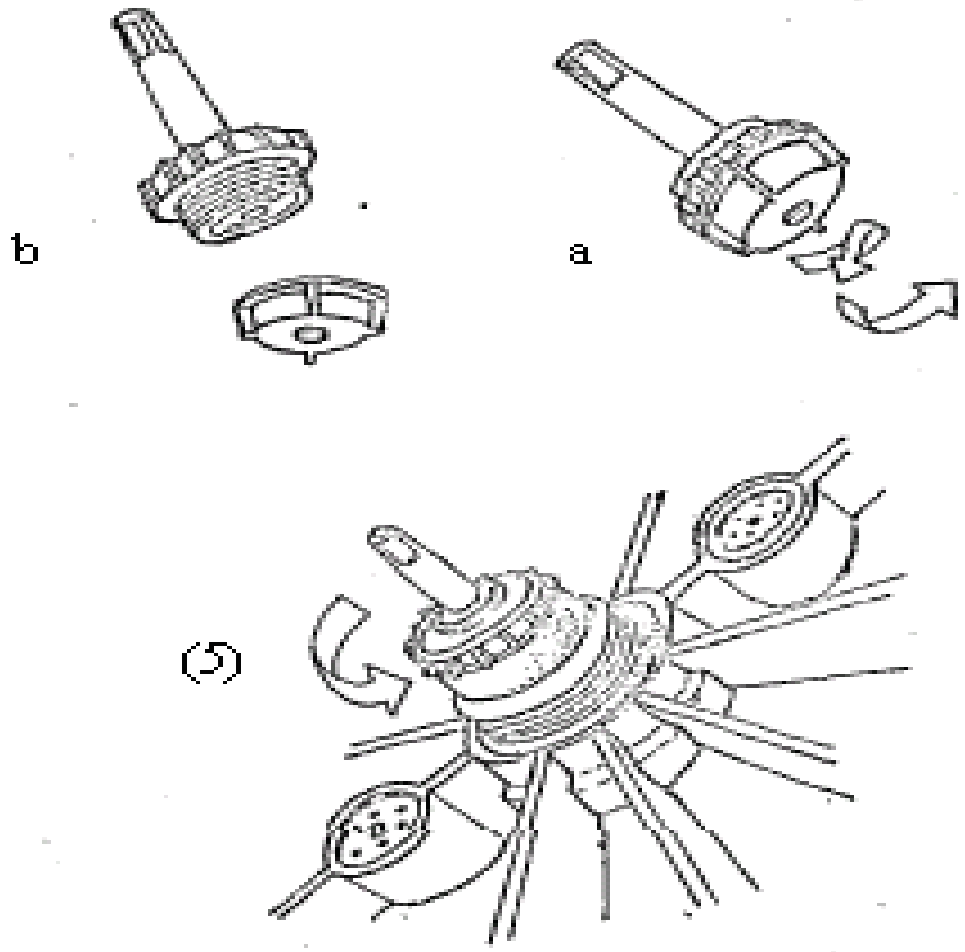
The Detonator:

The detonator contains an energizing material such as RDX; imbedded in it is a capsule that explodes on impact. The capsule is protected by a cover, figure 5a. It is removed by unscrewing it, then the detonator is set in the mine's cover by means of the gears, sketch (5).



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The body of the mine consists of a cover from the bottom that does not open because it is not necessary to open it from the bottom. It is only opened to see the explosive material and the two blocks of RDX Sketch (7).
You will notice two blocks of RDX that work as a stimulating material. TNT is placed in a hollow in the middle of the block of TNT. We also note that one of the two blocks is pierced in order to insert the detonator in it through a passage in the cover that holds the explosive material Sketch (7 a).

The mine consists of an opening in the bottom which is removed by unscrewing it Sketch (8) and (8 a) and this is to install a trapping device Sketch (8 b). The purpose from this trapping device is in case the enemy discovers the mine, he might disarm it and in case he does, the device starts working and the way it works is as follows:
Trapping Device:
This device consists of two parts that fit into each other through gears Sketch (9 a, b). In the first part Sketch (9 a) a detonator with a capsule is installed so the capsule is facing toward the pin and facing it. After we have secured the pin with a safety, through the side hole (Sketch 9 b) then we fit the second part in the first part and we install the device in the mine by the gears in the opening at the bottom of the mine. Then, we plant the mine in a hole and we attach the safety pin to a peg in the ground at the bottom of the mine. At that time, the enemy discovers the mine and removes it. Therefore, the safety pin gets removed because it is attached by a peg in the ground and the needle will fire because it was pressured and the capsule will be hit, thus the detonator explodes consequently exploding both RDX blocks then the TNT block. Sketch (10)

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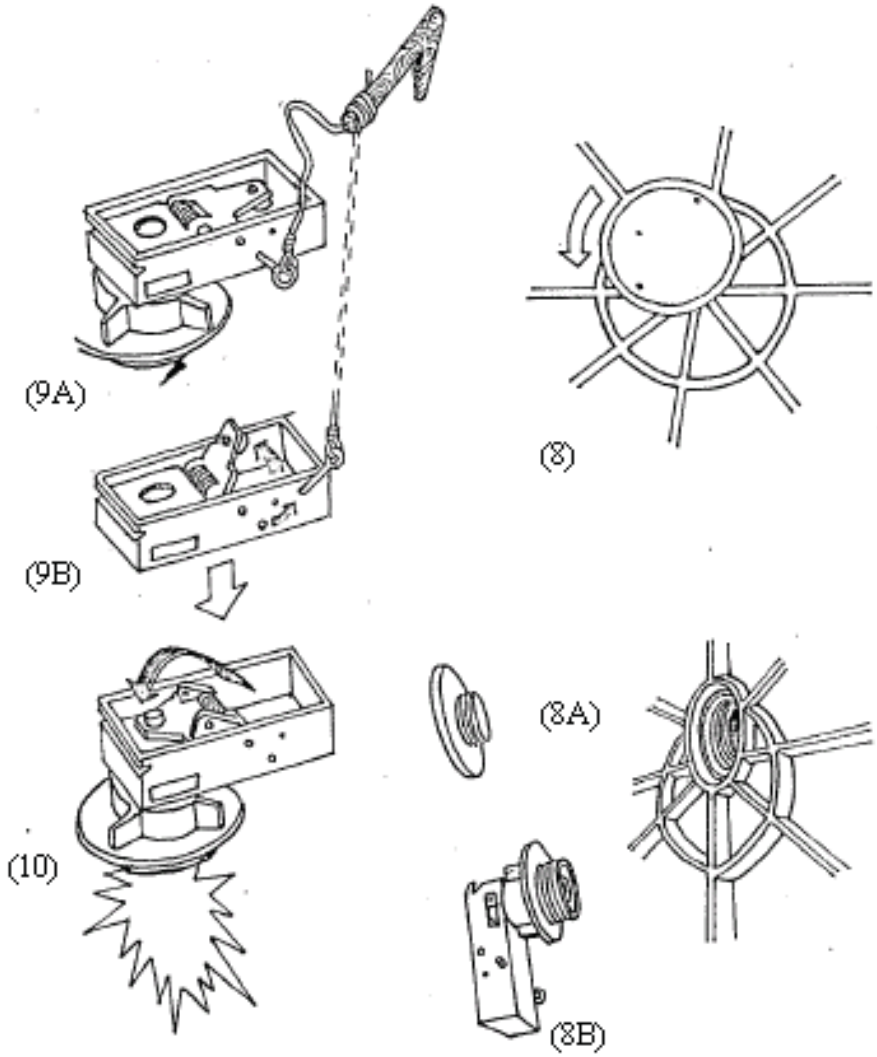
There is another way to make the trapping device and it is an easy way and better than the first one but it is more dangerous. Therefore, when we affix the trapping device, (after securing the pin and installing the detonator and the capsule fixed in the detonator), to the mine from its place at the bottom of the mine, then we put a small metal plate in the middle of the hole and we place the mine on it where the trapping device will close on the plate, then we stabilize the mine well. We then calmly pull the safety pin from its place and replace it with sand. Therefore, when this mine needs to be lifted, the needle will launch immediately hitting the capsule and detonating the mine.



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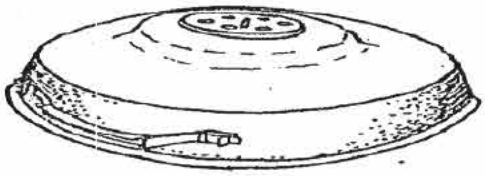
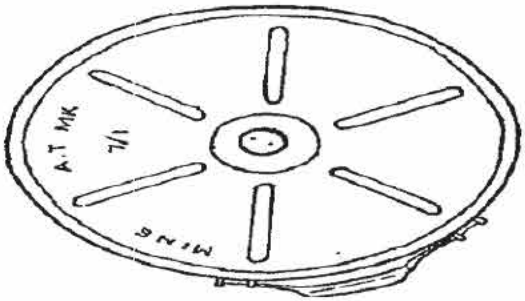
Czech Mine

It is an anti-tank mine which is considered among the most strong and effective mines. It is of a circular shape and easy to use, sketch (1). It has an outer cover from the top to insert the detonator and it is triggered by pressure. It contains some shrapnel upon detonation but it mainly operates relying on the strength of the explosive wave since it contains approximately 5 kg of TNT.

This mine requires approximately 180 kg of pressure to detonate. The most important part of this mine is the detonator.

(1)





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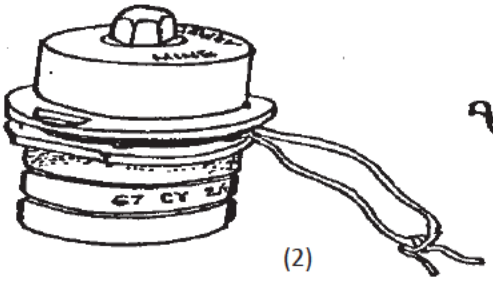
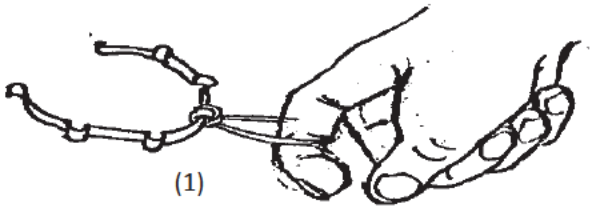
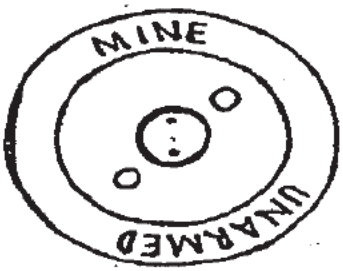
The detonator:
The inside of the detonator houses a strong spring that is difficult to compress (a heavy weight of approximately 180 kg) and a pin, spring, capsule and a stimulating material. There is also a safety for the detonator which consists of an open ring Sketch (2 a), which is located in a hollow in the middle of the detonator Sketch (2). There are two openings at the bottom of the mine -- the small one is to install the capsule and the second is to place the stimulating material Sketch (3), however, in the upper part of the detonator there are frames similar to the screw and one of its functions is to concentrate the pressure in the middle.



(2)



(1)



(3)

(A)

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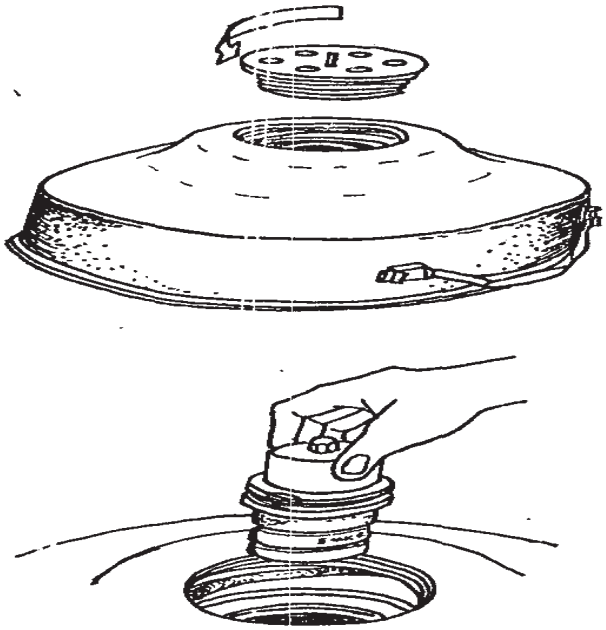
Process of Mine Preparation:

We prepare the detonator, then we remove the safety pin which is the metal ring, then we remove the outer cover of the mine and we install the detonator in its place. Then we return the cover one more time and the mine will be ready.

Method of Mine Detonation:

When a tank passes over this mine, the strong spring located inside the detonator gets compressed by pressuring the outer cover because there is another outer spring in the same mine.



After pressuring the detonator spring located inside, the pin gets released which is pressed by another small spring therefore, it launches hitting the capsule, detonating the stimulating material as well as the TNT material.

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Swedish Anti-tank Mine (FFV-28)

Data:	FFV- 028-Rio	FFV-028- SD
Weight:	7.5 kg	5 kg
Charge Weight:	3.5 kg	3.5 kg
Height:	110 mm	110 mm
Diameter:	250 mm	250 mm

History:
The production of both of these mines is ongoing. They are widely used by the Swedish Army. They are also made available for export.
The anti-tank mine was introduced as a result of experiments and tests dating to the mid-sixties. It had been determined at the time of production that it does not lead to the disabling of any tank, but to its destruction. For that purpose, a number of designs and ideas have been studied the outcome of which was the mine (FFV-028) that is currently under production.
The (FFV-028) mine uses the principle of the hollow charge or a shaped charge. However, the warhead of this mine is connected to advanced electronic parts located inside the body of the mine. The mine valve operates by a handle located above the mine which requires the mine to be turned upside down when deploying it. The valve works automatically after a pre-determined period of time.
When the tank approaches the mine, the sensor device inside the mine sends a signal to the other parts of the firing device to start the detonation process.
The electronic parts continue to work by continuing to send signals until the tank lands over the mine. At that time, the electronic circuits detonate a charge that tears up the soil or other means of concealment that covers the other upper part of the mine. It also lifts the cover of the mine, and when this happens the shape charge is launched upward in the direction of the hold of the tank. Despite the lack of accurate information about this mine, it is still capable of destroying any type of tank. The sensor devices are arranged in a way that the mine will not detonate unless the tank falls directly above it and this is to let the shaped charge reach the inside of the turret area which will usually detonate its ammunition or cause horrific damage to its crew.
The (FFV-028) mine was designed to be planted automatically by the (FFV) mine deployment system which is a tracked vehicle with a rake or drag that broadcasts mines. This system can spread more than 20 mines per minute at a speed of 7km/hour. It is trailed usually by a (6x6) truck that carries a quantity of reserve mines ready for dissemination.

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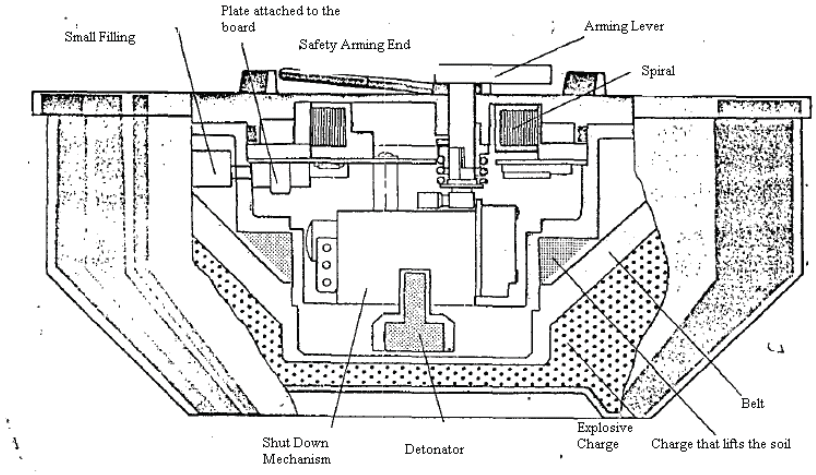
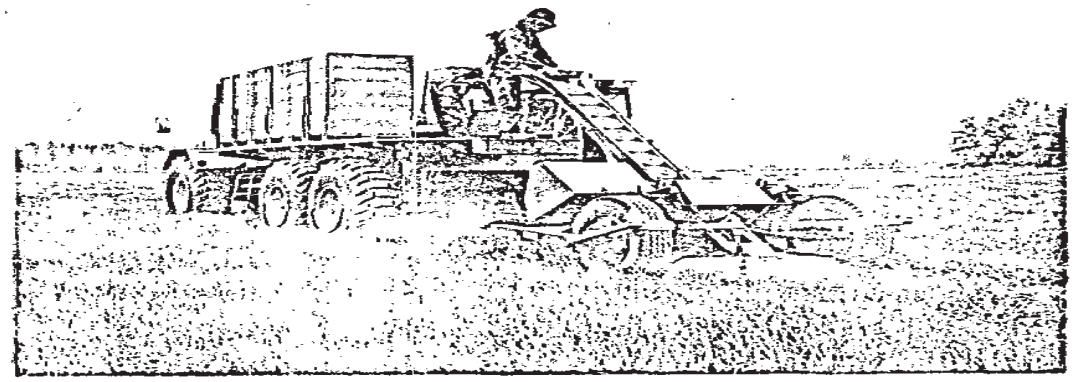
Two shapes of mines are be produced, the (FFV-028) and the (FFV-028-Rio) which remains effective for a period of 120 days as well as the (FFV-028-SAW) that self-destructs after 30 days. After 120 days from planting the (FFV-028-Rio) mine, it can be removed and re-used when necessary. This does not require renewing the interior filling because it lasts over a period of 5 months and it is often exchanged before the end of this period.



The (FFV-028) Anti-tank Mine operates via hollow shaped charge. The mine contains advanced electronic parts.



The Anti-tank Mine Type (FFV-28) was designed to operate with the (FFV) mine deployment system. The sketch illustrates its operation showing that it can spread more than 20 mines per minute at a speed of 7km/hour.

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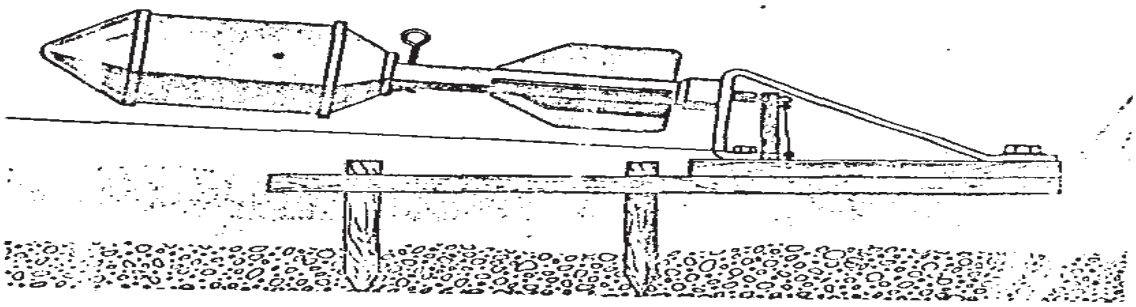
Russian Mine (LMG)

The (LMG) Mine is known as “the flying Galitski mine” and it is of World War II era design, some of which are still in use though today often with a revised shape. The (LMG) Mine consists of a grenade affixed to an artillery tube placed on a fixed launcher on the side of the road where it is likely that enemy armor is used. It is usually hidden in a shallow trench. The mine is connected to tripwires that are extended across the road that the enemy vehicle will hit, which launches the grenade which will hit its side, at which point the grenade explodes on impact. The first sketch of the mine (LMG) shows an explosive warhead, but modern designs of it use shaped charges as warheads. It is difficult to find any reliable data, due to the availability of many diverse shapes of it but the common factor among them is the weight of the grenade which is 10 kg. This mine is still in use by the countries of Warsaw Pact.



Soviet Mine (LMG). The sketch illustrates how to prepare the grenade to operate it against armor. The sketch shows the fixed launcher on both sides of the street as well as the trip wire that detonates the grenade.

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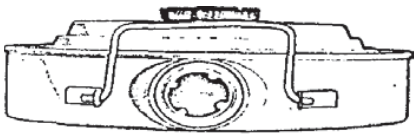
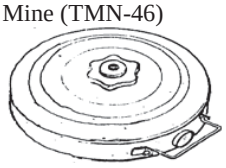
Russian Mines (TM46) (TMN46) (TM-57)

Data:	(TM-46)	(TMN-46)	(TM-57)
Weight:	8.7 kg	8.98 kg	9.5 kg
Charge Weight:	5.3 kg	5.92 kg	7 kg
Height:	74 mm	76 mm	100 mm
Diameter:	310 mm	304 mm	300 mm

History**:**
The (TM-57) Mine seems to be the only mine of this group which is still produced.
These three types are in use by the armed forces of the Warsaw Pact and a number of them were exported to Middle Eastern countries.
The (TM-46) Anti-tank mine is a metal mine of a circular shape used by the armed forces belonging to the Warsaw Pact as one of its standard anti-tank mines. The mines similar to it are the (TMN-46) which includes regular equipment for disabling the mine, and the same applies for the (TM-57) Mine which is a larger type and is more advanced. These three types of mines are laid manually or by one of the various automated mining devices which are used by Warsaw Pact countries. These methods range from the use of specialized tracked vehicles such as (GMC) with pulled or tilted tillers for deploying mines, to planting mines by helicopter. All of these types of mines use pressure triggers, but it is possible to use equipment like the tilted rod when necessary.



Soviet Anti-tank Mine Type (TM-46), metal-cased circular conventional shape. This mine is of a smaller size than Mine (TMN-46)



The Anti-tank Mine Type (TMN-46) with anti-lift capability is one of anti-tank chain of type (TM-46) mines which is considered of a larger size and more modern. It utilizes a conventional fuse mechanism which is pressure activated. It can also be deployed manually or through various mine deployment devices.

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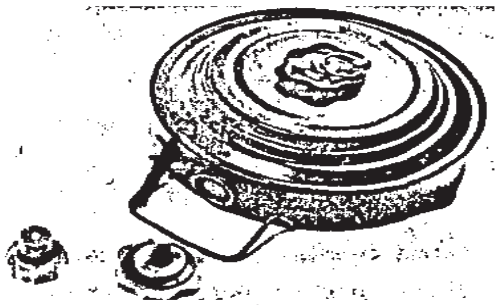
Israeli Anti-tank Mine (Number 6)

Data**:**

Weight:	9 kg
Charge Weight:	6 kg
Height:	110 kg
Diameter:	205 mm

History:
It is currently in production and in use by the Zionist enemy forces. It is also made available for export.
Mine (Number 6) is considered the standard anti-tank mine for the Zionist enemy forces. It is a conventional mine of a circular shape with a body which is a pressure plate. This cover prohibits the entry of water so you can place the mine when necessary underwater. The molded TNT material is used as the main explosive. The upper surface of the mine is also covered with a pressure plate which is stabilized by a plastic spiral and which secures the mine during the transport process. In order to use the mine, we lift the plastic spiral and install the pressure fuses (Number 61) in the central fuse hollow. We can also use other types of ready and available fuses which are used instead of the aforementioned. Fuse (Number 6) works when more than 260 kg pressure falls on it. For this reason, the infantry who cross by mine fields that are planted with mines equipped with fuse (Number 6) may cross it with a degree of relative safety. It is possible to install anti-disarming mine devices from the ground.



Zionist Anti-tank Mine (Number 6), a conventional mine of a circular shape and a metallic body.

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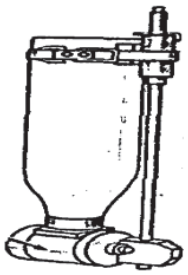
French Anti-tank Mine (Model 1953, 1954)

Data:	(Model 1953)	(Model 1954)
Weight:	1.9 kg	1.2 kg
Charge weight:	0.3 kg	0.3 kg
Height:	280 mm	280 mm
Diameter:	73 mm	73 mm

History:
The production of these mines was stopped, but it is still in use by the French Army. The process of spreading each of the two models 1953 and 1954 of the anti-tank mines requires careful attention. For this reason, it is not often used in mine fields that are prepared in a hurry, but it is used in mine fields that are planted well in advance before any anticipated tanks attack. Both models use the same shaped detonator charges, but model 1953 uses two detonator charges while model 1954 uses only one charge. Both types are buried in the ground using a special tool that makes a hole up to 330 mm and then these launching charges are placed in these holes. However, model 1953 requires additional preparation, because the two launching charges were assembled together and were connected to another anti-tank mine or with a fuse device which operates separately but is also connected to an explosive fuse. The two launching charges are arranged so the tank triggers the main anti-tank mine or the fuse device by passing over it. At that point, the two charges will explode. These bombs were buried where one will directly explode into the hull of the tank. When each of the launching charges is a shaped charge, 73 mm caliber, each one can penetrate armor that is 100mm thick. This is enough to disable any tank. The 1954 type mine consists of a single launching charge which is planted in the same way as the model 1953 mine, but it is equipped by a special ignition mechanism where the fuse is installed on a tilted that rod when the tank passes over a mine, the rod then

French Anti-tank Mine Model 1953, 1954 are shaped charges. The sketch on the right is for Model 1954 which uses only one charge but Model (1953) uses two charges.



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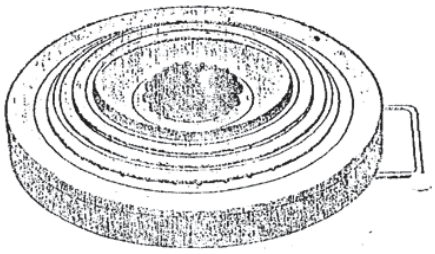
triggers the fuse to make sure that the tank is exactly on top of the mine, so the bomb will not explode until after half a second. The resulting impacts of the explosions are similar in both mines.

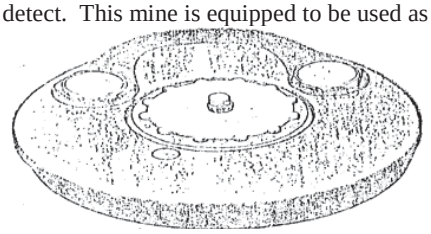
Czech Anti-tank Mines (PT-Mi-Ba)

Data**:**	(PT-Mi-Ba)	(PT-Mi-Ba)	(PT-Mi-Ba)
Weight**:**	7.6 kg	9.7 kg	9.9 kg
Charge Weight:	5.6 kg	6 kg	7.3 kg
Height**:**	1.2 mm	125 mm	175 mm
Diameter**:**	222 mm	(220x295) mm	220 mm

History**:** It is still in production, but typically only the two last models. It is available for use by the Czech Army.



Anti-tank Mine (PT-Mi-Ba) made of Bakelite material, nonmetallic, which helps in making the mine difficult to detect. This mine is equipped to be used as booby-trap and includes a demining device.



Anti-tank Czech Mine Type (PT-Mi-Ba11). This mine is different than the other Czech mines because it was made of nonmetallic material and it is manually deployed.

AFGP-2002-000032-0176

British Horizontal Anti-tank Mine (Mark 1)

Data**:**
Weight: 12 kg
Length**:** 260 mm
Diameter**:** 20 mm
The ability to penetrate armor: 70 mm at an 80 meter distance (in the range of 30 degrees).

History**:**
Its production is still underway. It is in use by the French and British Armies and a number of other countries.
It is known to the French Army by the name (Horizontal Anti-tank mine) or (MIACAH). The mine is a launched charge that can detonate a shaped charge targeting the exposed side of the armored vehicle passing by.
This mine is similar in shape to a small drum with a steel structure hanging from its sides in a circular pattern. The drum also consists of the shaped charge that is aimed by facing it toward the road that the targeted vehicle might traverse. The mine can be lifted a little bit to be installed and when the aiming is done, the drum is fixed in its place. Then, the tripwires belonging to the mine are placed in the way of the vehicle while the body of the mine is connected to the fuse mechanism. When any vehicle moves the tripwire, the mine explodes and it fires the shaped charge toward the side of the vehicle. When the charge collides with the target, it can penetrate armor up to 70 mm thick and this is at a 80 mm distance. If the sides of the armored vehicles are less armored from the other parts, such a hit would disable the specific vehicle.
This in itself shows the tactical uses of this anti-tank mine. It is an ideal weapon for ambushes. It also represents a good method that denies the enemy from using certain roads. Therefore, if this horizontal effect anti-tank mine is used heavily, it could easily slow the advance of an armored attack. When these mines are spread they are easy to conceal. The tripwires also should be hidden from the tank crew.
This mine has now become an important weapon among the anti-tank mines in France and in other places. Two types of mines were produced for the training which produces an effect that simulates the effect of the original mines. One of these two mines releases a piece of wet sponge paints or a similar indicator instead of the specific shape charge that is usually used. When the tank passes over (the target), this mine is allocated for training purposes and it releases an electronic beam that operates a device in the tank's engine which stops that engine from running.

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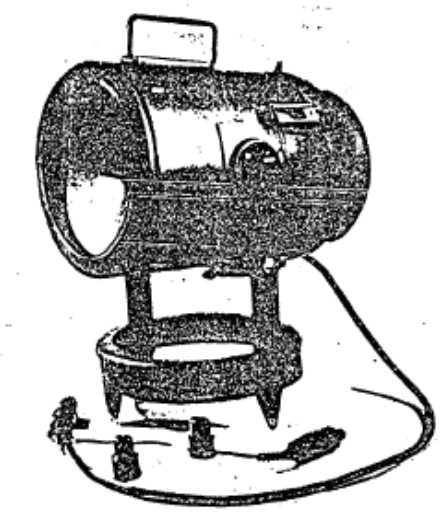
And thus the tank stops from moving when these two mines are in use. Despite the success that the horizontal effect anti-tank mine achieved, however, the use of tripping wires constitutes restrictions for use in certain circumstances.
In order to overcome that, the mine now is equipped with an infra-red detector known as (IRMAH Model F1). It is a small detector installed on a drum launcher and it is able to detect infrared radiation and the tremors emanating from the vehicle/target. This is for a distance of up to 80 meters.
When the signals reach the appropriate degree of force, it launches the explosive device, and there is also a tool for this device which is prepared in advance that allows the mine to neglect the first two or three targets to only launch against the targets that are in the rear.



Anti-tank Mine (Mark 1) of maximum impact used by British and French Armies. This mine was designed to penetrate an armored plate 70 mm thick by firing the hollow charge after the tank has come within a distance of approximately 80 meters. This mine can also be launched close to the road with any type of sensor devices.

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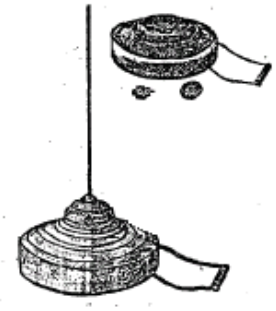
Anti-tank French Mine (Type 1951, 1952)

Data:

Weight:	7 kg	9 kg
Charge Weight:	6.486 kg	6.486 kg
Height:	95 mm	120 mm
Diameter of Body:	300 mm	300 mm

History:
Neither is in production now, but they are still in use by the French Army and a number of other armies. West Germany's Army copied a design of the 1951 model and is using it by the name of (DM-11) It is also similar to the Dutch Anti-tank Mine Model (26).

The two anti-tank mines 1951 and 1952 are similar in terms of their external shape but they use different types of fuses. The two models use three blocks of TNT material.



The sketch above shows the French anti-tank mine model 1951 which uses a pressure plate or chemical operating valve. The sketch below shows model 1952 that uses a mechanism that consists of a reversing rod. Both models are difficult to detect by normal devices.

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[TC: Pagination of English translation reordered to accurately convey the Arabic text]

Anti-tank Mine (PRBM-3)

Data:

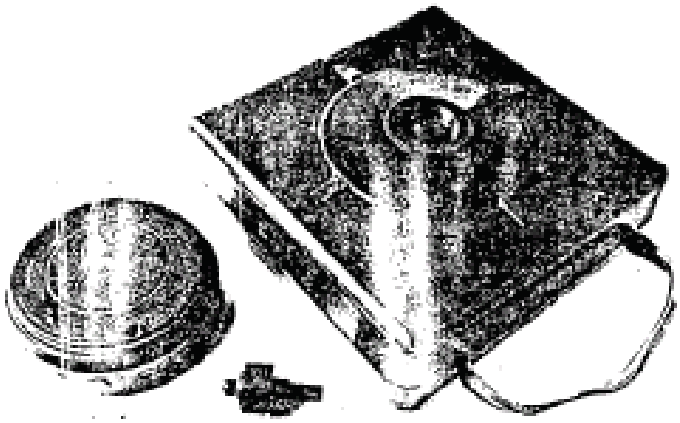
Weight:	8.8 kg
Charge Weight:	6 kg
Height:	130 mm
Width/Length:	215 mm
Required Pressure for the Explosion:	250 kg

History:

Its production is ongoing. It is in use in many countries. The anti-tank mine (PRBM-3) follows the general pattern of modern mine designs where it is entirely made of plastic material in order to make it difficult to detect, it is low cost and it is not affected by erosion.
The design is distinguished by its simplicity and it follows the pattern of other mines that are produced by the (PRB) Institution like the (M 35) and the (M 409) and this is by using the same double-piercing fuses. This fuse is installed in the (PRBM-3) mine in the middle of the squared body under a plate of plastics of duplicate parts. When the plate is under pressure, it pushes the latch, releasing both hammers. There is also under the main fuse a hollow that can be used to contain an anti-mine removal device. The device that is used with this mine is type (PRBM- 30) that operates when the mine is lifted by more than 30 mm. As is the case with other similar designs, the square shape gives a number of advantages in terms of handling and storage. A handle is installed on one of its sides. Mines are usually distributed in boxes, each containing six with their fuses stored separately. Each box weighs 44.5 kg and the square shape also allows each mine to contain more explosive material than the conventional round designs can carry. Therefore, the hexolite explosive material weight reaches 6 kg from the total weight of a mine that weighs 8.6 kg. This quantity is quite adequate to disable almost any tracked vehicle. To ensure the use of the mine against the vehicle only, the fuse does not operate unless it is under powerful pressure exceeding 250 kg. The PRB Institution claims that their mine will not explode if other mines explode next to it. This means that (M3) minefields are not affectively cleared by Bangalore Torpedo or similar devices of clearing minefields.
The (PRB) Institution produced latent dye for training purposes and to produce smoke from plastic materials. The regular (M3) mine is produced in dark olive green color but it can also be produced in other colors for export purposes.

AFGP-2002-000032-0178
[TC: Pagination of English translation reordered to accurately convey the Arabic text]

Anti-tank Mine (PRB-M3) is distinguished for its square shape. The sketch also illustrates the double valve piercing which is affixed to the middle of the mine as well as the duplicate plastic plate.



Russian Anti-tank Wooden Mine
Yam 5 (TMD 44) and Yam 10 (TMD-B)

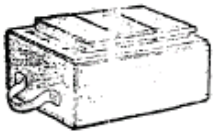
Data:	(Yam-5)	(Yam-10)
Weight:	from 5 kg to 608 kg	11.8 kg
Charge Weight:	3.6 kg to 6 kg	10 kg
Height:	95 g	196 mm
Length:	475 mm	620 mm
Width:	195 mm	216 mm

History:
Its production is on an as-needed basis and it is in use by Warsaw Pact countries. It is also potentially used in other places.
The first of the two wooden mines is the (Yam-5) mine which is simply assembled and operated on the basis of principles that slightly differ from the principles of operating the two mines (TMD-B) and (TMD-44). The (Yam 5) mine has a cover on the wooden case which operates as the main pressure plate; each has an extension that shows outside the separator in the middle of this extension that there is hanging part that is affixed above the valve piercer .
This section was designed to include clamps stuck to a wooden or metal screw that passes through firing pin. Pressing on the cover leads to pushing the screw to the bottom until it breaks. When the firing gets released to detonate the mine, and as it is the case with the other similar models produced currently, there are various results. They are all fundamentally similar, so the above information is also just a general guide. As for the (Yam-10) mine, it is a larger model than the previous one and it appeared after the war and it contains twice as much explosive material as the first model.
It is usually made of amatol, amonite or dinamone material, and these are wrapped

AFGP-2002-000032-0179
[TC: Pagination of English translation reordered to accurately convey the Arabic text]

in waterproof papers. Many shapes were made that were based on these two basic examples. As is the case for the boxed wooden mines of other shapes, it can be produced under very simple conditions with many different types of basic materials. Some of these mines' trunks are pasted to each other and fixed by screws, while some other samples were fixed by special connections. Some pressure plates operate on axes while other types of pressure plates are pre-cut and do not break unless pressure is placed on them.

Soviet Anti-tank Mine Type (TMD-44) made of wood and operates by the pressuring process of the valve. Its main characteristic that it can be easily manufactured.



The boxed wooden mines in the Soviet Union occupied a prominent place in World War II due to its easy manufacturing and inexpensive production. The above sketch illustrates the boxed wooden mine type (TMD-B) which differs from type (TMD-44) by its upper pressure plates which consist of 3 plates based on three axes.

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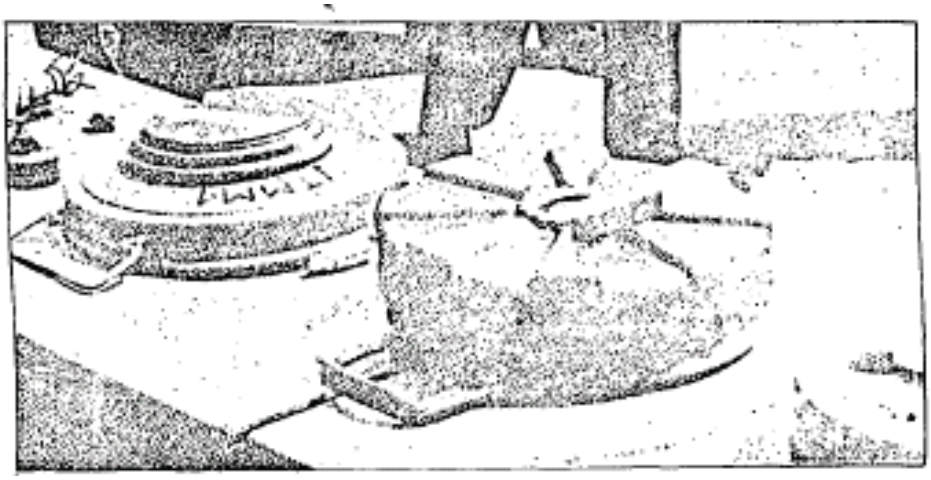
Yugoslavian Anti-tank Mine Model (TM-A1)

Data:

Weight: 5.5 kg
Diameter: 300 mm
Height: 105 mm
Type of Basic Charge: (TNT) highly explosive material
Weight of Basic Charge: 5kg
Operating Force: 200 to 300 kg (It can be controlled)
Type/Model of Fuse: UTMAH-1
Country that uses it: Yugoslavia
Manufacturer: Manufacturing Countries- Yugoslavia

It is a circular anti-tank plastic mine equipped with two triggering devices. There are four intersecting openings along the front of the body of the mine to plug the connectors that are designed to enhance the fragmentation power. The pressure directed toward the bottom cuts the fuse capsule which creates the friction that ignites the incendiary compound that ignites detonator number 8 and triggers the smaller flame and consequently the main explosive charge.



Anti-tank Mine TMM-A1

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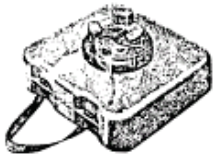
Austrian Anti-tank Mine (Panzer Mine 75)

Data:
Weight: 8.2 kg
Charge Weight: 7.4 kg
Overall Height: 70 mm
Width/Length: 280 mm



Anti-tank Mine Type (Panzer Mine 75)

History:
The production of this mine is ongoing and it is used by the Austrian Army.
(Panzer Mine 75) (PZM-75) mine is considered a modified design based on conventional land mines, but it uses modern material in addition to a heavy charge. To ease its trading, packaging and storage, the body of the mine takes a square shape. The walls of the mine are also made out of plastic material in order to reduce the weight as much as possible while ensuring that it contains the maximum amount of explosive material. There is also a braided handle installed on one of the sides. The other reason for using plastic is to be able to use the (PZM-75) mine under water for long periods of time without allowing the corrosion to affect the efficacy of the mine. The fuse of the mine is placed in the center of one side of the mine, and the other side remains open for use. If necessary, a preventive charge can be used to remove the mine. The operational mines consist of a circle of joints made of plastics with pre-functional springs. When there is any pressure on any pod for this ring it will operate the equipment of those springs which work on engaging the mine charge. The mine depends mainly on the effects of its explosion to cause damage to regular vehicles. This highly explosive charge is enough to remove at least the chain of a tank and it may cause more damage on light vehicles. These mines can be distributed through a slanted passage towed from the back of a truck. By using this passage, 380 mines can be planted in 15 minutes.

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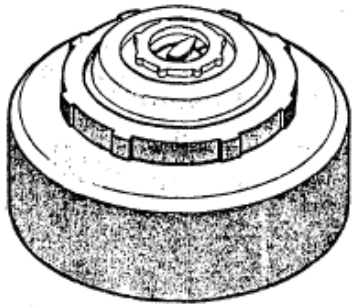
Japanese Anti-tank Mine (Type 63)

Data:
Weight: 14.515 kg
Charge Weight: 11 kg
Height: 216 kg
Diameter: 305 kg

History:
Generally, this mine is no longer in production. It is in use by the Japanese Armed Forces. The Japanese produced only one type of anti-tank mine (Type 63). It is a completely conventional mine, of a circular shape and made of nonmetallic material to include plastic. This mine was delicately designed to prevent water seepage, where the Japanese Armed Forces use it in particular to set up barriers that spread under the surface of water to prevent crossing rivers and small bays. The (Type 63) uses a pressure fuse that operates upon a pressure of 180 kg but it is not armed unless it is turned manually by a screw driver placed above the valve. The (Mine 63) is considered a unique and highly effective weapon, even if it was used as an anti-tank weapon.



Conventional Anti-tank Mine Type (63) made of plastic material

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Spanish Anti-tank Mine (C-3-A)

Data:

Weight:	5.9 kg
Diameter:	285 mm
Height:	115 mm
Type of Main Charge:	(TNT) material that is highly explosive
Weight of Main Charge:	5 kg
Country using it:	Spain
Manufacturer:	Fasizes Explosives factories- Spain

It is a circular mine that consists of a plastic body and a central plastic ignition valve and a pressure plate assembly.

Anti-tank Mine C-3-A

Anti-tank Mine C-3-A body, Fuse and Cover of Mine

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Austrian Anti-tank Mine (Directional Shrapnel 3/21 C)

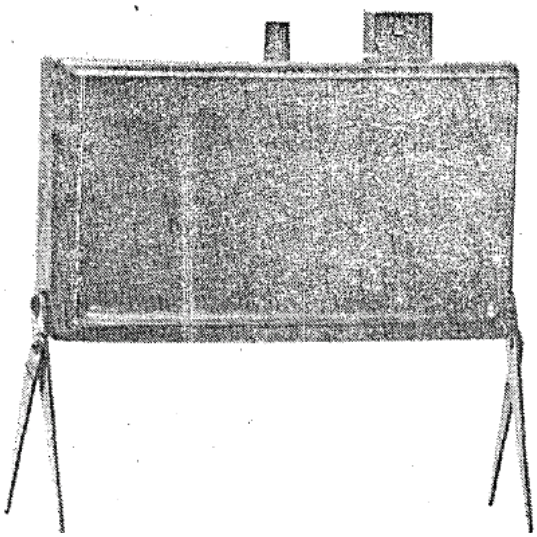
Data:

Weight:	6.5	Width:	340 mm
Height:	160 mm	Number of Shrapnel:	1300
Weight of Shrapnel:	101 g	Weight of Explosive Charge:	3.5 kg from vehicle B
Angle of Shrapnel Spread:	60 degree		

Penetration Capacity: Up to 50 meters. 4 mm Steel thicknesses.
Up to 100 meters. 25 mm Wood thickness.
Manufacturer: SMA Company- Austria

The design of this mine is similar to the design of the anti-personnel Mine 1/20C but it is of a heavier weight and is better able to pierce armor at a great distance. Therefore, it is considered effective in the destruction of various types of equipment except tanks.
This mine is used to protect military installations and sensitive positions against insurgents and surprise offensive operations because it provides an intense fiery and destructive cover for these centers and institutions.
The body of the mine is made out of reinforced plastics and is equipped with two igniter fuses. One is located at the top of the body and used as an electronic detonator and the other is located at the tail of the body and is used to detonate the other mines that are close by.
It is currently used by the Austrian, Greek and Turkish Forces.

Anti-tank Mine with Forward Direction Shrapnel C3/21



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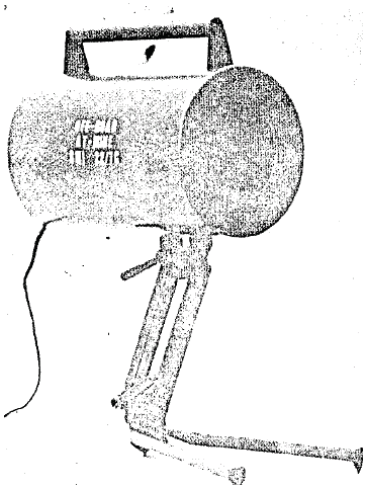
Austrian Anti-tank Mine (C7/22)

Data:
Weight: 13.5 kg Weight of Explosive Charge: 7 kg from Composition B
Length of Body of Mine: 290 mm Diameter of body of mine: 180 mm
Duration of Battery: 3 months Level of Accuracy: (+ or-0.5 degree)
The Maximum Effective Range: 50 meters
Penetration Ability: Up to 30 meters steel of 80 mm in width
Manufacturer: SMA Company-Austria

This mine represents the new generation of anti-tank mechanisms that rely on electronic intelligence for their operation.
It is virtually impossible to reveal the location of this mine because it is placed in camouflage up to 50 meters in distance from the detonation point. Thus, it becomes possible to protect passages and roads from attacking tanks in an effective way by just using a small number of these smart mines.
The mine consists of a highly developed explosive charge that has large penetration ability up to 50 meters in distance and an electronic section that is equipped with two sensor devices that are able to differentiate accurately between different types of equipment and discover an advancing tank.



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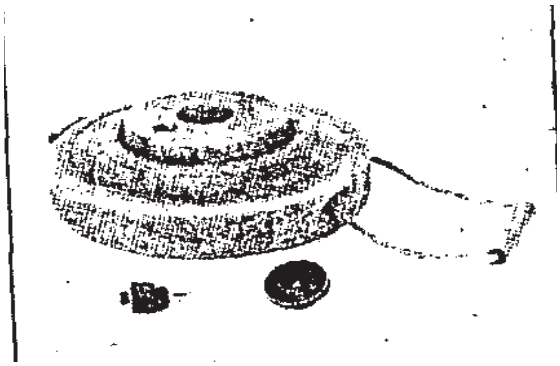
It is used currently by the Austrian, Greek and Cypriot forces, and other armies.

French Anti-tank Mine Model (MACI 1951)

Specifications:
Weight: 7 kg
Diameter: 300 mm
Height: 95 mm
Type of Main Charge: TNT Material highly explosive mold.
Weight of Main Charge: 6.486 kg
Reinforcement Charge: R D X
Weight of Reinforced Charge: 498 gram
Operating Force: 300 kg
Countries that use it: France and other countries
Manufacturer: Zitex factories-France

This mine consists of three parts of TNT material molded and reinforced in a glass ring: the pressure plate section, the central core which contains the valve, and the detonator and outside connector which connects the first two parts with each other.



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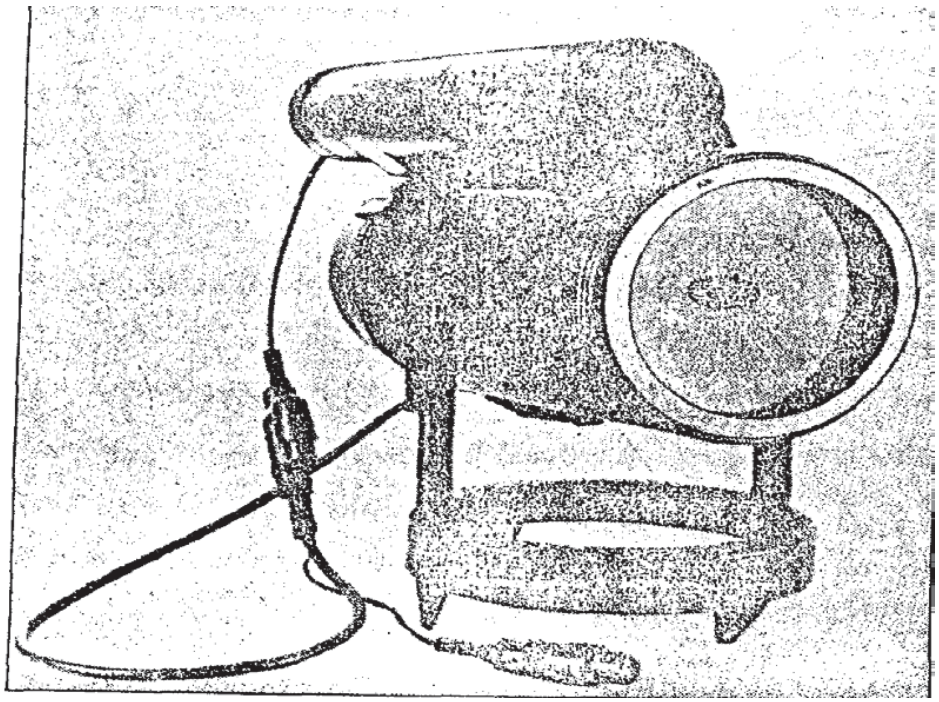
Horizontal Anti-tank French Mine
Model (MK1 Equipped with an infrared sensor device)

Data:
Weight: 1.35 Length: 250 mm Diameter: 8 mm
Power Supply: Miaka Battery Target Range: from 0 to 80 meter for a target that moves with a speed that ranges between 5 and 60 km per hour.
Countries that use it: France, Holland and Italy.
Manufacturer: Industrial Assembly of Ground Weapons-France
It is an anti-tank mine that operates horizontally, standard type that is equipped with a hammer that works via infrared to improve the performance of the mine in rugged areas such as swamps, rocky terrain and lands that are covered with snow.
This mine is capable of discovering targets up to 80 meter in distance and with a speed that ranges between 5 and 60 km/hour. The hidden programmer has the capability to deal with any of the targets that it reveals. It also has an internal hidden ability against counter-measures.



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Czechoslovakian Anti-tank Mine (PT-MI-BA)

Data:
Weights: 706 kg
Diameter: 32.3 mm
Height: 10.2 cm
Material body made of: Plastics
Charge: TNT
Manufacturer: Country Factories

It is a mine which consists of two molded plates welded together. It consists of a smaller pressure plate installed on the external surface and in the upper plate center.
200- 400 kg of pressure is sufficient to detonate this mine. It is not equipped with a completely functioning booby trap. It is used by the Czechoslovakian Forces and some Arab and African countries.

The British Anti-tank Mine (L3A1)

Data:
Weight: 8kg
Width: 22.7 cm
Height: 11.6 cm
Material of body make: Ceramic encased in plastic treated with rubber
Charge: High explosives 6.1 kg
Method of Planting: Manually
Ignition: By pressure
Charging: The mine is placed inside a soft steel container. The two mines are connected by each other through a clasp for transport purposes.

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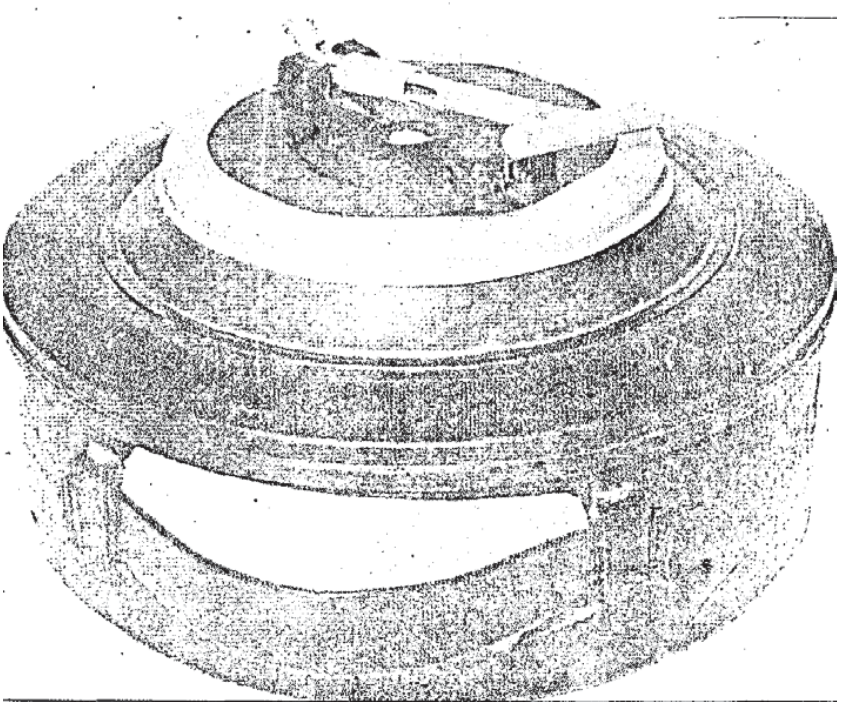
Manufacturer**:** British War Factories
Light nonmetallic mine which consists of a circular black container with a couple of loops at the top.
The pressure source is an integral part of the mine. It can be provided if necessary with rings that help reveal it by the detector.
It is used by the British Forces.



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The French Anti-tank Mine (HPD-1A)

Data:
Weight: Light type: 5.3 kg
Heavy type: 6.3 kg
Length: 280 mm Height: 103 mm
Width: 187 mm
Weight of Main Charge: Light type: 1.4 kg
Heavy type: 204 kg
Power Supply: Two rechargeable lithium batteries.
Countries using it: France
Manufacturer: Land Weapon Industrial Complex –France

This mine was designed to be placed or buried by burial or mechanical devices.
If the mine is placed on ground level, it can penetrate 250 mm plates of an armored vehicle body from a distance of half meter. If the mine was buried to a depth of 150 mm, it can penetrate 50 mm of the armored vehicle body from the same distance.

Anti-tank Mine HPD-1A

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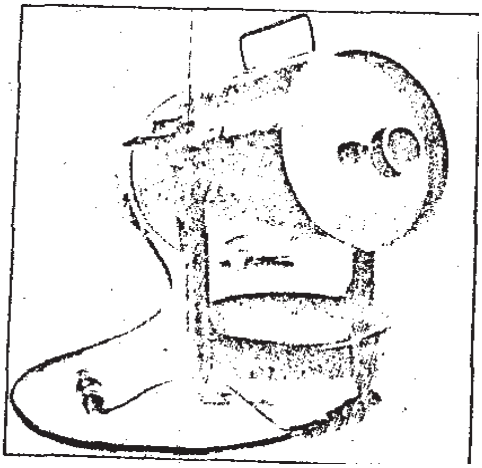
French Horizontal Anti-tank Mine (MK 1) Model

Data:
Weight: 12 kg
Length: 260 mm
Diameter: 200 mm
Countries using it: France, Britain and other countries.
Manufacturer: Land Weapon Industrial Complex-France
This mine consists of a cylindrical drum that is installed in a circular shape.
The mine is usually fixed to the ground then camouflaged and directed across the road that the tank is expected to pass upon. A wire is extended from the mine and when a mechanized vehicle passes over the wire, then the mine operates and the pointed charge penetrates the side armor of the tank.



Anti-tank Mine M K F1

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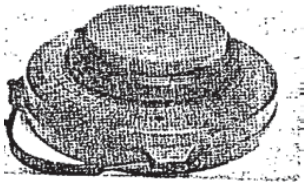
Anti-tank Italian Mine Type (SH-55)



Data:
Weight: 7.3 kg
Diameter: 280 mm
Height: 122 mm
Type of Main Charge: Composition B
Weight of Main Charge: 5.5 kg
Type of Reinforced Charge: T4
Anti-tank Mine S H-55
Weight of Reinforced Charge: 50 g
Operating Force: 185 kg
Countries using it: Italy Manufacturer: Valsella Company-Italy
Hidden inside a cover of plastics and its valve operation is as follows:
The pressure on the top of the mine pushes the pressure plate down and this in turn pressures the trigger, then the ring that holds the trigger falls and it hits the detonator and ignites the main charge.

Italian Anti-tank Mine Type (TC/3.6)

Data:
Weight: 6.8 kg Diameter: 270 mm
Height: 145 kg Type of main charge: Composition B
Weight of main charge; 3.6 kg
Operating Force: (Average 180 kg) (Maximum 310 kg)
Range of Operating Heat: 31 to 70 degree Celsius
Countries using it: Italy
Manufacturer: Technovar Company-Italy
It is a circular anti-tank mine made of plastics, completely waterproof and it will not float. It can be planted manually to a depth that ranges between 75 and 150 mm in the sand and up to one meter in the snow. It can also be planted mechanically from an armored vehicle that is operated when a weight of 180 kg is directed on the pressure plate

A
nti-tank Mine TC/6.3 Technovar

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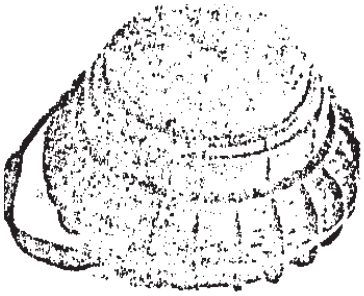
Anti-tank Italian Mine Type (VS-2.2)

Data:
Weight: 3.6 kg
Diameter: 247 kg
Height: 117 mm
Weight: Main Charge (1.85 kg)
Reinforced: (280 g)
Type of Main Charge: Composition B
Type of Reinforced charge: RDX
Operating Power: 180 to 220 kg
Range of operating degree of Heat: -31.5 to 55 degree Celsius
Countries using it: Italy and other countries.
Manufacturer: Valsella Company-Italy

It is a metal anti-tank mine placed inside a case made of reinforced plastic resin with a carrying handle. The mine is waterproof, will not float and it is shock-resistant. The mine can be planted manually by placing a pressure plate at a maximum depth of 150 mm.



Anti-tank Mine VS-2-2 Valsella

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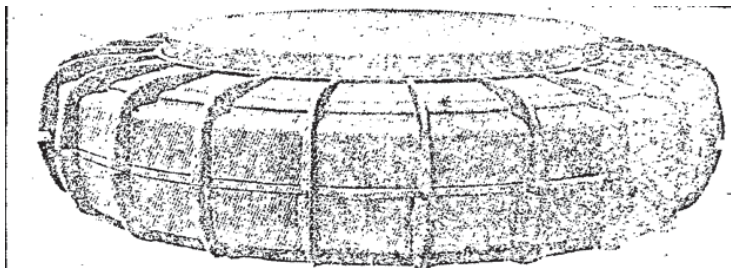
Anti-tank Scattered Mine (SB-81)

Data:
Weight: 3.2 kg
Diameter: 232 mm
Height: 90 mm
Type of Main Charge: Highly Explosive
Weight of Main Charge: 2 kg
Operating Power: 150310 kg
Packing: A box containing 5 projectiles and weighs 19.5 kg
Countries that uses it: Italy and other countries
Manufacturer: Misar Company-Italy

This mine can be scattered by helicopters, armored ground vehicles or laid manually.
It also can be buried in the ground to a maximum depth of 100 mm. Air dropping the mine does not impede its ability to destroy tank tracks or irreparably damage tank running gear.
The shape of the mine is circular and hidden inside a plastic case that is available in any color.
The mine is pressure-activated and will function whether it lands on its top or its bottom.
The mine is waterproof, will not float, is maintenance-free and it can be stored for a period of 10 years.



Anti-tank Scattered Mine (SB-81) Type Yasar

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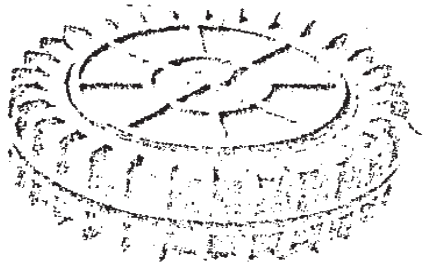
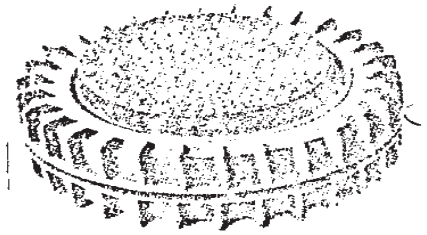
Scattered Anti-tank Mine Type (Matz)

Data:
Weight: (Type1) 3.6 kg
(Type 2) 5 kg
Diameter: (Type 1) 220 mm
(Type 2) 260 kg
Height: 90 mm
Type of Main Charge: T4 or Composition B
Weight of Main Charge: (Type 1) 105 kg
(Type 2) 2.4 kg
Operating Power: (Average 180 kg) (Maximum 310 kg)
Range of Operating Heat: 31 to 70 degree Celsius.
Countries that uses it: Italy
Manufacturer: Technovar-Italy

It is a circular anti-tank mine made of plastics. It is completely waterproof and it was designed to be scattered from helicopters that fly at speeds up to 200 km/hour and an altitude of 100 meter. This mine can also be planted by armored vehicle or by being buried manually at the depth of up to 75 mm.



Scattered Mine Type Matz (The view from the bottom)



Scattered Mine Type Matz (The view from the Top)

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French Anti-tank Mine Type (HPD)

Data:	HPD	HPD-11 Light	HPD-11 Heavy
Weight:	6kg	5.3 kg	6.3 kg
Length:	280 mm	280 mm	280 mm
Height:	105 mm	103 mm	103 mm
Width:	185 mm	187 mm	187 mm

History:
Its production is ongoing. The main mine (HPD) is in use by the French Army. As for the two other mines (HPD-11), they are still in development.
(HPD) is an abbreviation for the French expression which means (high capacity of destruction). It is considered among the most common anti-tank mines. The primary models were developed during 1970 and the French army approved the first acceptable formula for service in 1974. This mine was designed from the outset to be deployed manually and automatically. It is automatically deployed by planting and deploying mines device type (A and A). This device is towed behind a truck weighing 4 tons or behind a mechanized vehicle. It also deploys between 900 to 1500 mines per hour as long as the mine supplies are available. (HPD) mine is encased in a body of plastics which contains a generator of electrical power and a fuse mechanism, as well as improvised explosive devices. There are two charges for each mine, the first charge is to remove the earth that covers the mine to explode it in order to facilitate the explosion of the second charge which is considered the main offensive charge that is directed upward toward the lower hold of the target vehicle.
This second charge takes a form which allows it to make its way by penetrating to the top through the thinner armors of the belly of the tank to disable its movement or to at least destroy one of its mechanized chains.
The experiments confirmed that the (HPD) Mine is able to penetrate armors of a70 mm in thickness, while the thickness of the main Soviet military tank base armor type (T62) is 20 mm. In order to add more development to the (HPD) Mine, the fuse mechanism in it does not depend on the pressure alone, but it also depends on a combination of the effects of vibration and magnetic fields so that infantry can pass over it safely. Among other safety factors that are available in this mine is a timer device to separate the electric power from the mine itself or to use it in more disturbing tasks. There is also a self-destruct mechanism of the mine that works after a pre-determined time limit. As for the training task, there is a quite similar formula for the original mine called (HPD-XF (1)). This mine is transported and planted in a completely similar way of that of which

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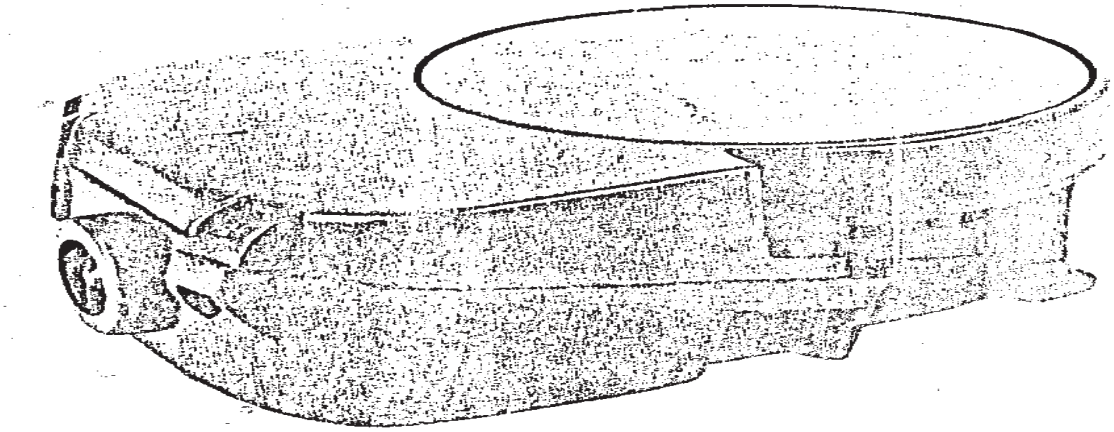
followed in the actual mine except that when it explodes, it produces red smoke for a period of 30 seconds. The igniting fuse will be defused in the training mine automatically after 24 hours. The French were not satisfied with the excellence they achieved with (HPD) mine, but they continued to develop the design and they now reached the implementation phase of (HPD-11) design. This design is being developed in two different sizes and it can be transported and deployed in the same way followed in (HPD) original mines. The main changes deals with the fuse mechanism and charge, as the fuse mechanism now started operating by sensitivity; it operates only against vehicles of certain sizes in terms of width and weight. The charge also has become more potent and experiments have shown that the new mine, even when buried at a depth of half a meter can penetrate a 250 mm thick armor. Among other enhancements that have been introduced are that no mine is ready to work automatically, until after 10 minutes, allowing the vehicle that is deploying mines to completely get away from the place of mine that are deployed. The development processes for these mines are still ongoing.



Two Charge French Anti-tank Mine type (HPD). The advancement processes for these mines are still ongoing.

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Electronic Technovar Mines
Mines and Illumination Equipment (TC 3.61 & TC 61)

Specifications:	TC 3.61	TC61
Weight:	6.8kg	9.6kg
Charge Weight:	3.6kg	6kg
Height:	145mm	185mm
Diameter:	270mm	270mm

History: In production, undergoing field experiments before using them in Italian military service.

Anti-tank Technovar Electronic Mines (found in two forms) are a new invention that will increase the use of electronic devices in anti-tank weapons. The modern electronic circuits inside the mines can detect electronic encryption signals that make the mine ready to detonate or that can make the mine inactive. Specific encryption signals or frequencies are transmitted through a special transmission device that can be towed by a vehicle. Therefore, friendly forces can go through minefields when they desire, as it is safe to go over these mines. It can be prepared for reuse after passing over it. A special device has been developed that has a round antenna on a mount that can be used by infantry on foot. It weighs 15 Kg. It can be used and transported easily by one person. The benefits of this device are many and very clear; however it has one drawback in the midst of widely used electronic countermeasures, and the different types of electronic wars. An enemy may discover the specific encryption signals and use this information as a tool to bypass minefields. Clearly, to overcome this problem, traditional mines should be used to cover the rest of the area that needs to be covered. In addition to operating these mines electronically, they can be operated in a traditional way by using pressure fuses which can be planted by hand or by using automatic methods. It is usually made of circular parts made of plastic that have no electronic signature.

The smaller Technovar mine (TC 1/3.6) is considered an anti-vehicle mine and is identical in appearance and dimensions to the traditional anti-tank type (TC/3.6). Another anti-tank mine that looks similar is type (TC 1/6); however it is bigger and heavier. It is possible to disable the largest tanks using these two mines. To date, these two mines have not been used widely. However production has

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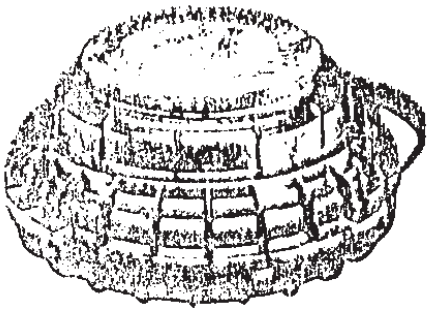
Has started on both. It seems that many of these mines are likely to be adjusted in the future to be used with circuits (electronic keys).



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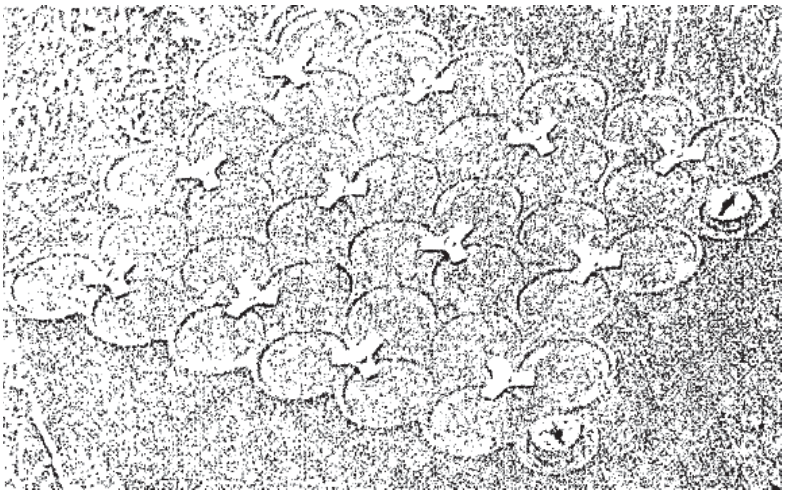
Vuasin Illumination Device

Specifications:

Weight:	4kg
Length:	220mm
Width:	174mm
Height:	105mm
Lighting time:	40 seconds
Lighting distance:	200 meters
Number of lighting strobes:	36
Countries in use:	Several countries
Manufacturer:	Rogiere Corporation– France

This device was designed to provide illumination and is not affected by weather conditions such as wind. Therefore, the illumination rate does not change and remains steady. This instrument delivers light five times more than a flashlight (LUX) covering an area of 300 meters in diameter in less than 40 seconds. Thirty six flashes are generated sequentially every second in a symmetric path. These flashes remain lit at a height beyond 40 meters, and die down when it falls below 40 meters height.



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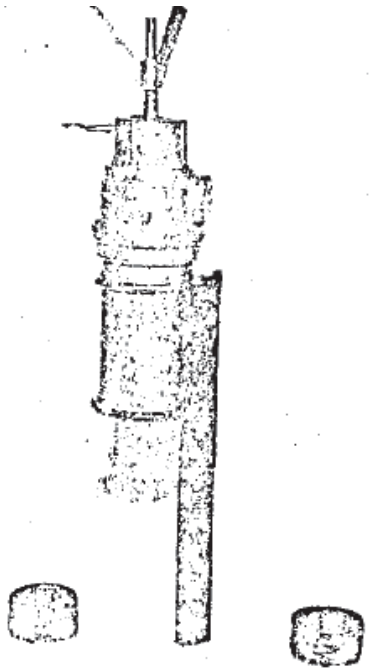
Illumination Mine type VAR EG

Specifications:

Weight:	500 grams
Diameter:	65mm
Height:	210mm
Illumination Beam:	57mm
Flare Strength:	10 candlepower
Illumination time:	No less than 40 minutes
Operating Power:	12-13 Kg (pressure) 6 Kg by (pulling)
Range of Operating Temperature:	- 41 to 70+ Celsius.
Countries where it is in use:	Italy and several others.
Manufacturer:	Technovar Company, Italy

This mine is made of a cylindrical plastic container that has a fuse on the top.
It could be buried in the ground with the top visible or on a steel post that is used for this purpose. It is completely water resistant and does not float.



Technovar EG Illumination Mine

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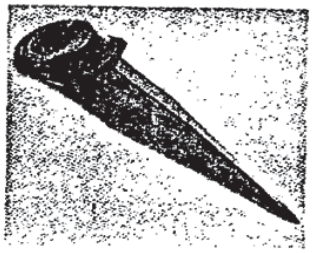
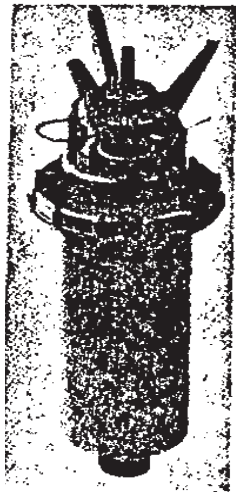
AFGP-2002-000032-0201A

Illumination Device Type (VS-T)

Specifications:

Weight:	470g
Diameter:	70mm
Height:	210mm
Weight of illumination compound:	350gr
Illumination Strength:	no less than 20 candlepower
Illumination Radius:	570 meters
Illumination time:	No less than 40 seconds
Operating Power:	4-10 Kg (pressure) 3 Kg by (pulling)
Countries in use:	Valsilla Company – Italy





Valsilla Illumination Device

195

AFGP-2002-000032-0202A
[TC: Pagination of English translation reordered to accurately convey the Arabic text]

Illumination Mine with Sound impact Type (RTA 424)

Specifications:

Weight:	: 500 Kg (Without fuse)
Weight:	: 1.5 Kg (With fuse)
Diameter:	: 60 mm
Height:	: 373mm
Illumination time:	: 40,000 candlepower
Countries in use:	: France
Factory:	: Rogiere Corporation- France

This mine is made of a long cylinder that contains the fuse, sound effect and illumination instruments. It is usually buried in the ground and can be set off with a tripwire. The sound device is triggered at 10 meters and releases a siren, and then the illumination device burns for three minutes.

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AFGP-2002-000032-0202
[TC: Pagination of English translation reordered to accurately convey the Arabic text]

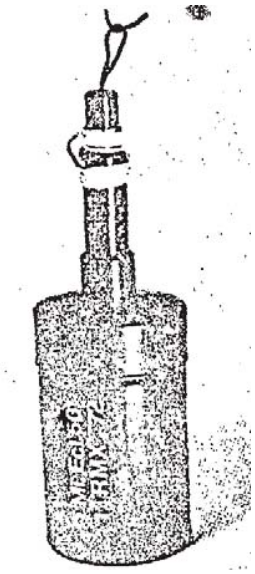
Illumination Mine Type (50)

Specifications:

Weight with fuse: 465 grams
Diameter: 55mm
Height with fuse: 170mm
Height w/o fuse: 110mm
Weight of 30 meters of tripwire: 110gram
Illumination Time: 40 seconds
Illumination Strength: 40,000 candlepower
Counties in use: France
Factory: Rogiere Corporation – France

This mine is made of a cylindrical container that contains the illumination device, fuse and a wire attached to the top of the mine. Once the mine is placed and the wire is pulled, the fuse gets triggered and the mine explodes illuminating an area more than 100 meters wide.

Illumination Mine Type 50



197

AFGP-2002-000032-0203

Chemical Mines (KH F– 1) & (KH F – 2)

Specifications:

Weight:	15Kg	15Kg
Height:	345mm	280mm
Diameter:	150mm	185mm

History:
Current situation is not known, however they are likely to be replaced with newer and more modern designs.

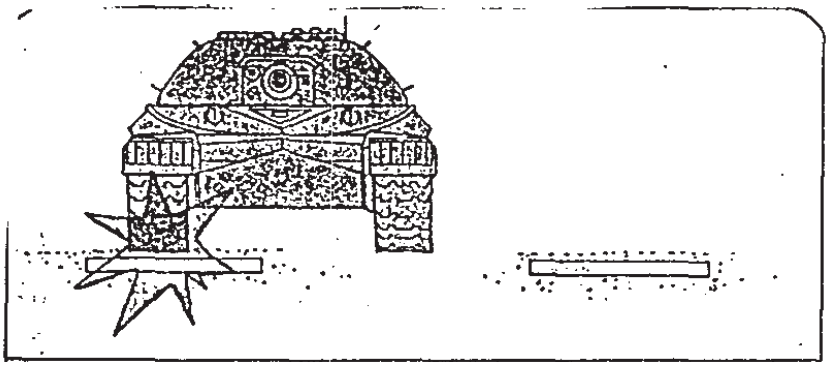
Although we may not see these two chemical mines (KH F– 1) and (KH F – 2) today in their current form, we still mention them here to show how to operate and use such mines in case they get used in a future chemical war. The design was made during WWII, but they fortunately have never been used. Both operate on the same basis as jumping or bouncing mines. These mines are designed to be placed in open areas in visible containers at an appropriate distance. When tripped, the propellant charge of black gun powder propels the mine up and triggers a delay mechanism for 1 to 1.5 seconds. The main charge inside the mine detonates, which leads to fragmenting its chemical contents over an area of approximately 300 square meters. Different chemicals that have been used included Mustard Gas, Chlorine, and Phosgene. Today, the contents are mostly nerve gases.

The two mines are the same except for their size, and we do not know the current conditions with regard to production or storage.

AFGP-2002-000032-0204

Typical Cylindrical Anti-tank Mines

These cylindrical mines are known to be the most popular type due to their ease of production which employs simple methods. The ease of use helps us during their deployment due to the fact that it is easily hidden. This type of mine delivers huge explosion power in a compact unit. However the deficiency of this type of mine is that the type of detonation fuse used can only be activated by pressure; therefore it does not explode without pressure applied directly by the track of the tank. Therefore the damage does not disable the tank totally. Despite the damage to the track, the tank remains in control of the battle field as long as the cannon remain usable by its crew who remain alive, unless it becomes a target for anti-tank missiles. There are limitations regarding the size of the produced mine and that is due to transportation, placement, and concealment. This can be applied in cases where the mine size is about 40 cm in diameter and weighs about 7 – 8 kg. However, if it exceeds this weight, difficulties quickly escalate.



Drawing shows a tank going over a mine that is activated by pressure and impacts only the tank's hull. This is one of the deficiencies of this type of mine. Efforts are made to avoid it in other types.

AFGP-2002-000032-0205

Hollow-Charge Mines

Hollow-charge mines that are capable of severing a battle tank's track may be dispersed by means of helicopters (the American and Italian armies are currently pursuing this method), or by launching them from projectiles, or by 155 mm caliber artillery.

A well-embraced technique for dispersing mines is through the use of armored vehicles. Numerous armies have pursued the use of vehicle-borne delivery devices. An example is the British-made "BAR" mine that can be scattered at a rate of 700 mines an hour by employing only three men.

Most mines today are made of plastic or other nonmetal material enabling them to thwart various means of detecting mines, whether they be usual mine-detection equipment or the latest electronic instruments.

There is no doubting the great progress achieved in mine technology during the past twenty years, yet the science of detection has stayed in place without moving forward. There are no methods existing today that we can rely on to detect nonmetal mines when they are buried or hidden. There have been experiments based on methods of ultrasound and infrared rays to detect mines. Some countries have resorted to trials using various animals. It appears, however, that no success in pursuing these methods has been recorded.

AFGP-2002-000032-0206

Sensors

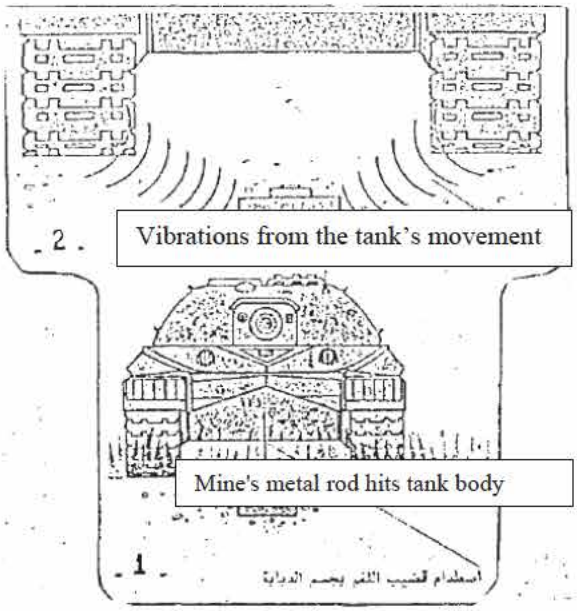
Mines can be actuated by various and numerous triggering effects. The most satisfactory of these actuators is simple pressure, whereby a tank passes directly over the mine which has a built in spring that pushes the ignition pin inside the detonator to explode the mine. An improvement was introduced to this system: the detonator is not activated inside the mine as a result of the first tank passing over it, instead it makes it ready to operate. Therefore it does not cause any harm to the first tank when it passes over. However when the second or third tank or the ones to follow pass over, the mine is likely to explode in one of them. This technology is aimed to deter the use of an excavating tank for mine sweeping. It also allows tanks to fall into a trap without realizing a threat.

Due to this equipment's reliance on direct pressure, damaging the tank's tracks and damaging sensing equipment and to target the main body of the tank requires more advanced sensitive sensors.

It is possible to use hydraulic pipes and line them on both sides of the mine to make them stronger, where it requires pressure from both sides prior to exploding the mine. And this necessitates the presence of both tracks over the pipes to make the mine explode entirely below the tank. A tilted arm can be installed, and extended in the air to hit the tank frame which causes the embedded mine to explode under the body of the tank. Some of the more advanced sensors rely on ground vibration that is caused by the movement of the tank as it comes close.

Other types of sensors are used which are sense electromagnetic currents that emanate from the metal body of the tank.

More developments were made also using visual sensors that respond to interruption of its ray path when the tank passes over it. Also, there are infrared sensors that react to heat coming from the tank.



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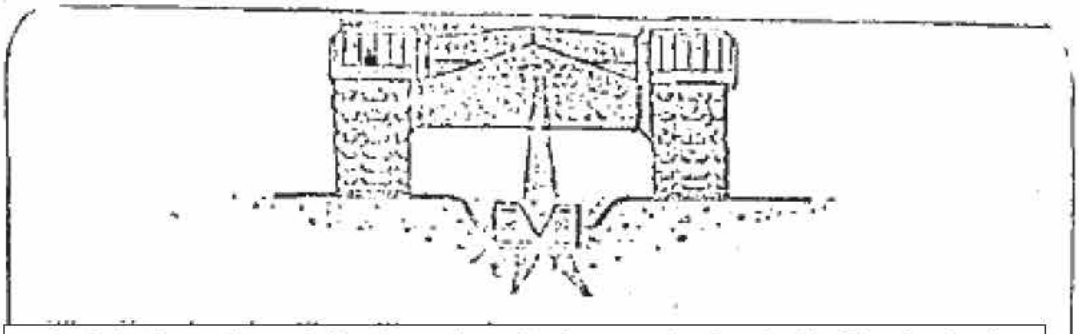
To cause the maximum damage to a tank and destroy it, it is preferred to apply the term known as "Attack from within". This way the mine explodes under the frame of the tank where it impacts the fortified thin part of the undercarriage of the tank causing damage inside it to its equipment and crew. There are other methods where sensors are adapted to connect to cylindrical mines; however using a regular mine is not enough to overcome the opening between the tank's frame and the ground. Therefore, other special types are being used that are fit for these applications, such as mines with hollow charges. This type has been adapted for being more effective in impacting the tank's frame, and penetrates the tank's bottom to destroy what is inside. We chose the hollow charge mine since it "jumps" across the distance that separates the tank's frame from the mine. Actually, the space in between allows the penetrating mine to be more effective and improves the penetration process. All the angles and the depth of the cone were designed to make the hollow charge deliver wider impact with less strength, enough to penetrate the undercarriage of the tank without affecting the sides. However, when burying this mine in the ground, it is necessary to allow for a two stage explosion, the first to remove the sand covering the mine by pushing it away, followed by a split second delay to explode the penetrating mine that now has a clear path to reach its target.

Other types of these mines have been designed to be used on the sides of roads and deliver an impact relatively similar to long range mines, or what is known as **[TC: Illegible]** which has the same strength and impact.

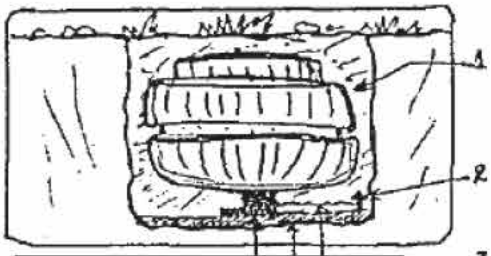


A sketch showing a tank over a hollow charge mine. Notice the sensor tubes along the side of the mine whereby it does not explode until the tank passes over these tubes and does not explode until the tank is on top of it.

AFGP-2002-000032-0208

Booby-trapping Mines

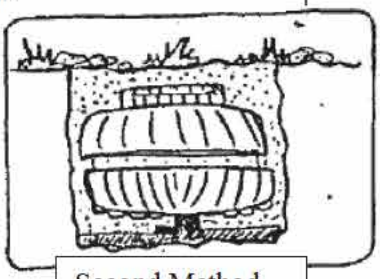
Booby-trapping is done using igniters. The goal here is to not allow the enemy to lift the mine and use it when they discover it. The following are the different methods of booby-trapping:



1. Charge
2. Wedge to hold the pull string
3. Pulling string
4. Stone block
5. Igniter

First Method:
Pull Igniters: Similar to Chinese Mine type (TC 36), if the mine is found by the enemy and pulled out, the string that holds the igniter is untied and the mine explodes.

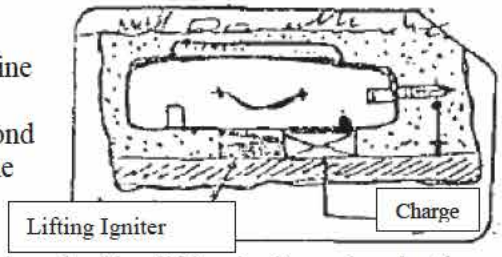
Second Method:
Two mines are used here, a small one and a big one. This method uses an igniter that ignites by lifting, whereby the weight of the mine prevents the explosion. Once the mine is lifted, the trigger is released and hits the capsule which detonates the small mine and then detonates the big one. This is much more dangerous than the first method, since the person who places the mine is not in a position to secure the mine.



Second Method

Note: Since this is a dangerous process and calls for caution and skill, one should be careful when placing the mine with the detonator underneath it, securing it well in the hole, then pull gently and carefully check the wire that secures the igniter, then the mine will be ready to explode. Once pressure is applied on it by a vehicle or a tank, or whenever it is found by the enemy, it will explode.

Third Method:
Uses a pulling igniter and an external charge, once the mine is lifted the igniter triggers and the external charges explode, and the mine explodes by chain reaction. A second igniter can be added by moving the lifting igniter from the side as shown in the sketch.



Fourth Method:
Uses personnel mines, placed under the big mine and equipped with a lifting igniter, whereby the mine explodes at the time of lifting the big mine which explodes consequently by chain reaction.

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Minefields

Introduction:

A- Protective Mine Fields: these are employed to prevent the enemy penetrating through defense locations. It is considered a duty of all units and falls under the control of a regiment or higher.

B- Defensive Mine Fields: used to prevent the enemy from penetrating the main defense line, and placed by the Corps of Engineers in case the units cannot do so. It falls under the responsibility of a brigade or higher.

C- Tactical Mines: used to disrupt the enemy's maneuvering and forcing it to retrieve and move to locations chosen by friendly forces. These are deployed by the Corps of Engineers and this task falls under the command of the regiment commander in charge.

D- Deterrent or Scattered mines: these are placed at small locations for the purpose of deterring the enemy from coming close to a certain location. It is not necessary to cover such location with fire. The mines should be skillfully hidden and should not be surrounded by fencing. You can use booby-traps whenever possible. These are deployed by the Corps of Engineers if the units are not able to deploy them, and the Army Command in charge.

E- Skeleton Minefields: used in areas of land to deceive the enemy into thinking a minefield is there. These dummy minefields are fenced off like a real minefield.

F- Responsibility of employing, placing and recording minefields: this is the responsibility of all units. The Corps of Engineers is responsible to provide training, guidance and technical support. If it is not possible to be carried by the units due to emergencies, then the Corps of Engineers is next in command.

AFGP-2002-000032-0210

Minefields

A minefield is an area of land used to plant regular or irregular anti-tank or anti-personnel mines or both. A minefield is considered one of the biggest deterrents employed widely during WWI and WWII. Germans excelled in using them and employed creative and imaginative methods because of their technical industrial advancements as well as the establishing of specialized institutions to develop minefields and methods of placing them and teaching the methods. Other armies followed in the footsteps of the Germans' methods in placing minefields which became a vital element of preparing the land for defense and significantly impacted the methods of fighting in all wars that broke out after WWII.

The significance of employing mines compared to artificial deterrents became popular due to its low cost, the ease and speed of use and the ability to deter major attacks and deter infiltration of small units, in addition to its tangible effects and impact on the morale of the attacking forces during the attacks and pursuing the enemy. Minefields are used during attacks to protect a front or for force maneuvers at the front after occupying territory. They are also employed by the advancing forces while crossing bridges to protect against opposition attacks. Paratroopers also use them to protect themselves from surprises; however the main use of minefields is for defense and in fighting while retreating. In the later, the purpose is to delay and prevent the enemy from aggressively advancing and pursuing friendly forces. However, a minefield achieves the maximum results against the enemy and protects friendly forces itself from falling into the friendly minefields when armies apply certain technical and tactical rules.
Tactical Rules as follows:
1- Creativity and initiative when planting minefields.
2- Coordination of minefield with natural and artificial surroundings.
3- Camouflaging and booby-trapping of minefields to achieve maximum surprise.
4- Providing adequate depth for minefields and placing them ahead of the front defense line and in the midst of the defense area.
5- Covering minefields with anti-personnel and anti-tank fire.
6- Placing minefields in locations that do not hinder communications between troops and allow maneuvering and countering attacks.
7- Provide self-protection for the anti-tank minefield through support of anti-personnel minefields. The less the vulnerability of attacking anti-personnel minefields with anti-personnel fire, the more the need for such measures.
8- Using different means of deceit when choosing the location of the minefield.

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Technical Rules as follows:

1- Keep mines away from each other at a distance of 5 – 6 meters to avoid mines from exploding when other nearby mines explode and to prevent enemy tanks from detonating a large number of mines. To maintain secure distances between mines they should be placed in a chess checkerboard form.

- Mines are planted in the field at 4 – 8 sequential lines, where the depth of the field is 50 meters.

- To increase the density of the minefield, increase the number of lines instead of decreasing the distance between the mines or the lines.

4- Mark the minefield to allow friendly sectors, when need arises, to determine the location of the minefield, and the spot of each it its mines, by drawing a map delineating the minefield with respect to prominent landmarks and on the military map. Specify numbers, rows of minefields, distance between those rows **[TC: Illegible]** row, number, and type of mines used, implanted booby-traps, **[TC: Illegible]** previously opened gaps in **[TC: Illegible]** the friendlies.

- Define the external perimeter of the minefield in a way to ensure that friendly **[TC: Illegible]** do not enter the minefield by mistake. For impact on **[TC: Illegible]** of the enemy, use certain means and markers that do not attract the enemy's attention and which cannot be noticed except by those who put them there. When the enemy is some distance away, the outside perimeter should be defined by **[TC: Illegible]** barbed wire (concertina). Deep within the defensive area, the field is to be surrounded by a fence with protective red triangles every 6 meters and by writings and danger signals indicating the presence of mines. It is imperative to deceive the enemy's agents by not making the boundary fence correspond to the minefield. Have a boundary fence around fake minefields. As for concealing fencing from hostile aerial surveillance, that is done by using the topography, erecting the fence over lines of the land that are embodied in the aerial image.

A–3

AFGP-2002-000032-0212

Planting Minefields

Anti-personnel minefields are planted ahead of the advanced front defense anywhere infantry personnel could infiltrate. They are also planted in the heart of defense areas where paratroopers may come down.
Anti-tank minefields are planted ahead of the first front defense line at the heart of the defense area and around closed support points, or the openings in between. They are also planted at airports, landing runways and abandoned landing areas or the ones that we or the enemy have withdrawn from.
At a friendly river shore or the shore that is being defended, it is important to defend since minefields tend to hinder both the friendly and the enemy's maneuvering. Therefore, it is important to plant it in such a way to ensure that the implementation of the overall defensive maneuvering is done the best possible way and in accordance with the defensive plan of the higher command.
Due to this, the control of identifying the location and the depth of traditional minefields is left in the hands of the commander of the larger unit (Corps or Division).
With regards to scattered mines that are planted temporarily, it is left up to the higher command of the unit's commander at a brigade or battalion level. Commanders of smaller units rarely have the power to give orders to plant mines and in case of total isolation from the higher command.
Mines are planted in regular fields in parallel lines at 5 – 7 meters apart from each other. The usual number of field lines is 8 lines, and 4-5 mine lines ahead of the rapid field. Several methods are used in planting mines; they vary according to existing scientific conditions and the nature of the field that will be planted, and the type of mines that are being used.
The following are the most important methods to plant mines:
1- Rapid planting on foot.
2- Planting by a net (10 x 12 meters) which has openings that specify the location of a mine by foot and the vehicle.
3- Using boundary rope that has rings.
4- Planting in a star pattern.
5- Automatic planting by special mine planting vehicles.

Regardless of the method used for planting, it is necessary to record it accurately in detail and to duplicate and archive the record at the army command.
Mines are usually affected by weather conditions; they may lose their sensitivity or become less effective in destruction. This makes the minefield lose part of its effectiveness, in which case the defense divisions resort to supporting the field with additional one, two or more lines of mines. The number of lines is subject to the rate of loss in effectiveness that the field suffers. Artillery forces resort to the same method if the enemy shells the minefield

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by tanks and blows up some of the mines hence defeating its effectiveness. Or if wild animals enter the minefield and detonate some of the mines (especially the anti-personnel mines).
It is insufficient for friendly forces to plant just one minefield ahead of them in the case of long term defense, or when armored attacks are more immanent. They must plant subsequent fields that cover 200- 500 meters. Armies have used this method during the World War during defense in the desert, plains, or in risky locations of normal territory.

The group sergeant makes 3 average steps, not short or long, along the lines, then points with his right hand toward the right in the enemy's direction, then No (1) of the group moves 3 foot away in a direction completely parallel to the delineating strip. Once No (1) gets close to the sergeant, he can place the mine on the ground, then the sergeant moves 3 feet and stops to point his left hand toward the left (in the direction of our forces). The first person of the group advances on the left side until he gets beside the sergeant and places the mine in the ground. This process is repeated as mentioned earlier, where a mine gets placed once to the right side and once to the left. The distance between every 2 mines should be 6 feet, whether in the direction parallel to the line or its vertical direction.
When you are done stacking these mines, go back again to the nearest mine cache to bring another load, and lead the group to repeat the work as mentioned. The other two engineers start working directly behind the stacking individuals by placing the igniters in the mines and leaving them secured. They should continue until the process of stacking the mines is completed over the whole band. The mines that are stacked will be considered the center of the group of mines which are usually anti-tank mines. If you must stack a group of anti-tank mines and anti-personnel mines, the sergeant should order the stacking group to bring the anti-personnel mines from the cache and notify the group of the required number and type of mines that has to be stacked by the groups. The stacking group takes the mines and stacks them around the anti-tank mines the same way as mentioned earlier. The sergeant then comes over and adjusts the anti-personnel mines forming the groups as desired, provided these groups are different from each other and place tripwire next to the mine which has to be connected to a booby-trap by placing it upside down.

AFGP-2002-000032-0214

Responsibility of laying, lifting and recording booby-traps

The Corps of Engineers is in charge of the laying process or it has to be carried under their supervision or by specially trained units. However, the responsibility of removing and clearing the mines remains the sole responsibility of the Corps of Engineers.

Concealing mines and the depth where they are placed

A- If mines are to be placed on the ground surface, the color has to be identical to the nature of the ground; this is not applied except in rare occasions.

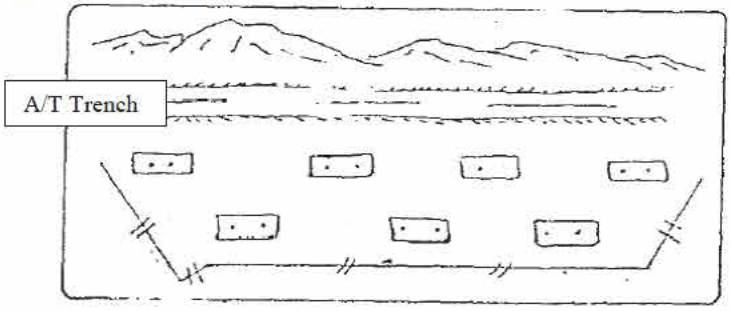
B- Placing mines below the ground surface helps greatly to conceal them. The depth where the mines are placed depends on the hardness of the ground. If the ground is soft, the hole should be the same size as the mine and a layer of 1-2 inches of soil should be placed on top of it. If the ground is hard the hole of the mine should be a bit bigger and a layer of 2-3" gets placed on top.

Where to plant Minefields

1- Choose unavoidable passages – roads.
2- Public roads.
3- Low terrain in rivers and shallow swamps.
4- Grounds fit for the advancement of the enemy's tank s and equipment.

Conditions for constructing Engineering Barriers

1- It should be versatile (anti-personnel and anti-tank) with trenches and traps.
2- It should be of gradual depth (density and depth).
3- It should be hidden and concealed (surprise factor).
4- It must be protected by friendly forces' fire cover.
5- It should not affect the movement and maneuvering ability of friendly forces.
6- Gaps should be known to friendly forces.
7- Carry out periodical inspections to ensure validity.



A–6

AFGP-2002-000032-0215

Pay attention to the following during planting:

1- Mines do not explode by chain reaction.
2- Ensure the complete safety of the person planting the mines.
3- Try to achieve the highest level of casualties in personnel and equipment of the enemy.
Individuals operating in minefields should be distributed properly by maintaining safe distances between them, so in case a mine blows up it does not go beyond the person operating it.
4- Pay close attention to:

A- Hide the mine under 1cm of topsoil.
B- Throw away the excavated sand or spread it evenly.
C- Concealment should suit the location.
D- Do not leave any trace of mine parts, such as mine covers or safety latches.

Where to expect mines

1- Locations where equipment and personnel make their advance.
2- Crossroads and intersections.
3- Roadsides.
4- Places adjacent to exposed locations and buildings.
5- In and around potholes in the road.
6- Shallow places and locations by rivers.
7- In front of road mileage signs.

A-7

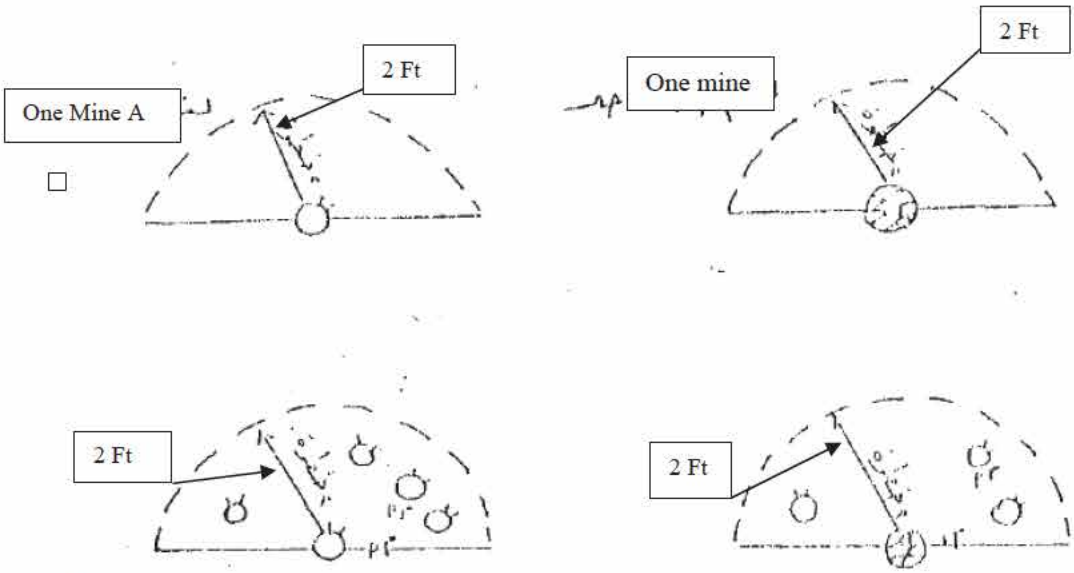
AFGP-2002-000032-0216

Laying Minefields (American Method)

Introduction: The American army came out with a way to lay mines which is currently adapted by NATO countries. This way is known as (planting by utilizing the groups, where a planting unit is made of one mine, or several mines being a single group and termed a mine cluster).

Definitions:

A- MINEFIELD: An area in which explosives have been placed for anti-personnel or anti-tank purposes or a mix of both.
B- Group (CLUSTER) of mines: the basic mine-planting unit. Groups may be anti-personnel, anti-tank, or a combination (illustration 1-2-3)



M/A Mine, multiple no more than 5

Mine/M One + Several mines
M/A inside half circle, Dia=2ft
2 Ft from the mine center M/D

Mine Cluster Illustration (1-2-3)

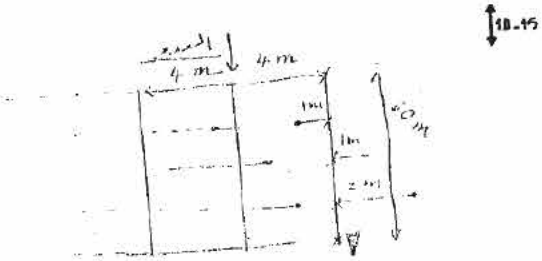
A–8

AFGP-2002-000032-0217

Planting Mines the Russian Way

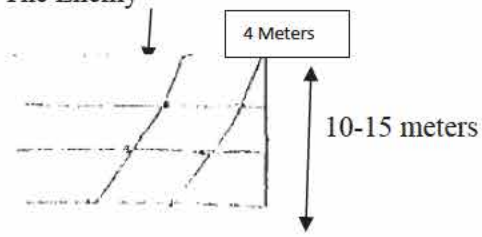
1- Planting using vertical rope at the front:
An indication of the use of the Russian method, which is done by 7 people, is a rope that has a knot every 15 meters. The first person takes the rope between his legs and walks till he reaches another knot while carrying a stick 4 meters long.

Field Sign (Mark)



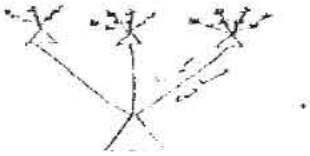
By dropping we know the density of the field. Point markers are taken and are depend on the type of field.

2- Planting using a rope parallel to the front:
The rope has a knot every 4 meters.
The Enemy



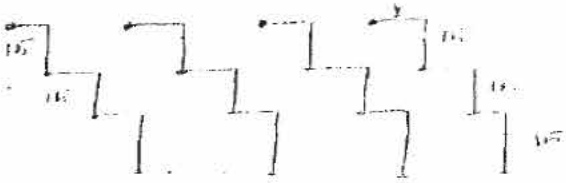
The American Way

Secondary sign



Main sign

Planting is done by group, each person has 4 mines



Ladder Method

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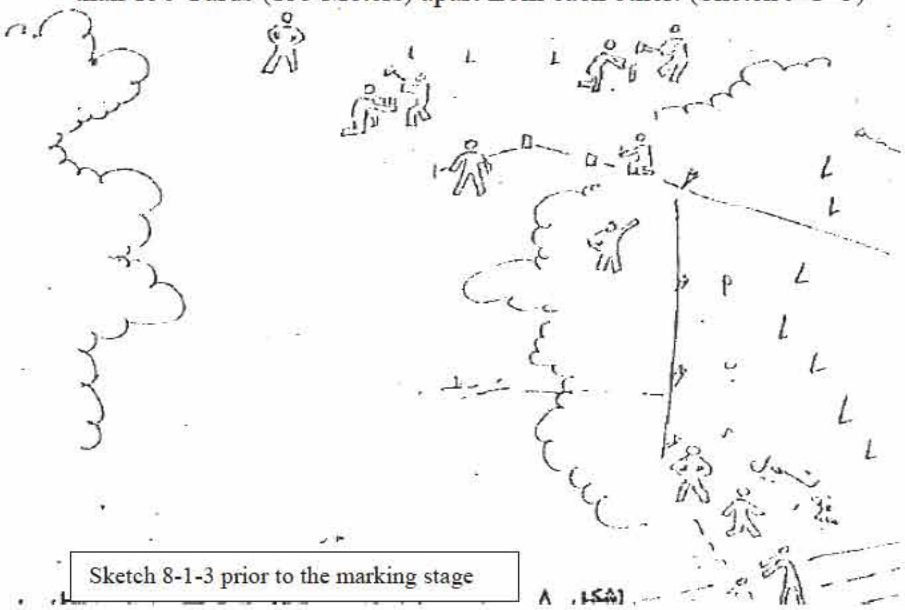
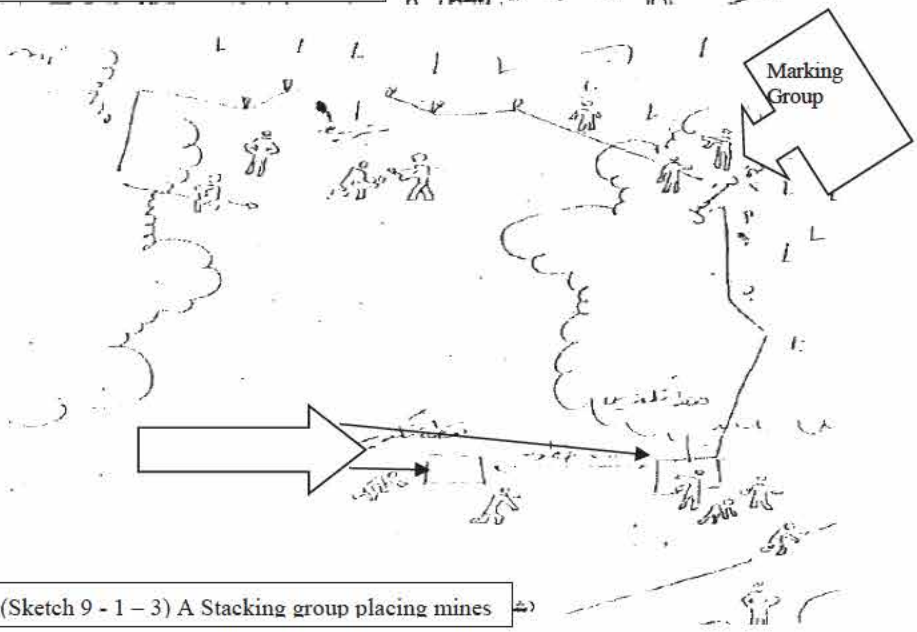
3- As the surveying team move forward to do their work, the recording team follows to record the required details in the registration form that will be implemented on the ground once the marking and allocating process ends. (Sketch 8-1-3).
4- During this time the lining team will be placing the mines in the field at distances no less than 150 Yards (135 Meters) apart from each other. (Sketch 9-1- 3)



Sketch 8-1-3 prior to the marking stage



(Sketch 9 - 1 – 3) A Stacking group placing mines

A-10

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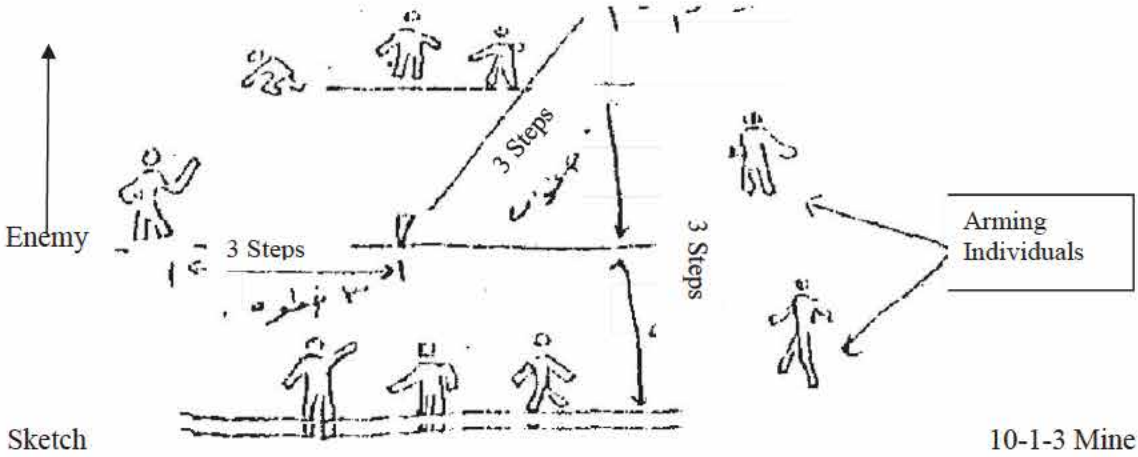
When the mentioned work is carried out, the three lining groups resume their work by placing a strip of mines once they identify the types of mines within the strip, the location and the number of gaps that have to be left in the field, as well as distances between the gaps.

Once the registration tape identifies a strip of mines, the sergeant in charge of the lining team employs the whole group as mine planters except for two individuals to load the mines that are being lined up.
Then, the two members and the planting group head back to the cache of mines, each of them carrying the mines that will be placed in the field. The weight of mines to be carried is subject to the type of mine that the team will be placing in the field. Usually it does not exceed 60 lbs. carried by each person if it is an anti-tank mine, or one case if they are anti-personnel mines. The igniters and explosives are carried by the two charging individuals in a special suitcase which makes it easy to protect.
5- Once the team's sergeant ensures the planting personnel had carried the required number of mines, he then walks to the line. The planting team is dived into two groups, each 3 feet apart on both sides of the line, as illustrated in sketch (10-1-3), with the two arming individuals behind them.



Sketch 10-1-3 Mine

Lining by Group.

The sergeant reorganizes the lining group to remove the delineating strip to remove the bags and any indications of mines in the field; and leads the team to a safe area across the field if available, or leads them to the side to the assembly point and submits a report to the platoon's leader for the work that has been carried out. The platoon leader may assign a different task to the team as needed.

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*Conditions for placing vertical wires in the groups (Sketch 11-1-3).

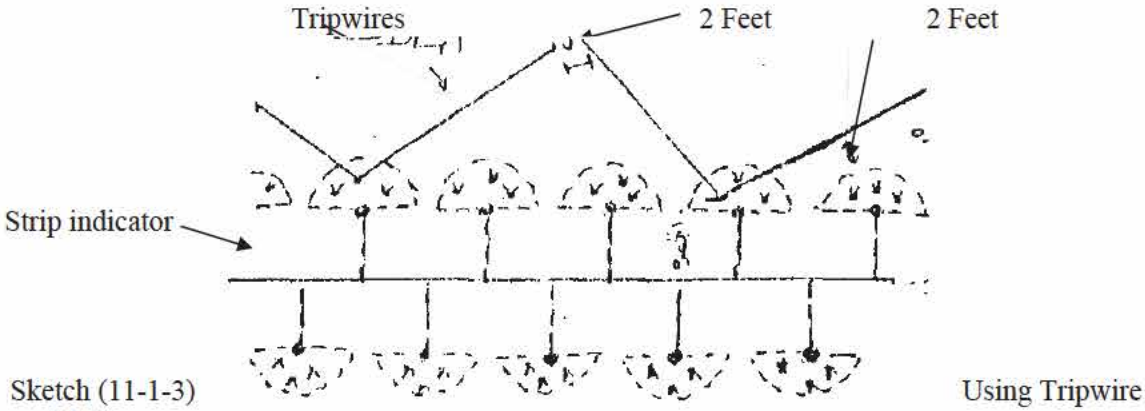
A- Mine at location 2 is armed by charging only.

B- Vertical wires should not be closer than 2 yards from each other.

C- Vertical wires should be less than 10 yards away from the lining belt.

D- Vertical wires should not be closer than 2 yards

E- Vertical wires should not be vertical toward the direction from which the enemy is advancing.

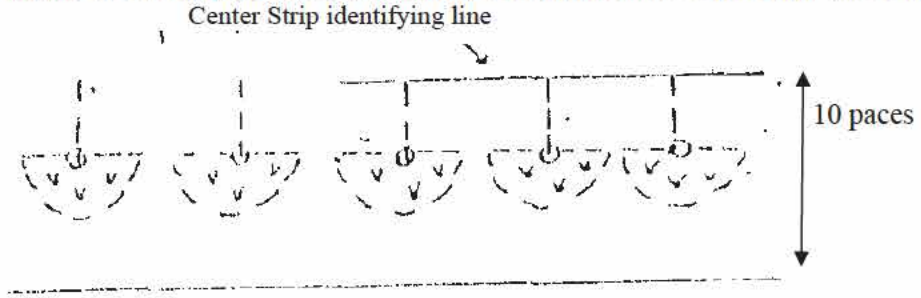


Sketch (11-1-3) with Groups

Using Tripwire

Safety Measures:

A delineating tape should be placed behind each delineating strip in the ground and removed at the end of the process. This is known as the Safety Line to allow individuals to walk over it during the lining process, 10 yards away from the middle of the strip. (Sketch 12-1-3)



Safety line 10 paces to the rear.

Sketch 12-1-3 extent of the safety line from center mine strip.

*Number the groups of all strips as shown in (Sketch 13-1-3). Note that bands must not be closer than 18 paces from each other.

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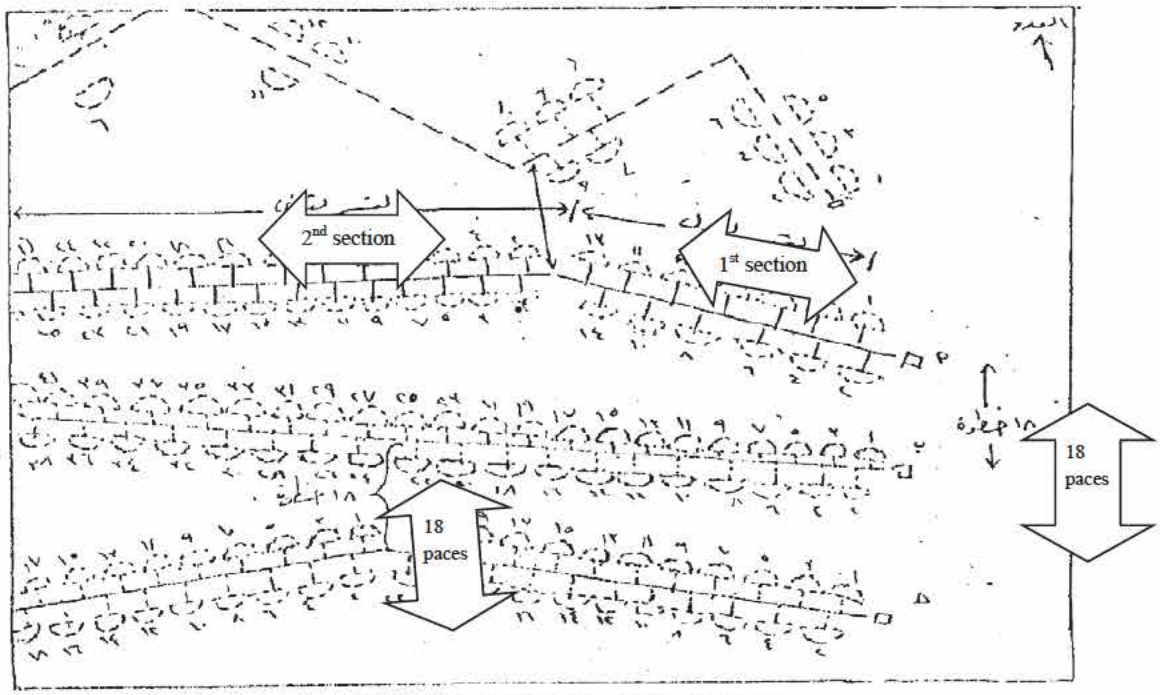

(Sketch 13-1-3) Numbering Mine Line Groups

Minefield Equations

When we examine a simple minefield consisting of pressure-actuated mines for severing tracks of battle tanks, spread in a traditional pattern, it is then possible to arrive at a mathematical formula that determines the arrest rate of the minefield. This is the degree to which the minefield stops enemy tanks. Let us suppose that a tank approaches a minefield in a normal way and at random. There is a likelihood of collision with a mine by one track of a tank passing over a mine of the first row of a minefield. If we assume that the width of the tank track is x, and the interval distance between mines is L, we would thus find that the probability rate is $(x - L)$. Usually, however, the tank moves by two tracks, so the probability rate becomes $(2x - L)$. This is with the assumption that the ignition fuse and the explosion rate of the explosive material inside the mine reach 100% efficacy. In practice, mines that have been placed for some period of time do not reach this rate of efficiency. If we use B for the efficiency of the igniting fuse, and B2 for the effectiveness of the explosives, the formula for the possible collision will be as follows:

$(2x * B * B2) \div L$

In practice (B * B2 usually reaches 0.75).

Therefore, the probability of the tank not colliding with a scattered mine in the first row can be calculated

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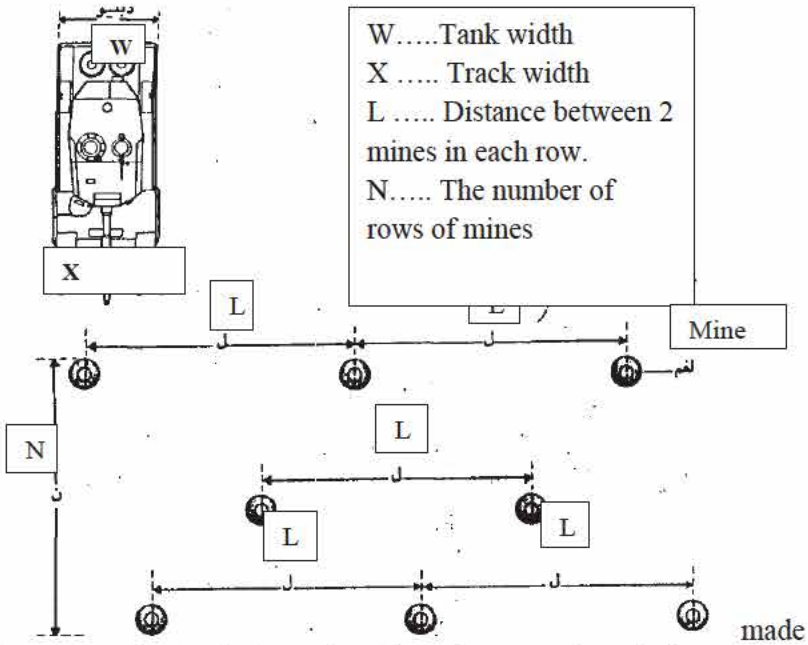
with the following equation:
1 – ((2 *x* * B * B2)÷L)). Likewise the possibility of the tank not clashing with the mine in the first or second row:
2 * ((2 *x* * B * B2))÷L))
We can calculate this for the number of rows of mines that the field is made of.
Therefore, the ultimate possibility of the tank to cross over the rows (N) in a minefield, or the likelihood of stopping the tank is:
1 – (((1 – 2 *x* * B *
B2) ÷ L)) x N
That is referred to as the preemptive force of the minefield. Most minefields have been designed to provide a preemptive force reaching (0.7). If a tank approaches a minefield at a 90° angle at random, it has a 30% chance of passing through, or in other words if 10 tanks move side by side approaching a minefield, it is likely that 7 out of 10 will be stopped. If the tank approaches the field at a 90° angle, that is different from the existing one, then the chances of passing through become less, due to that.



The above drawing illustrates a minefield made of three rows (N). Distance between each mine is (L). When the tank passes through the field at a 90° angle, the possibility of colliding with any mine is subject to several factors, most important of which is the width of the tank's tracks (X) and the distance between the mines in the field. Note that the chances of the tank escaping decrease whenever the tank passes across the mines outside a 90° angle.

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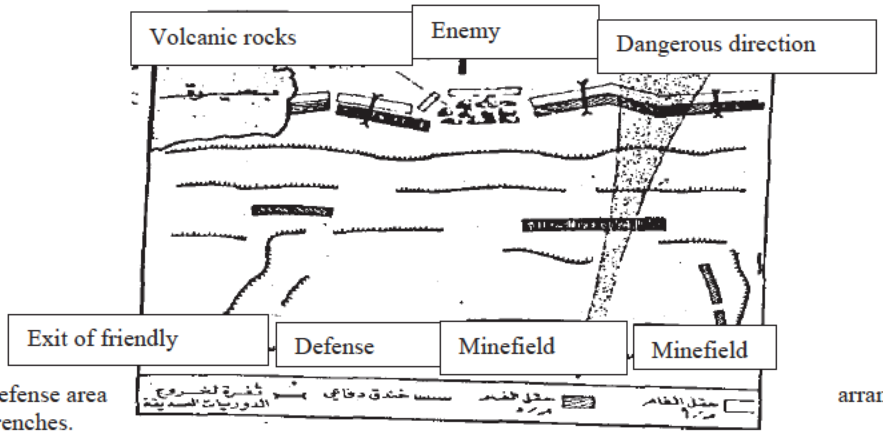
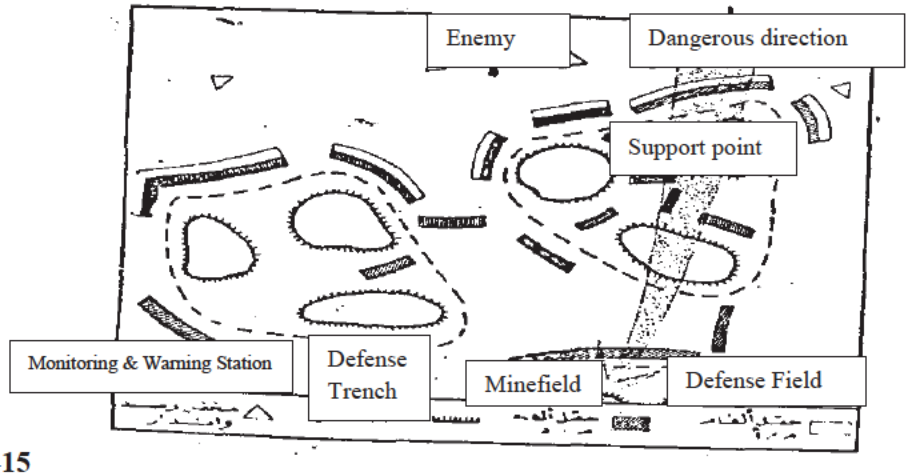
Density of Minefields

The density of a minefield is measured by dividing the number of planted mines at a certain front across the width of it in meters. The density in a quick mine field is one mine in every 1 meter across the width of the field. But the density in a traditional field averages at 1.5 – 2 mines/meter. The density when planting successive minefields close to each other that are suitable for maneuvering tanks may reach 6-10 mines/meter. To measure the density of a specific minefield in a certain frontier, it is calculated by dividing the number of mines planted in successive fields found within the defense area by the width of each front in meters. Of course, this density is not the same in every area of the front. It increases at major weak points where enemy armor may penetrate and to a lesser degree at secondary locations.



Minefields in defense area arranged by connected trenches.

Minefields in the defense area arranged by closed support points



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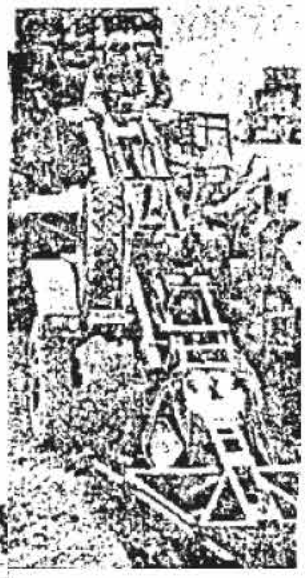
AFGP-2002-000032-0224

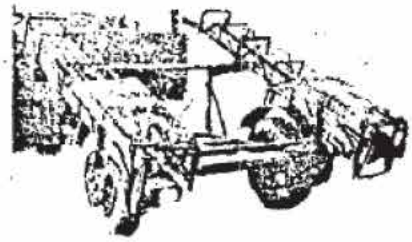
Soviet Union:
Towed Mine Planting Systems type BMR-2 and BMR-3 t, BMR-4.

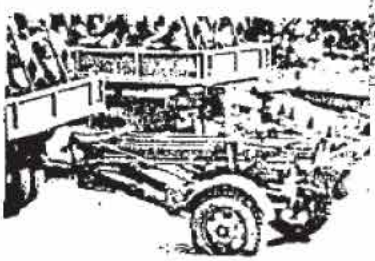
Mine Planting system BMR-2 is a 2 wheeled armor trailer made of two tilted Z shaped chutes. The upper part is made of a hopper with a wide opening that anti-tank mines are dropped in. The mines slide down below to a carrier connected to twin tubes on a mechanism that plants the mines apart from each other at a distance of two to four meters apart.
BMR2 or BMR3 planting system is pulled by an armored personnel carrier type BT2R -152 (6x6) that has been modified specifically to carry anti-tank mines type TM120-46 or similar. One fully loaded armored vehicle type TR-152 carries 120 mines to plant in a minefield of 0.5 kilometers at 4 meters apart in 5 minutes.

BMR-4 Mine Planting System is identical to BMR-3 but has the capacity of planting 200 mines.

Specifications:
Type: BMR-3 Crew: 4 or 5 people
Length: 3 meters Width: 2 meters
Height: 2.5 meters Wheel Size: 7.50 x 20
Distance between mines: 4 – 5.5 meters
Landfill thickness: 300-400mm (Soft sand)
Operation Speed: 4 -10KM/hour for surface planting of mines
2 – 3KM/hour mines planting.
Planting Rate of Mines: 10-12 mines a minute.
Reloading Time: 10-12 minutes.
Made by: Arms production facilities in the Soviet Union.
Countries in Use: Used by Warsaw Pact and other countries.







BMR3 Mine Planting Equipment

AFGP-2002-000032-0225

ITALY**:**

Mine Scattering Laying System (DAR)

This system provides for manual and mechanical dropping of anti-personnel type TS-50 mines, or MATIS anti-tank mines or both. The system is made of two main sections, the first is the programming computer connected to a screen of a measuring system found in the helicopter which carries the system, and the automatic dropping system.

If planting an anti-personnel minefield, mines are dropped off in a cluster of 80 mines, in groups equal to 8 anti-tank mines, and an amount of 4 anti-tank and 40 anti-personnel mines of both kinds. The ideal flying altitude is 100 meters at speed of 200KM/Hr.

Specifications:

** Capacity of Anti-personnel Mines:
Made of: Steel
Length: 280cm
Width: 145mm
Height: 910mm
Empty Weight: 8kg
Capacity: 40 anti-personnel mines type TS-50

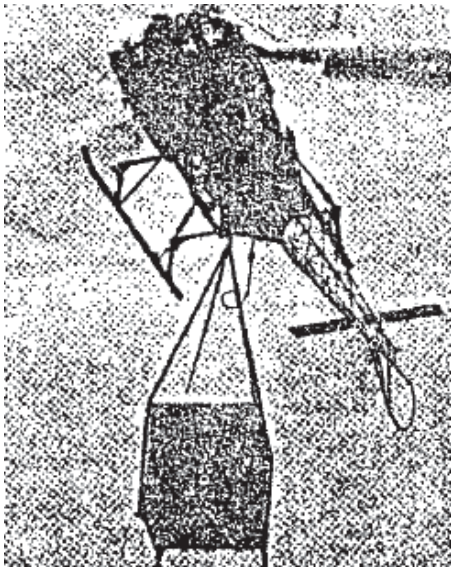
** Capacity of Anti-tank Mines:
Made of: Steel
Length: 290mm
Width: 200mm
Height: 910mm
Empty Weight: 11.5kg
Capacity: 8 anti-tank mines type MATTIS.
Where used: Italy
Factory: Technovar, Italy

AFGP-2002-000032-0226

ITALY**:**
Scattered Aerial Mine laying System for anti-personnel and anti-tank mines type (SY-AT) is made of a primary distribution unit and 2 secondary units.
Mines are dropped off through an opening in the bottom of the distribution system. The opening can be opened using programmed timing or manually by pushing a button on the control panel of the helicopter. The safety system prevents the opening of the hole until the helicopter reaches the target location.
The primary distribution unit has 32 magazines which contain 2496 anti-personnel mines or 160 anti-tank mines. The two secondary distribution systems are connected with clips on each side of the primary system. Each is made of 8 magazines contain 624 anti-personnel mines or 40 anti-tank mines, or a combination of both. The whole system carries 3744 anti-personnel mines or 240 anti-tank mines or a combination of both.

Description:
**Capacity of Anti-tank Mines:
Weight Empty: 3.5kg
Weight Full: 19.5kg
Number of Mines: 5 type ASB – 81 mines
Dimensions: 246 x 110 x 1142mm

**Capacity of Anti-personnel Mines:
Empty Weight: 3.6Kg
Full Weight: 15kg
Quantity: 78 of type SB-33 mines
Dimensions: 246 x 110x 1142mm
Primary Distribution Unit:
Empty Weight: 150kg
Gross Weight with Anti-tank mines: 774Kg
Gross Weight with Anti-personnel: 630Kg
Capacity 32 magazines each contain 5 Anti-tank mines or 87 anti-personnel mines.
Dimensions: 1545 x 1320 x 1380mm



Anti-personnel & Anti-tank Mine Distribution System
Secondary Distribution Units:
Empty Weight: 35Kg
Weight loaded with anti-tank mines: 191kg
Weight loaded with anti-personnel mines: 155Kg

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Capacity: 8 magazines each contain 5 anti-tank mines or 78 anti-personnel mines.

Whole Unit:
Empty Weight: 220kg
Weight loaded with anti-tank mines: 1156kg
Weight loaded with anti-personnel mines: 940kg.
Capacity: 48 magazines each contain 5 anti-tank mines and 78 anti-personnel mines.
Dimensions: 1545 x 2119 x 1380mm
Factory: MISAR Company, Italy
Countries used in: Italy, Austria, Greece.

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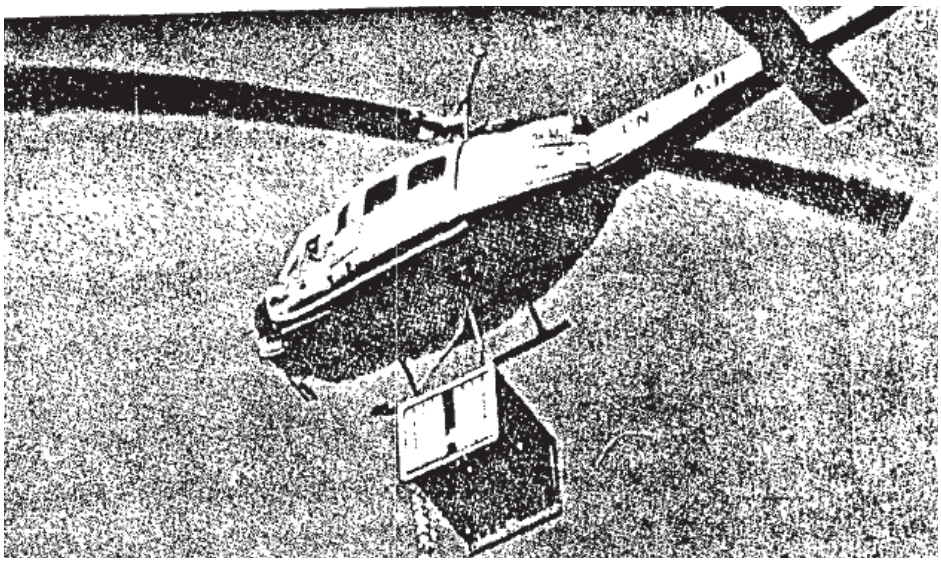
ITALY:

Mine Scattering System Type VS/MD

This system was designed for the scattered dropping of mines, either 2080 anti-personnel mines or 200 anti-tank mines at various rates. The system is made of two main sections:
Control panel found on the helicopter and the mine distribution system.
Anti-personnel mines are dropped off in clusters of 52 mines, and anti-tank mines are dropped off in clusters of 5 mines at a time. The mine distributor is tied with clamps in the middle of the helicopter by hemp belts with steel rings.
The control panel may be installed on the side of the helicopter or in any convenient spot. The system is designed for manual and automatic scattered dropping. It is operated by a control panel connected to a transistor that opens the doors at 0.1 to 0.6 second intervals. The helicopter usually flies at a height of 200 meters at a speed reaching 100km/hr.
Specifications:

Loaded Weight: 930kg Empty Weight: 240Kg
Length: 1.7meter Height: 1.7meter Width: 1.6meter
Countries used in: Italy, Greece, Egypt, Libya.
Manufacturer: Valilla company-Italy

Mine Scattering laying System Type VS/MD



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AFGP-2002-000032-0229

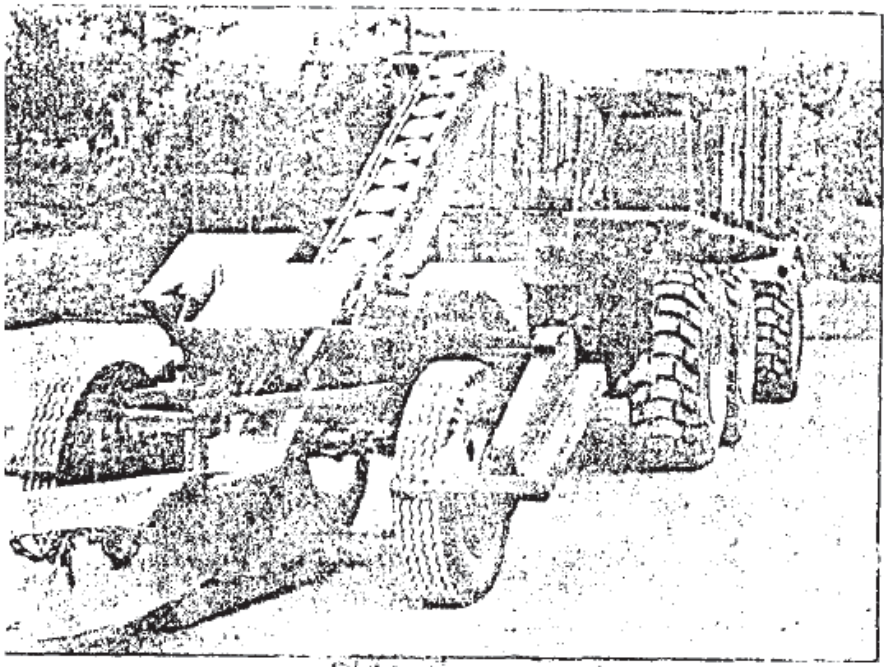
SWEDEN:

Mine Planting System Type (FFV)

This system was designed to be used specifically with the anti-tank mines (FFV28). The system was developed and produced in 1976 and used by the Swedish Army.

This FFV system is able to plant mines on the ground's surface or buried at 0.25 meter deep, at distances of 3.5 to 13 meter. The maximum planting capacity is 20 mines a minute at an operating speed of 7Km/hr. The system pulls the safety pin of the mines and places them on a slanted conveyor. Then it buries the mines and covers them with sand. The system can be towed by any military vehicle.

Specifications:
Crew: 2 – 4 people Weight: 1200Kg
Length: 4.2 meters Width: 2.4 meter
Countries used in: Sweden, Norway, Holland.
Factory: FFV Company, Sweden.



Mines Planting System FFV

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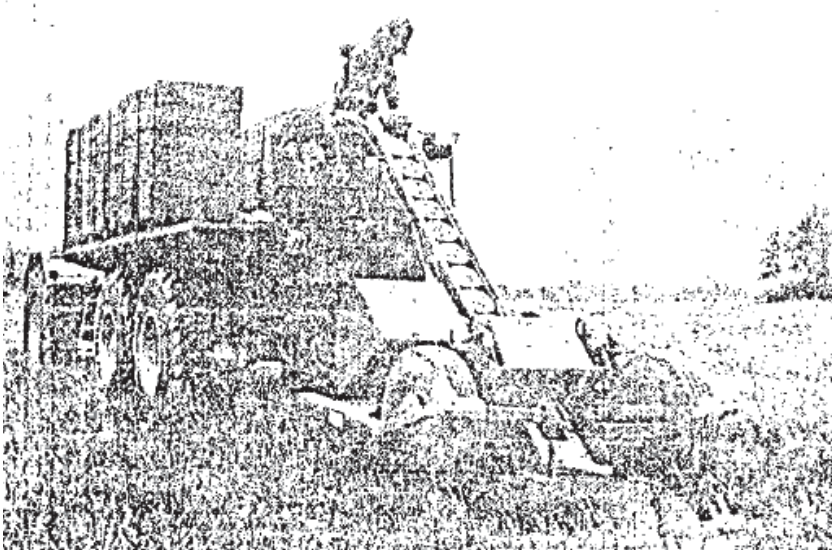
FFV Mine Planting System



FRANCE:

Mines Planting System (Type ARE)

This system was especially designed to plant anti-tank mines.
This system is loaded on a 4-ton trailer or on a tractor trailer that carries the crew and the mines.
A crew of 4 people is required to operate the complete system: commander, 2 mine loaders and a driver.
The system digs a groove in the ground, and plants the mines then brings back the topsoil to where it was. Mines may be planted on the ground surface if needed. HBD mines can be buried to a maximum depth of 150mm and at distances of 2.5, 3.3, and 5 meters apart. The maximum speed it reaches is 900-1500 mines/hour.
Countries used in: France, Germany, Iran, Iraq.
Description:
Weight: 1700Kg.
Length when moving: 4.36 meters
Length when operation: 4.5 meters
Width: 2.23 meters
Height: 1.7 meter
Maximum towing speed:
Road Speed: 80km/hour Planting Speed: 4.5km/hour
Factory: Crusoe Company, Loire, France.

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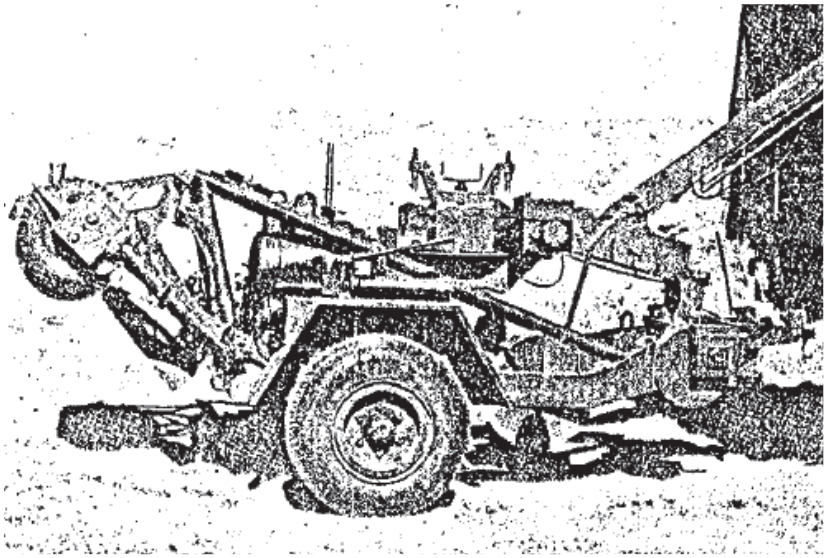
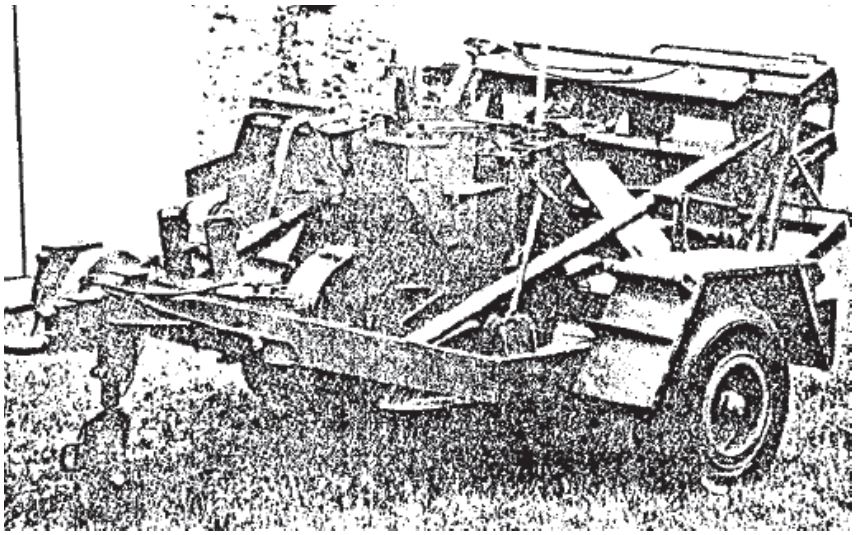


Plowing Mine System Type ERE



Plowing Mine System Type ERE installed on a truck

AFGP-2002-000032-0232

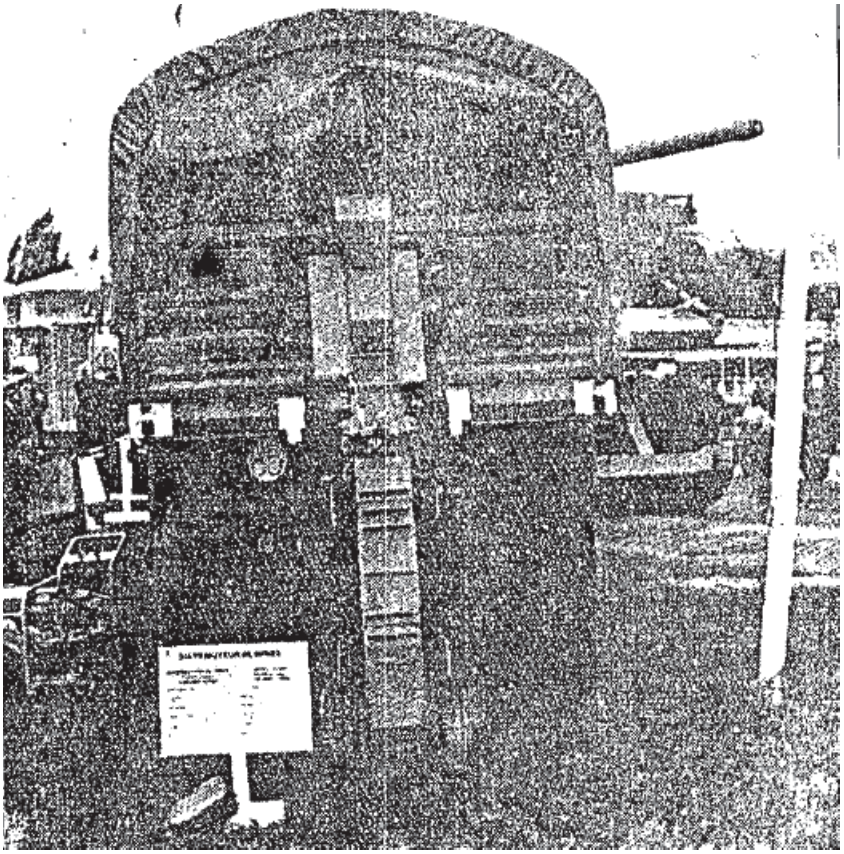
FRANCE

Crusoe-Loire Mines Distributor

The Crusoe factory recently made this minefield distributor for anti-tank mines type (HBD) to meet the needs of the French army. The system can be towed by an 8 wheeled trailer (RVATRM4000) or a similar armored vehicle.
The mine distributor is made of a conveyor that has two wheels underneath. Mines are placed by hand on top of the conveyor and filled by the distributor which ensures the planting of mines at different distances such as (2.5, 3.5, or 5 meter), at different angles and inclinations in any weather conditions. A high planting rate is possible, reaching up to 1000 mines/hour.

Countries in Use: France
Manufacturer: Crusoe Company – Loire City

Crusoe Loire Mines Distributor



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AFGP-2002-000032-0233

FRANCE:

MATINEN Mines Planting System

An 8-wheel self-propelled vehicle that digs trenches, made by MATINEN factory.
This system can operate in rural areas and is capable of planting or burying mines in areas that armored vehicles can be driven in. The system is also capable of placing mines in rivers and stream beds at a depth not to exceed 1.2 meters.

The vehicle carries 4 containers, each filled with one hundred and twelve mines, and a maximum capacity of 476 mines. Mines can be planted in a straight line or zigzag. The distance between mines varies from 2.5 meters to 10 meters. Planting speed reaches up to 400 mines/hour, however when a 3 meters distance is left between mines, the rate increases to 500 mines/hour.

Description:
Crew: 2 Trailer: 8 wheeler vehicle
Empty Weight: 12700kg Loaded Weight: 16,000kg
Height: 7.55meter Width: 2.5 meters
Height: 2.77meter Space undercarriage to ground: 0.5meter
Wheelbase: 3 meters Maximum Speed: 65Km/hour on roads
Average Speed: 50 Km/hour on roads.
Speed using Hydrostatic shifting gear: 3.6Km/hour
Range: 600Km Max Inclination Degree: 50%
Max Side Inclination: 25%
Passing Power: vertical obstacle at 0.5 meter
Submerge in water: average submerge level one meter.
Maximum Submerge: 1.6 meter
Engine: MANN Engine type D2156HM, six cylinders, water cooled and operates by diesel fuel, delivers 215 HP at 2300 RPM.
Tires: Size 16,000 x 25 low pressure
Gearbox: Hydro Mechanical shifting gear
Brakes: Power
Forklift Capacity: 5000kg, 10,000 Kg using special equipment.
Voltage: 24 Volts
Status: In production and being used by the French army.
Manufacturer: MATINEN corporation, Paris, France

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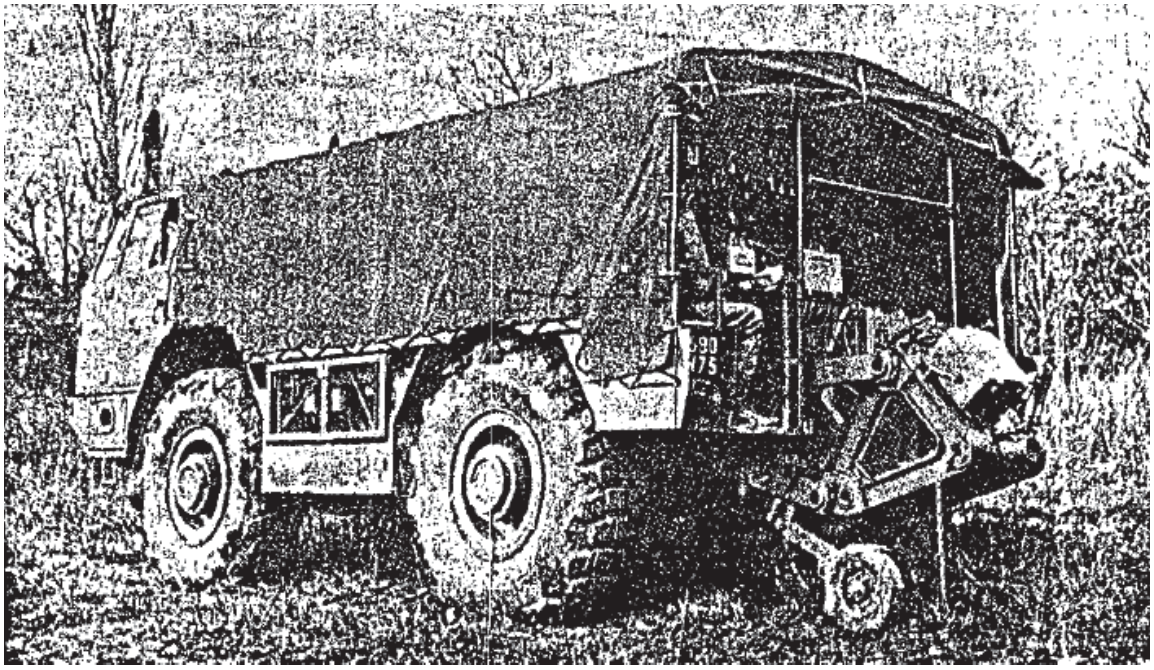

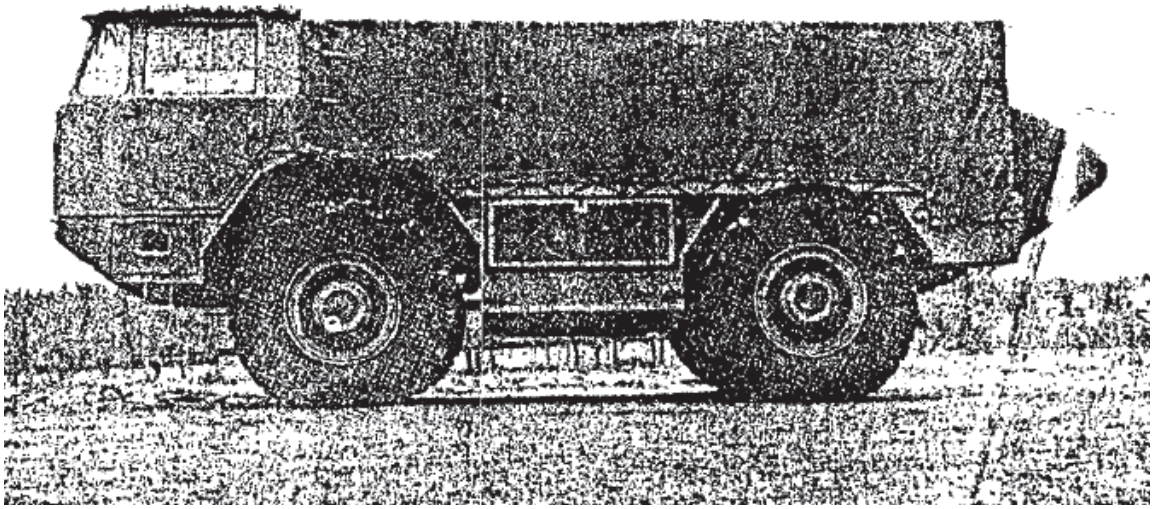

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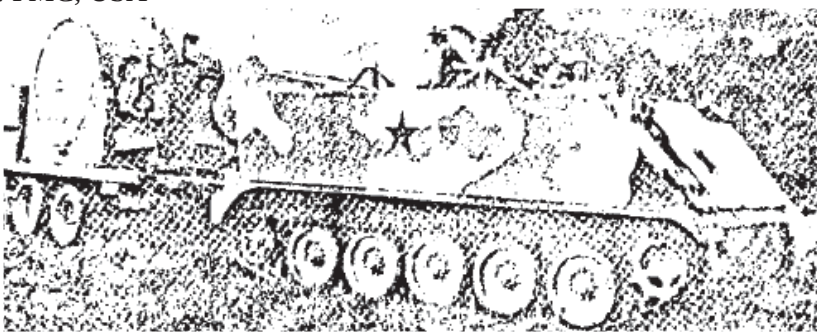
AFGP-2002-000032-0235

United States of America:

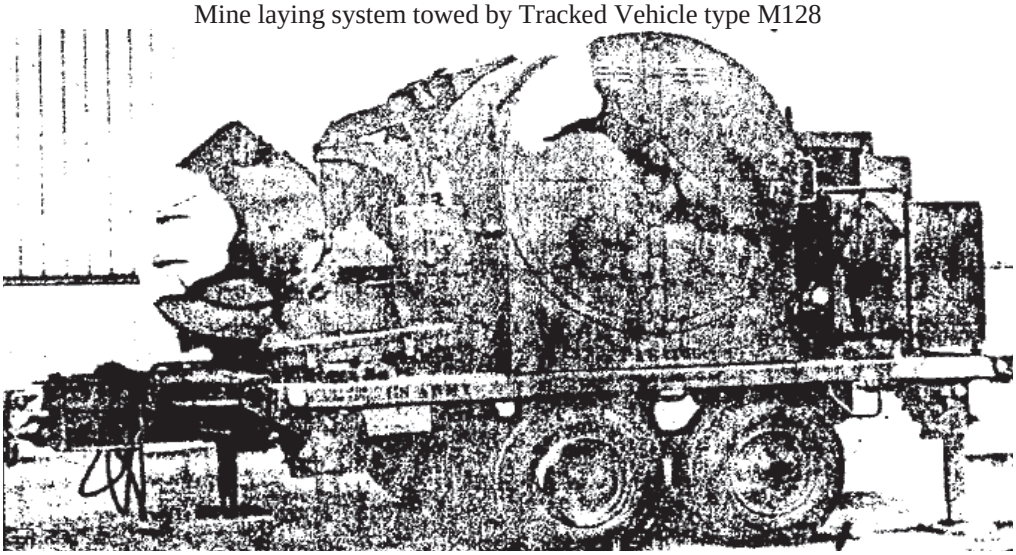
Towed Mine Dispensing System (M128)

This scattering mine laying system is installed on a modified trailer that has a flat bed, type M794. It could be towed behind a truck or a vehicle with a track such as personnel carrier type M113 on roads and rural areas. Anti-tank and anti-personnel mines of different sizes are placed in a container that looks like a drum and can be dispensed in different predetermined ways and styles, either synchronized or one at a time. The mines' dispenser weighs 4773Kg empty and 6364kg loaded.

Countries in use: USA and some NATO countries.
Manufacturer: FMC, USA



Mine laying system towed by Tracked Vehicle type M128



Mine planter on a flatbed trailer type M128

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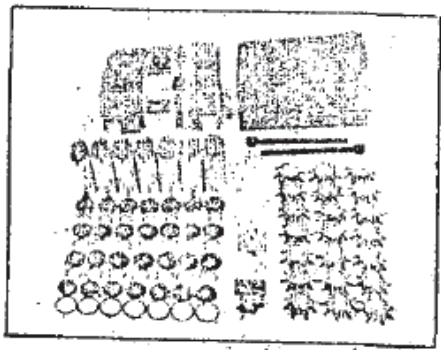
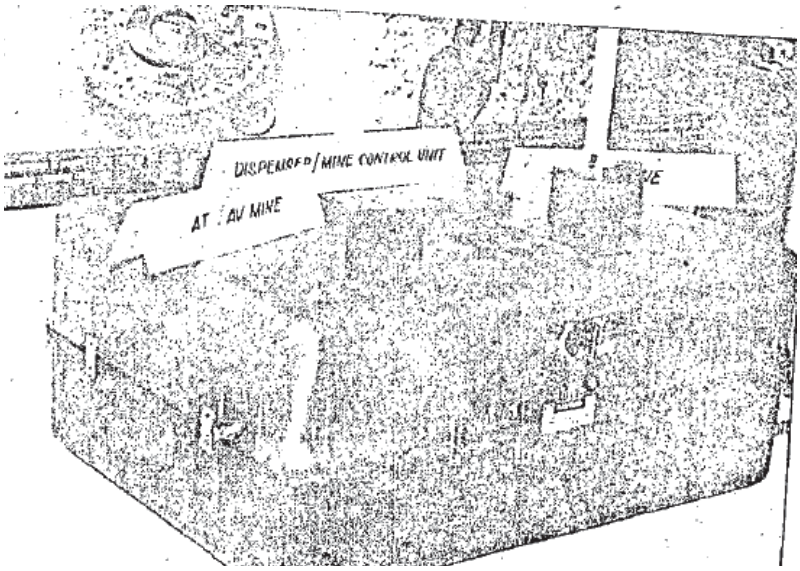
AFGP-2002-000032-0236

United States of America:

Multiunit Mine Dispensing System

This system is used as a protective measure to cover small areas to secure the withdrawal of friendly forces.
Each unit of this system weighs 67kgs, is transported to the field by trucks and carried by two men to the desired location. The units can be controlled remotely through signals transmitted by cable.
The mines are equipped with self-destruction programming devices, or they can be detonated by a remote control.
Status: in production and used in the United States of America.

Multiunit Mine System 



Anti-tank and Anti-personnel Mine Dispensing System

A-28

AFGP-2002-000032-0237

Soviet Union:

Mines Detector (UMAV-1)

Carrying method: Carried on the back of the operator.
Weight: 6.6kg
Manufacturer: State factories.
Does not function under water, however it has a range of 45cm. Operates on the same principal of fluctuation frequencies, but limited to the detection of metal mines.
Limited use by the Soviet forces and some WARSAW Pact countries.

Metal Detector UMAV-1

A-29

AFGP-2002-000032-0238

Soviet Union:

Mine Detector (AMB)

Carrying method: on the back of the operator.
Weight: 9.7kg
Manufacturer: State Factories
Capable of detecting any metal articles up to 1 meter deep, operates easily in water.

The head of the detector is kept inside a plastic cylinder size 42 x 4cm; while the controls and battery are kept in a small rectangular box weighing 3.5kg.

Used by the Soviet forces and some Warsaw Pact countries.

Mine Detector AMB

AFGP-2002-000032-0239

ISRAEL:

Metal Mine Detector Type (BMD)

Specifications:
Weight of the unit including accessories: 2.9kg
Detecting Capacity: Capable of detecting anti-tank mines to 30cm depth.
Operating Temperature:-158° to +72 Celsius.
Used in several countries.
Manufacturer: Israeli Beta Industries

This solid state system is sensitive, intricate and small.
It is used for the detection of anti-tank and anti-personnel mines in magnetic and nonmagnetic soil. It can detect any heat-conductive metal, metal or nonmetal in any soil. This system was designed for military use in extremely harsh environments.
Waterproof up to 2 meters deep, shockproof and vibration-proof.

Metal Detector Beta BMD-34

AFGP-2002-000032-0240

Federal Republic of Germany:

Metal Detector Type (EL1302 VALON)

This system is designed to detect the location of items that contain magnetic metals, such as grenades, bombs, shells and electric cables. The system monitors the earth's magnetic fields and indicates the presence of any distortion to the magnetic field due to articles buried through audio visual methods.

Description:

Weight: 6 kg Weight with casing: 16 kg

Case Dimensions (930 x 320 x 165mm)

Energy source: 10 x 1.5volts, single phase, type EESR20.

Detected Item	Metal Type	Dimensions	Detection Depth
Bomb	Iron	51 x 13mm	250mm
Bomb	Iron	150 x 37mm	1000mm
Bomb	Iron	320 x 75mm	1200mm
Bomb	Iron	440 x 105mm	1800mm
1000kg Bomb	Iron	1750 x 510mm	6000mm

Status: produced in limited amounts

Manufacturer: VALON Company, Federal Republic of Germany.

Metal Detector type EL1302 VALON

A-32

AFGP-2002-000032-0241

Federal Republic of Germany:

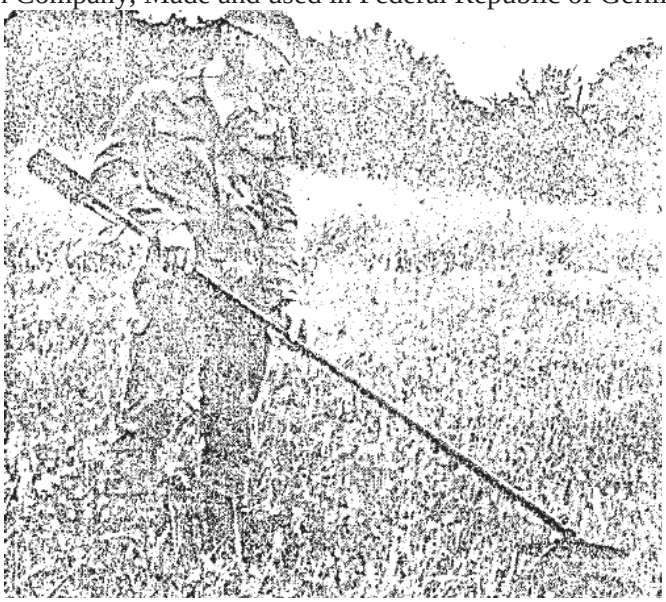
Metal Detector Type ML1655 VALON

This detector uses closed electrical circuits and was designed to detect different types of metal and nonmetal objects that are buried in the ground. It has a telescopic arm, headphone, and frequency knob to select 8 predetermined frequencies.

Description:
System Weight: 3kg Weight with Casing: 10kg
Casing Dimensions: 1330 x 380 x 120mm

Sensitivity	Metal Type	Dimensions	Detection Depth
Empty Shell	Soft Steel	19 x 9mm	170mm
Shell	Iron	15.3 x 9mm	150mm
Empty Shell	Soft Steel	99 x 20mm	390mm
Shell	Iron	51 x 13mm	300mm
Shell	Iron	150x37mm	500mm
Shell	Iron	300 x 75mm	550mm
Shell	Iron	400 x 105mm	700mm

Manufacturer: Valon Company, Made and used in Federal Republic of Germany.



Metal Detector ML1655 Valon

A-33

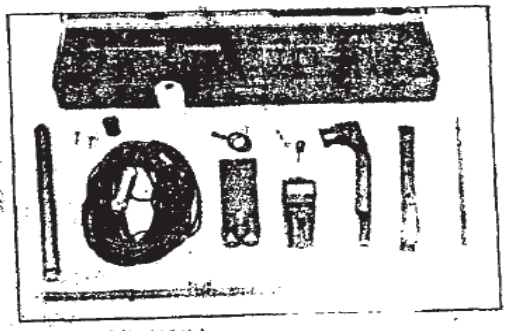
AFGP-2002-000032-0242

Federal Republic of Germany:

Metal Detector Forester 4.021

This detector is equipped with a standard waterproof probe up to 100 meters deep, in addition to other probes to reach deeper water. When the probe is used in the river it is tied to an extension cable and a rope while all controls are kept in a boat.
When a metal is detected, the needle in the dial vibrates and gives audible sound through the speaker installed inside the control panel.

Description:
Equipment Weight ready for use: 4.5 kg
Control Panel:
Length: 260mm
Width: 100mm
Height: 95mm
Power Supply:
Length: 325mm
Width: 95mm
Height: 55mm
Instrument Carrying case:
Length: 1.11m Width: 270mm Height:145mm
Probe: Length 600mm Diameter: 46mm
Length of Carrying Handle: 1.055m Battery Voltage: 6 – 12 volts
Battery Type: 6 x 105Volts
Operating Temperature: -15 to 65° Celsius
When used with special panel: -50 to 80° Celsius
Manufacturer: Doctor Forester Corporation, Federal Republic of Germany
Countries in Use: Several Arab and African countries.



Metal detection using Forster Metal Detector showing the probe details

A-34

AFGP-2002-000032-0243

Britain:

Mine Detector (4C)

Description:
Detecting Head:

Length:	28.5cm
Width:	18.5cm
Height:	10.8cm
Weight:	1.8Kg
Telescopic Rod:	38cm
Length fully extended:	128cm

Amplifier:

Depth:	21.6cm
Width:	10.8cm
Height:	10.8cm

4C Mine Detector in Use

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AFGP-2002-000032-0244

Unit total weight with battery: 1.8Kg
Electric Current: 3.3 – 3.6 Ml Amp (Average)
Battery Life Span: 300 hours if in occasional use.
Whole unit: 53.3cm long inside the case.
Shipping details: Width: 25.4cm Height: 20.3cm Weight: 14kg
Performance: equal to British mine 7K of equivalent.
On regular ground: up to 51cm. On paved surfaces: up to 32cm
Manufacturer: United Scientific Instruments, Britain
Countries in use: Britain, Iraq, Iran, Turkey, Kuwait, Libya, Egypt, India, Pakistan.

A modern design unit, equipped with transistors, mechanical and vibration proof. Operates on alternate contact principal between two transmitters, adjusted properly.

4C Mine Detector in Use

A-36

AFGP-2002-000032-0245

Mine Detector BMD156

Description:
Instrument Carrying Case:
Length: 600MM
Width: 400mm
Height: 190mm
Weight Empty: 6.2kg
Weight Loaded: 10 kg
Detection Head:
Length: 221mm
Width: 221mm
Height: 56mm
Weight: 770 grams
Control Panel: (Without battery and Sensor):
Length: 180mm
Width: 64mm
Height: 78mm
Weight: 800 grams
Information Processing Sensor:
Length: 122mm
Width: 66mm
Height: 10mm
Weight: 57 grams
Battery:
Type: Lithium Ion BI5847U
Length: 95mm
Width: 38mm
Height: 64mm
Weight: 250 grams
Short handle:
Length: 300mm
Width: 30mm
Height: 56mm
Weight: 110 grams

AFGP-2002-000032-0246

The long handle:

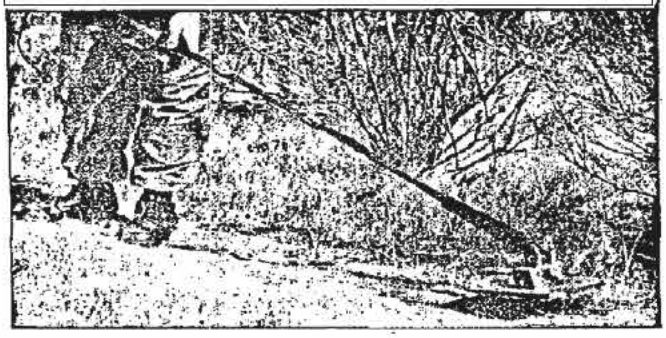
The telescopic length: 480 mm
The total length: 1. 46 m
The diameter: 35 mm
The weight: 620 grams
Operating temperature: -32 to +52 degrees
Countries where it is used: Britain
The manufacturer: United Scientific Equipment Limited Company - Britain

It is good to use for detecting metal mines as well as metal mines

The processing unit transforms information coming from the outer detecting head into a signal that can be heard in the headset, which consists of two earphones that are connected together through a rust- resistant adjustable steal headband. There are rubber pads attached to the headphones to reduce any background noise.

Mine detector model B M D 156 in the recumbent position

Mine detector model B M D 156 in the standing position



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AFGP-2002-000032-0247

Britain:

Metal Mine Detector Model (D 2000)

Specifications:
Weight of headphones: 376 grams
Weight of electric equipment/battery compartment without batteries: 1.9 kg
Electric equipment/battery compartment
Length: 252 mm width: 153 mm height: 43mm
Source of energy: 12 volts, 1. 8 Amperes
Weight of the rechargeable unit: 400 gram
Diameter of the detector coil: 100 mm or 300 mm
Weight of the 300 mm diameter detector coil: one kilogram
Weight of the 100 mm diameter detector coil: 300 grams. Size of detector probe: 400 or 1000 mm
Weight: 400 mm probe: 400 grams. 1000 mm probe: 700 grams

Detecting Ability:
A two-pence English coin (of copper and nickel), with a diameter of 25 mm and thickness of 2 mm.

Limited axis cable which is 400 mm long
Mallory battery type R 675 H
(Diameter 11 mm and 5 mm thick) 175 mm
Aluminum sheet (250x250x 1. 17 mm)
Steel sheet (216x216x19 mm)
Countries where it is used: Britain as well as other countries.
Manufacturer: Bonaventure Company, Britain.
Mine detector type (D 2000) is used as follows:
Direct pulses of electrical vibration are passed through the detector's coil creating magnetic vibrations that in return penetrate the ground and surrounding environment.

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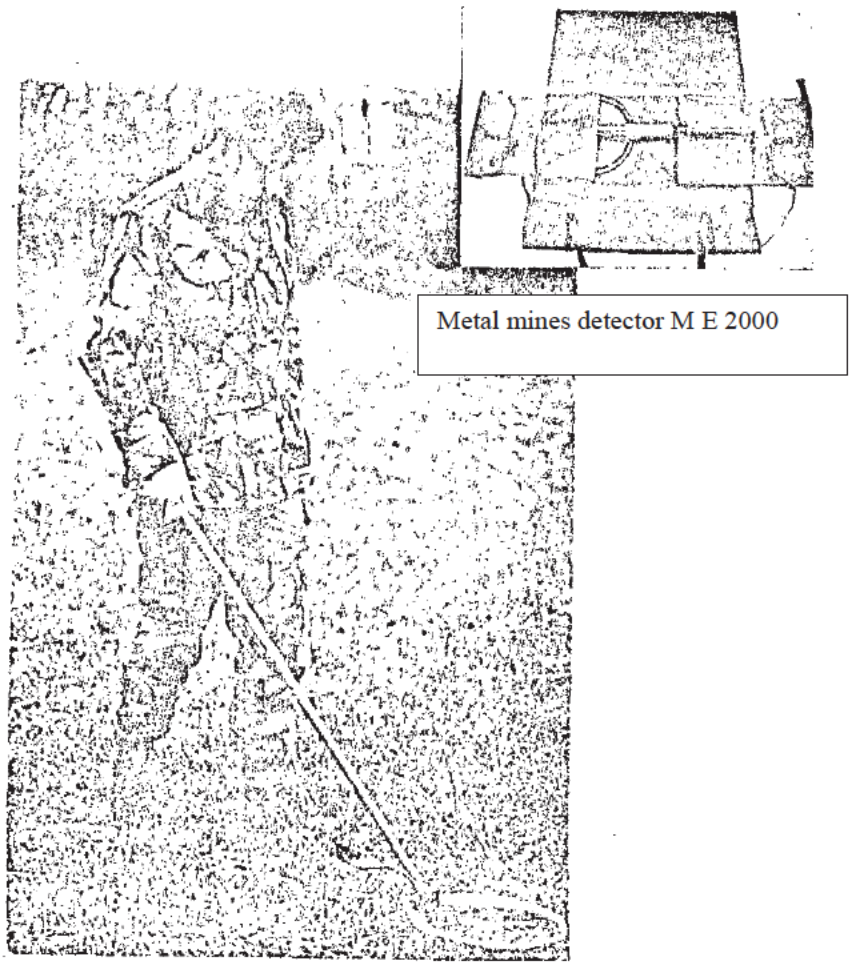
Vibration of the magnetic field creates a circular current in any metal body near it. Then the detector coil in the echo chamber unit receives the resulting echo and once all of these magnetic responses are collected, they create an exit signal indicating the presence of a metal piece.



A-40

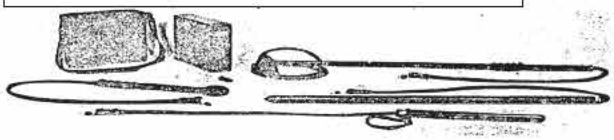
AFGP-2002-000032-0249

Britain:

Metal Mines and Metal Detector Model (B 2/6)

Specification:
Weight of the entire system including the electronic unit as well as the detector's bag and probe is: 45 kg.
Source of detecting sensitivity: open circle probe, 400 mm deep hexagon, 220 mm deep two-pence coin
Source of energy: standard self-sufficient batteries (HB11, MN 1400 or Nickel-Cadmium rechargeable batteries.
Weight of the rechargeable unit: 400 gram
Diameter of the detector coil: 100 mm or 300 mm
Weight of the 300 mm diameter detector coil: one kilogram
Weight of the 100 mm diameter detector coil: 300 grams. Size of detector probe: 400 or 1000 mm
Weight: 400 mm probe: 400 grams. 1000 mm probe: 700 grams
Countries where it is used: Britain, Holland, Greece, as well as some other countries.
Manufacturer: Blice Company, Britain.
Development of mine detector type (B 2/6) began in 1974, where it was used for military purposes by the British Army the following year. It consists of a lightweight solid metal and mine detector. The system uses the provoking vibration method that causes sensitive responses upon operation.

Metal and mine detector model (B 2/6)



AFGP-2002-000032-0250

Britain:

Metal Mines Detector Model (M K 1 Eurodec)

Specifications:
Weight of the electronic unit: about 3. 3 kg.
Intensity of transmission: ranges between 13, 2 and 80 watts.
Sensitivity: power ranges between 44000 to 1,140,000.
Type of operation: automatic.
Control box: made of water-tight aluminum and has five control settings and a push-button control system.
Battery unit: rechargeable battery, 4 amp/ hour
Source of energy: 12 volts of direct current.
Electric current consumption: 45-260 milliamps.
Detecting head, basic: coil with diameter of 380 mm and it includes a pivotal axis to adjust the angle.
The handle: it is made of fiberglass and has removable and adjustable parts.
The straps: they are made of rubber and have collapsible cables.
Detection ability: 600 mm above the copper dish with a 25 mm diameter.
Countries where it is used: Britain, as well as some other countries.
Manufacture: Belzand Action Limited - Britain.

This system uses a unique method by having the detector probe attached to the user's body, which frees the user's hands during the detecting process and allows him to simultaneously carry an automatic weapon or a radio. Also during emergencies, the user can remove the equipment using cables that are stored inside a canvas band.

The operating unit can be folded using belts and then carried. The entire system weighs about 6.8 kg and its technical method of operation is based on provoking vibrations. Moreover, its handle and coil can be used under water.

AFGP-2002-000032-0251
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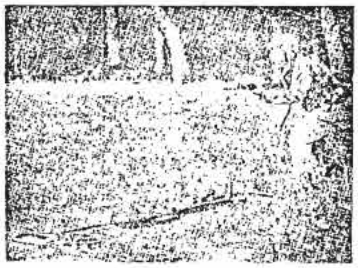
AFGP-2002-000032-0252

Metal mines detector H4 and I1Milbek



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AFGP-2002-000032-0253

The Soviet Union:
Bangalore Charges (U Z 1 and U Z 2)

These charges are used to create a mine-free corridor through mine fields and barbed wire. Each part of the Bangalore charge type (U Z 1) consists of metal tubes that are one meter long, with a radius of 53 mm, and it contains 5.3 kg of explosives. Each part of the Bangalore charge type (U Z 2) is two meters long, its radius is 52 mm, and it contains 3 kg of explosives material.

Once the Bangalore compound is put together, it gets deployed through the mine field, where it explodes; creating a mine-free corridor that is between 2.5 and 3 meters in width. If a wider corridor is needed, double or triple power charges can be put together through special rings. These charges can also be placed on carts, rollers, or sleighs not only for the purpose of making it easy to move and use, but also to maintain the proper elevation for the explosion.

Countries where it is used: Warsaw Pact countries
Manufacturer: State factories of the Soviet Union.

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AFGP-2002-000032-0254
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AFGP-2002-000032-0255
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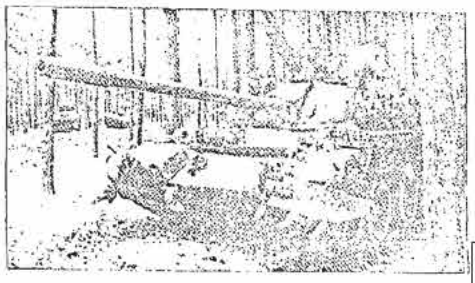
AFGP-2002-000032-0256

The Soviet Union

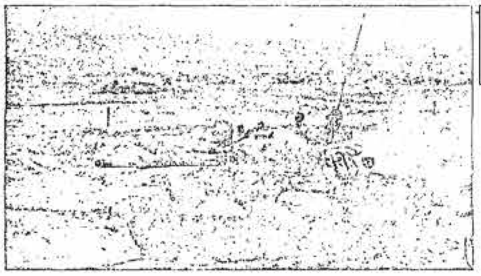
Minesweeping Device Type (K M T-5)
It works as a roller and a plow and is installed on a tank

Specifications:
Weight (equipment): 7500 kg.
The roller: 500 kg.
Swept Corridor: 0.81 m.
(Body): 2265 kg.
Width: 4 meters.
Speed of operation: 12 k/h
Radius of the safety rotation: 65m.
Sweeping capacity: 2.5 m width channel
Time it takes to attach the device to the tank: 15 minutes.
Countries where it is used: Warsaw Pact countries
Manufacturer: State factories of the Soviet Union.

This type of device began to be used recently as a device that combines minesweeping, roller, and plow. Moreover, it contains the plow that is designed to mark the path as well as the (B S K) equipment, which mark the mine-free path at night using a luminous material. When the device is not in use, it is hauled on a truck equipped with a special helping crane type (K M -61).



The minesweeping roller in- 54



The minesweeping roller in- 62

AFGP-2002-000032-0257

Israel:

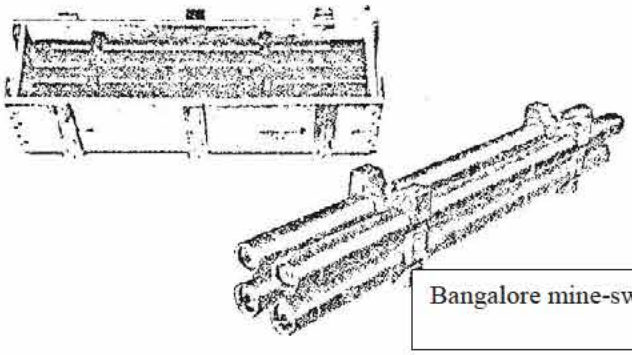
Bangalore Explosive Charge (Number 21)

Specifications:
Total weight of the assembly charge: 19.35 kg.
The individual charge:

Length: 1.1 m. Diameter: 57 mm.
Weight: 4 kg. Type of charge: TNT
Weight of the charge: 3.3 kg.
Countries where it is used: Israel, Iran, Turkey
Manufacturer: Military factories of Israel.

Although this charge is mainly used to break through barbed-wire, it can be used to sweep minefields. The device consists of four pieces of aluminum tubular charge, four connecting sleeves, and two head units.
The charge explodes within 18 seconds by an igniting device, as shown in number (41).

Parts that are 1.1 meters long are assembled inside the charge unit and are launched onto the minefield. Then the explosion occurs using igniting unit 4. The resulting explosion clears a narrow corridor inside the minefield.



Bangalore mine-sweeping charge number 21

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AFGP-2002-000032-0258
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AFGP-2002-000032-0259
[TC: Identical to AFGP-2002-000032-0251]

Federal Republic of Germany:

Minesweeping device shaped like a ladder, type Comet 3010. Operated by 2 persons

The main system of this device consists of a storage bag which is made of canvas cloth and which contains the minesweeping device that takes the shape of a ladder made of rope and synthetic fiber strings which are connected together in parallel fashion by wooden joints. The total length of the device is 53 meters and it is 0.6 meter in width. A solid propelling smokeless rocket, type (D M 10) with an ejector mounted on a base and the rocket is equipped with a propellant fuse type (D M 41), which works for 20 seconds.

The device's operation method is as follows:

Components of the mine sweeping device are towed on a sleigh to the specific location in front of the mine field that needs to be swept. It is towed by a two person crew, while kept in its special storage bag. The bag opens from four different sides and then the component parts are assembled. The rocket would then launch and the ladder gets extended to its maximum length. After that the detonator's ropes are set off automatically by the wick of the fuse, type (D M 9.1). The explosion would create a mine-free corridor that is 50 meter long and 0.8 meter wide. If there is a need to create a longer corridor, these procedures would be repeated using another explosive system.

Countries where it is used: West Germany, Iran, and Israel.
Manufacturer: Comet Company, Germany.

Minesweeping device type Comet 3010

AFGP-2002-000032-0260

Britain:

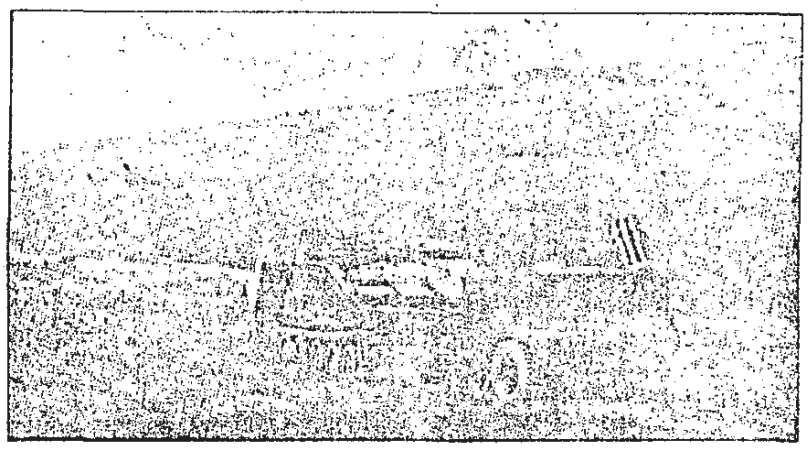
Anti-tank Minesweeping Equipment (Giant Fiber)

The anti-tank minesweeping device "Giant Fiber" consists of a tube that is 229 meter long and has a diameter of 68 mm. It is filled with plastic explosives. The tube is rolled and stored in a wooden box that is carried on a two-wheeled trailer that can be hauled by any type of vehicle.

The tube is launched across the minefield by a group of eight rocket engines that use the minesweeping equipment as follows: the equipment is hauled to the launching point, which is about 45 meters away from the boundary of the minefield, then the hauled equipment is affixed to the projected launching point, while remaining intact with the hauling vehicle during the minesweeping process. After that the "Giant Fiber" is launched electronically from the hauling vehicle.

Every "Giant Fiber" minesweeping device requires the support of a three ton capacity truck. Items are placed in containers that a person can carry with the exception of the box that contains the 2136kg tube, which is carried by a forklift or regular lift.

Countries where it is used: Britain
Manufacturer: the Royal Weapon Factories-Britain



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AFGP-2002-000032-0261

Czechoslovakia:

Mine-Sweeping charges

The Czechoslovakian Military has a two-wheel trailer that is hauled behind a combat tank type (T54/T55) and is equipped with minesweeping equipment in the form of rollers or plows. The trailer places a series of roped explosives behind the tank on the part of the land where mines have not yet been swept using the minesweeping equipment that is attached to the front of the tank. The ropes are set off by the detonator inside the tank to sweep any mines. Also, the Czechoslovakian military owns a minesweeping device that mounts on an armed four-wheeled trailer that is hauled behind a vehicle type (O T 64) (8x8), or some other similar vehicle. The vehicle contains rockets, to which a number of soft minesweeping explosive strings get attached. These rockets are launched across the minefields, and then set off.
Manufacturer: state manufacturers- Czechoslovakia.

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AFGP-2002-000032-0262
[TC: Identical to page AFGP-2002-000032-0254]

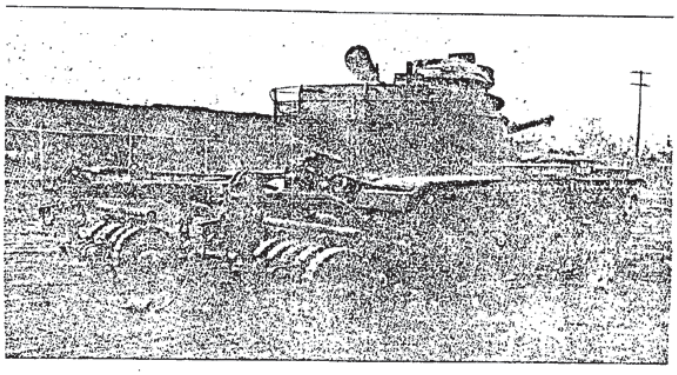
United States of America

The Mine-Sweeping Roller System

The American military developed the minesweeping roller system to fulfill the need of the European mission theatre for mine-sweeping operations. Such a system needed to work day and night, in any weather conditions, and needed to have the capability to rapidly penetrate through defensive minefields. The system consists of a roller-unit, installation kit, and two manually-operated jacks. The system is towed by a tank; type (M 60 I 3).

The crew who is operating the tank, along with the help of the two jacks, needs fifteen minutes to install the roller-system onto solid pre-arranged points located in the front of the tank. Then, the tank pushes the roller through the minefield that is intended to be penetrated in order to detonate any mine that is activated through single vibration pressure, which may be buried underground or spread on the surface.

Countries where it is used: United States of America.
Manufacturer: Chrysler Company for Defense Weapons –US.



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AFGP-2002-000032-0263
[TC: Identical to page AFGP-2002-000032-0255]

United States of America

Anti-personnel Minesweeping System Type (M 1)

Specification:
Weight of the entire unit: 42 kg.
Diameter of the storage box: 420 mm
Weight of the explosive material: 21 kg
Countries where it is used: United States, as well as a number of European countries.
Manufacturer: American military manufacturers, USA.

This device consists of a round storage box made of aluminum and an explosive cable that is 52 meters long, as well as a propel unit, ejaculation unit, and launching equipment.
The bombing cable consists of 19 braided explosive strings covered with nylon.

The device is used as follows:
The entirety of the equipment is placed right outside the minefield and mounted to the ground using the stake of one of the explosive cable's end. Then the launching device, which works through a jet launching system, launches the bombing rope through the minefield and the rope explodes as soon as it touches the ground.

United States of America:

Bangalore Explosive Charge Type (M 1 and I 1)

This charge is used to sweep minefields as well as other obstacles such as barbed wire. The charge consists of steel tubes that are one and a half meters long, and it is filled half way with highly explosive material along with connecting sleeves.

The igniting device could consist of six rolls of bombing ropes that are rolled around one side of the assembly charge and which are connected to a detonator that has a delayed action of 8-15 seconds. When one of the assembly charges explodes, the rest of them explode consecutively.

The tube parts are connected together according to the needed length in an operation. Then the tube is launched across the minefield and set off.

The impact waves resulting from setting off the tube makes mines located in the area of these waves explode.

Countries where it is used: United States of America.
Manufacturer: American military manufacturers, USA.

AFGP-2002-000032-0264

United States of America

Air-Launched Fuel-Based Minesweeping Explosives

The American Military manufactured the first air-launched fuel-based minesweeping explosives in 1960. Following the ground testing of these explosives during the Vietnam War in 1971, the American Navy adapted the 227 kg cluster bomb type (C B U 55 B) for multipurpose use including the minesweeping of minefields and to clear vast jungle areas to be used as helicopter landing points.

The cluster bomb is to be launched by a helicopter type (U H-1) or low-speed airplane that flies at 600 meters altitude such as (I 1) Sky rider airplane.

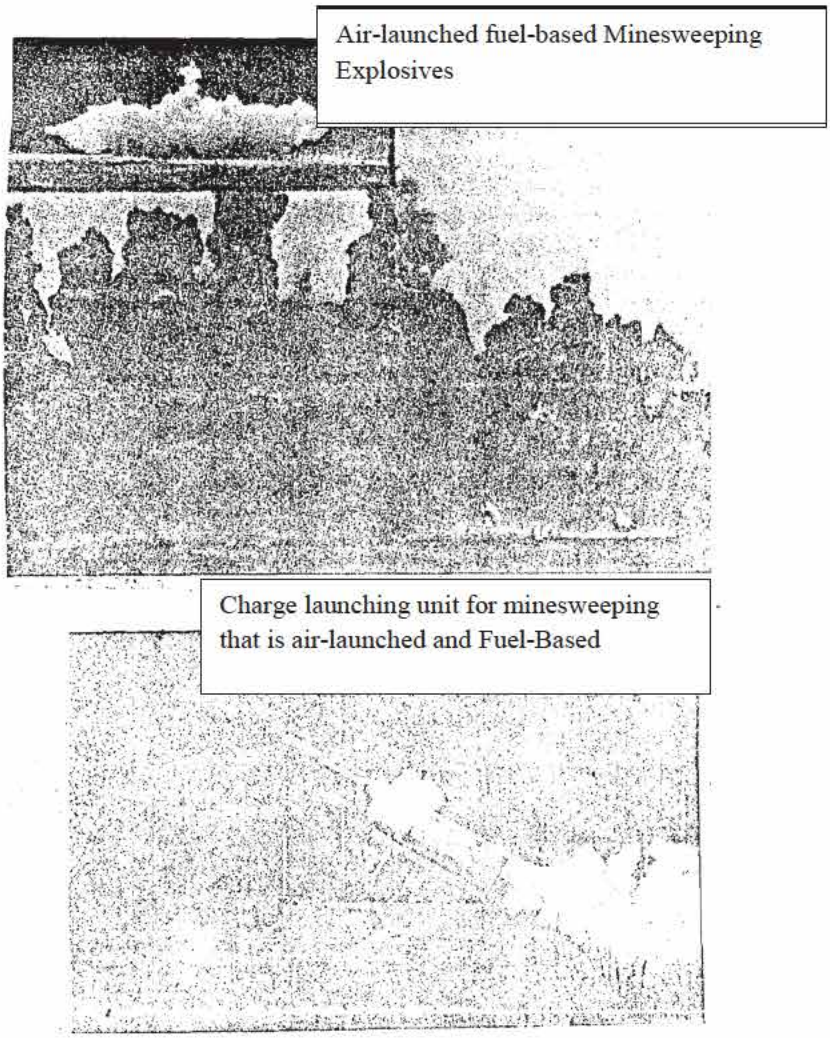
The cluster bomb has three non-pressurized containers and as soon as the helicopter or the airplane drops this bomb, the containers are released from the bomb-box and slowly descend through a parachute used for that purpose. When the containers touch the ground, they burst and release liquid ethylene oxide to create a cloud of vapor with a diameter of 15 meters and a height of 3.5 meters. These clouds are later set off using delayed action igniting devices.

In 1973, the American military began to develop fuel-based explosives that are land-launched by a multi-rocket minesweeping system. These explosives are set off by pressure, so when they hit the ground the pressure sets off the explosive charge and the fuel spreads inside the aerosol cloud, which in turn explodes and produces within 300 millisecond of extra pressure 90 kg, which would detonate all single-vibration mines.

Helicopter U H-1 launching minesweeping charges

AFGP-2002-000032-0265

Countries where it is used: United States of America.
Manufacturer: American military weapon manufacturers -United States.



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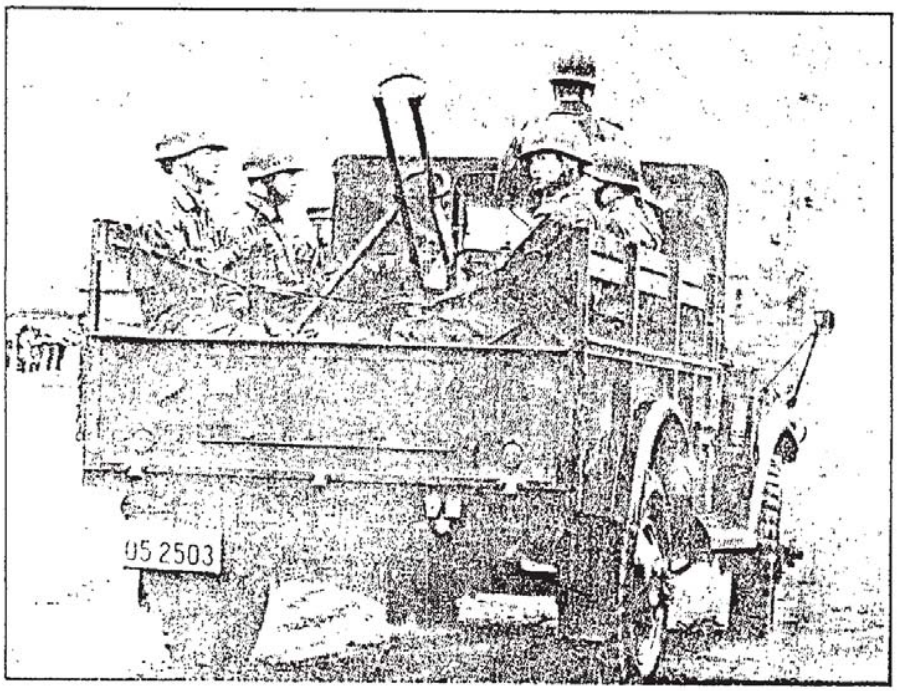
Japan

Minesweeping Equipment

It is known that Japan has developed at least two types of minesweeping equipment. The first one consists of a minesweeping device in the form of a roller that is hauled by a tank. And the second one is a mine-sweeping charge that is full of explosives and it is launched via rocket. It is known by its flexible explosion cable type (70) and it is used to sweep anti-personnel minefields. The devices consist of a rocket-launcher frame and the rocket is equipped with a wire rope attached to it.
Countries where it is used: Japan, South Korea, Australia.
Manufacturer: Nissan company- Japan.



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Minefield Marking Equipment

Devices for marking paths illuminated by (beta) rays between minefields

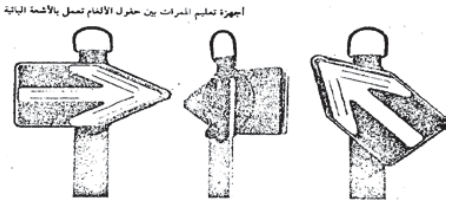
This equipment is used to mark paths in minefields. It uses illuminated arrows. When such equipment is used to mark paths of bridges, two arrows are directed inward to mark the beginning of the path; when they are directed upward they mark the safe crossing area, and when they are directed outward they mark the end of the path.

Illumination here is provided through a self-illuminating source of (beta) rays. The arrows are very clearly spotted from a distance day or night. Moreover, it is safe to use and its lifespan ranges between15-20 years, without need for any maintenance. The path-marking arrow is small, firm, safe for soldiers to use and can fulfill the needs of the army's mechanized environment, and moreover it can be used in any environment or climate.

Specifications:

Length: 130mm. Width: 75mm. Height from the backboard: 20mm.

Countries where it is used: Britain as well as other Asian and European countries.
Manufacturer: Saunders Roe- Development Limited Company- Britain



Minefield Path-making Devices that are illuminated using Beta Rays.

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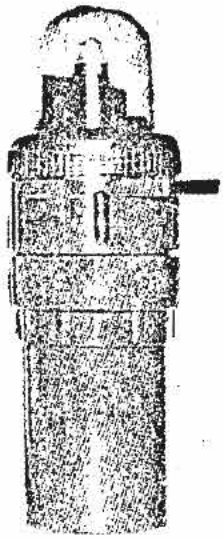
Illumination Lamp Type (F1) for Path-Marking of Minefields

This type of bright lamp is used to mark paths in minefields that have been mine-swept. Its light can be seeing from a distance of up to 1000 meter. The brightness level can be reduced using a cover, when needed.

The lamp can be fixed on a pole or on the ground and a green screen can be installed above the lamp, if needed.

Specifications:

Weight without the battery: 185 grams
Height: 170mm. Diameter: 50mm.
Source of power: one battery of B I 30 type.
Duration: 100 hours.
Range of operating temperature: (-35 to +51 centigrade).



Illumination Lamp type (F1) for path-marking of minefields

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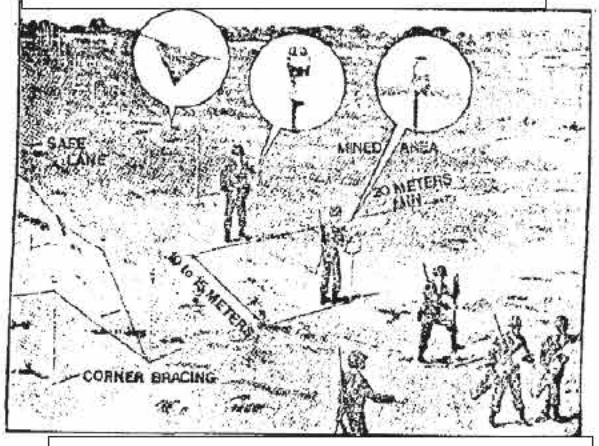
Handheld Device type (M 133) for marking paths in Minefields

This device is used by infantry groups for quick and temporary path-marking of minefields that do not have marked paths. The main parts of this device are: a pole, a marking tape with a bright orange glow, and an orange flashlight that is 152.4mm long with a diameter of 50.8mm that is to be installed on the top of the pole. The light bulb is neon and it produces a light with a continuity that is 82 times per minute. The poles are usually placed 10 or 15 meters apart, except for the poles at the corners, which are placed at a 4 meters away from the corner-pole. This equipment was designed to mark minefields with perimeters between 700 and 1000 meters while having the usual separating distance between poles less than 10 meters for 15 days and under moderately cold temperatures.

Device of Path-Marking in Minefields type (M 133)



Handheld Device type (M 133) for marking paths in Minefields

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Introduction:
This section provides instructions on planting minefields as well as explains how we can protect ourselves from enemy mines.

This book is used as a guide on mines and on how to counter them in addition to planning, preparing, practicing, and participating in mine-related operations.

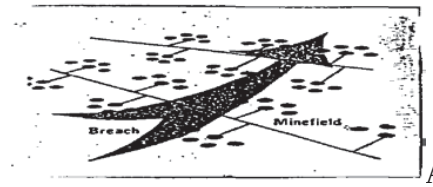
Moreover, this book is used in limited warfare, general war, cold war, and conventional war. For instance, during general war, the mines can assist our troops by protecting them from any enemy breach through wide gaps or openings. In addition to that it forces the enemy to go through other routes, which makes attacking them possible via air, artillery, missiles, or a counter-attack. Also, the book indicates that this strategy is to protect our troops from any surprise attack.

Mine warfare is used during strategic and tactical operations and it is not specified by the type and intensity of a battle.

Responsibilities:
All soldiers in all branches are responsible for mine-countering action in terms of detecting, marking whatever has been left behind, submitting reports on mines, and deception participation, in addition to planning and carrying out barrier-crashing operations, or to augment mine planting or expand minefields.

Unit of Combat Engineers:
Some of their tasks are: supporting breach attacks, if they exist, clearing breaches, or sweeping barriers that are created by the enemy as well as sweeping of minefields, providing hands-on advice for barrier operations, training other units on barrier and non-barrier operations, install large barriers with the help of combat units' soldiers.

Definitions:
Breach: is to create a path through minefields.
Attacking the breach of minefields:



A. Fighting in the path of the enemy's minefield and under the enemy's fire.
B. Breaches that helps to rapidly move and maintain the continuity of attack.
C. Breach that is intentionally planted in the minefield.
D. A breach in a minefield that is not under the enemy's fire.
Countering mines:
There are tactical and technical operations for locating, avoiding, or dismantling

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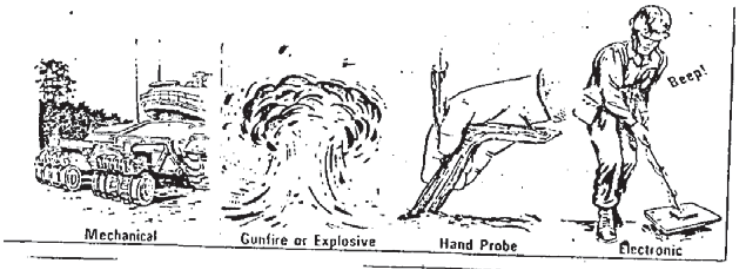
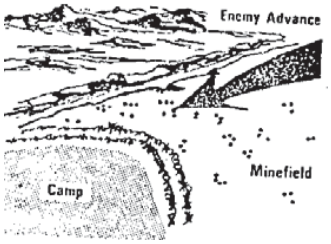
the enemy's mines, utilizing techniques to prevent the enemy from using mines against us.





The Path:
Is to drag the enemy where you wish for them to be.

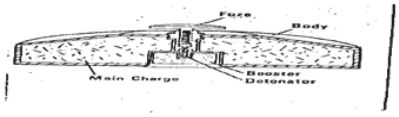
Quick Precautionary Minefield:
It is for short term protection, where the mines are bought from the base to be used at night, and then they are to be taken back when the unit leaves the area.

A Precautionary pre-planned (deliberate) minefield:
Near the unit for protection

The mine:
An explosive or some other material (usually boxed) that is used to kill, create an injury, dismember individuals, or destroy a vehicle, boat, or airplane.

Mines can be arranged using one of the following methods:

Suicide
Time sensitive
Remote-control
Timer-setting



Mine Warfare

Minefield:
A piece of land where mines are planted with or without sampling.

The minefield's breach:
It is the part of the minefield that is mine-free to allow friendly forces to pass through smoothly without any problems. In most cases the breach is less than 100 meters in width.

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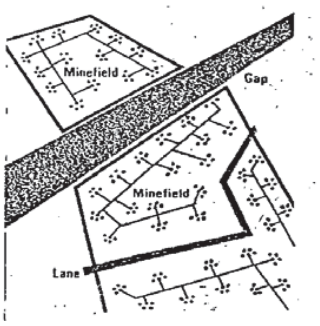
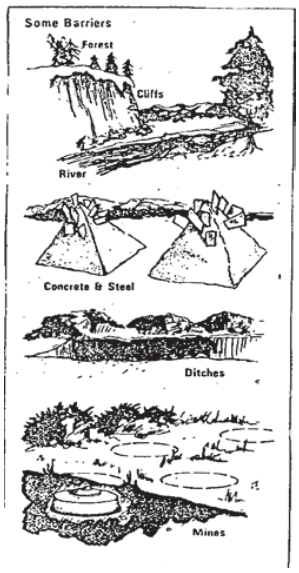


Path of the Minefield:

It is the path which is usually marked through the minefield. Pedestrian paths are two meters wide. Vehicle paths are 8 meters wide for one-way roads and 16 meters for two-way roads. The path width in the enemy's minefields depends on the breaches and the reason they were created (the need).

Example:
Pedestrian paths could be as narrow as 1 meter wide near the Bangalore breach point.



The Use of Barriers

Barriers are used to provide our troops with as much support as possible. Barriers can make the enemy's movement difficult in some areas forcing them to alter their path to other areas such as mountains, forests, rivers, lakes, cliffs, and swamps, all of which create natural barriers limiting the movement of the enemy. We can also add to these natural barriers man-made barriers such as (ditches, reinforced concrete, steal, torrent, and mines).

Natural barriers can be more effective when they are reinforced with man-made barriers making it more difficult for the enemy to cross that area. Moreover, torrents can deepen rivers and enlarge swamps.

Reinforced concrete, steel, and ditches can enclose an open area. Hills with plenty of trees are hard to cross and adding mines to all of these barriers makes them an even a stronger barrier. When we talk about barriers, we mean to mix the natural ones with the man-made ones to maximize our effort in repelling the enemy.

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Barriers help us in averting the enemy's attacks and allow us to have territorial control while utilizing minimum manpower and weapon. It also frees our men from the enemy's attack instead of waiting for the enemy to initiate such an attack. Moreover, it confines the enemy, while allowing us to move freely and forces the enemy to group its forces in order to break through the barriers. Although the barriers are used defensively, they can also be used in offensives and counter-offensive cases, so barriers are utilized in multiple types of confrontation.

When you consider using barriers, remember that you seldom have the time, manpower, equipment, vehicles, or machines that work according to your plan in addition to having other things that would take place at the same time which are: fortifying the field, organizing the land, and assigning battle support services.

Barriers should be taken into consideration when it comes to priorities. So think about the task of the unit, and then think about supporting such a task by using barriers.

Generally barriers are placed in front of and behind the enemy in an effort to prevent the enemy from advancing, protect the military wing, and keep the enemy out of the area's key location. Remember that all barriers are visible and protected by fire power. Moreover, mines can be dropped from air while making barriers allowing the process to be much faster than when mines are planted in the ground. So mines could be planted via aircraft when making barriers in rugged terrain.

In frontline areas it is required to have a large number of soldiers and equipment, particularly in the supporting services unit during combat, unless there are natural barriers. The use of long barriers is mostly not practical because it requires extensive manpower, so barriers are mostly used behind the combating belt.

Barriers are used to block any deep advancement of the enemy. They can also help in gathering the enemy and making them a target. Moreover, they create a place that can be used by our forces in counter attacks.

When you plan the barriers, remember to leave an area without barriers that is protected by fire power, so our troops can effectively move in the battlefield. This is handled by the supporting services unit.
* Mines are considered a man-made barrier.
*Mines can be used in conjunction with other natural and man-made barriers to enhance our combat capabilities.
* Land mines are made of fuse, igniter (catalyst, however, not always) the basic charge, and the box or the body.
* The mine is prepared, and then it explodes when the initial movement begins, which triggers the igniter. Then the tail of the charge begins to explode when the flame of the trigger caused by an electric or mechanical tool reaches the igniter.

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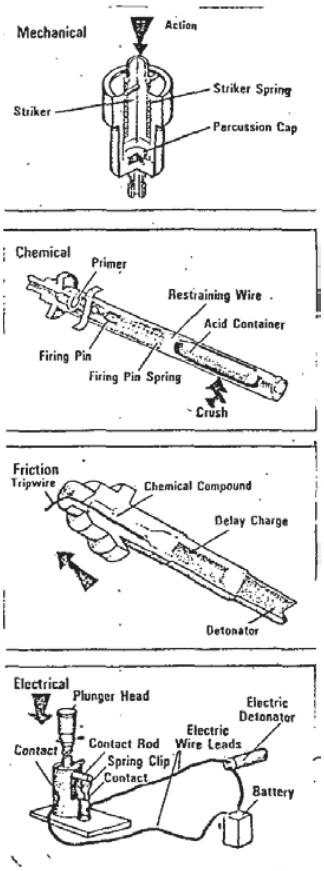
If the sequencing of explosions is suppressed at any point, the mine may not explode.

Warning:
The mine may carry more than one detonator in its bottom, so when you want to deactivate the mine, make sure that the detonator tails are dismantled.

The initial movement:

It is the movement that causes the mine to explode. It is the basic type of initial (primary) movement that makes the mine explode.

- Pressure: It is the force applied downward (below) such as the leg of a person, vehicle, truck, or an animal.
- Pulling: To pull a wire (called the trip wire) and it is connected to the igniter.
- To relax the tension: Relaxing the tension (such as cutting off the trip wire) causes the mine to explode.
- To release the pressure: To remove the weight from above the mine, which leads to the explosion. (There are some types of mines that work by this method, such as when a weight is placed on the mine, and then lifted, the mine immediately explodes).
- Electrical: Closing an electric circuit starts the igniter.
- Count down: To start the igniter by reaching a pre-set time.



Other types of initial process movement are:
Vibration, magnetic effect, transmission by frequency, and receiving by frequency.
Components of the mine:
Fuse and a striker, the igniter, which carries the initial element of the explosive tail and it is based on the initial movement. These elements are classified according to the explosion of the tail: mechanical, chemical, electrical, and by friction.

- Some mines are equipped with special fuses.

- There are four kinds of basic igniters that are based on the chain of explosion.

*Mechanical: A spring that pushes the hammer on the capsule that ignites the detonator.
*Chemical: A small container that has oxide which breaks down at the initial movement. The oxide breaks up the wire releasing the hammer that triggers the detonator.

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**Friction: The initial movement ignites the material inside the igniter using friction to make the detonator explode from the flame.

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**Electric: The initial movement closes the electric circuit which starts the electric detonator.

**Explosive tools: Usually used in ambush traps. They are tools that you should neither touch nor lift. There are numerous ways to detonate a mine or a field-prepared charge.

- Detonator: it is a sensitive explosive that gets set off by a flame or the temperature of a fuse. Detonators are used in most mines during preparation.
- Catalyst: It is used in some less sensitive mines; however, it is stronger than the detonator.
- Stimulator: It is a combination of a detonator and catalyst that can be used as an extra in the explosion sequencing of some mines.
- The explosion container: It is also a detonator that can be used to make additional tail-end explosives or handmade mines.
- The body or the container: The body or the container of the mine holds the igniter and the basic charge. It can be made of gypsum or metal plates, plastic, wood, or some other material. Field-made mines that are made of other material and do not have bodies or containers.

Types of mines:
Operational, percussion, training, preemptive.

*Service mines can be classified in terms of:
-Container or formed shape.
-The primary charge
-The initial movement or method of explosion.
-How easy or difficult to use.
** Container or formed shape:
-Metal, clay or pottery, plastic, wood, paper.

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** Colors consist of:
Dark gray for high (strong) explosion mines and regular gray for chemical mines

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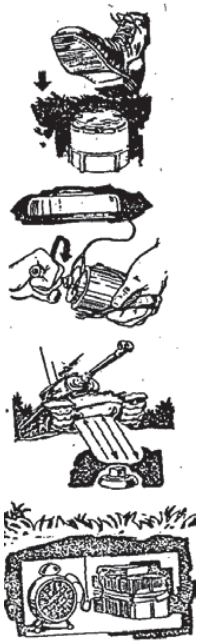
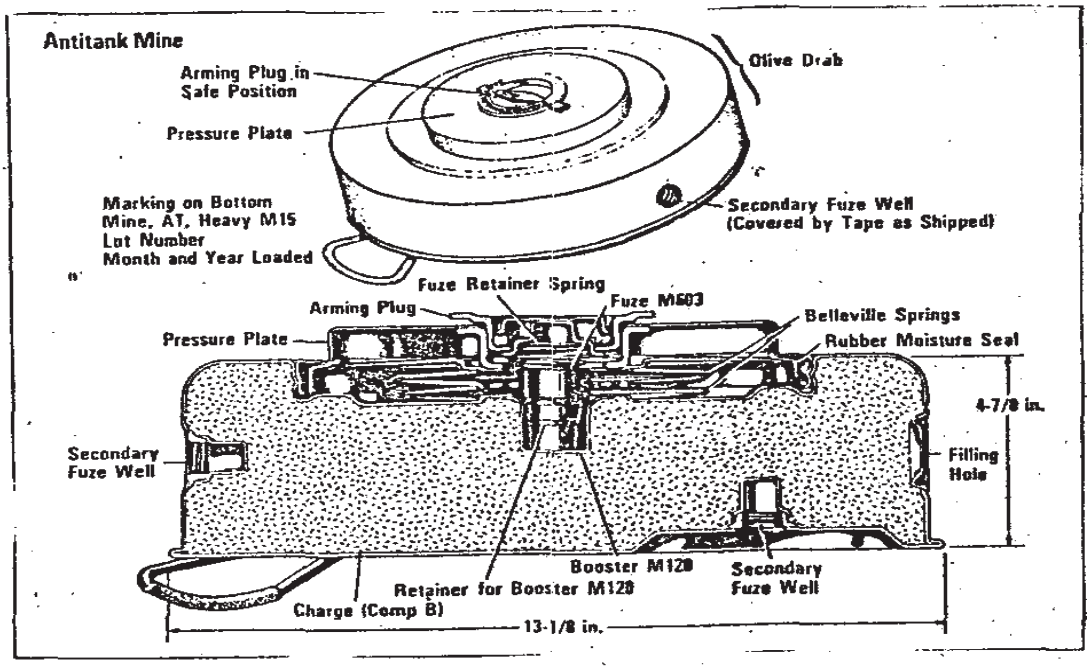


The initial movement:
*Contact mine: It explodes upon direct contact with the target.
*Controlled mine: It explodes via the monitor at the set time.
*Activated mine: It explodes by the effect of: magnet, tapping, vibrations, or voice.
* Self-explosion mines: It explodes after certain time without any external cause.

Mine Detection

*Mines that have metal containers can be detected via metal detector.
*Mines that have containers made of plastic, glass, wood, paper, or any other nonmetal material are hard to be detected mechanically.

Using anti-tank mines:
*Anti-tank mines were designed to destroy and demolish tanks as well as other vehicles.
*The anti-tank destroyer mine (M15, M19) disables the tires (tracks).
*The anti-tank vertical penetrator (M21) is used to penetrate the vehicle from beneath in order to kill or injure the crew.



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The horizontal anti-tank effect (M24, M66) is placed on the side of the street to damage the vehicle's side. It disables the vehicle and either injures or kills its crew.

Using anti-personnel mines:

- These mines were designed to disable or kill personnel

The anti-personnel explosive mines (M14, M25) have an explosive charge which is set off when the mine is stepped on.

- Anti-personnel shrapnel, which may have a shrapnel bomb or a box that turns into shrapnel when the basic charge explodes.

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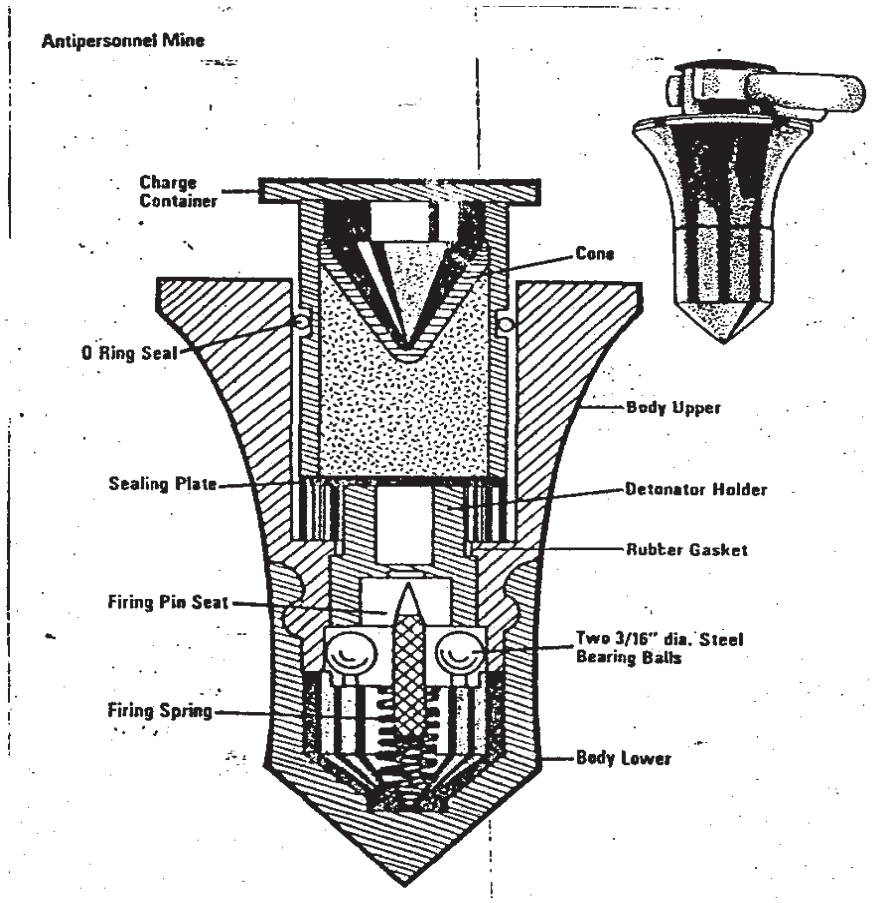

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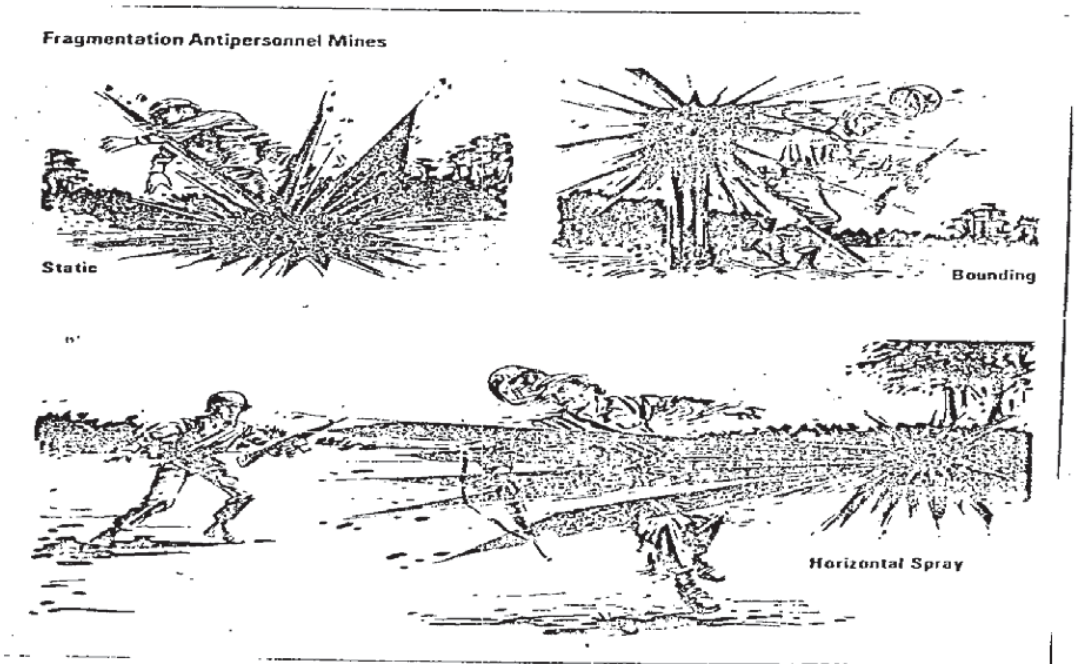
There are three types of anti-personnel shrapnel mines:
*Static mine (M14) that explodes in place when it is stepped on.
*Jumping mine (M16A1, M26) which shoots into the air and explodes at few feet above ground. It explodes by stepping on it or by trip wire.
*The horizontal effect of the mine (M18A1) throws shrapnel in one direction. It explodes by trip wire or remote control.



The chemical mine:
*The Galon chemical mine, which was created to carry a liquid chemical element. The mine explodes in a grouping in order to contaminate the barricade or the area facing the enemy.
* The (M23) mine is chemical and is similar to the (M15) anti-tank mine, but it is made differently and it has four pairs of elevated tubes, so it can be detected at night. The mine is full of two gallons of VX liquid and it explodes using the (M15) anti-tank method of explosion.
Other types of mines:
The percussion mine, which is harmless, is planted to give the enemy the impression that it is real.
*An example:
A tin container that is buried in the ground will have the same effect with the mine detector as a real mine container does. The enemy might be forced to take the same measures he takes with real mines.

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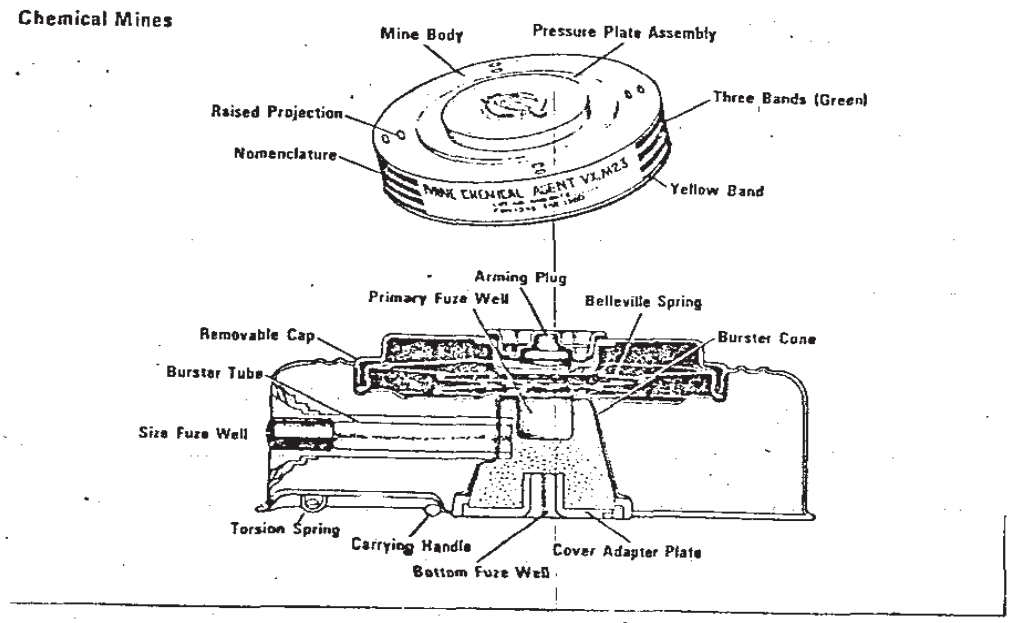

Training mines consist of three types:
*Exercise mines: Similar to the typical mine, whereas it produces smoke and discomfort and causes some harm when it explodes. Normally the training mines would have a training fuse.
*Static mines: Used for specific training purposes. It is usually brought from the manufacture before it is filled with explosives, to be filled with non-effective material that is used as a training tool. It weighs the same as the real mine and uses a non-functional fuse because the static mines do not have a vent to explode.

Training mines are low-cost copies of real mines, and of the same size and weight. They are used in training soldiers on planting and removing mines.

[TC: Illegible]:
Improvised or **[TC: 1 word illegible]** mines are those which are designed in the field. Amounts of explosives may have fuses and be used as mines. Bombs and some catalysts have fuses in their explosive tools, with or without covers, so they can be used as mines. Bombs and mortars can be used as mines. Burning fuel in containers can be prepared into incendiary mines (there is not a standard incendiary mine).
Manual mines:
They are the mines and fuses which are handled in the same way and with the same caution as any other explosive.
* Safety tool: The American military cross-board uses a safety tool for mines, so they do not mistakenly explode prematurely.
* Some mines have a safety feature, or safety pin, which would be in the safety position.
*The detonator, the igniter, and catalyst are removed from the mine when not in use.

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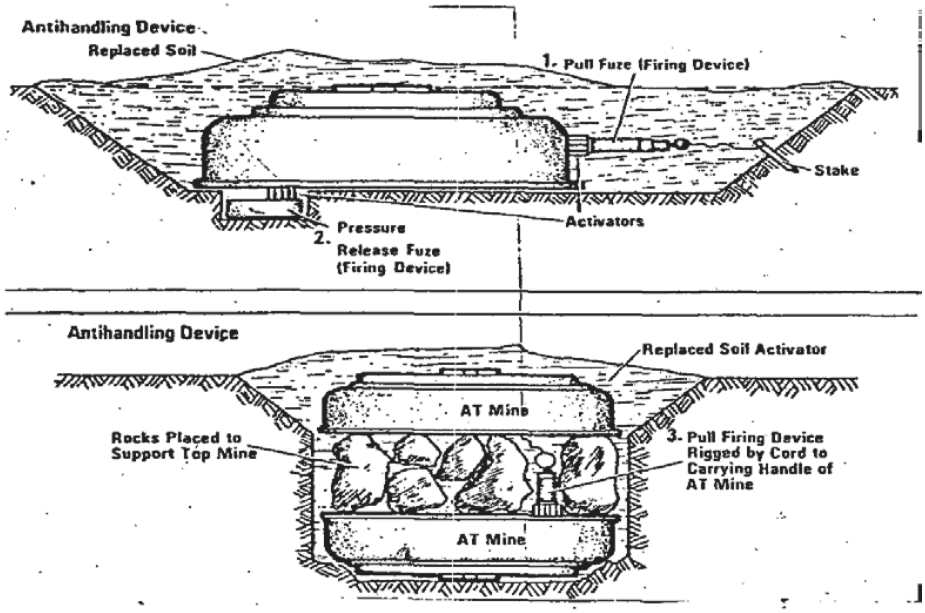
Notes:
*The igniter's gap needs to be clean and free of any foreign object when the detonator and the igniter are installed.
*Arming: After you place the igniter in the mine, remove the safety device, and if the mine has a safety arm it needs to be closed. Now the mine is ready to work.
*Safety: Normally it is the opposite of arming the mine.
*Examine the side and bottom of the mine for connectivity or dismantling when necessary.
*Return all pins, holders, or other safety tools to their proper places.
*If the mine has a safety pin, set it on safety making sure it is disarmed.
*Remove the igniter and place it away from the mine.
*If the detonator does not have an adhesive, remove the mine.
If you found the mine in a ditch and you do not know whether it has been connected or not, tie it to a long string or wire, keep yourself at a safe distance behind a barrier, then pull the string to extract the mine.
*Dismantling the mine may cause it to explode in place if dismantling it. Removing it is risky.
Warning:
* Do not set off chemical mines in place because that will polute the area, not disable them.
*All defects in mine operation should be written down in a report containing all relevant information.



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A historical background about mines and mine warfare

Mine warfare prior to the First World War:

The first mines were utilized to dig tunnels under the foundations of walls and fortifications then burning the wood columns that hold the roof of the tunnels causing the tunnels as well as the structure above it to collapse. History brought us stories of many mines that were executed in this manner, such as the mines that were successfully used in defeating Parga city in the Eighth Century and the city of Antioch in the Eleventh Century.

When the world became advanced in manufacturing and using gun powder, the making of mines advanced as well. It became possible to get better and greater-effecting results by detonating larger charges of gun powder at the end of tunnels dug under fortifications. The first recorded incident using this method was in the war that took place between Pisa and Florence in Europe in 1403, where the people of Florence exploded charges in forgotten tunnels built inside the walls surrounding Pisa.

Moreover, the two fighting parties during the American Civil War used this method. The most famous incident was the mine that was used under an establishment for the Federal Army in the American City of Pittsburgh in 1865 as well as what is called the tunnel mine, which was utilized using primitive mine methods. In 1820, a Chinese commander made and detonated a mine, whose charge consisted of an explosive powder placing pieces of metal on top of it. Similar successful attempts were carried out by the American Army during its war with the Indians in Florida in 1840. Mexicans also tried to use mines on convoys and buried in the ground mines and they were used more than once during the American Civil War.

**Military mines during the First World War
The First World War brought into play tanks and intensive use of vehicles that require paved roads, so as a result, new types of planted mines in addition to the development of electric warheads simplified the utilization of target impacted mines or remote-controlled mines. During the First World War the British manufactured a mine that consisted of various length cylinders filled with explosives, which was highly effective when planted in the middle of paved roads.

Moreover, primitive anti-tank and anti-armor mines, which are made of mortar shells, were used after introducing tanks to the battlefield during the First World War. These mines were successful in destroying much equipment in spite of the fact that minefields were not used on a large scale during that war, however

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it led into developing the modern war mines. The subsequent step in the development was: establishing the tactical principals that needed to be used in the minefield to achieve something or trap the enemy, as well as causing the greatest losses possible among enemy soldiers and equipment.

This equipment was developed in the time between the First and the Second World Wars as well as during the years that followed the Second World War.

** The Development of Mines in various countries:

During the period between the First and the Second World Wars, Germans were the pioneers in developing standard landmines. After that, armies of other nations began to develop their own mines in response to war preparations many European and Asian nations were undertaking. No nation's military possessed more than two or three types of mines up until the beginning of the Second World War. During the aforementioned war, the main countries in mine-developing were: (Germany, Japan, Italy, Finland, Russia, and the United States). All of these nations provided new developments in landmines and fuses. Below is a brief summary of mine-development during that period:

The German military: During the years prior to the Second World War and until the end of that war, Germans developed 36 types of mines and 26 types of fuses, which were used during the war. Some of the distinguished mines that were produced, the mine series (Teller) or “Tank”, which are anti-tank mines that were planted by the millions in Africa, Europe, and Asia. There was also the anti-personnel hopper shrapnel “S” which was first used against the French in 1940 and was named by the French “the silent soldier” and which the American soldiers called “the leaping ladies” as well as the anti-equipment mines that shut off water flow, and the tank piercing hopping and static mines with hollow charges, the piercing anti-tank mines with rectangle charges, and the anti-tank and anti-personnel non-metal mines that were made of glass, wood, cardboard, cement, and clay. Then there are the anti-personnel butterfly mines, which are thrown from airplanes using special bombs. This type of mines were one of the first ones to be developed and were able to be scattered in vast areas. It is also a very effective anti-personnel mine and effective in rendering useless the areas where it is thrown in. The Americans began to manufacture a duplication of it and use it against the Germans.

**The Japanese military:
Between 1935 and 1940, the Japanese concentrated their efforts in manufacturing two circular anti-equipment mines, one of which is equipped with two magnetic pieces to make the mine attach to the body of the equipment. Shortly thereafter, the Japanese manufactured the first anti-amphibious equipment mine. The explosion mechanism of these two mines consisted of a chemical-electrical fuse

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And near the end of the war, a ceramic anti-tank mine was designed but was never used.

** Finland's Military:

Finland's military manufactured and used the first of what is called “the ice mine” whose shape is similar to a milk bottle, it is filled with explosives, and it is prepared using shocking fuses. It is installed while hanging in a series using a rope or a wire, by passing it through numerous holes in ice. One of this series’ mines would be the initial activating mine, which is detonated electronically from a hidden observation position. The Finns used this type of mines against the Russians to create water barriers in frozen lakes and ponds. Moreover, they designed an anti-personnel shrapnel mine that was used against skiers and would be planted along the paths that are used by skiers.

** The Russian military:

The Russian manufactured their first landmine model in 1935. They were square flat-shaped anti-tank mines that have a metal cover known as (T-M35). It is equipped with a fuse called (M F F) that operates by pushing or puling. It is also the current fuse model in the Russian military. It is used in many Russian landmines. Moreover, the Russians were the first to manufacture model landmines that have non-metal covers due to lack of metals and not to protect against mine-detecting equipment. But also, they were the first to manufacture a non-metal mine for protection against mine detectors. That mine was made of tar plated paper and named (T M B1). Its first use was in the eighth month of the year 1942 in “Sevastopol”; however the pressure fuse used in it and in all other anti-tank mines is the (M V S) metal fuse. The first completely non-metal mine is the American (M S), which was first used in battle in 1943.

Moreover, the Russian military was the first to manufacture and use the anti-tank shell piercing mines in battle, as well as flame mines, anti-tank and anti-personnel wood-covered mines, and the (M U V) fuse that responds to being pressed on or pulled and that can be installed on most models of Russian mines. Russians were also among the pioneers in developing the fuse, which gets activated by the vibrations (anti-mine detector) as well as the fuses that respond to vibrations or magnetic fields. A vibration activated fuse was used against the Germans who duplicated, improved upon it, and then manufactured their own model (S M 12). By the end of the Second World War, the Russians manufactured 61 types of model land-mines. Fifty of them were shrapnel mines, one of them was shell piercing mine, another was chemical toxic which is the (C W) mine, and another an incendiary mine. At least 26 different fuses were developed and were all used by the Russian military (seven of which work

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by pressure) two by being pulled, two others by either being pressed on or pulled, while ten work automatically or spontaneously, two work by the effect of electronic vibrations (anti-mine detector), and three by the effect of vibrations. However, other types that were manufactured by the Russian military operate either via placing pressure then releasing the pressure, by pulling then placing pressure, or by the effect of electromagnetic fields, which were used as part of special types of mines.

**The American military:
The first model landmine manufactured by the American military was an explosive anti-tank (non-shrapnel) mine named static (M1), which was manufactured in 1941, and it was directly followed by the hopping shrapnel (M2) and the static (M3) mines. They are both anti-personnel mines. In 1943, the anti-tank (M4) was released, which is similar to the (M1) except that its base contains shrapnel pouches. In the same year, the (M5) mine as well as the anti-tank non-shrapnel explosive metal mine (M6) were released. The design of the last one was taken from the 1943 version of the German mine “Teller”. The last mine manufactured by the American military that they used in the Second World War was the light anti-equipment metal mine (M7). In the period following the war, the American military manufactured the anti-personnel integrated mine (M14), which is a non-metal mine that works via its explosive wave, and the anti-tank (M15) mine, which is a heavy version of the following mines: (M6), and the anti-personnel shrapnel jumping mine (M16), the anti-personnel directed shrapnel (Claymore M18), whose explosion can be controlled, the anti-tank non-metal square mine (M19), the anti-tank piercing metal mine (M21) whose charge is in the shape of sheet, and finally the (M23) mine, which is a chemical mine that works by pressure.

The Effectiveness of Landmines

- Statistics on the Allies’ tank losses during the Second World War indicate that 20.7 % of these losses were caused by mines. However, in mountainous areas, which limits the movement of tanks and forces them to take defined paths, the percentage of losses increased to 27.5 % as was the case in Italy and to 33.3 % as was the case in the Pacific Ocean region. And during direct combat, the percentage decreased to 10 and 15 %; however, it reached 30% and 40% when direct offense was needed to take over fortified positions. In regard to human casualties, the percentage ranged from 1% in the Pacific Ocean region, to 3% in Europe, and 4.4% in the Mediterranean Basin.

During Conflict: Losses caused by mines, as part of the Allies' total tank losses during their advancement toward the opposition forces increased to 70%, while human casualties reached 10% during these operations

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of progressive offense.

In Vietnam: equipment losses reached 70 % and human losses reached 33% of the overall losses that were due to mines and booby traps in 1970.

In addition to effecting the global percentage of casualties, minefields create obstacles, delays offenses, and requires plenty of time and effort to be removed.

For example: 45,000 man-days* were needed to remove eight million mines that were planted by the German military.

* A man day is the amount of work one man can produce in one day.
The use of mines and minefields has developed to the point where they cause one or more of the following:

1-Destroy equipment and humans.
2-Delay the enemy.
3-Lead the enemy to a predetermined location.
4-Inconvenience the enemy and destroy his morale.
5-Support other weapons.
6-Strengthen the defense unit, saving time.

**Types of mines currently in use and their methods of planting and use:
Anti-tank mines currently in use consist of explosive charges in the form of a disc, cylinder, square, or rectangular shape that could weigh up to 30 pounds (13.6kg) and would be stored in a metal, wood, or other non-metal material. It operates through detonators that get activated by the equipment on top of it, by being electronically controlled, by the vibration of the equipment, or by the magnetic effect emanating from the equipment's body. However, anti-personnel mines currently in use are produced in various shapes and sizes whether they are covered with metal or non-metal material. These mines are classified as shrapnel, explosive, as well as some shrapnel mines of the jumping type, which jump in the air prior to their explosion causing an increase in casualties. Some detonators used in anti-personnel mines operate by pressure, by alternating between placing pressure and releasing pressure, by touching, tripping, electrical control, or slow-release chemical detonators.

Mines are planted individually or in groups in roads, road sides, pathways, open-land, buildings, as part of booby traps, or as a way to cause the enemy distress by creating causalities and fear among them. Moreover, mines are largely used in minefields to create great obstacles in the enemy's movement and to control its path.
Many of the mines that were used during the Vietnam War by the Vietnamese were made in an improvised way using unexploded explosives and bombs

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and some types of containers or casings. They were prepared to explode either by direct contact, gradually, or by being electronically controlled from a hidden location. These mines or booby traps were either planted individually or collectively and were planted on roads, roadsides, open land, paths, as well as around camps and defensive sites. They were also used a lot in booby traps.

Any mujahid should expect to face similar mine threats from an enemy during a battle.

**History of mine-countering operations:

Mine detecting and mine deactivating were greatly significant obstacles during the Second World War. So, in dealing with mines, which were largely used by all militaries in defense and withdraw situations, mine-countering equipment was developed in various forms whereas Germans planted millions of mines in France to obstruct and prevent the advancement of the Allies. And Russians, according to related reports, planted 10 million mines to stop the German attack on Russia. Moreover, the Russian military had a specially-trained unit in the size of a battalion whose main mission was to plant Russian mines and remove German mines. The Japanese also heavily planted mines along the shores of the Indian Ocean islands when they were expecting attacks by the Allies. Moreover, the Libyan and Egyptian deserts were heavily planted with mines by both sides during the war that was taking place there.

When the Second World War began, mine detecting methods were no more than gun-spears and sticks. However, gradually most countries developed metal mine-detectors that have the ability to detect metal mine-casings. Toward the end of the war, the fighting parties began to manufacture non-metal mines to counteract the metal-mine detectors, so by the end of the war sticks and rods for visual detection as well as metal mine-detectors were together the available methods for mine-detecting. Now, after 45 years, the effective and trusted system in mine-detecting depends mainly on visual detection, along with the support of electronic equipment or dogs that are trained for this purpose, and to a limited extent on aerial photographs.

It was determined that the safest method of dealing with a mine, once it is detected, is to remove it while staying in a secure place at a distance because many mines are used as booby traps, therefore, mines should be pulled out using a rope or a long wire. However, if these mines are definitely free of booby traps or any methods that prevent deactivation, then the mine can be pulled out by hand before pulling out the detonator, the explosive charge, or it can be set off according to the type of detonator being used. Moreover, there are many ways to deactivate mines or set them off before they are detected; however, there is not a single ideal method to deal with all cases since there are numerous types of detonators

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and mines used by militaries. Moreover, equipment (minesweepers) and explosives used to open paths or clear areas in minefields are used to set off mines that are activated upon contact, to remove trip-mines, or mines that are activated either magnetically or through vibrations. However, detonators with delayed-action, which are activated using a distinctive method of contact, have overcome these methods making the mine explode by the equipment that drives the minesweeper or it keeps the mine active to hit another target. Internal cylinders and explosives mostly destroy the mine regardless of the type of detonator. Also minesweepers come in the form of plows and driven by equipment, they can extract mines onto the surface and deactivate them whether they are surface mines or mines buried at a depth not exceeding 6 inches (15 cm) in unpaved areas.

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Specification of Mines and their Methods of Installation

Planting mines manually:

Every structure that consists of a mine and a detonator has a unique method for hand installation and safety dismantling. Some mines are designed to work effectively both if planted underground or on the surface, as it is the case with (M15 and M19) mines, and others are designed to be planted underground only such as (M21, M14, M16 I1, M25, and M26) . However, other types of mines are effective when planted on the surface such as (M18, M24, and M66). And when planting individual mines, sufficient distance should be left between mines to avoid impact explosion.

The required distance for anti-tank mines, which are activated by the effect of the (non-shrapnel) explosive wave is at least 6 meters when the mines are underground and at least 12 meters when on the surface. However, individual shrapnel mines must be at least two steps apart.

In soft spongy soil, or areas that are covered with snow, anti-tank mines need to be placed on a board of wood or some other flat solid material to avoid being implanted in the soil, snow, or moist areas with rainy conditions. So, in snowy regions, anti-tank mines should be placed in a water and moisture proof bag. Also the edges of the mine should be covered with grease to minimize the amount of water or rust reaching the mine. Attention should also be paid to camouflaging the mine whether it is planted on the surface or buried underground.

The Role of Machines in Planting Mines:

The automated mine distributor “M 57” is a machine trailer that consists of a body on which the mine rail and a folding plow are installed. The mine distributor can automatically plant (M15) mines either underground or on the surface. See the diagram for additional details on this matter.

Camouflage:

Applying camouflage in mine planting operations increases their effectiveness and the impact of disability because it provides the element of surprise and resistance against the enemies’ attempt to penetrate it or cross it.

When planning all on-the-surface or underground mines, it is a must to achieve maximum possible camouflage. Any excess soil during digging is to be used for covering the mine when buried in ground, however, any leftover soil after that should be moved away from the minefield. Anti-tank mines that are set off by the pressure should be covered by a low raised soil, whose thickness is no more than 2 inches (5cm) as shown on the diagram.

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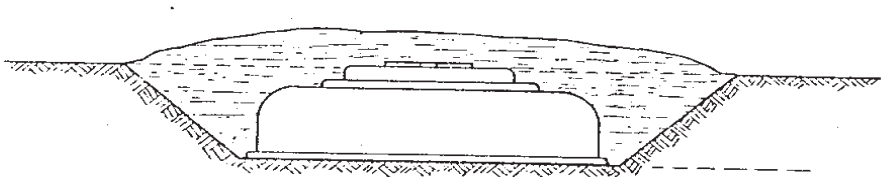
The Preferred Method to Plant Pressure Activated Anti-tank Mines

Figure C-1. Recommended Burial for Pressure Fuzed AT Mines



When a mine needs to be planted in an area where palm trees and (green grass) grows, the layer where the green grass is cultivated needs to be removed and rolled, then put back in its place to cover the mine, once it is planted. Moreover, camouflage provided by the type of terrain in the area can be utilized to increase deception and difficulties in mine clearing by selecting the appropriate mine that can easily be camouflaged. It is worth noting that a mine which remains planted in grassy or green pasture land would be more distinguished since the grass in the ground covering the mine would grow unequally to the other grassy areas surrounding it.

Mines planted in a way where their fuse is on or above ground, need to be camouflaged in a way that does not affect their effectiveness. Moreover, anti-personnel mines planted on the surface can be camouflaged by grass or some similar light-weight material, which does not reduce the effectiveness of the mine. It is preferred to use mines equipped with extended rod igniters in areas where plant cover can hide the rod. Also, caution should be taken to ensure that camouflaging material will not cause a pre-mature explosion or hinder the work of the fuse. Additionally, the camouflaging procedure should be completed prior to releasing the safety pin of the mine.

The enemy can be deceived by leaving traces in snowy or soft soil land of machinery in the minefield prior to planting mines to delude the enemy of believing that they have safe passage.

**Anti-personnel mine number (M18 I 1)

Anti-personnel mine (M18 I 1) that is shown in the diagram is a directed shrapnel mine that is usually used in defensive minefields, to protect camps and advanced positions, or to prevent breaching. This type of mine is effective against vehicles with narrow bodies such as trucks and Jeeps, where shrapnel can penetrate the wheels, fuel tanks, cooling-tank basin, and engine, so when the mine explodes, round steel shrapnel shouts out in a triangle-like shape, whose head is by the mine and it spread in a 60 degree angle covering an area with a diameter of 100 meters that is 2 meters high. Each mine

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of this type comes in a shoulder bag with a belt. The bag includes all necessity items and an instruction booklet.

**Description:

The (M18 I 1) mine: It is a square shaped mine and has a plastic cover painted with a dusty-olive color. The mine is 8.5 inches (20cm) in length, 35 cm in thickness, 8.5 cm in height, and weighs 3.5 pounds (1.3 kg). In the front of the mine, there are 100 steel balls weighing about (0.7 grams each) and are planted in a plastic net. The back of the mine contains 1.5 pounds (0.6 kg) of the directed (C4) material, which contains horizontally convex shrapnel to direct shrapnel at a 60 degree angled arch with a concave tip to control the spread in a 25 meter diameter in front of the mine.

** The back side
The 16 meter area to the sides and behind the mine is the danger zone, since casualties could result from the back side and secondary shrapnel. Therefore, all friendly- forces members present within 100 meters distance to the side and back of the mine, should seek cover to avoid the secondary shrapnel of the mine.

Figure C-2. Recommended Burial for Tilt Rod AT Mines

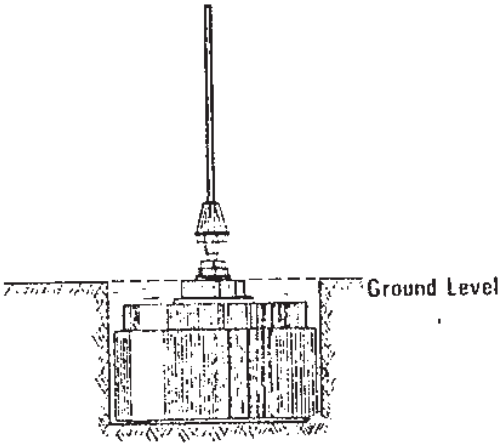

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Figure C 3. Mine, Antipersonnel, M18A1

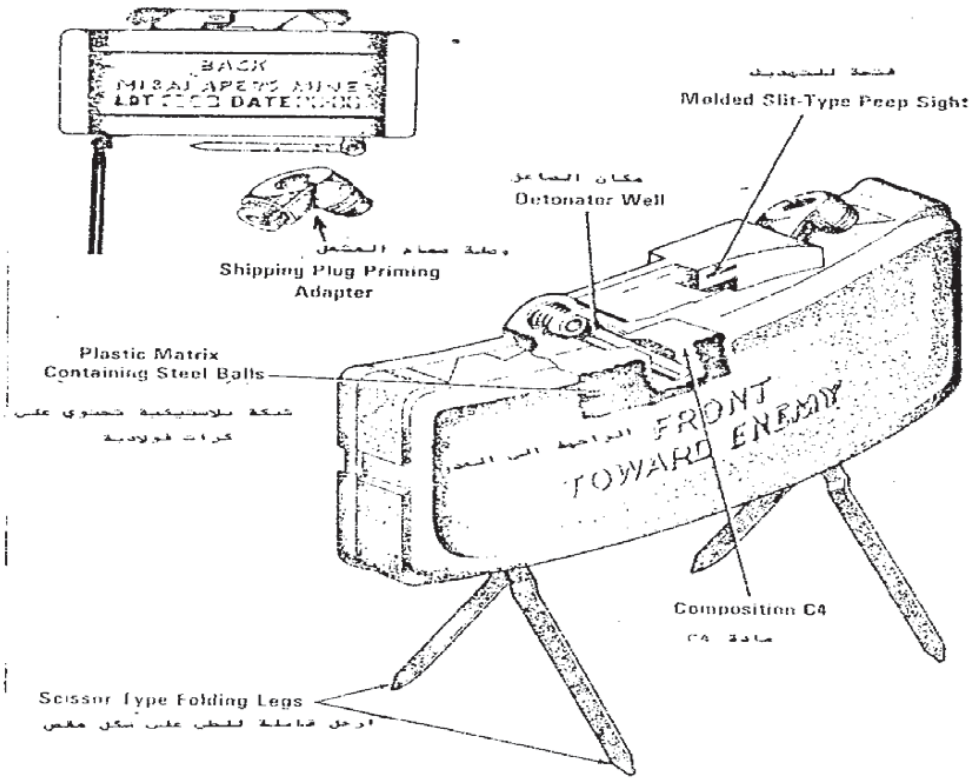
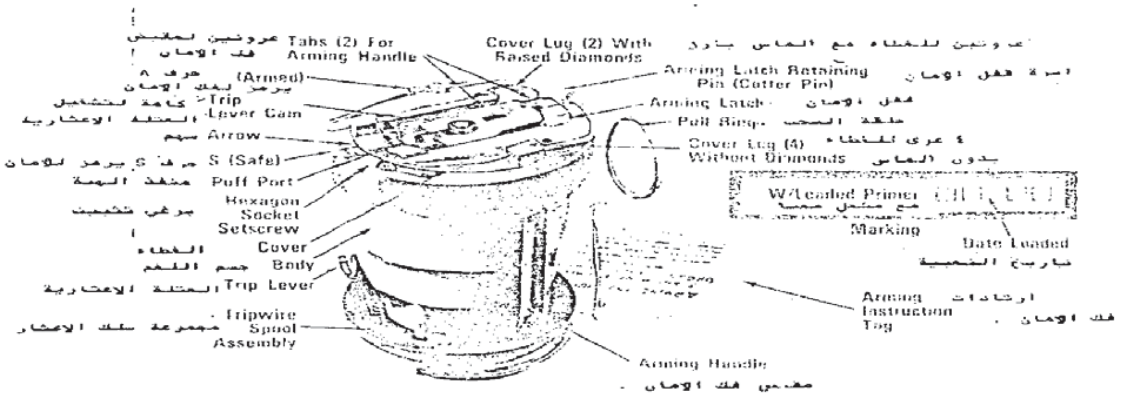


Figure C-4. Mine, Antipersonnel, M26



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Method of ignition:
This type of mine can be set off electronically or via tripwire.
Usages**:**
Definition and action of the (M18I19) mine are identical to the anti-personnel mine. The (M18I19) is designed to launch lethal steel shrapnel in a fan shape covering a specific targeted area. Detonating the mine can be controlled by friendly forces, or by connecting it to a tripwire that gets activated when the target comes in contact with it. In the second case, only one tripwire or doubled wire are to be connected with a fuse that gets activated by pulling or releasing the pulling tension (when the wire connected to the mine's detonator is cut). Wires are to be place in the targeted area (the triangle) in front of the mine. This mine can be planted in front, to the side, and back edges as well as the paths leading to defensive minefields as a defense mechanism to prevent the enemy infantry from coming through. The (M18I19) mine is not preferred for typical defensive minefields or in preventative minefields, unless it is used on the outer unorganized edges or to cover abandoned breaches and passages in the minefield. In order to protect the (M18 I1) from being set off or damaged by the impact of explosion from a nearby mine, the following distances should be left between mines:

- A mine should be at least 50 meters away from other similar mines when planted in a cross or at opposite sites and at least 3 meters when planted next to each other.
- At least 10 meters distance should be kept between anti-tank mines, between anti-personnel shrapnel mines, or between the (M23) chemical mines.
- Leave 2 meters distance between non-shrapnel mines.

Warning:
It has been proven through experience that the trip-wire group quickly would become malfunctioning when connected to the explosive head of the (M18 I1) mine during repeated action of assembling and disassembling. So if complete caution is not taken while assembling and disassembling the fuse, the wire could get damaged. Therefore, inexperienced persons should not try to fix the wire, and replacement of the electronic detonator must come from the regular supply channels.

Anti-personnel mine (M26):

The anti-personnel mine (M26) is a jumping shrapnel mine, see the diagram, so when it is pressed on it jumps in the air at 180 cm height, then it explodes. The range of coverage has about 20 meters in diameter.

Description:

This mine weighs 2.2 pounds (about 1 kg). Normally it is planted underground, where the top is on ground level and it is camouflaged.

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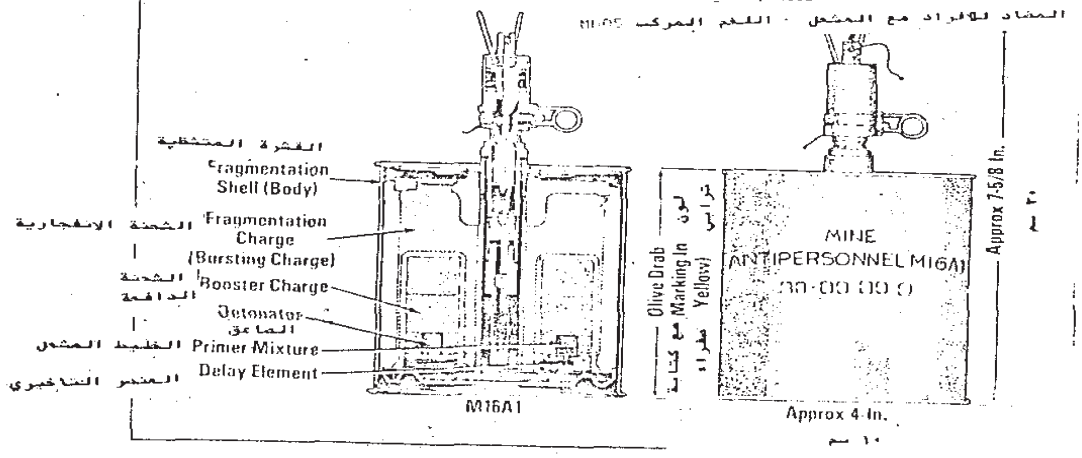
Method of Ignition:
Pressure from above with a 14-28 pound force (4.5-9 kg) or pulling a tripwire that is 20 feet in length (6meters) with 4-8 pounds force (1.15-3 kg) would instigate the mine.

Anti-personnel mine (M16 I 1 with igniting set):
This mine shown in the diagram is the jumping shrapnel type, which operates similarly to the aforementioned (M26) mine, however the (M16 I 1) carries an explosive charge that weighs three times the charge in the (M26) mine which indicates that it has a greater effect range.

Description:
This mine is a component that consists of the (M60 S) mine's igniter, propelling charge, and projectile, all of which are collected in a metal box. The spiral igniter fuse is installed on top of the box and extended through the projectile reaching the bottom of the box where the propelling charge is placed. The remaining space inside the box contains the projectile. Moreover, the old model of this mine, which is the (M16) is still being exported, with the main difference among that model and the current one being in the installation of the detonator and the projectile.

Figure C-5. Mine, Antipersonnel, M16A1 and Fuze, Mine, Combination, M605



Some of the (M16 I 1) mine specifications:

- It is the jumping shrapnel type.
- It is loaded weight without igniter (3kg).
- Height measurement without installing the igniter is (14cm) and with the igniter (20cm).
- Material: steel and iron ore.
- Weight of the explosive material (0.38 kg).
- Diameter of area covered: about 27 meters.
- Danger zone diameter 183v meters.

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Method of igniting:
Pressing with (3-7.5kg) force on any of the igniter's three sides or pulling the tripping wire that is connected to the igniter's safety pin with (1.2-3.8 kg) force. This would result in the release of the pin, the launch of the mine, and then its explosion.

The anti-personnel non-metal mine (M14) with complete fuse:

This mine which is depicted in the diagram is a non-metal mine of the explosive non-shrapnel anti-personnel type. It contains an explosive material weighing (.35kg). The body of the mine is made of plastic and includes a complete plastic fuse that has an igniting pin made of steel. The mine can be widely used and camouflaged due to its small size. This mine is capable of causing serious injuries because it explodes when the target comes into contact with it. And since it is a mine made completely of plastic, it is hard to detect it with a mine-detector.

Description:

It is a mine with a cylinder shape and it has six **[TC: Illegible]** on its outer perimeter, which are used as a tool to deal with the mine (identify it) in the dark. As for safety, the detonator and its plastic carrier are stored separately, but in the same container as the mine. On the pressure plate, there is a yellow arrow designed to have the mine's key and fuse installed on it. The letter (A) on the mine indicates that the safety is off and the letter (S) indicates that the mine is in the safety mode. Also there are holes on the pressure plate through which the safety net, in diagram U, goes.

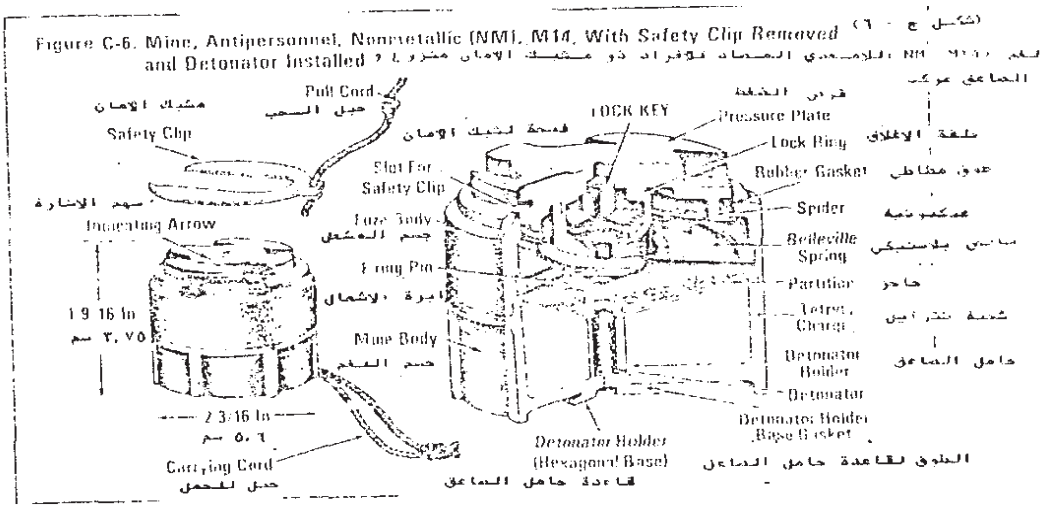

Figure C-6. Mine, Antipersonnel, Nonmetallic (NM), M14, With Safety Clip Removed and Detonator Installed

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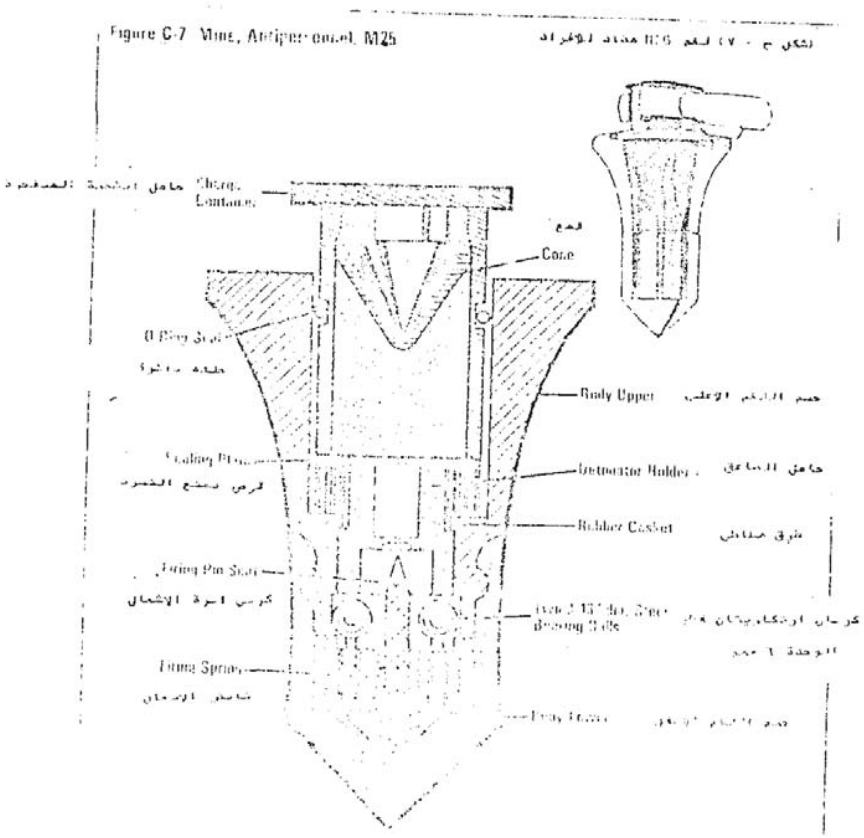
Specifications:
-Model number (M14)
-Type: Explosive non-shrapnel
-Weight: When loaded including the fuse and the detonator 121g
-Weight of the explosive material: 31 g
-Measurements: Height 3 cm
-Material: Plastic
-Fuse: Complete
-Effected area: It affects the area that comes in contact with the mine.

Method of ignition:
Pressure with (7.6-11.2 kg) force would press on the plastic circular **[TC: Illegible]** causing it to fold downward while exploding making it concave after being convex, which causes the igniting pin to move to the bottom, which sets off the detonator and in turn setting off the **[TC: Illegible]** charge.



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Anti-personnel mine (M 25)

The mine (M25) shown in the figure is an explosive non-shrapnel mine and has been designed to be easy to plant and to disengage its safety and to disguise it quickly. It is difficult to detect and it causes injuries to personnel. To disengage its safety is relatively safe. This mine is nonmetallic and it has a mixed charge. It is an anti-personnel mine and has an integrated ignition device.

Description:
The mine consists of two plastic assemblies, containing the ignition device and the detonator and explosive container. It has two safeties: the protective cover from the dust and safety nets, and the ignition device which works via balls and a predetermined amount of pressure (6.5 to 8 KG).
Item Number: (M25)
Type: explosive impact (directed non-shrapnel)
Weight: (120 grams)
Metrics with the filling: height (8.75 cm) diameter (2.6 cm)
Without charge: (7.5 cm) diameter (2.6 cm)
Material: Plastic
Explosive material weight: (51 grams) of TNT
Method of ignition: If pressed as much as (6.5 to 8 KG) on the mine, it will push the charge and the ignition device down and stressing the spring, which leads to the remaining steel balls to be loose resulting in the release of the spring and pushing the ignition pin into the detonator itself to explode and then the explosion of the main charge follows.

Mine (M15) is an anti-tank heavy explosive mine with ignition type (603).

This mine as shown in figure 90 is a heavy anti-tank mine.

Specification:
Item Number: (M15)
Weight without igniter: (11.4 KG)
Weight of explosive filling: (8 KG) of compound (B).
Measurements: Height (12.5 cm) diameter (32.5 cm)
Material: Steel
Detonator slot: The main detonator slot in the center of the mine.
Safety method of decoding ignition: By safety piston (M4) or (M4 B1) above the main detonator slot when transmitted or stored.

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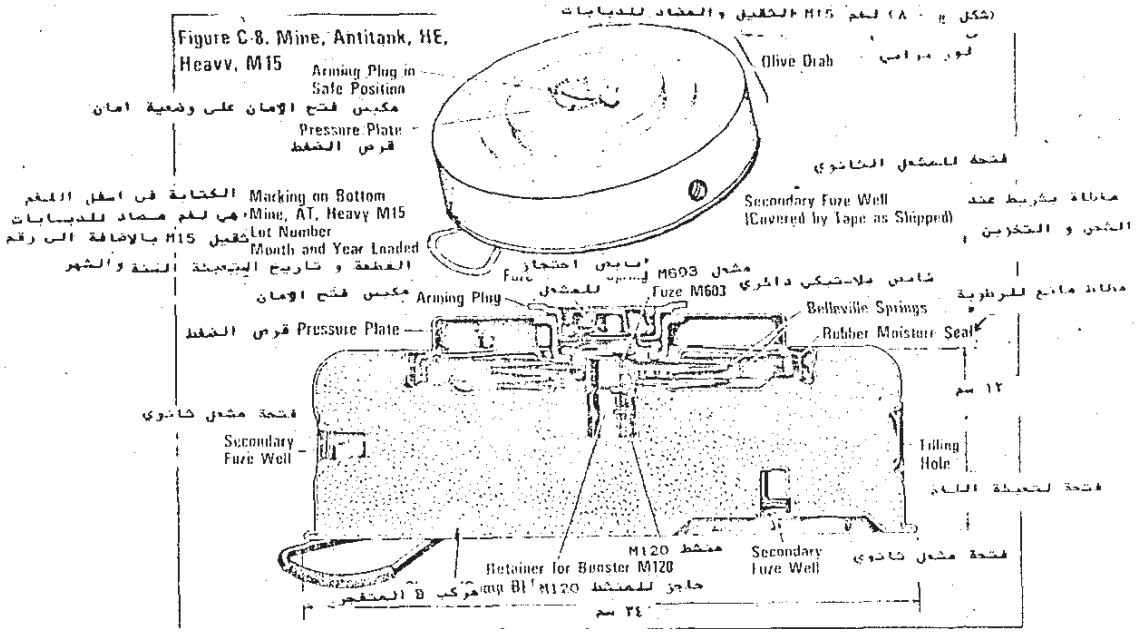
Detonator secondary slot: There are two slots; one on the side, and the other on the lower side (main detonator number 603)
Type: It works by circular plastic automatic-spring, weight (47 grams)
Safety: Forked safety clip
Secondary detonator (joint): Its ignition device is installed on a 1.5 cm slot and holds in its tip the number M2.
Ignition method:

When the safety piston is in the open position and (150 to 290kg) of pressure is applied to the pressure plate, it bends the plastic pulsating to the bottom, starting a series of explosions.

Ignition device (igniter) M608 anti minesweeper with rollers:

This ignition is used in place of the former igniter (M608) in a specific percentage of mines (the preferable percentage is 20%) when using anti-tank mine M15 in tactical minefields, this igniter needs constant pressure from 0.01 to .35 seconds until it explodes, and it is designed to be used against enemy minesweepers with rollers driven by tanks in areas that are expected to use minesweepers.



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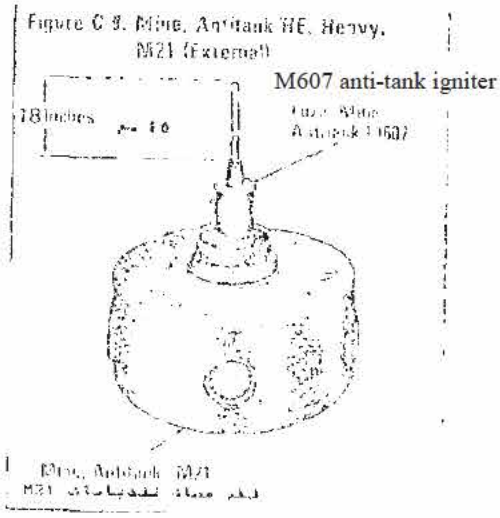
Mine (M21) very heavy explosive anti-tank mine:
The M21 anti-tank mine with anti-tank igniter M607 as shown in the figure, used for destroying tanks and other vehicles, is fitted with long arm so it will be detonated as soon as it touches any part of the front of the tank or vehicle.
The effectiveness of the mine (M21) against armor is caused by the explosive power generated by its highly explosive charge blast (compound H6) which launches a mass of steel to the top and quickly enough to penetrate the reinforcement at the bottom of the tank.

Figure J9: External view of M2 mine, with a heavy explosive anti-tank fuse



Very heavy explosive M21 anti-tank mine (external view)

Specifications:

The M-21 anti-tank mine has a diameter (22.5 cm) and height (11.25cm) and contains about (4 kg) of the heavy explosive compound (H6). The outer shell of the mine is painted with a sandy olive color, and the writing is yellow in color. It has an adjustable strap to carry the mine on the shoulder. The weight of the mine without the igniter is (6.8 kg)

Ignition method:

The igniter (M-607) works with or without the extension arm. With the arm, tilt the extension arm horizontally at an angle of 20 degrees or more and by a strength of (1.5 kg) then the explosive series will start. Without the arm, the pressure force on the pressure plate should be 110 kg or more.

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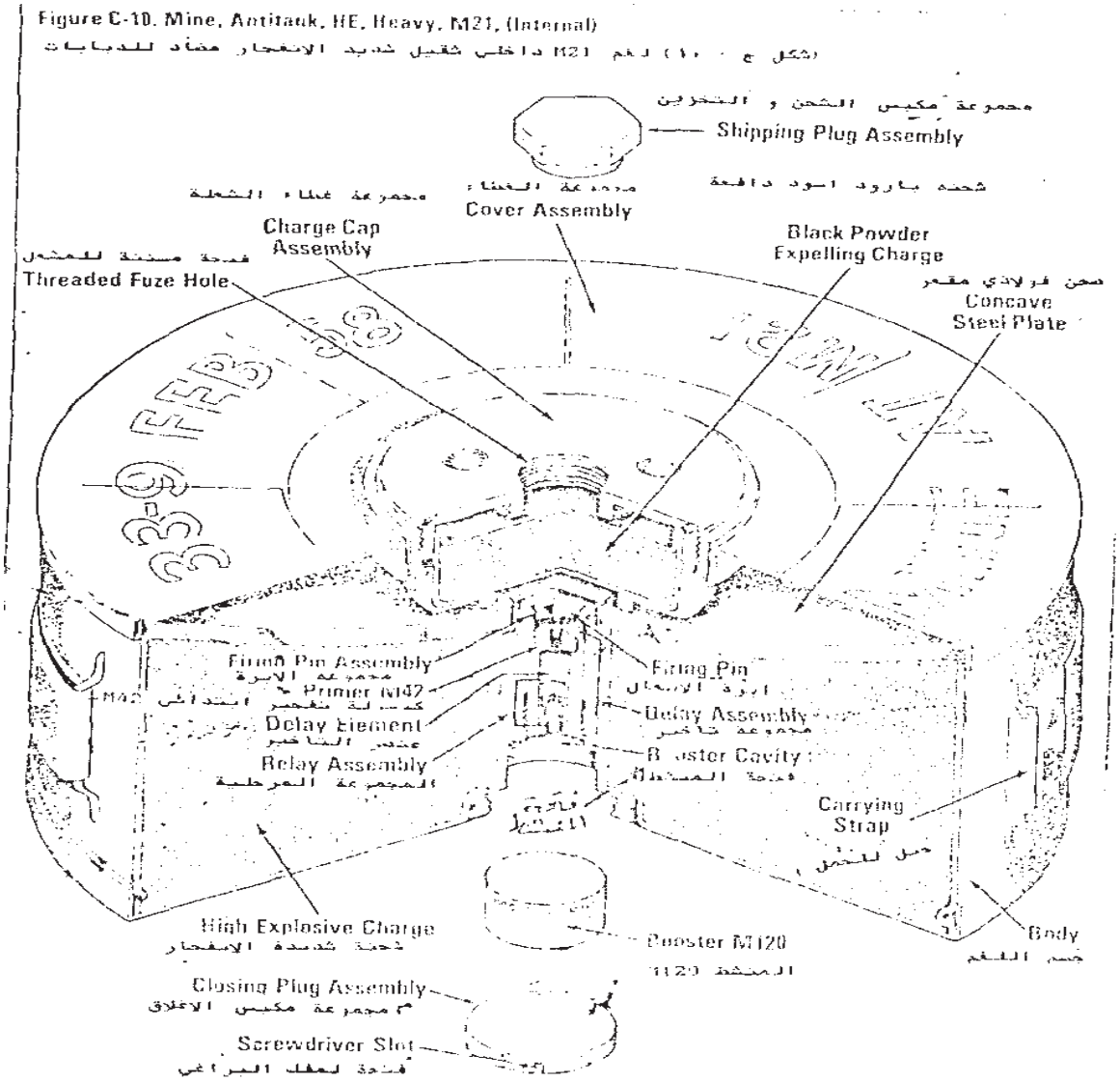

Mine (M19) nonmetallic, severe blast anti-tank, with mine igniter (M606)

The (M19) is a box-shaped anti-tank and other wheeled equipment, and has a plastic shell to make detection difficult. It has the (M606) igniter which works by pressure and is made of plastic as well.

Description: Box-shaped, measurements (33cm X33cm X 7.25cm) and contains (8kg) of the explosive compound (B) and the color is sandy olive with prominent yellow letters, it can easily be recognized even in the dark due to its shape. The box contains the explosive device, activated TNT, and the igniter. It also contains two additional slots -- one on the side and the other on the bottom. The body of the igniter contains a spring-loaded pressure plate, plastic spring, control button, numbered disc, a pin primer and a detonator.

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Ignition method:

When the setting button on the top of the mine is set to the safe position (S), the mine does not ignite via the main igniter, and when it is in the (A) position and when pulling the safety buckle, the mine will explode when placed under strong pressure (130 kg to 190 kg) because this pressure causes the plastic spring to be pressed to the bottom which will start the explosive chain.

(M-24) anti-tank and vehicle mine is planted out of the way

The (M-24) mine is a mining system for mines that are not in the direct path of tanks, it is meant for anti-tank purposes and uses the (M-24 I 1) rocket, and it is planted manually along roads, trails and branching roads. It is designed to destroy wheeled vehicles at a distance of up to 30 meters using remote ignition (see Figure C-12)

Description:

The (M-24) mine consists of the following main parts:

1- Ignition device
2- Electronic device
3- (M 28 I 1) rocket.

Ignition method:

This mine is planted as in figure (C12) and the missile is directed at the vehicle so when it touches the electric device the electrical circuit is completed, which initiates the ignition, then the rocket shoots at the vehicle.

The (M66) anti-tank and vehicle mine

This mine is similar to the aforementioned (M24) mine, but differs in the way the detonation is initiated whereas this mine has an audio alarm as well as an infrared detonator, and these two devices may be switched out with a pressure tape that ignites the (M24) and these two devices initiate the mine when a the alarm senses vibrations of approaching vehicles then the rocket is launched when the vehicle(s) cut the infrared line which spans across their path.

For details see operation instructions in the operation manual for the (M-60) mine anti-tank (the 8th month of 1972).

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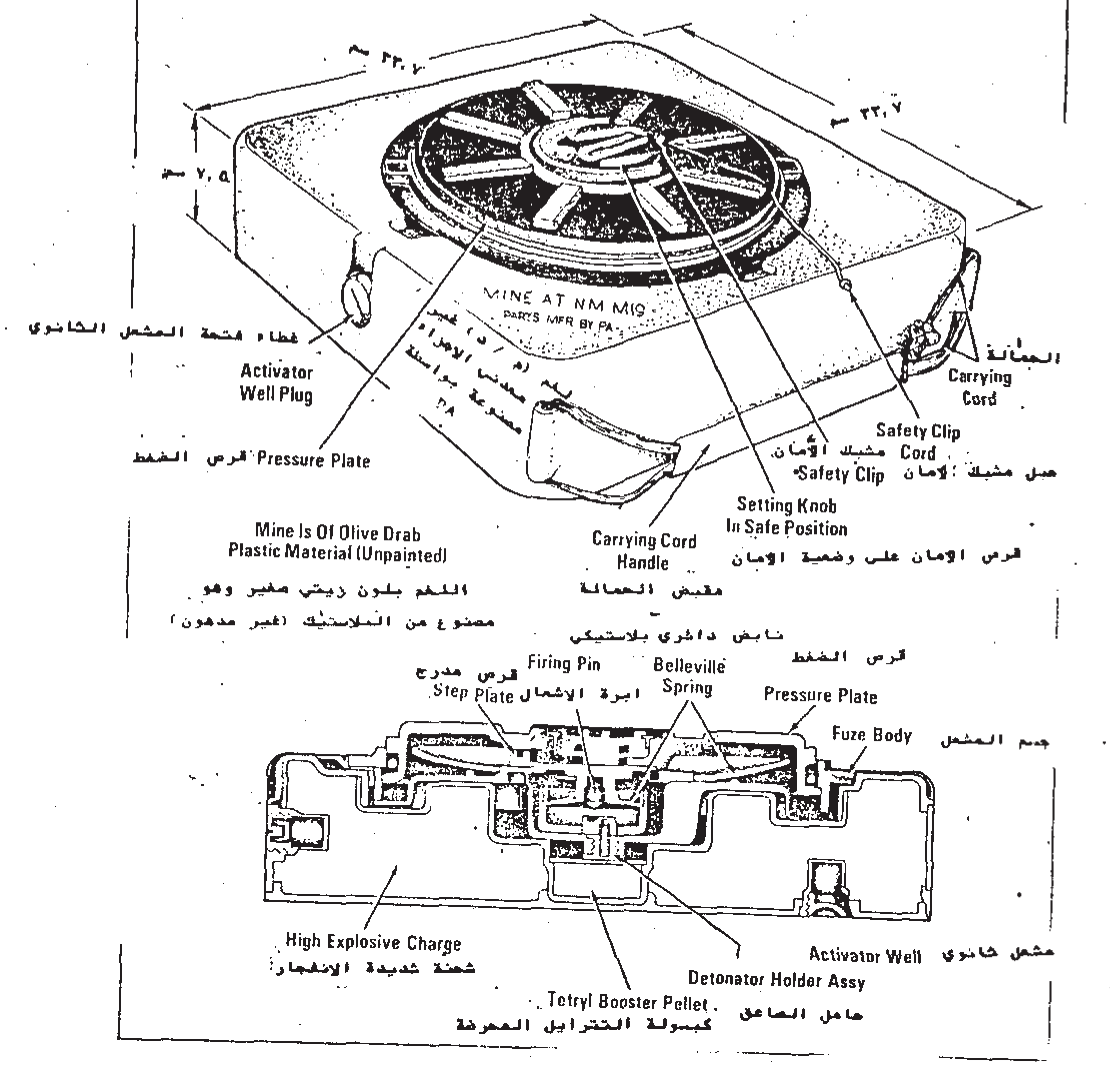
Figure C-11. Mine, Antitank, HE, Nonmetallic, M19, with Fuze, Mine, M606

(شكل ج - ١١) لغم M19 اللامعدني شديد الانفجار و المضاد للدبابات مع لغم - مشعل



Nonmetallic high explosive M19 anti-tank mine

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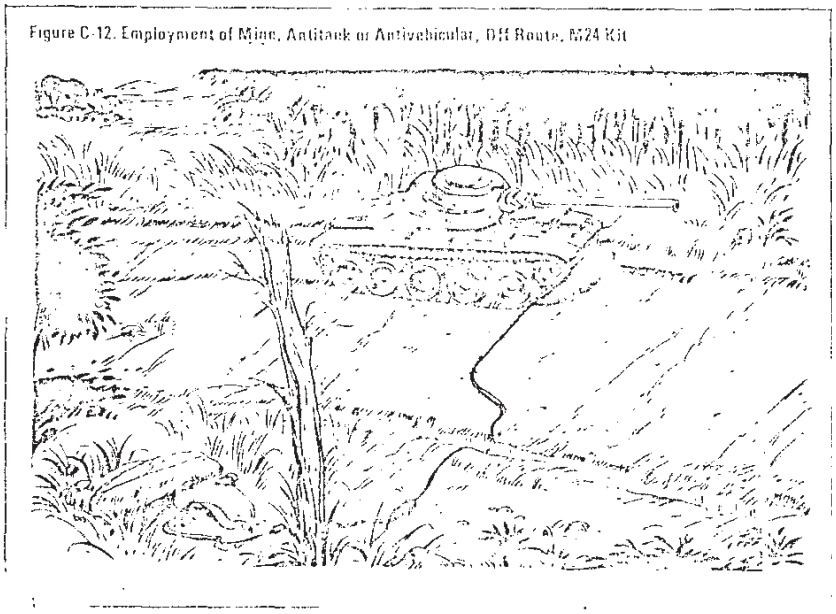

Deployment of M24 anti-tank and anti-vehicle mine (not placed in the direct path)

Incendiary mines made from raw materials

The flammable materials that work best and which are available on site are flares and gas lamps; they can also be used as incendiary mines. When these are used as incendiary mines and set off when the enemy comes in contact with them they are called improvised incendiary mines (made from available raw materials).

Specifications:
The improvised incendiary mine consists of:
1-Bucket or tray. 2-Burning fuel (usually gasoline and oil). 3- Ignition system to spread and ignite the fuel. The amount of space where the fuel spreads depends on the size of the bucket and the ignition system. You can use the (M4) incendiary fuse or it is possible to use the explosives in a white phosphorus grenade (WP) which will act as an igniter. This mine can have a number of different shapes and can look different. It all depends on the imagination and innovation of individuals on the battlefield in charge of preparation of such mines.

(M23-VX) Chemical Mine

The (M23) chemical mine is a loaded explosive used to spread nerve gas. The mine may be installed to explode when the enemy touches it or remotely. It may further be used as a normal anti-personnel mine.

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Description:
The (M 23) chemical mine is similar in size and shape to the (M 15) anti-tank mine and its body consists of the same type steel of the (M 16 I 1) mine. The (M 23) mine can be distinguished from the (M 15) mine by touching and looking at it, where there are 8 overhangs protruding at 90 degrees from the edges.

The (M 603) igniter is used as the main igniter, while the (M 1) activator with igniter is a secondary when using anti-personnel mines. The (M 1) igniter can be installed along with the activator tool on a special joint slot on the side or under the mine.

- Type number (M 23) - Type: explosive - weight without igniter: (8.6 kg) -weight of charge (4.3 kg)
- Measurement: Height (12.5 cm), diameter (32 cm)
- Material: Steel- the main igniter slot is in the center top of the mine.
- The secondary igniter slots: Two: one at the bottom and the other on the side covered with plastic.
- Color: Gray paint- letters printed in green along with the green lines that are (1.24 cm) wide and one yellow line at a width of (.5 cm)
- Capacity: (1 liter).

One-gallon Chemical landmine

This mine as shown in the Figure is a chemical landmine with a capacity of 1 gallon (4.5 liters) and can be packaged on-site by inserting the (M 2) landmine device. The chemical material is distributed via an external charge of explosive chords placed on the side of the box or the container.

Description:
The mine is a somewhat thick plate with a capacity of one gallon (4.5 litters). Affixed on its side are two wires of copper attached by welding. These two wires help fix the explosive cord to the box. This package is licensed for mustard gas **[TC: Illegible]** in the amount **[TC: Illegible]** or (MR) which is used for training purposes only.

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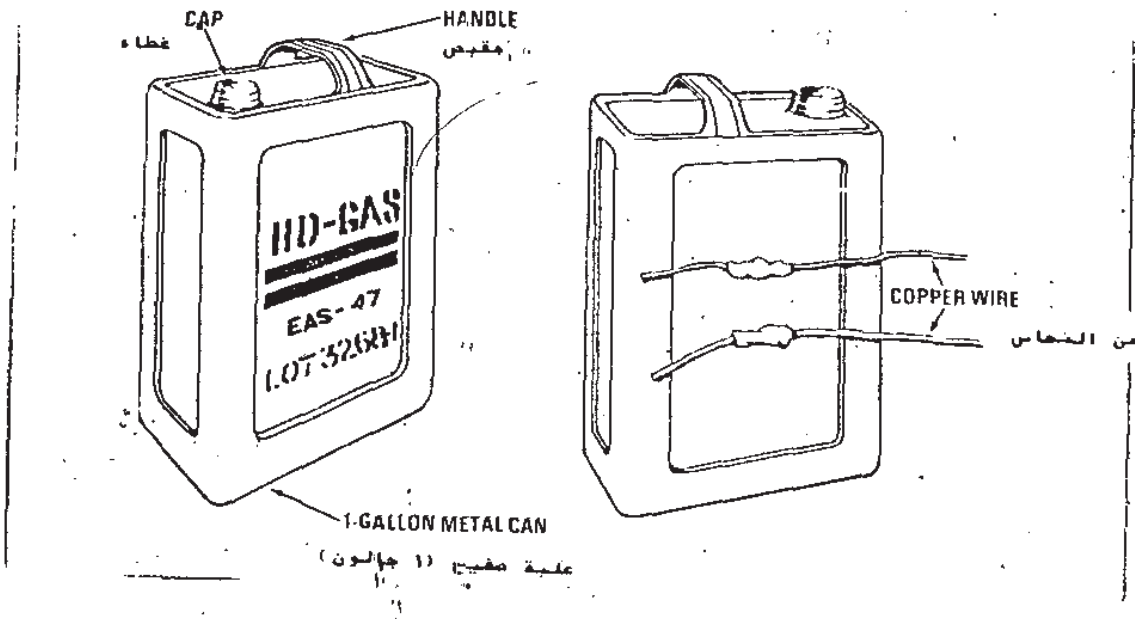
Figure C-13. Mine, Land Chemical, 1-Gallon (شكل ج - ١٣) لغم ارض كيمياوي سعة ١ جالون



اللغم الارضي الكيماوي سعة ١ جالون (٤,٥ لتر)

Land Chemical Mine, 1 Gallon (4.5 litters)

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Ignition devices

Many igniters are designed for use in providing anti-removal capabilities for American anti-tank mines. American igniters are ideal and have several advantages over improvised igniters (made on site from raw materials) to include supplies taken from commonly found equipment. They are distinguished by their installation speed, trusty performance, resistance to weather, safety, and all the typical problems. They have a serrated base which can be easily installed on different types of mines, and some of these igniters are mentioned in detail in the following sections. Usually, American anti-tank mines use igniters by pulling or releasing pressure or by both to prevent tampering with the mine after it is planted.

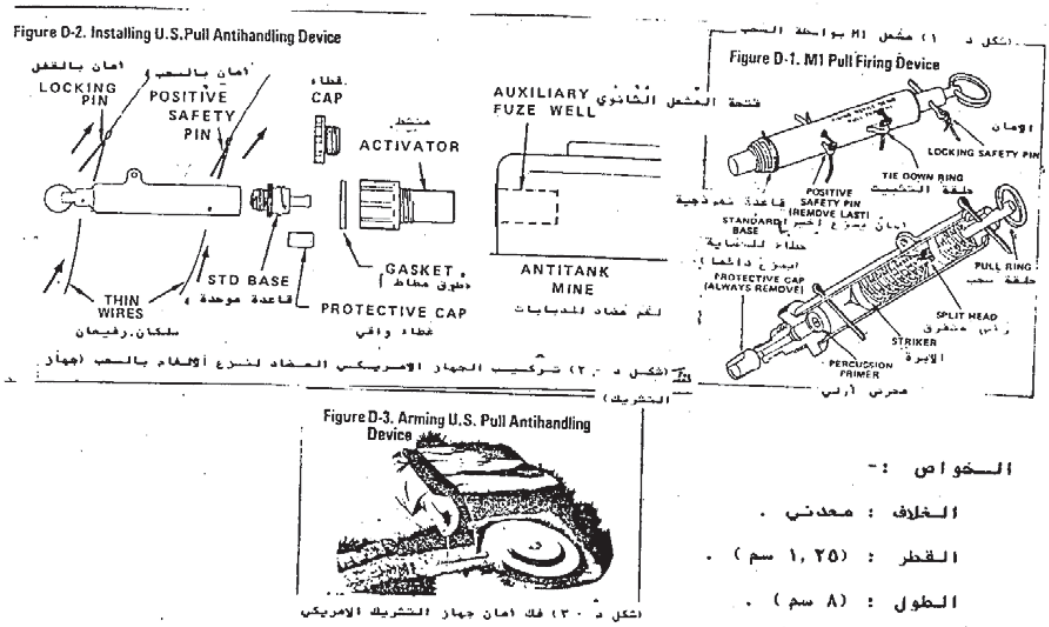
(M 1) Pulling igniter

Ignition method:

(1.1 kg to 1.8 kg) weight pulling on the tripwire connected to the igniter and will pull the releasing needle from the cleft head of the pin which will lead to the release of the pin to detonate the catalyst capsule.

Installation:

Dig a suitable hole to put the mine in the ground so that it is stable on solid ground and so the upper side of the mine's pressure plate is leveled with or slightly higher than the ground level. Disengage the safety of the mine before placing the igniter, then remove the cover from the joint base and install the ignition with activator on mine as it is in figure.



Properties: Cover - metal. Width: 1.25 cm. Length: 8 cm

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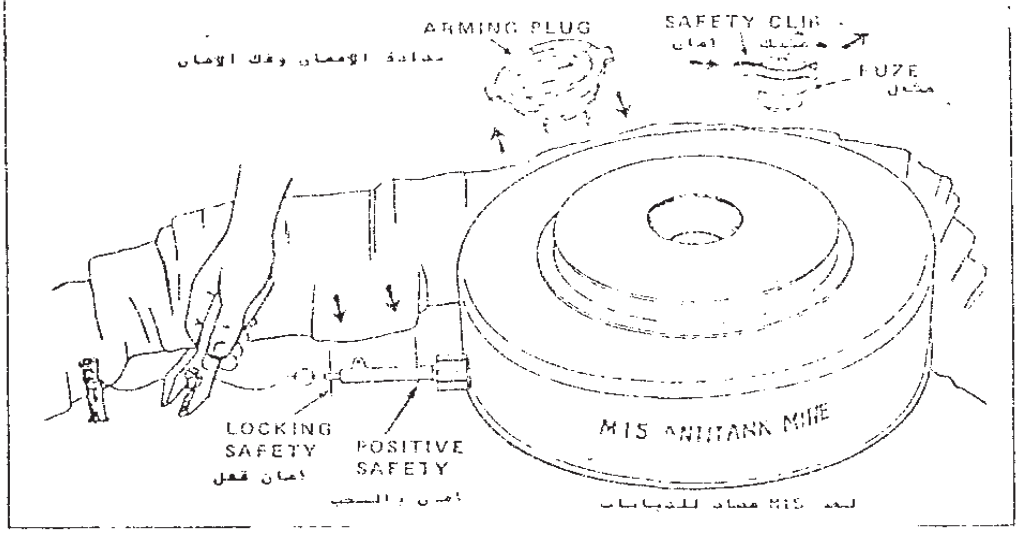
Inside the mine workings: automatic, the needle releaser is at the head of the box.
Catalyst workings: Tripwire with dragging power of (1.1 kg to 1.8 kg).
Safety: Safety locks and safety drag.
Packaging: Covers 5 igniters together, equipped with a unified base and two rolls of tripwire with a length of (24 meters) all put in small wooden boxes. Every 30 small wooden boxes are put in a larger wooden box.

Figure D-4. Disarming U.S. Pull Antihandling Device



- Put the mine in the hole and fill around it with dirt. Leave a small trench for the rigging device. Remove the mine safety pin and make the necessary camouflage, as in the figure above. Fix one side of the tripwire to a pole, and the other side to the pulling ring on the mine, remove the safety lock, and the safety pull pin, then complete camouflage as in the figure above.
- To disarm the mine: remove the dirt from above the mine with caution, look for any rigging device and locate it, engage the safety pin first then the safety lock, cut the tripwire, place the safety disc in the safe position. If you are sure that it will not set off the mine, remove the igniter and dismantle it, remove the safety pin, place the safety clip, remove the mine and the igniter and keep them.

(M3) pulling/pressure/tension-release activated igniter

Operation:-
A- Removal: pulling force of (2.2 to 3.8 kg) on the tripwire

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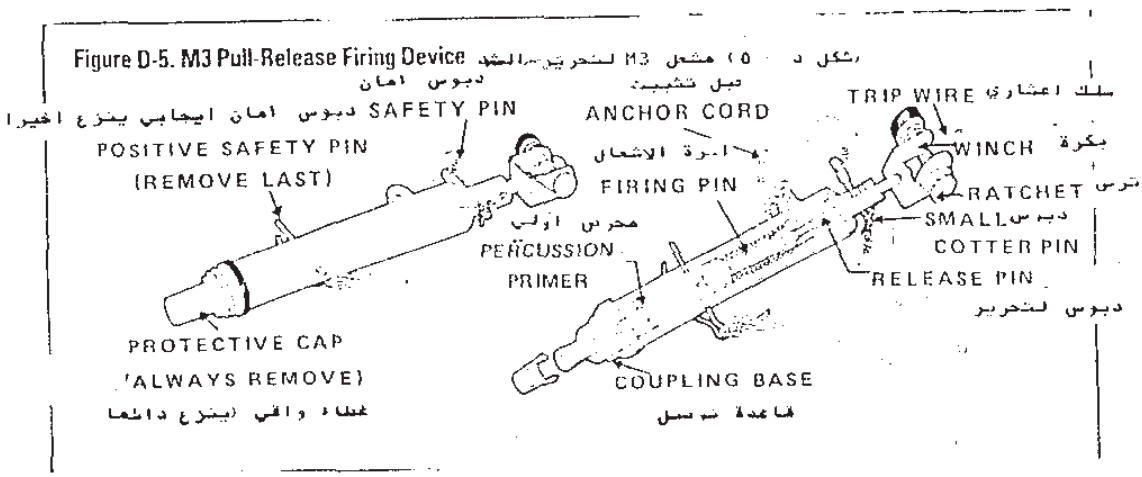
Lift the release pin to allow it to pass through the barrier inside the tube, and when the ignition pin holder is released, the pin hits the capsule causing it to explode.

B- Release the tension: (disconnecting the stretched tripwire) will allow the ignition pin to go forward driven by the spring and cause the capsule to explode.

(M 5) pressure-release activated igniter

Operation:

Lifting the weight off the pressure plate at (1.9 kg) or more will also release the firing pin which in turn touches the capsule and detonates it.



Installation:

Dig a suitable hole for planting the mine so that the base is on solid ground and so that the upper edge of the pressure plate is even with the surface of the ground or slightly higher, remove the protective cover of the rigging base, the igniter, the activator and the mine.

Place the mine and the igniter in the hole on a plate of wood to ensure a solid surface for the igniter, then complete camouflaging, and leave a side hole to remove

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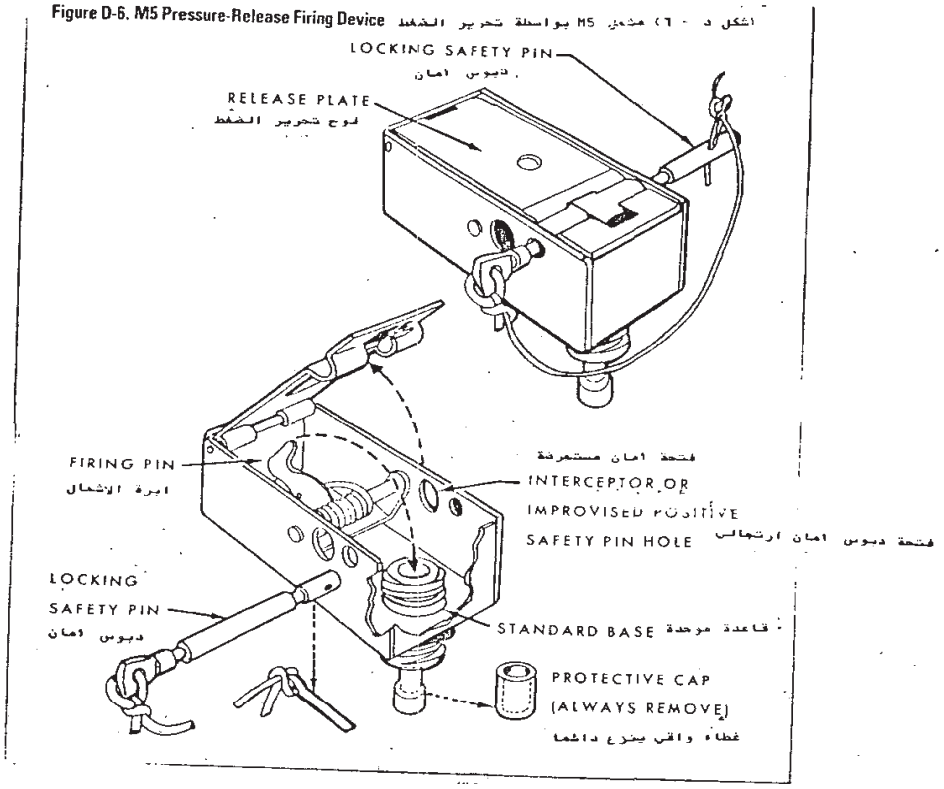
the safety pin. First carefully take out the safety pin, and then complete camouflaging as in figure D8.

Disarming the mine:

Carefully, remove the soil from the mine, and then determine the location of the connecting devices. Place the safety pin in the open safety slot, place the safety disk on status (letter S) and then place the safety clip. Take the mine and the igniter.
Take off the pressure plate (the igniter base), disarm the igniter, put back the charger lid and then reassemble the mine.

Specifications for removing and releasing pressure of (M 3) igniter:
Igniter body: Metal, Diameter: 1.4 cm, Length: 10 cm.
Internal Operation: Mechanically (automatically) by pin release.
Method of operation: Pulling force (2.2 to 3.8 kg) or by releasing tension (by cutting the wire)
Safety: Safety lock, removal safety.
Packaging: 5 igniters and two rollers of tripwire, each 80 feet long (24 meters), put in cardboard boxes, every five cardboard boxes goes in a wooden box.

Figure D-6. M5 Pressure-Release Firing Device



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Specifications of pressure-release activated M-5 igniter:-
Igniter is made of metal
Length: 4.5 cm
Width: 2.5 cm
Height: 2.5 cm
Internal Operation: Mechanically (automatically) by releasing a vertical pin.
Method of activation: Easing the weight by (at least 1.9 kg).
Required: Pressure plate.
Safety: Safety pin and an open safety slot.
Packaging: 4 complete igniters, 4 wooden pressure plates covered with cardboard, each 5 of these (20 igniters) is packaged in a fiberglass box, each 10 of these (200 igniters) is shipped in wood box.

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Figure D-7. Installing U.S. Pressure-Release Firing Device

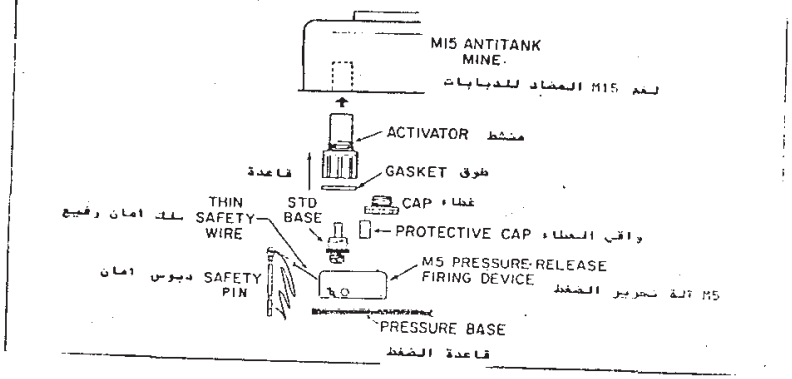
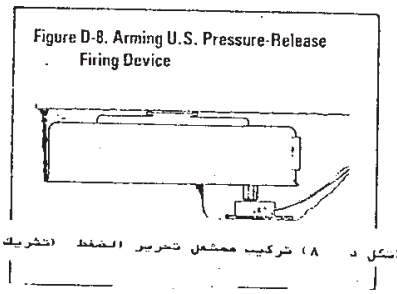


Figure D-8. Arming U.S. Pressure-Release Firing Device



Ignition (M 1) releasing pressure

Operation: After the weight is lifted from the igniter, the striker is freed and is pushed at an angle of approximately 75 degrees to hit the firing pin which in turn detonates the catalyst located at the connecting base.
Specifications: -

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Igniter body: Metal
Length: (7.5 cm)
Width: 5 cm
Height: 5 cm
Internal Operation: Mechanically (automatically) via vertical release.
Method of operation: By easing the weight by (at least 1.2 kg).
Safety: Safety pin and an open safety slot.
Packaging: Every 20 igniters are packaged in a light wooden box, and every 4 boxes in another wooden box (80 igniters).

(M 1 I 1) pressure igniter (figure 9D)

Activation:

Through pressure force of (7.7 kg) on the pressure plate will push the release spring of the pin, which pushes the pin to the inside. When the needle is parallel to the main slot (which is like a keyhole) the needle will hit the spring hard, detonating the capsule.

Specifications:
Igniter body: metal
Length: (11.5 cm)
Width: (1.3 cm)
Height: (5.2 cm without the extension of the pressure plate)
Internal Operation: Mechanically (automatically) via a trigger with a slot which looks like a keyhole.
Method of operation: Pressure at a force of (7.7 kg) on the pressure plate.
Additional requirements: Pressure head with three branches and another pressure head with three branches and an extension arm.
Safety: Safety clip and a pulled safety pin.
Packaging: Every 50 firing devices in one cardboard box and each 5 of these boxes in one wooden box (250 firing devices) packaged as required.

(M1, M2) Activators for anti-tank mines

Activators are originally for fuses, and can be used along with other types of igniters, which gives these anti-tank mines a secondary igniter.

The M1 activator is usually used in (M 15) anti-tank mines while the (M2) activator is used in (M19) nonmetallic anti-tank mines. The activator is used as a link to the igniter. At the end of the activator there are external indentations for installing the activator inside the “activator opening” in the mine, and on the other end there are internal indentations

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for the installation of the joint igniter base which contains the first catalyst.
Description:-
(M1) Activator: Length (5.3 cm), made of plastic in olive green color, it has a threaded cover and rubber gasket, as well as a capsule with a fuse attached, and it contains the explosive TNT. The thread diameter to mount it on the mine is (2 cm).
The M2 activator is similar to the M1 activator except it contains (RDX) and its total length 5 cm.

Figure D-9. M1A1 Pressure Type Firing Device (شكل د - ٩) مشعل M1A1 بالضغط

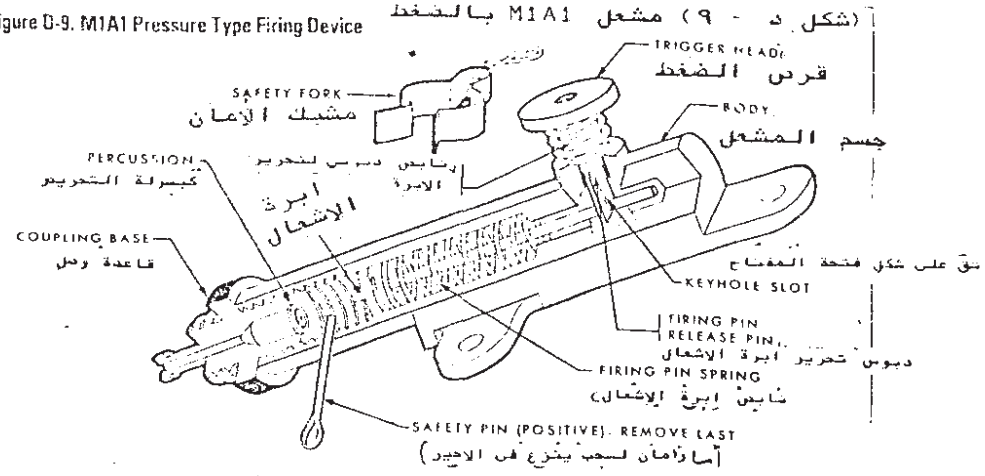
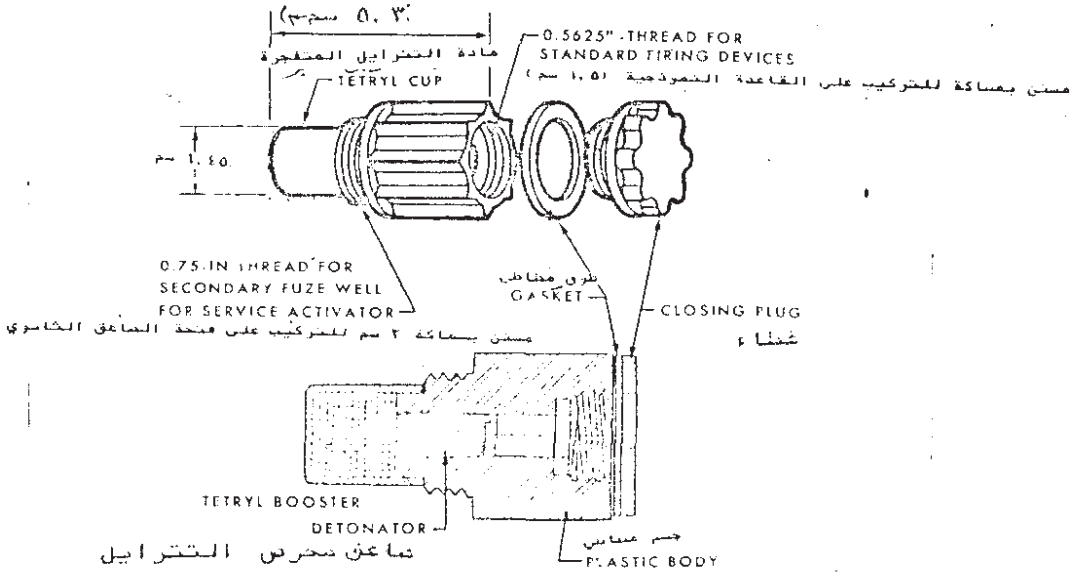


Figure D-10. Activator, Antitank Mine, M1 (شكل د - ١٠) منشط لغم الدبابات M1



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Removing mines and booby traps and deactivating them

After finding and determining the mine's location, you must put a clear sign and either walk away or blow it up at its place or pull at it with a rope from a safe distance or disable it and take it out manually. The decision on which method depends on location and the type of mine and the igniter as well as the tactical situation, for example:

- Mines planted in buildings or on bridges or any other sites, if detonated, will destroy important and useful facilities as a result of the explosion; therefore, they should be disabled and removed manually.
- Mines planted on the roads should either be pulled by rope or wire from a safe distance, or be detonated in place. In this case you should plan to repair and fix the road where the damage occurs.
-

In the event of chemical mines, it may be necessary to remove the mine by hand in order prevent pollution caused from its detonation.

- During offensive operations when silence/quiet and speed are essential, if you discover a mine on the targeted road, you must put a clear sign for our forces personals to avoid and not to waste their time trying to find it or to get it out. But mines with tripwires as well as anti-tank mines that are known to have firing device sensors, these need to be defused and removed.
- When silence/quiet is not necessary and destroying the mine does not cause major damage or destruction to the facility, then all kind of mines except chemical ones should be pulled out by rope or be detonated in place. As a general rule, the chemical mines should be defused and removed but not be detonated to avoid pollution. Consultation with the Mine Team is required when dealing with unknown type mines.

** Safety measures: you must note these measures during demining operations.

1- Individuals located in the minefield must:
   A. Be scattered.
   B. Do not run.
   C. Move in cleared places only.
   D. Move only to help injured individuals when ordered by the leader of the unit.
2- All suspicious areas should be searched thoroughly.
3- Any found mine should be presumed to have a tripwire until proven otherwise.
4- Removed mines should be defused from firing devices and fuses and stored separately.

Also, maintain a rapid means of communication to secure full control and the rapid evacuation of the wounded. You should consider the use of helicopters for evacuation.

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Also, there should be members of the medical team close by to the mine fields being demined so as to provide medical aid if necessary.
** On-site detonation:
It is possible to detonate mines on site using several methods including:
-Use the hook: Mines with tripwires or extended arms can be detonated by throwing or launching a hook tied to a rope to minefield and then dragging it to you until the mines explode. These hooks can be made at the site from scrap metal or flexible poles; the rope length is 50 meters. You should take a fortified position when throwing and before the hook or the rope touch the ground because it could trigger one of the mines when it falls.
-Explosive charges: You can use explosive materials used in sabotage to blow up mines on site as in figure (H1), a charge of (180 grams) of (TNT) or (C4) is sufficient to blow up one mine if you put it on top of the mine. It is possible to put charges above several mines linked with a rope and then detonate at once. You need a larger charge to detonate the mine.

Burning the vegetation:
When conditions allow, it is possible to burn the vegetation cover if it is thick and dry, leading to the removal of plants and to the detection of the mine. Some mines may explode when using this method, especially small individual explosive-effect mines (non-fragmentation), but when the fire stops you must examine the minefield well to detect places with mines that were not detonated by the fire.
Warning:
The burning may make unexploded mines hypersensitive and more dangerous than they were previously.
Demining by firing weapons:
Pulling mines from their place by ropes or wires prevents injuries to individuals working on demining armed mines. This method requires removing the dirt from the top of the mine until some part of its surface such as the arm or the holding ring is exposed, so as to be able to tie the mine to a rope or a wire without moving the mine in order to prevent the detonator and the mine from exploding.
This method is safe and prevents the detonation of mine, reducing noise and explosion craters, except in booby-trapped mines.
The task can be made easier by placing three wooden poles as in figure (E3) and making the pulling of the mine with certainty and easily on the first attempt. Following are steps for pulling the mine by rope:

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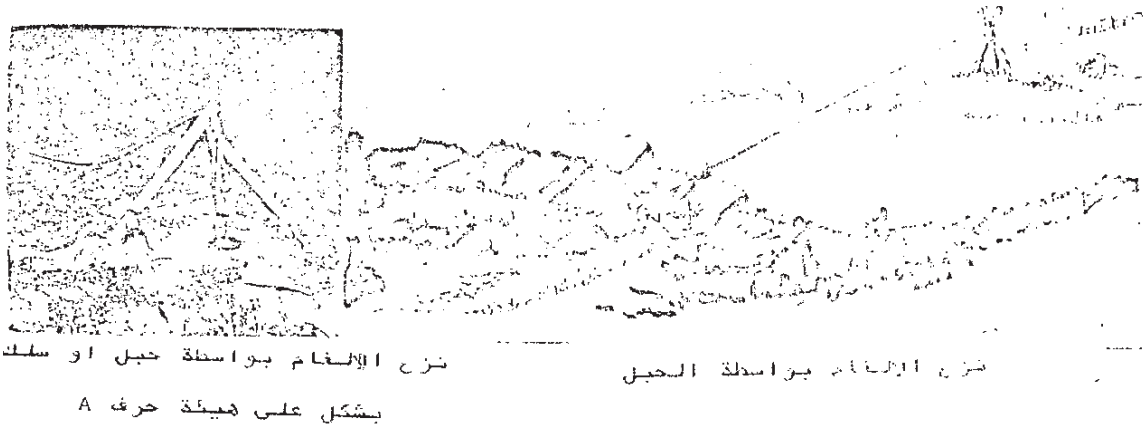
- Remove the dirt from the top of the, mine enough to make part of it visible and to enable tying the visible part by a hook to a rope or wire length of 50 m without moving the mine. If unable to tie to any suitable part of the mine then put the hook under the mine from the opposite side of dragging the mine.
- Barricade yourself behind cover after making sure that there are no mines, and if there is no place to barricade yourself behind then duck away from the mine by at least 50 meters and then pull it from its cavity. You can use armored vehicles for cover.
- Wait for five minutes before leaving the cover as a precaution from a delay timer placed on a mine especially if the type of mine is unknown.

Removal by deactivating manually:
U.S. mines must be defused by anti-mine squads who can defuse mines in the following cases:
- When progressing toward the enemy silently.
- When you need to use the building or bridge or any other facility where the mine is located.
-When you are sure of the type of mine and it can be defused manually and it can be used again.
- When the mine type is not known; then it would be necessary to obtain it for intelligence purposes.
- When the mine is a chemical type and it must not explode for fear of contamination. Certain steps must be followed to deactivate the mine manually. These steps vary greatly depending on location, type of mine, grade, and type of igniter.



Demining by using a rope or wire in the form Of a letter A

Demining using a rope

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How to defuse booby-traps

Do not touch any part of the mine or booby-trap or any other explosive charge without examining it well first. Locate all ignition devices and ignition primers (triggers).

When there are electrical or tripwires, look for and locate any middle electrical connections placed to hinder detection and removal. Do not move any wires when you examine explosive devices.

Special precautions:-

Be warned fully when dealing with the delay devices. Such devices must be exploded on-site, or clearly mark it to be handled by specialized personnel. You must also be very careful in dealing with booby-trapped grenades, whereas they are ready to explode at the slightest move or incitement. Usually its delay detonator is taken out when it is deployed, therefore it is preferable to detonate it on-site.

Containers and wood covers or those made of cardboard or alike containing explosive substances are very dangerous if agitated if it was put aside for a long time. They are also very dangerous when you try testing them by a rod or the like, especially if they have reached a high degree of decomposition. The decaying high explosive material is susceptible to explosion therefore it should be detonated in-place.

Some types of igniters become highly sensitive after exposure to moist soil and then must be detonated in-place as this would be the only safe way to remove and defuse them.

Anti-tank mine deployment system (M-57)

The anti-tank mine deployment system (M-57) or (ATMDS) is a system used to deploy (M-15) mines automatically when there is a need to deploy a large number or them. The deployment method of minefields is subject to all kind of procedures and required reports of minefields, such as the report “starting mine deployment” or the report “ending mine deployment” followed by another report “estimated weight of mines”.

Description:

(M-57) (ATMDS) system consists of a tank to store tools used in the preparation of the mine and a carrier or platform to help deal with the mines and (M-57) mine deployment system. The tank contains fast openers of **[TC: Illegible]**

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Mine containers:-

This is a safe way to transport mines with igniters in a safe position and you should pull at least every 3 containers together as in figure (F2).

Mine distributor:-

It is a two-wheel cart with two adjustable axes and an arm to drag, as well as middle and upper tracks which can be separated and reinstalled. The distributor has a toolbox for kits and spare parts.

It has two lights in the rear as well as a service light. It does not have ballasts, there is a weak link connecting the drag arm in the distributor with the dragging cart, which works as a safety device; it will cut when faced with tension of (3750 kg). The cut will disconnect and prevent any damage that could happen to the dragging cart or the distributor when facing any obstacle.

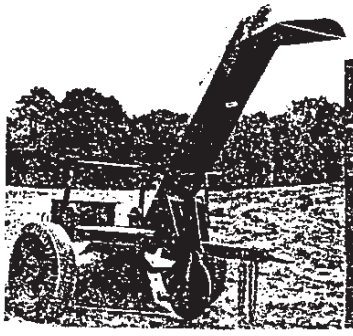

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Figure F-3

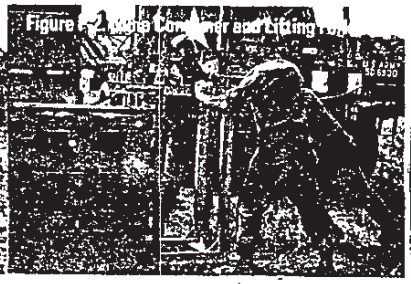

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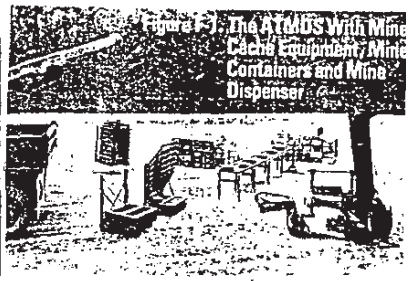
Figure F-2



شكل ١ ـ ف

Figure F-1

To facilitate the process of containing the mines there is a separate circular disk at the forefront of the container, and there is also a piece of rubber stored in the toolbox to mount on the back of it a base of formation plate to balance the mines so they do not turn upside down when they are deployed.

Dragging cart:

System (ATMDS) can be dragged by wheeled trucks (M-34, M-36, M-41, M-51, M-54, M-55, M-135, M-211, and M-656), truck M-548 is the favorite in remote areas. You can use truck (M-311) but its use is not preferred because it can only pull two mine containers.

The process:

The system (ATMDS) deploys mines (M-15). These mines are stored in the front distribution storage where they are taken out of their boxes and the igniters are installed without removing the safety pins, and then the mines and containers are placed on one of the carts mentioned earlier. When loaded on 2.5 ton combined trucks, they will be put in a row width of 8 wheels

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(48 mines = 625 kg). Each vehicle carries 3 containers (144mines=1875kg) while 5 ton trucks drag 6 containers (288 mines=3750 kg). Trucks will transport mines from a storage site to a minefield position. Usually the storage place is away from the minefield and you must have continuous communication between the storage site and the location of the minefield. When using this system to deploy mine type (M-19), the form and method of deploying this mine will lead to malfunction and disruption of the system which does not happen when deploying mine type (M-15).

In the minefield, the truck is connected with the mine distributor. Personnel ride in the storage room and the two of them hand the mine to the third individual who takes off the safety pin and places the mine in the distributor, where another individual supervising on the ground gives him the signal for where to unload the mines. The distributor has the ability to deploy mines on the surface of the ground or buried in the soil at a steady speed, deploying as many as 385 mines per hour. But the tactical speed depends on the ability of the truck as well as on the efficiency of the personnel and the natural conditions, such as rugged fields and the vibration of the truck and the slopes and speed of movement and atmosphere. The observation personnel on the ground completing the process disguise the mines by using natural materials available and by planting individual mines or booby-trapping the mines.

After the unloading of the truck, it is separated from the mine distributor and it is connected with another loaded truck with mines to complete the planting, while the empty truck heads to the warehouse to load up again.

Principles of the process:

Anti-tank mine planting is used in many places, in order to achieve quick results. Theoretically it is assumed you can deploy 385 tank mines. The speed depends on the coordination between the storage site and minefield. With much practice it is possible to deploy mines within equal distances similar to the distances that can be obtained by hand deployment. When deploying mines in two sequences interchangeably, then you can get the typical format of a minefield with two rows like the one deployed by hand. To deceive the enemy you must leave some gaps without deploying mines and others with partial deployment.

When deploying the mine, it must be marked with a stick or any label to help in the process of recording the field, and when deploying several rows, these signs and marks should be retrieved to be used again.

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Mine storage and supply process:

The speed of deploying anti-tank mines type (M-15 and M-19) at the operational field by using the (M-57) hook to prepare the mines requires that the supply operation be fast and organized at the same time. This site must supply a constant amount of mines to the minefield so the mine deployment process does not stop. The speed of the supply process depends significantly on the arrival speed of trucks from the supply centers and the number of personnel used, the organization, and the number of available supply lines in use.

The mine supply machine:

See figures (F1, F2)

Operators of the supply machine:

The number of operators required to operate the storage and supply site which supports the (M-57) system to deploy anti-tank mines depends on the number of machines deploying mines requiring support. Usually a group of 12 people is used to operate one supply line (see figure 4F). This system can, in one supply line, prepare 500 mines per hour.

Operation of the supply system:

Distance is an important factor for the operation of the supply system, where the point of supply must be as near as possible to the minefield to be mined, so as to make the towing distance as short as possible. If there is a sufficient number of trucks and containers so as to ensure a fully loaded vehicle with mines will always be at the minefield to be used when needed then distance is not to be of great importance. To obtain a larger quantity of supply the members of the group should be in a specific system as shown in figure (F4), and when the truck arrives loaded with mines from the storage centers, the boxes should be emptied of the mines and stacked as shown in figure (F1). The conveyor belt is set up vertically to stack piles of boxes. Open the boxes and separate the mines from the igniters and remove the mine brackets. Mount the igniter on the mine and close the safety cover fully and put the mine on safe status, and then the mines are carried in containers which are lifted using a forklift on the towing vehicle. The vehicles will transport the mines to the minefield. The distribution will be done by the (M-57) machine. Do not try to transport mines from one vehicle to another at the mine deployment site.

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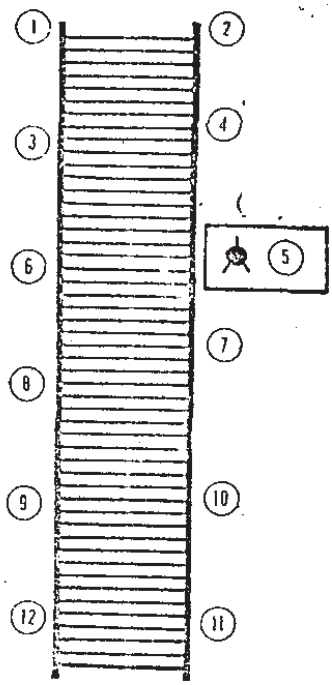
The (M-57) vehicle does not receive more mines outside the minefield, but instead the towing vehicle and the M-57 distribution vehicle meet wherever the distribution vehicle stops in the middle of the clear path in the minefield, and then the exchange takes place without the plow leaving this path.

Supplying mines: Mine boxes must be transferred to a site near the minefield to reduce the distance of transporting mines with igniters.

1- Remove the connection and place the mine on the moving conveyor belt.
2- Remove the connection and place the mine on the moving conveyor belt.
3- Open the box, take out the igniter box and place it on top of the mine.
4- Open the box, take out the igniter box and place it on top of the mine.
5- Open the igniter box and place the igniter with the clamp in the corner of the mine box.
6- Take the mine out of the box and remove the protection from the mine.
7- Remove the cover of the safety slot and place it on top of the mine.
8- Take the igniter out of the box and remove the safety clip and mount the igniter on the mine.
9- Remove the box from the moving conveyor belt.
10- Replace the safety slot cover and put your finger over it.
11- Monitor and inspect the igniter.
12- Raise the mine from the moving conveyor belt.



** Warning:
The same person who removed the safety device from the igniter must install it in the mine. Handle the igniter with great care.
The container that needs to be loaded can either be connected to or separated from the truck.

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Required equipment and training tools:
Mine detector
Blackboard
Classroom with electrical outlets
Fuses and igniters
Marking tools for the minefields and barbed wire
Surveyor's rods (or poles) and gloves
Flashlights (one per person)
Light signals
Wireless
Demolition tools
Tools for digging trenches for each person
Kit for mine training (DVC5-17)
Tape measure (distance in meters)
Sandbags
Cardboard boxes, pieces of wood or cardboard (2.5 cm) thick
Wires, safety pins, and clips
Notebooks and pens
Flashlights
Tripwire and dummy mines (non-explosive)
Geometric compass
Maps with drawings and scale models of the topography
Signals for marking, as well as adhesive tape
Examples of records of minefields
Multipurpose carrying bag
Nails and necessary preliminary kit
Photo display device
Display screen
Area suitable for deploying mines and showing how to record as well as showing an offensive progression
Fixed location installed with tripwires

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Typical configurations of minefields

Explanation and definition of terms:
Landmarks:
A natural or artificial mark, whose exact coordinates can be determined.
Outer edge:
It is an irregular group of mines deployed between the outer line and the outer perimeter of the marking fence so as to improve the performance of the minefield, to cover the expected approaching tanks, and to deceive the enemy from knowing the formation of mines used and extension of the minefield.

Cluster of mines:
It is the basic unit in the deployment of the minefields. They can be anti-tank, personnel, or mixed. It consists of one to five mines per cluster. The cluster does not contain more than one anti-tank mine (see figure H1).
Row of mines:
One row of clusters deployed almost in a straight line.
Strip of mines:
Two parallel rows of mines deployed at the same time that are six meters apart from each other (see figures H2, H3, and H4).
Mined area:
It is part of a row of mines that extends in a straight line and begins with a mark when the row of mines starts and it ends when the row ends or changes direction.
Typical formation:
Usually it is the agreed upon composition of mine deployment and it consists of a single irregular outer edge (IOE) and at least three regular rows of mines.
Methods of measuring distances or intervals:
Distance is measured in meters, and you can also measure by steps when mines are deployed manually, counting each step as (.75 meter) but the boundaries of the minefield must be measured accurately in meters. The safety distances must be measured in meters as well when using a mechanized method.
Other measurement devices:
You can use any other easy distance measures available to you when deploying minefields and we mention here some examples of these means:
*Held rope: It is possible to use a rope or wire or tape knotted at intervals (usually every 3 meters).

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You can create form and standard measurement at the desired length (see figure 5H). It is preferable to use this method when deploying minefields due to its accuracy.
*Stick and rope: This method enables the deployment of mines according to a model, which is more accurate than the measurement by step method and which is almost as fast. This method requires the use of a 3 meter long stick and rope. The rope will be knotted at the end of minefield area and another person standing exactly 3 meters away from the person in charge. The person in charge walks sideways another 3 meters toward the enemy side until the rope is taut where he will signal the mine holder to place the main mine.

In the first cluster of mines the lead man carries a stick perpendicular to the middle of the minefield, and while the lead man is doing that, another person who is standing to the rear walks forward to become exactly behind the lead man and then places the first mine. The lead man again moves and the person behind him moves forward again to the exact place of the lead man, who will mark (using the 3 meters stick) where to deploy the second mine, which will parallel the minefield area on the opposite side of where he placed the first mine.

Thus this work is repeated by changing directions until the minefield area is covered. When the lead man gets to the point of changing directions before the rope becomes taut; the person to the rear walks forward to stop at the point of direction change.

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Figure (1-C), cluster mines

Deployment of one anti-tank mine

Cluster consisting of an anti-tank mine plus a few individual mines deployed inside a semi-circle of diameter 2 meters around the tank mine.

Deployment of one personal mine

Cluster consisting of central personnel mine plus a few individual mines deployed inside the semi-circle of diameter 2meters around the central personnel mine.

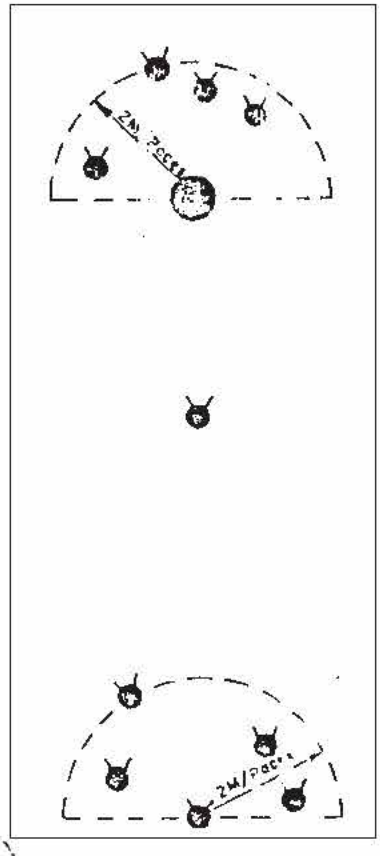
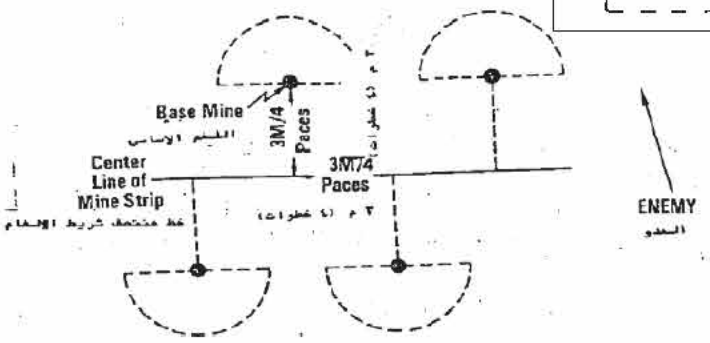


Figure (2-C) configuration model



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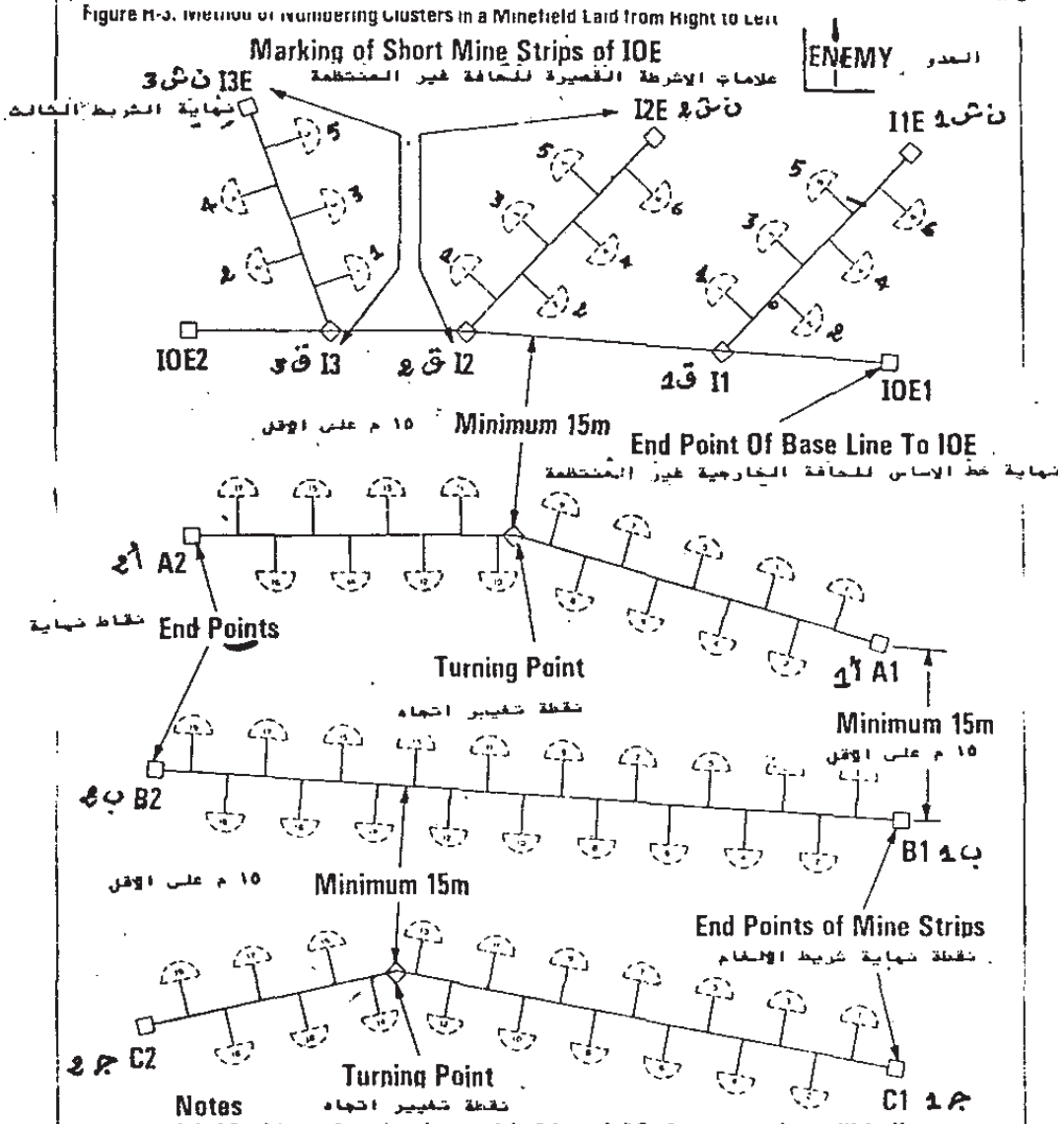
كل ح - ٣) طريقة ترقيم العناقيد في حقل الغام مزروع من اليمين الى شمال .

Figure H-3. Method of Numbering Clusters in a Minefield Laid from Right to Left



Notes
(1) Marking of end points with A1 and A2, for example, will indicate laying direction of a minefield.
(2) Laying will always begin at Point No. 1
(3) Odd numbers on enemy side of the strip.

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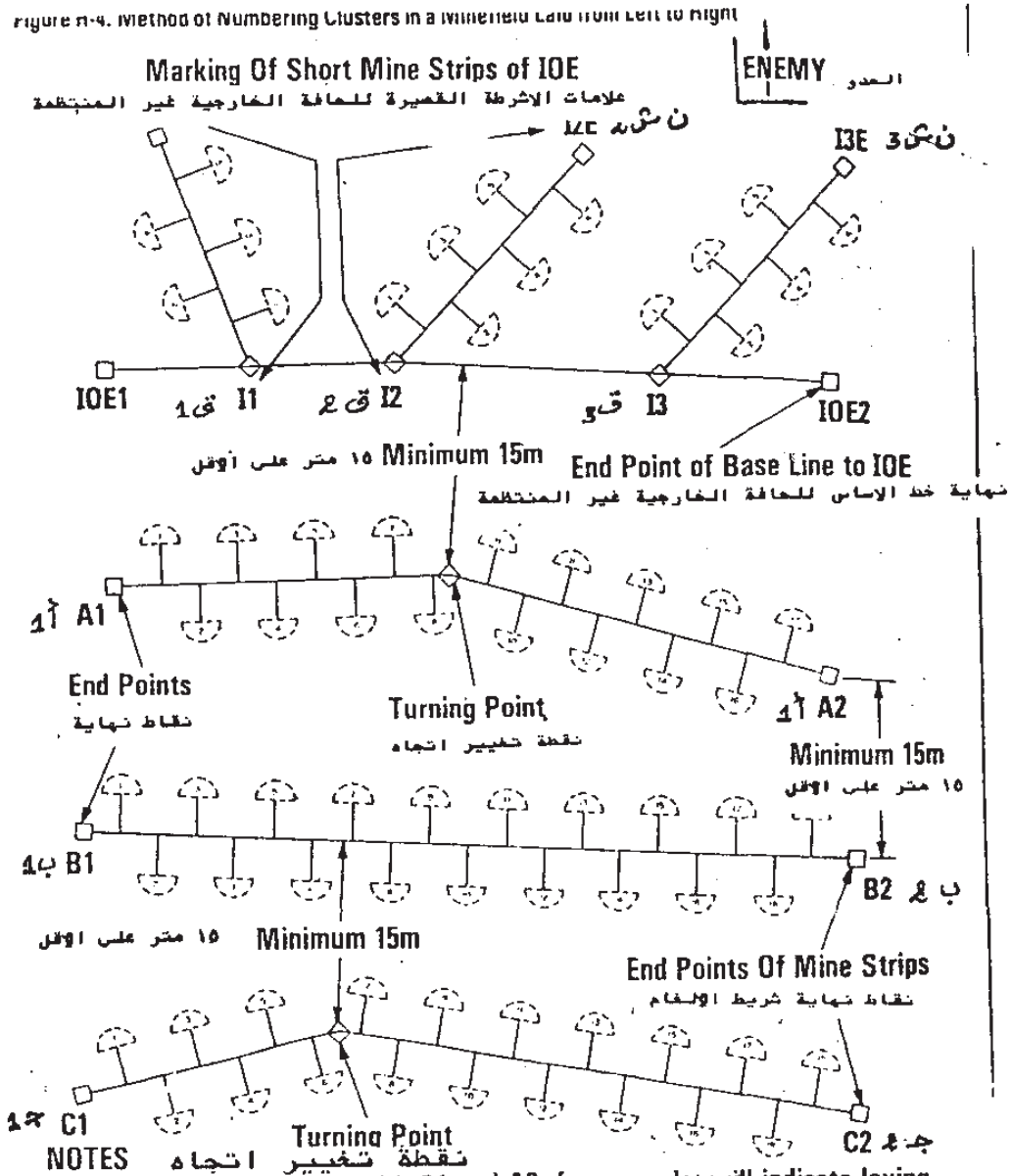
Figure B-4. Method of Numbering Clusters in a Minefield Laid from Left to Right



NOTES

(1) Marking of end points with A1 and A2, for example, will indicate laying direction of a minefield.

(2) Laying will always begin at Point No. 1.

(3) Odd numbers on enemy side of the strip.

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[TC: Illegible]:
You can measure distances between clusters of mines and within the minefield in steps then record it in meters. A normal step is .75 meters, so every 4 steps are equal to 3 meters. All members of a mine planting team should know this calculation. This gives us a minefield whose density is closer to the original design than measuring by the three-step method.

Form (DA 1335)
This form is printed paper on both sides. The front page contains a spreadsheet and information on the top, and on the bottom there is a drawing of a minefield. On the back of the sheet are the instructions on how to fill out the information on the form, as well as a table for counting the number of mines deployed in the field. It is preferable to use the scale (1 cm = 10 meters) to draw a field.
A minefield 400 meters long and 240 meter in depth can be drawn on a single form; the instruction numbers on the back refer to the numbers on each circle on the front of the form. The officer who issued the order of deploying the mines in the field will specify the degree of detail that will be included on the form. A copy of the form must be forwarded to the supreme command.
Detailed form for recording a minefield:
(Figure H6) shows front page of form (DA 1335) for a standard tactical model of a minefield, (figure H7) shows the back side of the same model which has a table showing the requirements for the minefield reflecting the estimated number of mines to be used when filling the form as shown in (figure H 5).

Recording important clusters of mines:
When making a detailed record, you must record some clusters in the note section in form (DA 1335) so that each one is known by the minefield number and the cluster number. See the (figure H6) note section and know the following items:
*Clusters that contain anti-mine-removal booby-trap.
*Clusters that have tripwires.
*Clusters of non-fragmentation explosive wave mines deployed in the outer edge of the filed.
*All clusters whose numbers were omitted.
*In addition to that, the table in the form (DA 1335) shows the location of all mines in the irregular outer edge with respect to the baseline of the edge.

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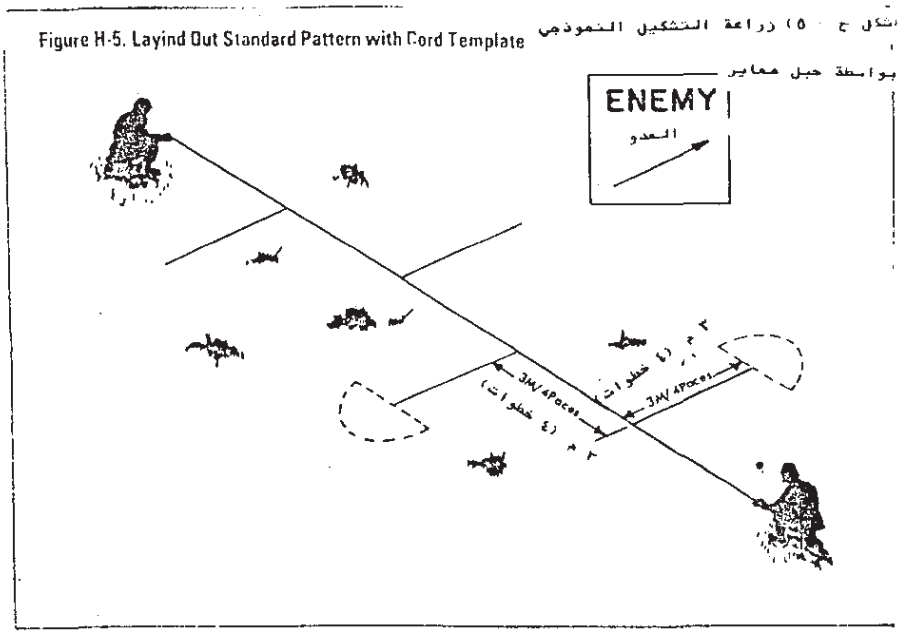
(DA 1335) shows the location of all mines in the irregular outer edge in relation to the baseline of the edge.



Large fields:

When a minefield is longer than the allocated space for drawing on the form, then you can use form (DA1335) as needed. At the lower-right corner of the field there is a place to start numbering the models next to each from right to left, starting from the first model. Then there is a place on the end of the first part for a distinct sign to help connect the models together, whereas the sign is clearly identifiable on the drawing of the minefield location.

Put this distinct sign on the left side of the first part and again on the beginning of the second part, as shown in (figure H6). We need two distinct signs to register and find the location of the deployed minefield and record it. When deploying several minefields from left to right we do this the opposite way.

Planning the typical composition of minefields:

The typical approach to deploying mines was designed in order to achieve an effective minefield while allowing for logistics and supplies and also to facilitate the drawing and accurate recording of the minefield on form (DA1335).

*Clusters of mines: The basic unit of a minefield is the cluster; see figure (H1) the term cluster is used sometimes to denote a group of mines or one single mine

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All mines in one cluster must be on or within a half circle with a radius of two meters or two steps. Deploy only one anti-tank mine in each cluster representing the base mine. The total number of mines in one cluster should not exceed five. When an anti-tank mine is not used in the group, then you choose the largest metal individual mine as an essential mine to be easy to detect. When deleting some clusters from the formation or if they do not contain any mines, they are numbered as if they exist in order to maintain the natural configuration system (see figure 9H). The clusters are numbered to facilitate the removal process and also so that we can identify clusters with tripwires or booby-traps to prevent removal or deleted clusters, and to record it in the note section in form (DA1335). Each strip of mines has its own formation of clusters as described in the following paragraphs:

Regular and irregular strips:

The irregular strip, usually called the irregular outer edge (IOE), is used to deceive the enemy and mislead him from knowing the formation used and the distances between mines in a regular strip and also to mislead the enemy from knowing the real sprawl of minefield. And the use of the outer edge depends on the amount of time available for deploying the mines, as well as by the area's terrain. This consists of the edge of the baseline component of several segment lines connected at points of change in direction. The baseline begins at the point marked number (IOE) 1 and ends at another marked point (IOE) 2. These points determine the direction of mine deployment and it always begins at point (IOE 1).

The points at which the direction changes are numbered consecutively starting from I-1. From the baseline, short strips of mines starting from the point where the direction changes extend at irregular angles in the direction of the enemy. These are marked with signs indicating a point of change in direction.

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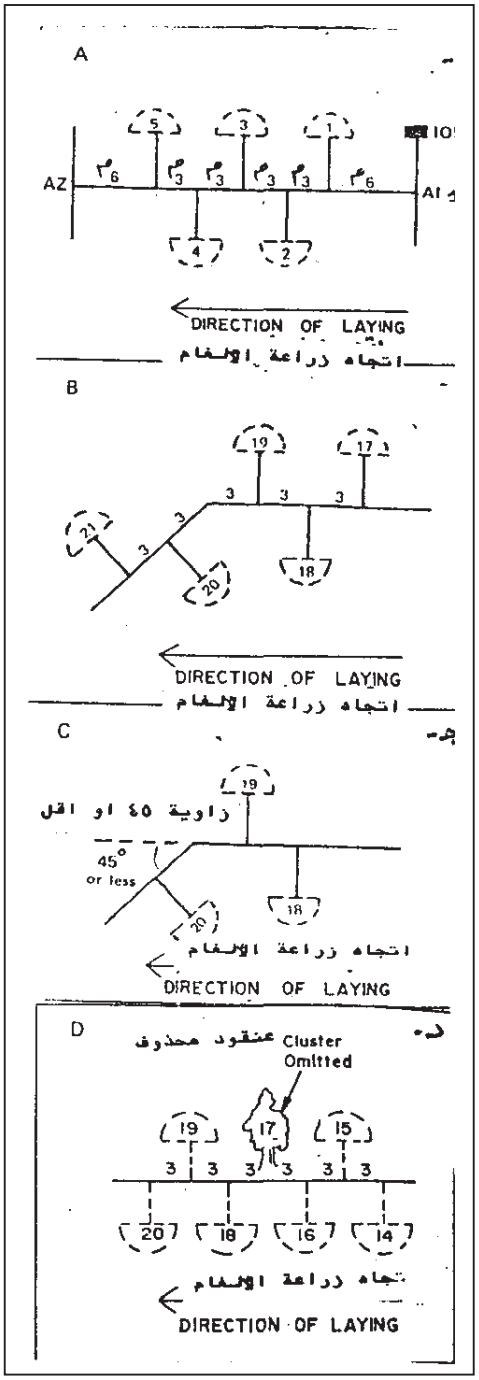
(Figure H-8-9) Points of change in direction for a strip of mines

A- The first and the last cluster are 6 meters from the field's outer border, and must also maintain a 2 meters safe distance between the cluster mines and the border of the minefield path.

B- When planting a minefield using a template we must make sure that points of changing direction are 3 meters from each other along the baseline. If the distance between the last cluster point and the point of changing direction is less than 3 meters then you must modify the changing point so that the distance remains 3 meters or 4 steps.

C- The corner at any change in direction point should not exceed 45 degrees. When maintaining a 45 degree angle as the ultimate angle it ensures a safe distance of at least 2 meters between clusters.

D- If the topography of the site is not suitable for deploying another cluster of mines, we maintain the formation of the field, and the cluster of mines has to be registered in the record as deleted.



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At the end of each short strip insert a sign in the ground with consecutive numbers starting with number (I 1), and deploy clusters at specific distances as shown in (figures H14, H15). The amount of clusters can be changed from one part to another to further mislead the enemy, and some of these clusters can be deleted clusters. These clusters are sequentially numbered so that the odd numbers are directed toward the enemy and the even ones are directed toward the friendly side. In general, the number of clusters deployed at the outer edge is equal to one third of the ones deployed as regular strips, and you should leave a distance of 2 meters between the cluster of the short strip and the main line of the outer edge. You should also leave 2 meters between the last cluster and the midline of the short strip, and leave 2 meters between them and the signs identifying the outer edge from the right or the left side, so as to observe the safety rules and facilitate the statistics work for logistical supplies of the outer edges. The clusters should be formed using a template and during the mines deployment you can change the composition of clusters at the outer edge but you must register any changes under “Remarks” in the corner of the form (DA1335). The clusters with odd-numbers are set toward the enemy side and the ones with even numbers are set on the friendly side. To determine the direction of laying mines, the eventual points are numbered (A1, A2 or B1, B2), and each regular strip has a cluster structure assigned by the officer of the deploying unit. During the mine deployment this order must be followed or recorded in the “Remarks” section on the form.

The regular strip:

In manually deployed minefields the first front row (No. 1) of the regular strip is the row facing the enemy and should be parallel to the middle of the strip at a distance of 3 meters. The clusters of mines should be at a distance of 6 meters (8 steps) from each other in one line. Cluster (No. 1) is always facing toward the enemy side, and clusters in the second line (No. 2) are arranged in an interoperated with first line so it will fall between the mines of the first line, and the clusters will be numbered sequentially from right to left or vice versa depending on the direction the mines were planted in.

Strip locations:

The smallest distance between the center lines of adjacent strips must be at least 15 meters, and does not have to be parallel middle lines, while it is possible that there can be an unlimited number of points of direction change, according to necessity or preference.

Tripwires:

The individual mines that are formed by tripwires must be placed at an angle toward the enemy side from the middle of the strip. The cluster does not contain more than one mine, and the wire must be placed at an angle toward the enemy and away at least 2 meters from any

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other cluster or the borders of the minefield path or the boarders of the minefield itself. The tripwire length should not exceed the blasting area of the mine. The trip wire is not considered an ignition device to prevent demining when t is used in mines (M 18 I 1, M 16).
Fencing minefields in the rear areas:

Fencing should be placed in the minefield's rear areas so it is completely surrounded by barbed wire or circular barbed wire at the time of laying the mines (see figure H 10). The fence does not go exactly with the minefield border so it will not reveal the actual borders location. The fence must be at least 20 steps (15 meters) from the nearest mine in the field. The high top of the barbed wire should be waist high, and the lower part ankle high. On the upper side of the barbed wire put recognizable signs every 15 meters distances, write the word "mines" on every sign and face it away from the mines. As for the minefields which contain chemical mines, it must add signs point to the existence of these chemical mines. These signs should be placed instead of the other signals (see figure H10). If chemical mines have exploded in the area then signs should be put placed pointing to the existence of chemical pollution which is a red triangle has yellow lines attached with other typical labels while the paths in the minefields should be marked as shown in (figure H 11). Distances between signs can be placed as needed and taking into account the visibility and terrain of the location as necessary.

The lead officer then determines the position of each strip of mines and locations of the distinguishable signs that outline the minefield location, as well as determining the fence placement and places where mines are to be deployed. He also determines the roads to be used to bring the mines, then determines the number of mines and other materials needed for deploying the minefield and should coordinate appropriately to make a request from the warehouses, and then finally give detailed orders to the team personnel, explaining everything by drawing out the determined plan.

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Location Planning Group:

This group will put surveyor rods or border pegs on the beginning and end of each mine strip to locate it and also to put signs on every point of direction change. It also places a strip on the mid-line of each strip of mines and on each pathway through the field as directed. After completion of the work, this group organizes for other groups according to directives.

Mines Planting Group:

Each group deploys and takes off the safety clips, camouflages all mines in the strip or part of it, and when it is done moves to do another one and so on.

Recording Group:

After the recording group gathers the necessary information it prepares form (DA1335) and places signs where needed. The group records the distances in meters, but it can record it in steps in minefields that were planted manually, but only along the mine strips.

Sign placing group:

They erect a fence and put signs on it and put up signs indicating the pathways through the minefields. After completion, they are assigned to groups according to directives.

Steps of deploying minefields:

Upon the arrival of the commanding officer with the location planning group and the sign placing group, it starts with the back borders of the field, either from the right or the left side of the field. (To determine the right and left of the field, face the enemy side). See (figure H 21). The graphics in this example are for a minefield deployed from right to left. The officer identifies for the soldiers the starting point of the rear strip, and that is for the fields with three strips. This strip is known as is strip (C). At this point the location planning group places surveyor's rods to indicate the starting point, see (figure H21). Then it indicates for the sign placing group the starting point of the fence which is at least 20 meters away from the starting point of the C strip according to the designated field drawing and depending on the nature and topography of the site. It also indicates the direction and location of the fence as well as if there is an existing fence which could be used. The sign placing group then immediately begins labeling 5 rods for the fence in a counterclockwise direction (when deploying from right to left). After all rods are placed, the sign placing group puts a single row of barbed wire around the whole field or on the desired place of the fence of the field. After the completion of placing the first strip proceed with placing the second wire.

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العلامات النموذجية للطريق (شكل ع - ١١)

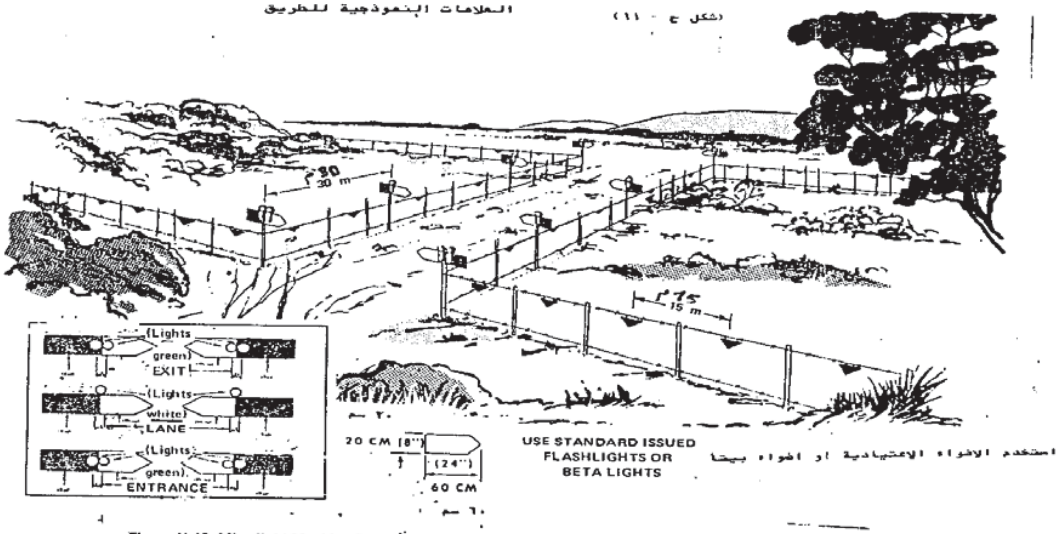
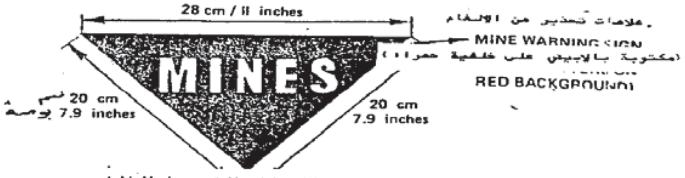


Figure H-10. Minefield Marking Fence (شكل ع - ١٠) علامات المنطقة الملغمة

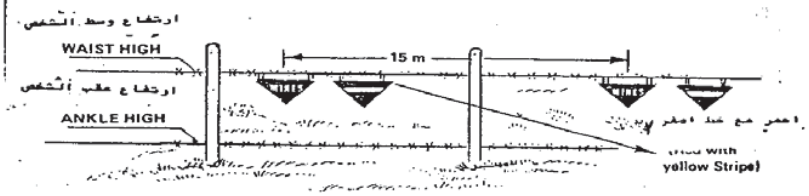
MARKING OF MINED TERRAIN



WARNING SIGN FOR AREAS CONTAINING MINES

(spaced at approximately 15 meters)

توضع كل ١٥ متر



WIRE FENCING FOR MINEFIELD CONTAINING CHEMICAL MINES

سياج الاسلاك الشائكة لحقل الغام يحتوي على الغام كيميائية

سياج شائك دائري

CONCERTINA FENCING

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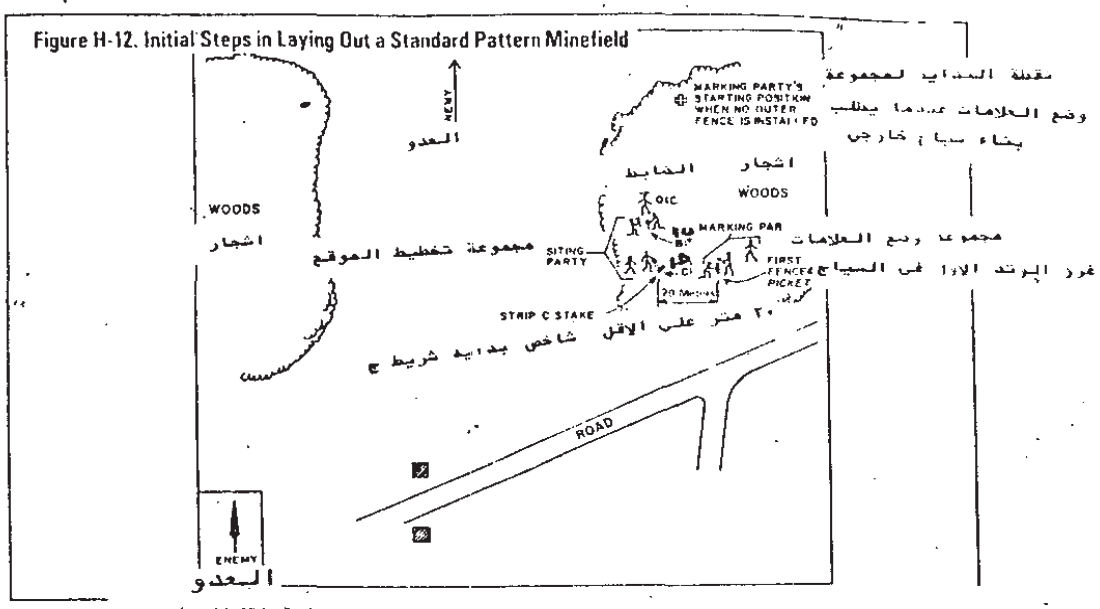
(شكل ح - ١٢) الخطوات المبدئية في تخطيط التشكيل النموذجي لحقل الألغام

Figure H-12. Initial Steps in Laying Out a Standard Pattern Minefield



(شكل ح - ١٣) غرز الشواخص على الحدود اليمنى لحقل تتم زراعة الألغام فيه من اليمين لليسار

Figure H-13. Placing Right-Hand Boundary Stakes in a Minefield Laid from Right to Left

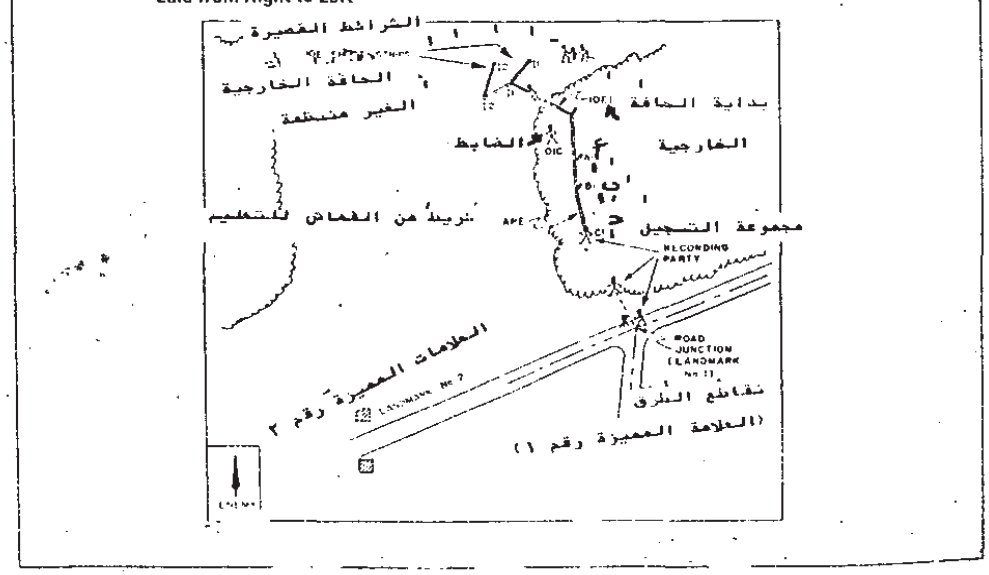


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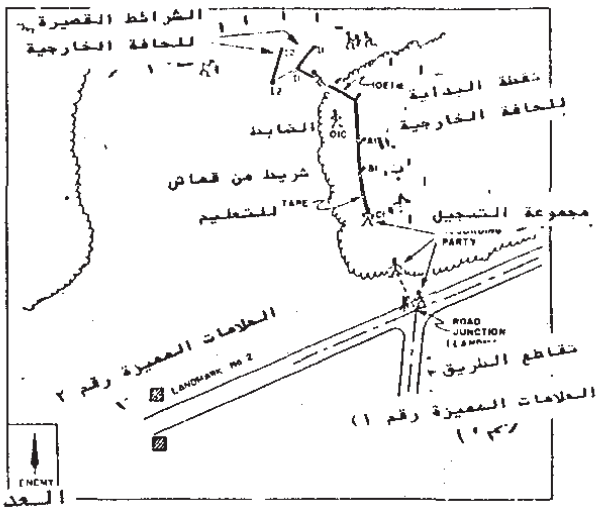
Figure H-14. Laying Out the IOE Base Line and its Short Strips (the recording party begins obtaining reference data)



(شكل ح ١٥) تخطيط الشريط المنتظم A و تحديد مكان تجهيز الألغام

Figure H-15. Laying Out Strip A and Establishing Mine Dumps

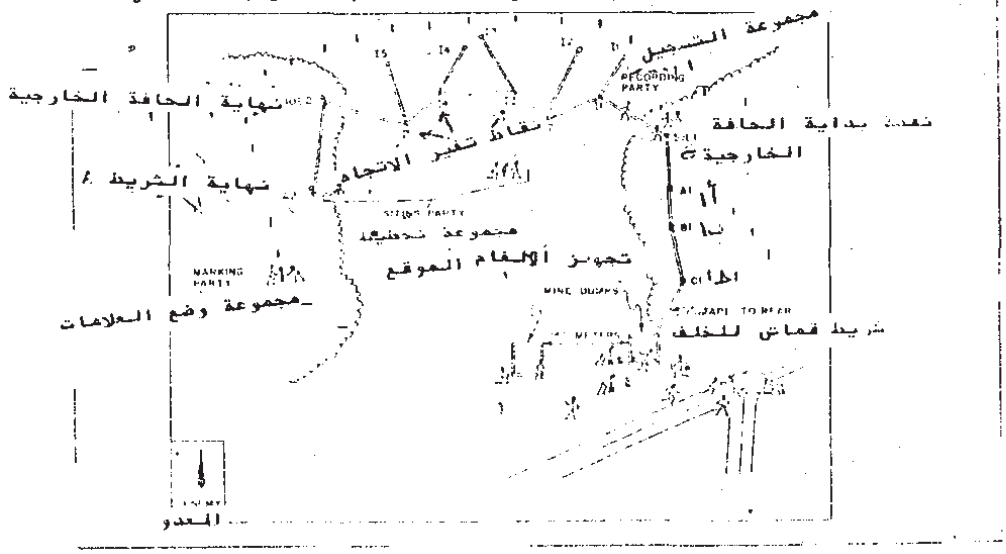


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Figure H-16. Standard Pattern Minefield Completely Taped by the Siting Party

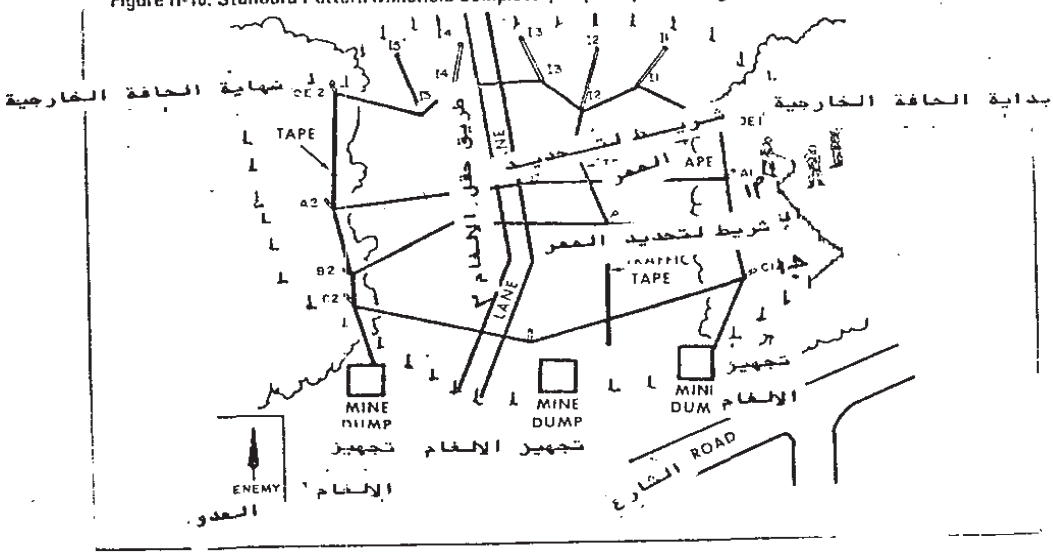
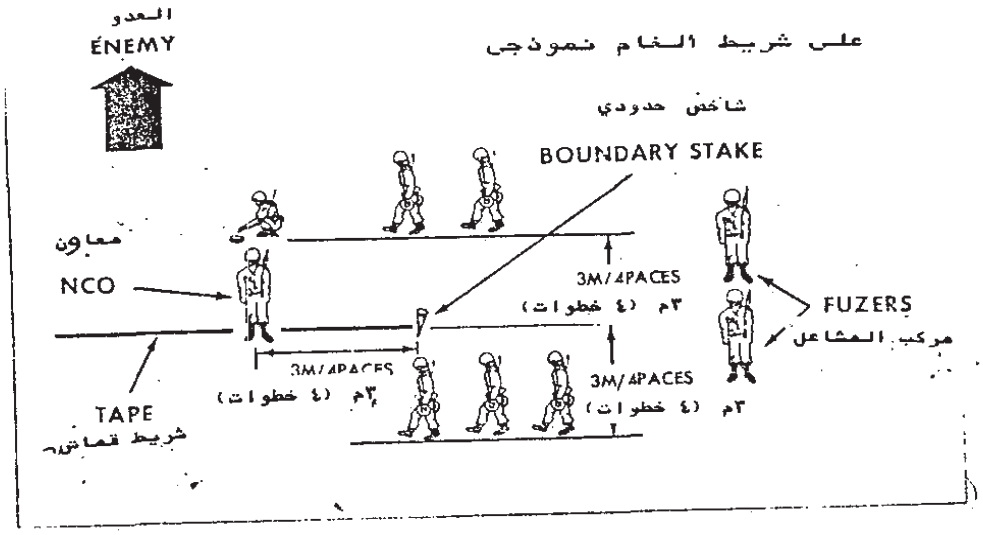


Figure H-17. Laying Mines on a Standard Strip (شكل ح - ١٧) زراعة الألغام على شريط الغام نموذجي



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Special mining techniques

Placing anti-tank mines in the water

Water depth more than (.6 meter or 60 cm):-

Deploying mines in streams depends on the water depth and on the condition of the bottom of the waterway. Deploying mines from the top of the projected water stream to the bottom is done by a group of 2 to 3 people. One person chooses the locations, the second prepares the mines on the bank of the stream at the deploying site. Mines deployed at the bottom of the water are without catalyzing substance (not ready for detonation). The third man stays with the planted mine while the other measure the distance between the newly planted mines. Angle and distance from one mine to the other is recorded and reported to the recording person at the bank of the stream.

The person located at the first mine fixes and secures the position of the mine, installs the detonator and stays downstream of the mine, then moves further downstream and away from the mine. The groups interchange positions until they all are downstream away from the mines that have been prepared for detonation. Figure (11) shows by numbers the sequence in which the mines must be planted in a waterway. Whenever any mine is planted, the mine deploying group (recording) department will be informed of the mine location. The strips of mines underwater should have a permanent recognized reference point under the waterway. That way they can be removed if necessary in case of such an order. Each group should be equipped with a prismatic compass and knotted rope one meter between one knot and another. A guidance safety rope should be placed across the water steam at the bottom of the water stream where the minefield is located to aid and protect the individuals deploying the mines. Rows and standard lines are installed as needed on the bank to complement the minefield. Deploying anti-personnel mines should be above the highest water level.

Water depth is less than .6 meter (60 cm):-

Row minefields are easier and quicker to record whereas the groups have uniform distances, and parallel rows, and its ends extend tilting toward the upper side of the water stream. A knotted rope is used with equal distances between knots to deploy mines where the rope will be extended and fixed. When deploying each row, the reference rope will use a compass and measure the distance from the end of the previous row. Figure (12) the reference rope is showing the location for planting line (C). Like in the first method, mines in the upstream are planted first.

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Figure I-1. Mining of a Ford Site, water over 0.6 meter

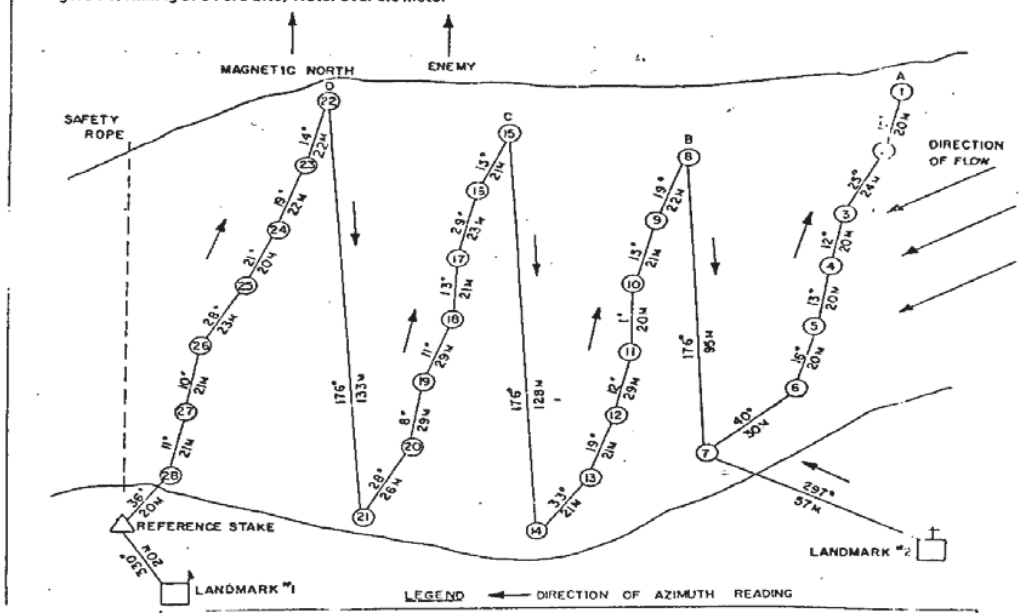

Figure I-2. Mining of a Ford Site, water less than 0.6 meter